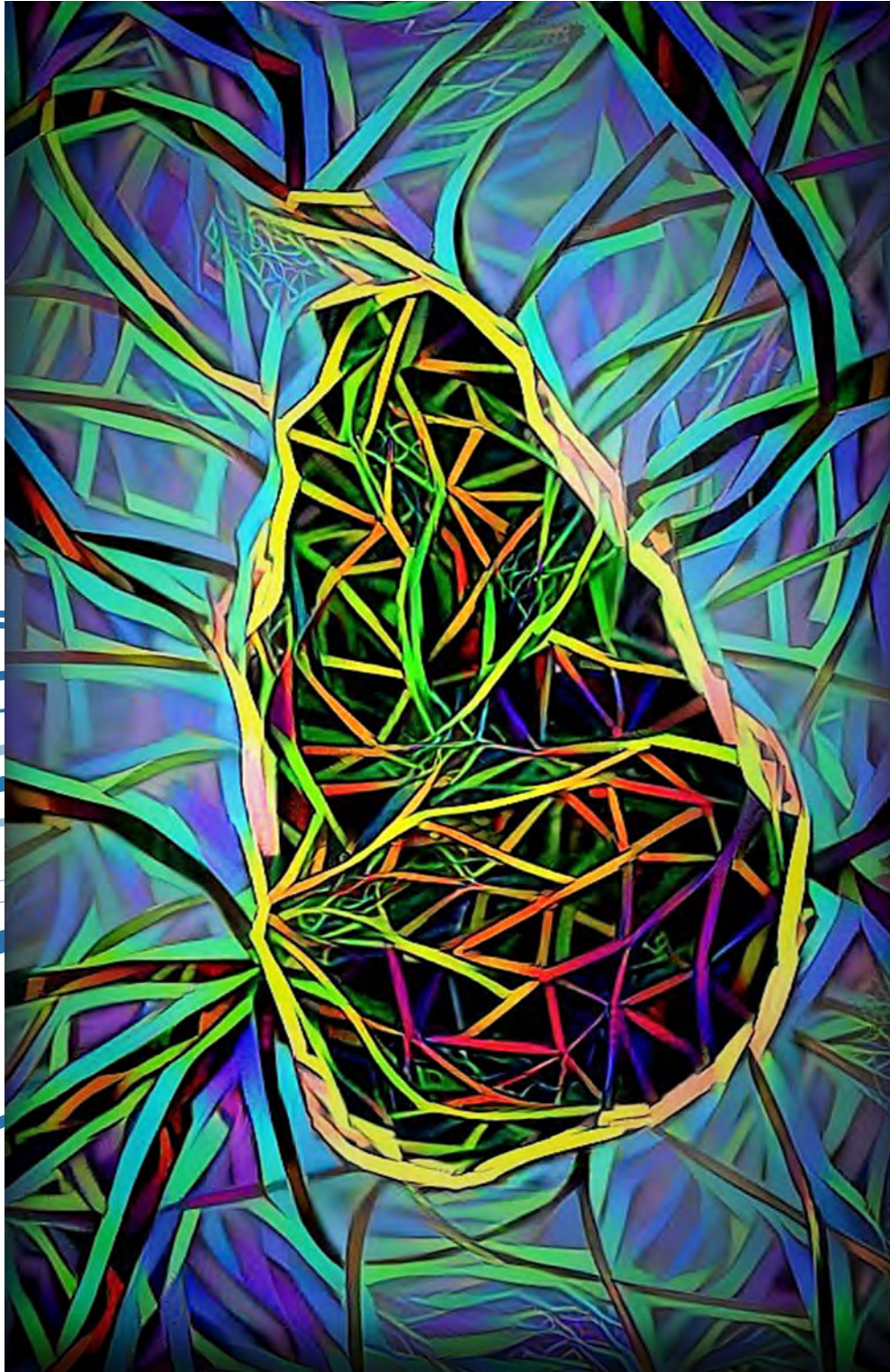


MIGRATION HEALTH RESEARCH

to advance evidence based
policy and practice in Sri Lanka



VOLUME 1



International Organization for Migration (IOM)
The UN Migration Agency

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MIGRATION HEALTH RESEARCH

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policy and practice in Sri Lanka

Volume 1

Edited by: **Dr Kolitha Wickramage**

Co-editors: **Dr Davide Mosca** and **Dr Sharika Peiris**

February 2017



International Organization for Migration (IOM)

The UN Migration Agency

Message from His Excellency the President of Sri Lanka

The rapid economic development over the past few years has accelerated Sri Lanka's global connectivity with increased population mobility both within and across our national borders. It is well recognized that public health is greatly influenced by population mobility. Protecting the health and well-being of migrant populations, their families and host populations is paramount to ensure sustainable development in the country.

Since its adoption in 2008, Sri Lanka has progressed rapidly in advancing the 61st World Health Assembly resolution on Health of Migrants. My commitment to implementing the migration health agenda extended from my tenure as the Minister of Health to my Presidency. In 2009, the Ministry of Health with the technical and financial assistance of the International Organization for Migration spearheaded a national programme to ensure better health outcomes for the various types of migrant flows; inbound, outbound and internal migration. Today, Sri Lanka is one of the few countries in the world to have a dedicated comprehensive National Migration Health Policy and an action framework that was driven through an evidence-informed, Inter-Ministerial and multi-sectoral process.

I appreciate the authors' contribution to present the empirical evidence harnessed through a national research agenda that informed Sri Lanka's National Migration Health Policy. This publication covers a wide range of domains related to migration health, including infectious disease, mental health, forensic medicine and health diplomacy. It advances our understanding and analysis of factors that impact the health of migrants, and reminds us on the need for a shared multi-sectoral response.

I sincerely hope the collection of scientific articles presented in this book will be an invaluable resource for policymakers, practitioners, researchers and advocates to learn from Sri Lanka's experience and guide them in implementing their own national migration health development agenda through an evidence-based approach.



Maithripala Sirisena
*President of the Democratic Socialist
Republic of Sri Lanka*

Foreword

We live in an era of unprecedented human mobility - a period in which more than 1 billion people are on the move. But the numbers, by themselves, do not provide a satisfactory explanation for the vast amount of attention the topic receives from governments, the coverage it receives from the media or the debates it gives rise to in the community at large. International migration is driven by many push and pull factors such as conflict, globalization, trade, economic disparities, climate change, educational advancement and poverty. Account must be also taken of the complex and sensitive issues surrounding migration, such as national identity, labour market dynamics, economic growth, and international protection. Migrant health is one of these important issues but, sadly, it receives only a fraction of the attention it so much deserves.

“...We need to be guided on the basis of firm evidence not superficial and misleading perceptions. We need to be guided by science and pragmatism, not fear and misinformation...”

Despite the magnitude and complexity of migrant flows, the health of migrants, especially labour migrants from developing nations, continues to be an under researched domain, whether the focus of enquiry is on the health consequences of forced displacement, global health security or the linkage between development and health. Migration health is also a largely neglected theme in international high-level dialogues on health and human development. In consequence, government policy makers and researchers struggle to obtain timely, accurate and comparable data. Much work remains to be done on the identification of both the determinants and consequences of migrant health.

We do know, however, that despite the significant contributions of migrants to both sending and receiving countries, some migrant groups are often exploited and marginalized, lacking access to essential health services. Nor is mortality and morbidity associated with migration limited to situations of displacement and forced migration. Wherever migrants are present in a community their health needs and vulnerabilities must be attended to, according to the principle of Universal Health Coverage.

In a world where migration is a polarizing public affairs issue, and migrants are the target of discrimination and xenophobia, we need to be guided on the basis of firm evidence not superficial and misleading perceptions. We need to be guided by science and pragmatism, not fear and misinformation. Understanding the effects and determinants that drive health outcomes across diverse migrant population groups is needed.

A national migration health research agenda aims, at its core, to capture the health status and wellbeing of various migrant groups residing within a State, and to establish the impact human mobility has on disease spread and public health protection. The goal of a national migration health policy and intervention framework is to enable the development and implementation of a ‘migrant sensitive and mobility competent’ health system architecture, that ultimately results in health equity and inclusiveness. The non-inclusion of certain migrants groups within pandemic preparedness plans due, for instance, to their lack of legal status, not only jeopardizes the public health safety of these groups, but equally the health security of their host communities as a whole.

To address health issues and determinants stemming from various migration flows, a "whole-of-government" approach was adopted by Sri Lanka to advance the National Migration Health Policy. The policy formulary and intervention framework was guided in large part by the evidence generated through a National Research Agenda commissioned by the Ministry of Health with technical cooperation from IOM since 2009. Identifying health risks and consequences through rigorous research, and linking these research findings to policy-

making processors is a hallmark of Sri Lanka's Migration Health Policy Development process. The leadership of His Excellency the President Sirisena continues to be instrumental for Sri Lanka's success as a leading nation in migration health.

Edited by IOM health specialists Dr Kolitha Wickramage, Dr Davide Mosca and Dr Sharika Peiris, this book serves as a veritable reference guide for those seeking to develop effective migration health policies and interventions through applied research. A wide range of research areas within public health and medicine within the scope of Sri Lanka's migration health research agenda is touched upon: from global health diplomacy, infectious diseases and perceptions of irregular migrants, to forensic analysis of domestic maid abuse. I hope this book will serve to

enhance understanding of methodological approaches available for the investigation of issues migration health and provide lessons for those seeking to advance migration health policy and practice in their own countries or regions.

Governments today are faced with the challenge to integrate health needs of migrants into national plans, policies and strategies as outlined in the 61st World Health Assembly Resolution on *Health of Migrants*. This book teaches that effective policymaking requires better data for evidence informed decision-making. IOM remains committed to supporting governments and partners in strengthening our collective capacity to address health risks and vulnerabilities associated with migration and human mobility.



William Lacy Swing

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Migration health research series

Despite the growing recognition of the importance migration health plays in advancing Global health and Sustainable development goals, there is a paucity of technical guidance and "lessons learnt" documents to guide Member States, international organizations, academia, civil society and other stakeholders seeking to develop effective migration health policies and interventions using evidence-based approaches.

Studying the health of migrants residing within and crossing national borders, across diverse linguistic and cultural gradients and with differing legal status pose challenges in evidence generation.

IOM's *migration health research series* aims at sharing high-yield scientific papers and analytical commentaries aimed at advancing migration health policy and practice at national, regional and global levels.

The first book of the series is a two-part volume profiling the development of the National Migration Health Policy and intervention framework in Sri Lanka, that to a large extent was driven by an evidence-informed, multi-sectoral approach.

Overview of book

The book is divided into four sections (See Figure 1).

Section 1 – presents a brief overview of the overarching global frameworks on migration health and describes the National Migration Health Policy development process in Sri Lanka.

Section 2 – presents papers at the nexus of migration and infectious disease.

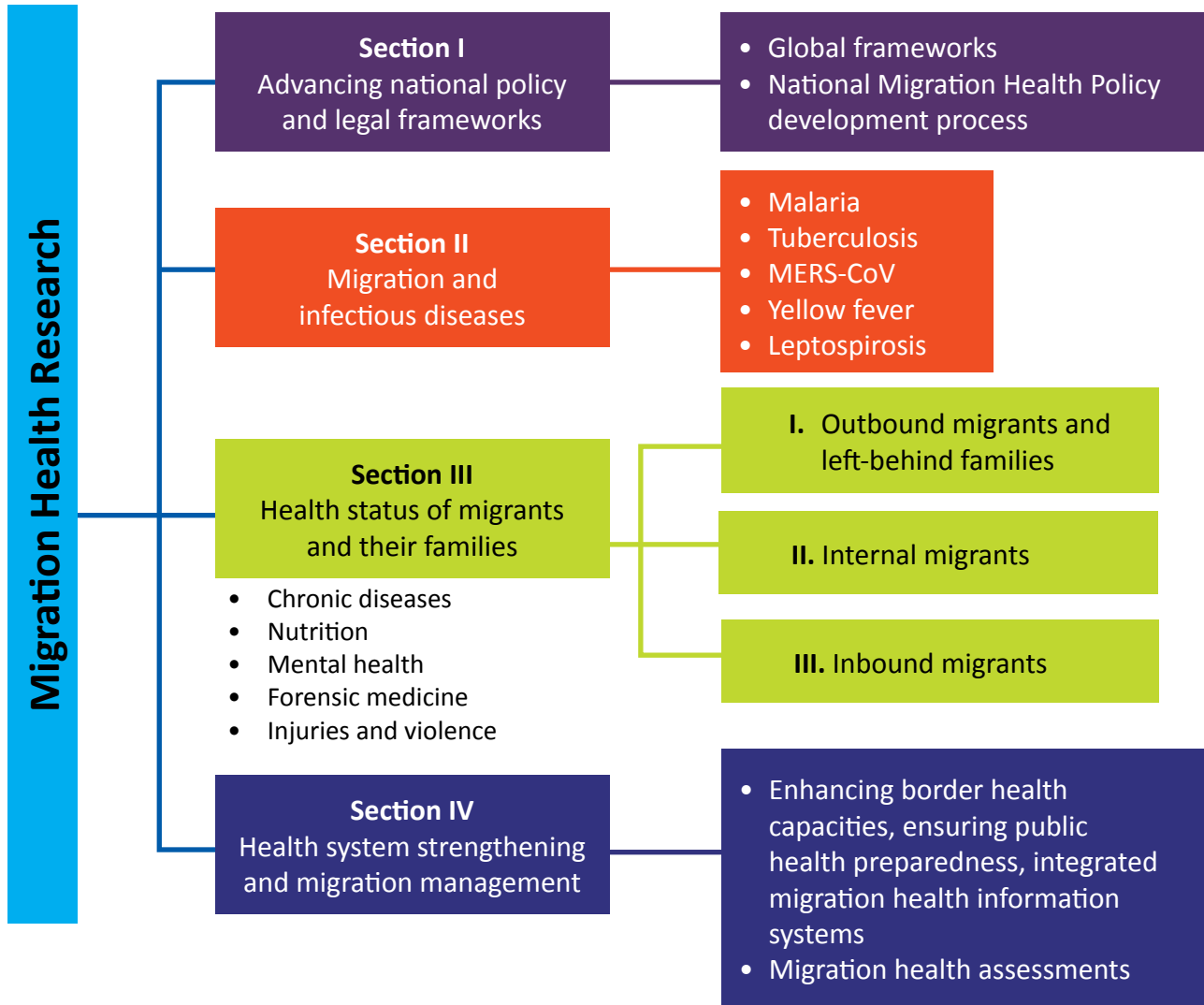
Section 3 – explores health research across "outbound", "inbound" and "internal" migration flows in Sri Lanka. It encompasses a wide range of research areas including nutrition, mental health, forensic medicine, violence and injury prevention and health law.

Section 4 – focuses on applied research undertaken in domain of health systems strengthening and migration management. This includes national border health mechanisms, International Health Regulations, management of medico-legal cases at international points of entry and integrated migration health information systems. Two critical commentaries linking migrant health assessments with health systems are also presented.

The majority of original research articles (25 of 30) included in this Volume has been published in peer-reviewed medical, public policy and law related journals over the past four years (2013 to 2016). The papers were selected on the relevance of their findings to migration health related policy and practice in Sri Lanka. All relevant permissions have been sought with publishers in order to present full versions of papers.

Studies presented have harnessed both quantitative and qualitative research methods, and captures a diverse array of health related themes. Papers in the collection include empirical research studies based on nationally representative samples, critical commentaries, analysis of domestic legal frameworks, and systematic reviews.

Figure 1: Overall structure of book





SECTION I
Migration Health Policy Development

Advancing a global agenda on migration health

Source: Content in this paper are derived from information sheets developed by the Migration Health Division, IOM, Geneva, Switzerland (2016).

Human mobility stands out as an integral part of globalization, and is a mega-trend of our time [1]. The number of people who migrated across international borders surged by 41 per cent in the last 15 years to reach 244 million in 2015 [2]. Migration continues to evolve across traditional and new countries of origin, transit and destination, with increasingly diverse migration flows. Understanding these human mobility patterns in our rapidly changing societies and studying their health consequences are crucial to implement more effective policies for human development and ensure health protection.

Migration is in and of itself not a risk to health. Conditions surrounding the migration process can increase the vulnerability to ill health and well-being of individuals and communities. Migration can improve the health status of migrants and their families by escaping from persecution and violence, by improving socioeconomic status, by offering better education opportunities, and by increasing purchasing power for "left behind" family members thanks to remittances. However, the migration process can also expose migrants to health risks, through perilous journeys, psychosocial stressors, workplace abuse, nutritional deficiencies, changes in life-style, exposure to infectious diseases, limited access to preventive services and the quality or interruption of health care. This is particularly true for migrants in "irregular situations", those forced to move, migrant workers involved in conditions of precarious employment, exposing them to occupational hazards, with no health insurance may be more susceptible to ill health than other migrant groups.

Depending on the policies and legal frameworks of States, migrants may not be granted equitable access to affordable health care. Local health systems may not have adequate capacity to meet migrant health needs. Other barriers to health services may include discrimination and stigmatization, administrative hurdles, restrictive norms generating fear of deportation or the loss of employment for those affected by medical conditions. When health

services are available to migrants, these may not be culturally, linguistically and socially sensitive to their needs, leading to delayed or undiagnosed conditions or ineffective treatment. Conversely, migration may have positive effect in reducing health vulnerabilities, and enhancing access to reproductive health services for some migrants in destination countries. Labour migration may enhance nutritional outcomes for left-behind children in some countries while leaving them susceptible to negative outcomes in other settings.

Migration health in the SDGs

The UN 2030 Agenda for Sustainable Development puts people at the center of all actions, particularly the most marginalized. It also acknowledges that migration carries a development potential, owing to migrants' intellectual, cultural, human and financial capital, and their active participation in society. Being and staying healthy is a fundamental precondition for migrants to work, to be productive and to contribute to the social and economic development of communities of origin and destination. Multi-sector partnership and coordinated efforts are needed to ensure that migrant health is addressed throughout the migration cycle. Efforts to develop migration-sensitive health systems that respond to increasingly diverse population health profiles and needs.

In response to the call to "leave no one behind" which is at the core of the UN 2030 Agenda for Sustainable Development, governments, humanitarian and development actors should integrate the health needs of migrants into global and national plans, policies and strategies across sectors and across borders in accordance with the 17 Sustainable Development Goals (SDGs) and their targets.

With migration being such a prominent factor of society today, governments are faced with the challenge to integrate health needs of migrants into national plans, policies and strategies. Addressing the health needs of migrants prevents long-term health and social costs, protects global public health, facilitates integration and contributes to social and economic development.

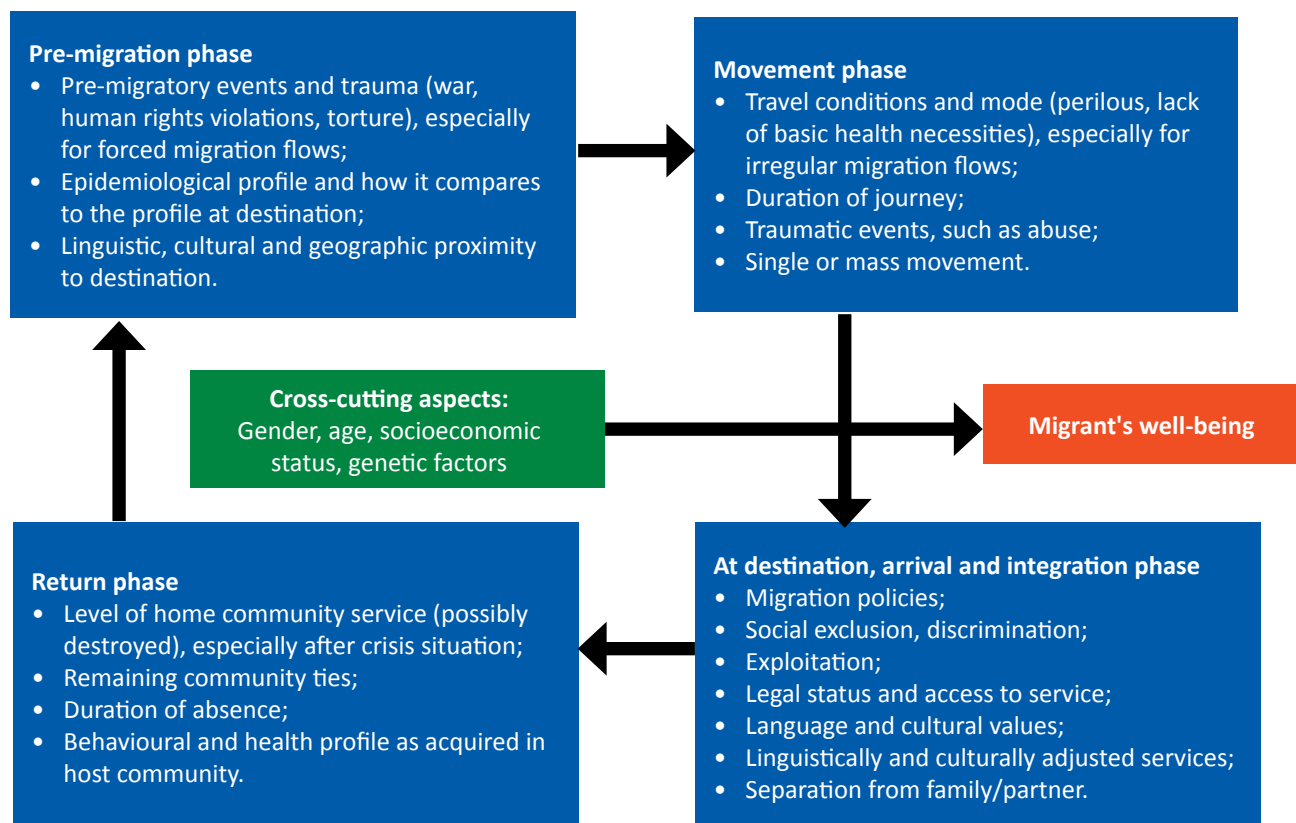
Advancing the global agenda on migration health

With increasing globalization, migration has become an everyday event in the lives of most people, regardless of causation, necessity or choice. Investing in migrants' health means ensuring the health of a seventh of the world's population. Addressing the health needs of migrants through migrant sensitive, mobility competent health systems, reduces long-term health and social costs, facilitates integration and contributes to social and economic development.

Acknowledging the inherent connection between migration and health, Member States adopted the 2008

World Health Assembly (WHA) Resolution on the health of migrants (WHA.61.17). Although not legally binding, the WHA Resolution 61.17 is politically significant. It recognizes that health outcomes can be influenced by multiple dimensions of migration, and highlights the need to take into account the determinants of migrants health in developing inter-sectoral policies to protect their health. The migration process consists of four phases: the "pre-migration phase"; the "movement phase"; the "arrival and integration phase"; and the "return phase", and determinants of migrants' health can be identified at each stage (Figure 2). Migration Health interventions aim to respond to the health needs of migrants throughout all phases of the migration process, as well as the public health needs of host communities, through a multi-sectoral approach.

Figure 2: Potential factors affecting the well-being of migrants during the migration process [7]



The WHA Resolution 61.17 paved the way for the 1st Global Consultation on Migrant Health in Madrid, which was co-organized by the International Organization for Migration (IOM) "the UN Migration Agency", World Health Organization (WHO) and the Government of Spain in 2010. The Consultation defined an operational "four-pillar" framework providing Member States and relevant agencies a guide to implementing the principles and priorities articulated in Resolution WHA.61.17:

- **Pillar 1:** monitoring migrant health—aimed at strengthening the knowledge on the health of migrants via research and information dissemination to ensure evidence-based programming and policy development;
- **Pillar 2:** developing and implementing migrant-sensitive policies and legal frameworks that ensure the health of migrants, their families and communities in countries of origin and destination;
- **Pillar 3:** promoting migrant-sensitive health systems—aimed at delivering, facilitating and promoting equitable access to migrant-friendly and comprehensive health services;
- **Pillar 4:** ensuring partnerships, networks and multi-country frameworks—aimed at establishing and supporting ongoing relevant dialogues and cooperation.

This operational framework was presented at the 63rd WHA and was adopted by a number of governments, including the Government of Sri Lanka in formulating national action on migration health.

At the 106th IOM Council in November 2015 the urgency to 'advance the unfinished agenda of migrant health' was emphasized through the organization of a *High-level Panel on Migration, Human Mobility and Global Health*. During the Session, His Excellency, President Sirisena of Sri Lanka presented a message to the IOM Council on brining greater accountability to the resolution and requested a 2nd Global Consultation on Migrant Health. The 138th Session of the WHO Executive Board in January 2016 reiterated the need to address migrant health and the health challenges associated with migration as a key global health issue. During the Session, several Member States called for better global health coordination and

relevant international action. IOM in collaboration with WHO and the Government of Sri Lanka resolved to organize the 2nd Global Consultation on Migrant Health in 2017 according to the objectives and outcomes outlined in Text box 1. Research features as a critical dimension in both Objective 1 and Expected outcome 4 of the Gobaal consultation.

Text box 1: Objectives and Planned Outcomes 2nd Global Consultation on Migrant Health (2017)

Objectives:

1. To share lessons learnt, good practices and research in addressing the health needs of migrants, and to identify gaps, opportunities and new challenges;
2. To reach consensus on key policy strategies to reach a unified agenda across regions on the health of migrants, reconciling acute large scale displacement, as well as long-term economic and disparity-driven structural migration, and to pave the way towards a possible roadmap of key benchmarks;
3. To engage multi-sectoral partners at policy level for a sustained international dialogue and an enabling policy environment for change.

Expected outcomes:

To facilitate a continuation of the political dialogue on the advancement of migrant health:

1. A common position paper, the "Colombo Statement";
2. A renewed Migration Health Conceptual Framework for Member States for addressing Global Migration Health Challenges;
3. An agreed upon "Accountability Framework", based on the 2010 Madrid "Operational Framework", including a set of indicators to also be considered within a possible new WHA Resolution on the health of migrants, within relevant SDGs, UNGA Global Compacts and in line with the priorities as outlined in WHA report (A69/27) "Promoting the health of migrants";
4. A common roadmap towards research and policy dialogue milestones;
5. Elements for the establishment of an international network of expertise on migrant health and an information sharing platform.

Migration health research: An imperative to strengthen the evidence base

“Member States should promote evidence-based policymaking and invest in data collection, research and capacity development with respect to migration and its impacts on individuals, communities and societies. The international community should create a dedicated capacity-building initiative to assist countries in improving the collection and use of migration data.”

- Mr Ban Ki-moon

Report of the UN Secretary-General on International migration and development, Recommendation Clause 119, 2014 [3].

There is a multiplicity of research questions that needs exploration at the nexus of migration, health and development. These include for instance:

- Does "low-skilled" labour migration especially from low-income countries cause negative health and social consequences to those children of migrant households? Or, do such migrants and their families thrive by using remittances to purchase better food, health care and education? Do such risks/rewards change over time?
- How and in what directions does health vulnerability and resiliency change during a persons' migration trajectory, and across the four phases of the migration cycle (pre-departure, during transit, at destination and upon return)?
- How can a better understanding of health vulnerabilities and resilience can support the development of targeted health interventions for migrant populations?
- What role does human mobility play in the spread of diseases of public health importance, to mitigate global health security threats and for the reintroduction of diseases in elimination and near elimination settings?
- What role does migration play in affecting the global burden of disease? What are the disease profiles and dynamics of various migrant groups and versus host/destination communities? Which migrant groups are most at risk? Who "benefits"?

- What are the health care system costs associated with delivering health services to migrant populations including irregular migrants/asylum seekers?

In examining at just one typology/subset of migrants, that of international labour migrants, the critical data and research gap is revealed. The number of international labour migrants continues to grow, especially within and between low and middle-income countries. Current global estimates vary, with an estimated 150.3 million migrant workers in 2013. Those in low-skilled domestic work sector total 11.5 million. Such migrant labourers and those working in construction, textile and meat/livestock industry often work in conditions of precarious employment, within 'difficult, degrading and dangerous' jobs [2]. Their remittances form a key part of foreign currency income for labour-sending countries across Asia, Africa and South America. Often explored through a "development" lens, the health of these low-skilled labour migrants and the families left-behind have received sparse attention. The patchy and scarcely available evidence shows a wide array of mixed health outcomes and increasing health burden for migrants working abroad and their left-behind families, in particular for children and elderly.

The field of global health, including its multitude of branches, appears to miss the critical importance of labour migration-health nexus, despite the magnitude of health burden presented by the ever-increasing international labour migrants [4]. Understanding the health of these populations is critical for all stakeholders, including labour-sending/receiving countries, international organizations and global health community. The negative impact of labour migration on migrants, their families and labour-sending nations has to be micro and macro-managed to ensure a safe, dignified and productive labour migration experience. In this regard, it is essential that policymakers, practitioners, researchers and academics come together to give an evidence-informed voice to the global community of labour migrant workers and their families [4].

It should be noted that the case of international labour migrants presented here is just one strand of global migrant flows. The lacunae of public health evidence is glaring considering the sheer magnitude of migrant

flows and its importance in globalization. Effective policymaking requires better data for evidence informed decision-making.

At the minimum, better data on international migrant stocks and flows disaggregated by legal status and duration of stay are needed. Understanding health-care access, health conditions and degree of economic, social and legal integration across migrant typologies are also important.

The Government of Sri Lanka, with the technical cooperation of IOM, commissioned a *National Migration Health Research Agenda* in 2011 that assisted in facilitating tailored programs and led to the formulation of a National Migration Health Policy and an interministerial action plan. Such national research commissions may be a critical first step for member states to take stock and examine the migration health issues within sovereign borders. These efforts may ultimately strengthen existing health, migration management and administrative systems to better harness, collect and assess migration health related data. If migration modules have not been integrated into existing national survey programs such as Demographic and Health Surveys (DHS) and living standards measurement studies, then dedicated surveys and applied research studies may be needed. National disease control programs such as Anti Malaria Campaigns, National Tuberculosis Control Programmes, Expanded Programme in Immunization should also include migrant variables in order to capture disaggregated data.

Cross-border and regional cooperation is also critical for the exchange relevant health information between countries of origin and destination. For instance, the Ministers of Health of the countries in the Greater Mekong sub-region: Cambodia, China (Yunnan and Guangxi), People's Democratic Republic of Lao, Myanmar, Thailand and Viet Nam established the Mekong Basin Disease Surveillance (MBDS) network in 2001 in order to improve cross-border infectious disease outbreak investigation and response by sharing surveillance data and best practices in disease recognition and reporting [5]. By jointly responding to outbreaks and developing expertise in epidemiological surveillance across the countries the network is a key to enabling health security in the Greater Mekong Sub-Region [5,6].

The increasing complexity of global, regional/sub-regional migration trends; debates on "migrant" definitions and nomenclature; polarizing political viewpoints on migration and its close tethering to nationalistic and populist movements presents real challenges to researchers designing studies along epistemological, theoretical and analytical lines. Particular challenges persist in collecting data on irregular 'undocumented' migrants living in the shadows of society and working in countries with more restrictive policies on access. Since migration is an ever-changing dynamic process, generating and maintaining timely and comparable migration data and improving relevant information systems is also critical. Such data should also be collected in accordance with international standards of privacy and protection and in strict adherence to ethics. A handbook by Schenker and colleagues (2016) provide a useful methodological guide for exploring health and social disparities among migrant populations [8].

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Migration health policy development process in Sri Lanka

Kolitha Wickramage, Susie Perera, Sharika Peiris

12

Current migration trends

Sri Lanka is an island nation whose geographical location in the Indian Ocean continues to be of strategic importance for travel, trade, commerce and cultural exchange, especially within the South Asian region. Migration is an integral part of Sri Lankan society, and is a key driver of the nation's economic development engines. Sri Lanka's labour migration flows have grown ten-fold during the past decade [1], with nearly two million Sri Lankans, or the equivalent of 24 per cent of the total labour force employed overseas [1]. An average of 730 registered workers depart the country each day [2]. Around 90 per cent of the reported departures are to the Middle East region [2]. Despite the fall in crude oil prices affecting potential economic growth as well as the political tensions in the Middle East, remittances by migrant workers remain the highest contributor to the Sri Lankan economy, with earnings reaching 7.2 billion USD in 2015 [3].

The growing economic aspirations are driven by labour market demands of rapidly developing regions of the world. In recent years employment opportunities from within Asia, from countries such as Malaysia, Singapore and South Korea has increased net outflow of Sri Lankan workers. In what was once a highly feminized labor force, today 49 per cent are women, and of these 86 per cent are employed as 'domestic housemaids' [2]. Greater demand for skilled migrants in certain types of professions such those within health care professional sector may shift the labour migration profile in future.

Sri Lanka is not only a 'labour sending' country, but is increasingly becoming a 'labour receiving' one. Growing numbers of foreign workers and long stay resident visa applicants arrive from countries such as India and China [1]. The end of protracted conflict in 2009 has also led to return of Sri Lankan refugees and those internally displaced within the country, to return to their homes. The ushering of peace after years of civil conflict has seen greater investments and travel into the country. The tourism sector achieved a 300 percent increase over the past 6 years to reach a historic 1.8 million arrivals in 2015.

[4]. Construction of new highways, sea and airports has also resulted in increased connectivity and population mobility across national borders and within the country.

These rising trends and changing dynamics of internal, outbound and inbound migration flows pose both opportunities as well as challenges for Sri Lanka. With one-in-ten Sri Lankans employed overseas as labor migrants, the impact of migration on the health and well-being of low-skilled labor migrants and their family members have received little attention. Despite the clear monetary benefits for the State, utility for human capital formation in migrant households through greater spending on health care, food and education requires more empirical exploration.

Located at the heart of the Indian Ocean, Sri Lanka is a growing hub for tourism, trade and travel. The opening of new shipping and air routes and trade across new and emerging markets may influence international migrant flows [1]. These changing dynamics have hastened the need to strengthen capacities at the points of entry to Sri Lanka and ensure health security and preparedness measures to prevent/mitigate the spread of diseases of public health importance. For instance, the reintroduction of Malaria to Sri Lanka through inbound travelers from Malaria endemic countries pose a real threat to a country which achieved elimination status.

In summary, migration is a key determinant of socio-economic development of Sri Lanka. Managing this multi-dimensional domain to achieve maximum benefit with minimizing negative outcomes requires credible policies and programmes designed based on evidence and analytical review of both its positive and negative consequences on health [1]. With this backdrop the national migration health policy development process was launched in the country in 2009 with technical assistance from IOM.

Key features of Sri Lanka's National Migration Health Policy Development process

In recognizing the multidisciplinary nature in addressing health issues and determinants stemming from various migration flows, a participatory, inter-sectoral 'whole-of-government' approach was adopted by the Government of Lanka (GoSL) to advance the national migration health policy process. Table 1 presents key milestones on the journey of Sri Lanka's policy development process catalysed by the Ministry of Health (MOH) in 2009. The policy formulary and intervention framework was guided in a large part by the evidence generated through a National Research Agenda commissioned by the Inter-Ministerial committee in 2010, with technical co-operation from IOM.

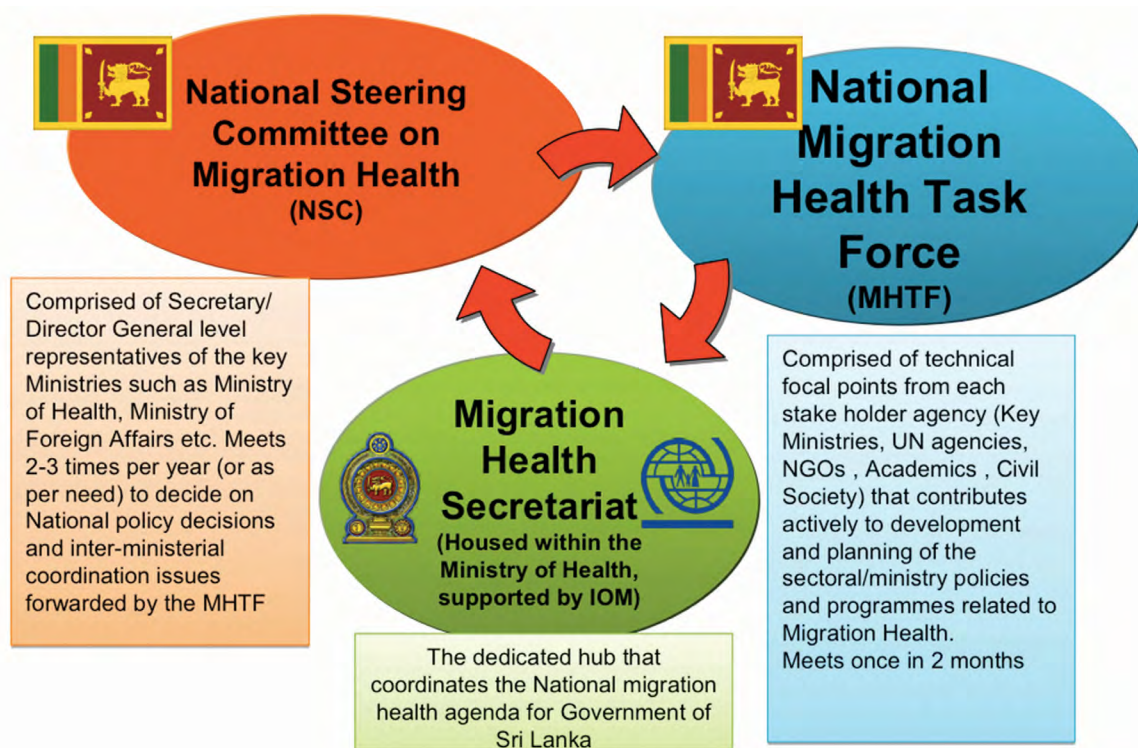
Sri Lanka hitherto remains one of the few countries in the world to have a dedicated migration health policy, including a focus on strengthening health security threats arising from human mobility. Sri Lanka is also the first country to report on progress made towards advancing the *Health of Migrants Resolution* (61.17) at the World Health Assembly in 2010 and 2011.

Six key approaches and lessons learnt in advancing Sri Lanka's National Migration Health Policy and action framework are:

1. Adopt a participatory, inter-sectoral and multidisciplinary approach

Migration health is a shared responsibility. Addressing the social determinants of migrant health can only

Figure 1: Inter-Ministerial and Inter-Agency Coordination Framework for Migration Health Development in Sri Lanka



be meaningfully achieved through a multi-sectoral approach, involving for instance health, foreign policy, labour, economic development, immigration and border protection authorities. A 'whole of Government approach' involving 13 key Government Ministries and other key stakeholders was adopted by the Government of Sri Lanka to advance the national migration health

agenda – a process which catalyzed in 2009.

An inter-ministerial coordination mechanism was established with technical and financial support from IOM, with the Ministry of Health (MOH) playing a coordinating role to galvanize the migration health agenda. Figure 1 shows the inter-Ministerial and inter-

agency coordination framework that comprised of three elements: a Secretariat to drive coordination, a National Migration Health Taskforce (MHTF) to drive technical cooperation, and a National Steering Committee (NSC) to drive legal and executive level action. The MHTF also enabled participation from civil society, non-governmental sector, academic and intergovernmental organizations for the policy formulation.

Through this coordinated framework, the GoSL was also able to proactively respond to emerging migration health related challenges such as the health services provision for returning refugees and the health assessments of resident visa applicants to the country, and the threat of A key formative step was the establishment of a dedicated Migration Health Secretariat/Unit by Ministry of Health within the Directorate of Policy and Planning with the ongoing technical and financial support of IOM (Figure 1). The unit's role is critical as it acts as a dynamic coordination node to support: the administrative and management functions of the policy development process; coordinate MHTF and NSC meetings; facilitate monitoring and implementation of the inter-Ministerial action plan; develop a repository/knowledge hub for all relevant technical papers and planning documents; ensure future sustainability and respond to emerging migration health related issues.

2. Adopt an inclusive approach covering all migrant flows.

Developing a description of a country's migration patterns requires a basic understanding of the typologies and dynamics of migration flows. Migration is frequently not a one-way process but tends to be characterized by various forms of circular, return and internal migration patterns. Migrant typologies are diverse and highly contextual within sovereign State territories. As such they are often based/influences on a person's legal status (e.g. resident visa holders, refugees, international students). These also have dynamic patterns of movements into, out of and within the territory of a sovereign state. Health risks and vulnerabilities and conversely factors enabling well-being and health resilience and may affect the various migration typologies/flows differently. Through extensive deliberation, the National Migration Health Taskforce defined 3 typologies of migration flows for formulation within the National Migration Health Policy document:

- **Out bound migration (emigration):** Refers to the movement of people out of the country. Out bound migrants from Sri Lanka will include, but not be limited to, migrant workers (professional, skilled, semi-skilled and low skilled workers, members of the

armed forces serving on peacekeeping missions and other areas, seafarers), students and those seeking asylum in other countries. **Families of migrant workers left-behind** will be identified as specific group a within the mandate of this Policy.

- **In bound migration (immigration):** Refers to people moving into the country. For purposes of this Policy, inbound migrants included, but were not limited to foreign migrant workers (professional, skilled, semi-skilled and low-skilled workers), students and tourists. These migrants will be identified as valid visa holders (visit/entry visa or resident visas as defined by the laws applicable to immigration and emigration in Sri Lanka). The Policy also recognizes returning Sri Lankan refugees and failed asylum seekers.
- **Internal migration:** Refers to the flow of people within a country's internal borders, and includes categories such as free-trade zone workers, workers in Board of Investment (BOI) industrial zones, internally displaced persons, seasonal agricultural workers, fisher folk, construction workers, professionals, including members of the armed forces.

3. Adopt an evidence-based approach and develop a national research agenda.

A hallmark of Sri Lanka's policy development was that to a large extent the policy formulary and interventional framework were guided by findings distilled from research studies commissioned through a *National Migration Health Research Agenda*. While GoSL routinely produced a country *Migration Profile* with assistance from IOM, during the formative phase of the policy development process, it was determined by the NMHT that there was a scarcity of data on health status and vulnerabilities across the various migrant populations. More specifically, research gaps existed that required required:

- Health status of specific migrant populations and identify priority diseases/issues of public health concern pertaining to migration health.
- Mapping existing domestic and legal frameworks pertaining to health of migrants.
- 'Service mapping' of key stakeholders, current capacities and functions, needed to enable.

The NSC commissioned a *National Migration Health Research Agenda* in 2010 along the three migrant flows, including left-behind families of migrant workers. The GoSL with the technical and financial input from IOM facilitated this research agenda over a three-year period by harnessing local research institutions to addressing research questions and ensure scientific rigor. Effort was made to undertake large-scale national studies that were

representative of various migrant populations. A number of studies presented in this book were a result of the research commission.

The findings were shared through a series of *National Symposiums on Migration Health Research* with the participation of government agencies, civil society, development partners, UN agencies, private sector and academia. The research symposiums were useful in providing a public forum to debate the implications of research findings, enable evidence-informed decision making and guide direction of future programming.

4. Adopt a pragmatic and responsive approach

An important feature of the policy development process was the need to respond to emergent migration health challenges and public health threats the country would encounter, rather than remain a static process, only for purposes of policy formulation. The utility of an inter-ministerial taskforce in taking action is also realized in the two examples highlighted:

After the cessation of protracted civil conflict in 2009, a large number of Sri Lankan refugees residing in India (over 78,000) resolved to return to their homes, mainly located in the North and Eastern Districts of Sri Lanka. At a meeting in 2010 the Ministry of Foreign Affairs informed the Migration Health Taskforce on these potential return and repatriations. Decision was taken by Taskforce members to advance interventions to help facilitate the integration the returning refugees within the routine health and administrative systems, to ensure a comprehensive health package for returnees, as well as to avert any public health risks via a health check conducted upon return within a safe and dignified manner. The “Welcome Home” health program was initiated and led by the MOH in partnership with IOM and members of taskforce. The provincial and village level administrators and health authorities were sensitized to advance the program. A health awareness booklet was developed and distributed at registration points India for health promotion and to raise awareness of health services and health check available upon arrival. Furthermore, information brochures on health issues such as dengue were developed and distributed.

Sri Lanka is heralded as a success story in Malaria control in Asia and the first country in the South East Asian region to enter the pre-elimination phase in 2012. Since the end of civil conflict in 2009, there have been numbers of Sri Lankans leaving via irregular routes to countries such as Australia and Canada. A partnership was established between IOM and Ministry of Health’s Anti-Malaria

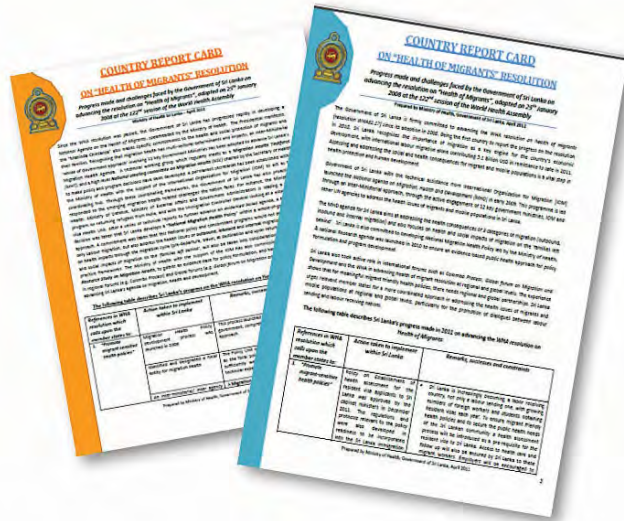
Campaign (AMC) to screen Sri Lankan voluntarily returning from West African countries at Sri Lanka’s international airport. At a MHTF meeting the Department of Immigration, Airport Authority and Ministry of Foreign Affairs (MFA) was also sensitized on the critical importance of malaria elimination. The International airport carried messages through information posters and leaflets for all travellers returning from Malaria endemic areas for symptomatology and voluntary testing and the MFA through its diplomatic missions operating within malaria endemic zones advanced a circular notifying of similar on arrival measures. Of the total of 78 confirmed malaria cases in Sri Lanka in 2012, 71% were imported. Of these, 25 cases (41%) were from irregular migration routes screened by the AMC-IOM partnership. The largest group of Sri Lankan returnees came from Togo (65%), with the average of 20 weeks spent in Africa. Surveillance of in-bound migrant flows from endemic areas is vital to prevent re-emergence of disease. Beyond human rights abuses and exploitative practices of people smugglers, irregular migration plays an important but often forgotten pathway for malaria re-introduction.

With the rapid increase of international travel comes the emergence and re-emergence of diseases of public health importance such as MERS-CoV, Ebola, Zika and pandemic influenza viruses. The MOH working with immigration, law enforcement, aviation and seaport authorities and with the technical cooperation of IOM advanced a national Border Health Strategy to enhance capacities to better prepare, respond and mitigate health risks, and improve disease surveillance and coordination at points of entry.

5. Embed a regular reporting and accountability framework

Sri Lanka became the first country to formally report on progress made against the 4 intervention domains contained in advancing the Health of Migrants Resolution (61.17) at the World Health Assembly in 2010 and 2011. The report cards (see Figure 2) can be read in full at www.migrationhealth.lk.

Figure 2: Sri Lanka WHA Country Report Card on Advancing Health of Migrants



Tracking progress within the national migration health program development, and sharing regular progress reports for national, regional and global audiences is a key aspect of policy development. Whilst this function was primarily undertaken by the MOH and effectively implemented during the policy formulation stage, the current challenge has been to sustain the reporting and coordination efforts between ministries and partners.

6. Ensure advocacy and engagement at regional and international level

In a globalized world, Individual member states cannot “do it alone” in effectively advancing their national migration health agendas. In order meaningfully mitigate risks of health concerns of low-skilled international migrant workers for instance, multilateral diplomatic efforts need to be made with those sending and receiving countries. Health vulnerabilities diffuse across all phases of migration and across borders. A robust and comprehensive migration health strategy requires regional and inter-regional engagement.

Sri Lanka as the chair of the *Colombo process* (a Ministerial level regional consultative process on the management of overseas employment and contractual labor for countries of origin in Asia) successfully advanced the inclusion of health of migrants as a thematic area on the Colombo Process Ministerial agenda for the first time in 2016. Sri Lanka has also been active in advancing health of migrant’s agenda at various regional and international fora. His Excellency the President Sirisena of Sri Lanka has called for greater degree of accountability to health of migrants and in partnership with IOM and WHO is

hosting the 2nd Global Consultation on Migrant Health in Sri Lanka in February 2017.

Conclusion

A hallmark of Sri Lanka’s migration health policy development process is that it does not focus exclusively on migrant typologies (Point 1) but also aims at capturing issues pertaining to human mobility via efforts to enhance public health protection through border health management and mitigate issues of (Point 4). The aim is to advance a “migration sensitive” health policy framework. Being Migrant sensitive and mobility competent within a health system, a disease control program and migration governance system promotes equity and inclusiveness. In a globalized world, migration health also calls on Governments to pursue policy goals through global health diplomacy. As highlighted in Point 6, the interconnectedness of states and territories through migration warrants joint ventures, partnerships and sharing of technologies for cross-border disease control. Peter Sutherland, UN Special Representative of the Secretary General of the UN for Migration expressed that for societies to successfully adapt to new migration flows and increased diversity it brings, governments should not only adopt a whole of government approach at a national level but should pursue inter-sectoral collaboration at an international level.¹

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¹ United Nations Special Representative of the Secretary-General (2013) Project Syndicate. October 2013. Weblink: www.un.org/en/development/desa/population/migration/partners/srsg.shtml



SECTION II

Migration and Infectious Diseases

High attack rate for malaria through irregular migration routes to a country on verge of elimination

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ABSTRACT

Irregular migration in the form of human smuggling and human trafficking is recognized as a global public health issue. Thirty-two cases of *Plasmodium falciparum* were detected in 534 irregular migrants returning to Sri Lanka via failed human smuggling routes from West Africa in 2012, contributing to the largest burden of imported cases in Sri Lanka as it entered elimination phase. Beyond the criminality and human rights abuse associated with irregular migration, plays an important but often forgotten pathway for malaria re-introduction. Active surveillance of the growing numbers of irregular migrant flows becomes an important strategy as Sri Lanka advances towards goals of malaria elimination.

Keywords

irregular migrants, human smuggling, malaria elimination

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Background

Sri Lanka is heralded as a 'success story' for malaria control in Asia having succeeded in reducing malaria cases by 99.9% since 1999 and is aiming to eliminate the disease entirely by 2014 [1]. This report focuses on a migrant flow of major importance for malaria importation that, until recently, has received little attention from public health authorities.

Since the end of the protracted civil conflict in 2009, there have been an unprecedented number of migrants leaving Sri Lanka to countries such as Australia, Canada and the UK via 'irregular migration' routes [2]. An irregular migrant is defined as someone who, owing to illegal entry or the expiry of his or her visa, lacks legal status in a transit or host country [3]. Irregular migration takes many forms, ranging from human smuggling to trafficking of persons for purpose of exploitation. Globally, numbers of undocumented cases have increased despite spending on enforcement measures at major destination countries [4]. A significant number of such migrants may remain stranded in transit or destination countries, often in clandestine situations or in detention facilities. In such situations, many have poor access to health services, become exposed to endemic diseases, and/or are vulnerable to violence, exploitation and other health risks [5]. The International Organization for Migration (IOM) estimates that 10–15% of the world's total international migrant population of 214 million persons are irregular migrants [6]. IOM working with member states, assists such stranded migrants to voluntarily

return to their countries of origin through Assisted Voluntary Return and Reintegration (AVRR) programmes.

Methods

Screening strategy

From the end of 2011, local and international law enforcement authorities intercepted people-smuggling operations from Sri Lanka to Canada across nine West African nations: Togo, Benin, Guinea, Sierra Leone, Mali, Ghana, Senegal, and Mauritania. In close coordination and partnership with the Governments of Sri Lanka, Canada and West African nations, IOM assisted these irregular migrants who are intercepted or detained, to return to their place of origin.

From January to December 2012, all irregular migrants returning from West African countries were subjected to malaria screening upon arrival at the Bandaranayake International Airport (BIA) in Sri Lanka. Screening was conducted on site using the rapid diagnostic test kit CareStart™ Malaria HRP2/PLDH, with 98% sensitivity and 97.5% specificity for *Plasmodium falciparum* [5], and microscopic examination of blood smears, collected at the airport and performed at the national reference laboratory. Health personnel from the airport medical unit, Anti-Malaria Campaign (AMC) and IOM officials were involved in facilitating the on-arrival screening process. Under a directive of the Anti-Malaria Campaign, repeat RDTs were carried out for all returnees at district level within one week of their arrival at home destination. This intensive follow-up was carried out with the collaborative efforts of both the AMC and IOM field staff.

Ethical consideration

Mandatory testing of all returnees were performed according to standard Ministry of Health Anti-Malaria Campaign Guidelines and routine protocols. All returnees were provided clear explanation on the testing at pre-departure phase and upon arrival before test was conducted.

Results

Of the total number of returnees screened (n=534), 32 were positive for *P. falciparum*. Nearly two thirds (n=19) were identified at the point of entry at the BIA and 13 during district level follow-up. The total number of malaria cases from irregular migration routes in accounted for 76% (32/42) of the total number of *P. falciparum* cases detected in Sri Lanka in 2012. This route contributed to 46% (32/70) of the total number

of imported malaria cases in the same year. Imported cases overtook indigenously acquired cases of malaria for the first time in Sri Lanka in 2012, contributing to three-quarters of the total malaria burden (70/93).

Figure 1 superimposes the districts of return of the irregular migrants with the geographical map of the Annual Parasite Index (total number of positives cases per 1,000 risk population) for Sri Lanka for the Year 2012. It shows that the largest number of irregular migrants (n=17) had returned to Jaffna district which has the highest API of >0.2 to 0.3 in comparison to other districts in Sri Lanka.

Economic hardship, disenfranchisement and other social determinants form powerful push-factors for those marginalized to seek opportunities through irregular migration. The rationale for such increased people movements from Sri Lanka are interlinked to complex social and political determinants, which warrants a detailed description beyond the scope of this research article. The largest group of returnees was from Benin (n=20, 77%), followed by Nigeria (9%), Guinea (13%), Liberia (6%), Togo (6%) and Sierra Leone (3%). Socio-demographic data revealed that the majority were males (91%), young (mean age 30 years), of Tamil ethnicity (94%), and originated from North and Eastern Provinces of Sri Lanka (88%). The average duration of stay in Africa was 20.5 weeks. Their prolonged stay in endemic settings increased the risk of transmission. Qualitative assessments (through return interviews) revealed a number of persons had suffered febrile illnesses during their stay in West Africa. However, details on total number, time and place could not be characterised through such narrative construction. It was also revealed that smugglers used force and intimidation to prevent the migrants from escaping. The smugglers intended to channel all cohorts of migrants to a singular port (Sierra Leone), and then charter a large fishing vessel to enter Canada illegally.

Discussion

Malaria incidence in returnees from source countries have proven to be a sensitive predictor of malaria risk, particularly where there is sub-national transmission [8]. The fact that the largest number of migrants returned to districts with the highest API indexes reported nationally is also significant. Re-introduction and risk of spreading the parasites occurs when there is a long term return into areas of endemicity with presence and prevalence of the mosquito vector. For this reasons the close follow up and monitoring performed by the AMC and IOM field based

teams is an important strategy. Unlike other categories of inbound migrants such as tourists, who may also import malaria to the country, returning Sri Lankan citizens from endemic areas are more likely to be exposed to mosquito bites and hence are more likely to contribute to the spread of malaria upon return to their homes within locally endemic regions. Other inbound migration categories include: returning Sri Lankan labour migrant workers, Sri Lankan armed forces personnel from UN peace keeping missions, and returning students.

The attack rate for malaria in this migrant group using irregular modes of travel is considerably high (sixty cases per 1,000), when compared to the risk of contracting malaria for regular travellers returning from West Africa at three per 1,000 [9]. For the migrants themselves, their 'illegal' status and clandestine nature of movements enhanced health vulnerability, including having little or no access to health care in transit countries. Remarkably, 98% of irregular migrants from West Africa had undertaken yellow fever vaccinations at the Ministry of Health vaccination centre in Colombo prior to their departure (proven through receipt of vaccination card). The people-smugglers were aware of International Health Regulation (IHR) checks at ports of entry, and insisted these be obtained by the migrants during pre-departure phase.

An analysis of registry data on yellow fever vaccinations of Sri Lankan travellers from 1998 to 2011. Since the end of conflict in 2009, there has been a rapid increase in the volume of travellers to malaria-endemic countries, with the majority (97% of the 4,500) departing to the West Africa.

Conclusions

Irregular migration will always exist in a globalized world of increasing disparity and criminal opportunism. The post-conflict period has seen a dramatic increase in the number of irregular migrant flows from Sri Lanka [10]. Surveillance of inbound migrant flows from endemic areas is vital to prevent the re-emergence of disease, especially as Sri Lanka has entered the malaria elimination phase.

Beyond the challenge of combating the criminal networks, abuse and the exploitative practices of people smugglers, irregular migration plays an important but often forgotten pathway for malaria re-introduction. More attention is needed by global public health communities to the contribution and dynamics of malaria importation and introduction via irregular migrant routes.

Competing interests

The authors declare that they have no competing interests. No financial assistance has been provided in undertaking this research.

Authors' contributions

KW: the conception and design of the paper; KW and SP: involved in acquisition of data, analysis and interpretation of data; KW, RP and SP: drafting the article or revising it critically for important intellectual content; KW, SP and DM made final approval of the version to be submitted. The final manuscript has been approved by all authors.

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Figure 1: Map showing annual Parasite Incidence (API) (total number of positives cases per 1,000 risk population) for the Year 2002 superimposed with place of destination of returnee cases

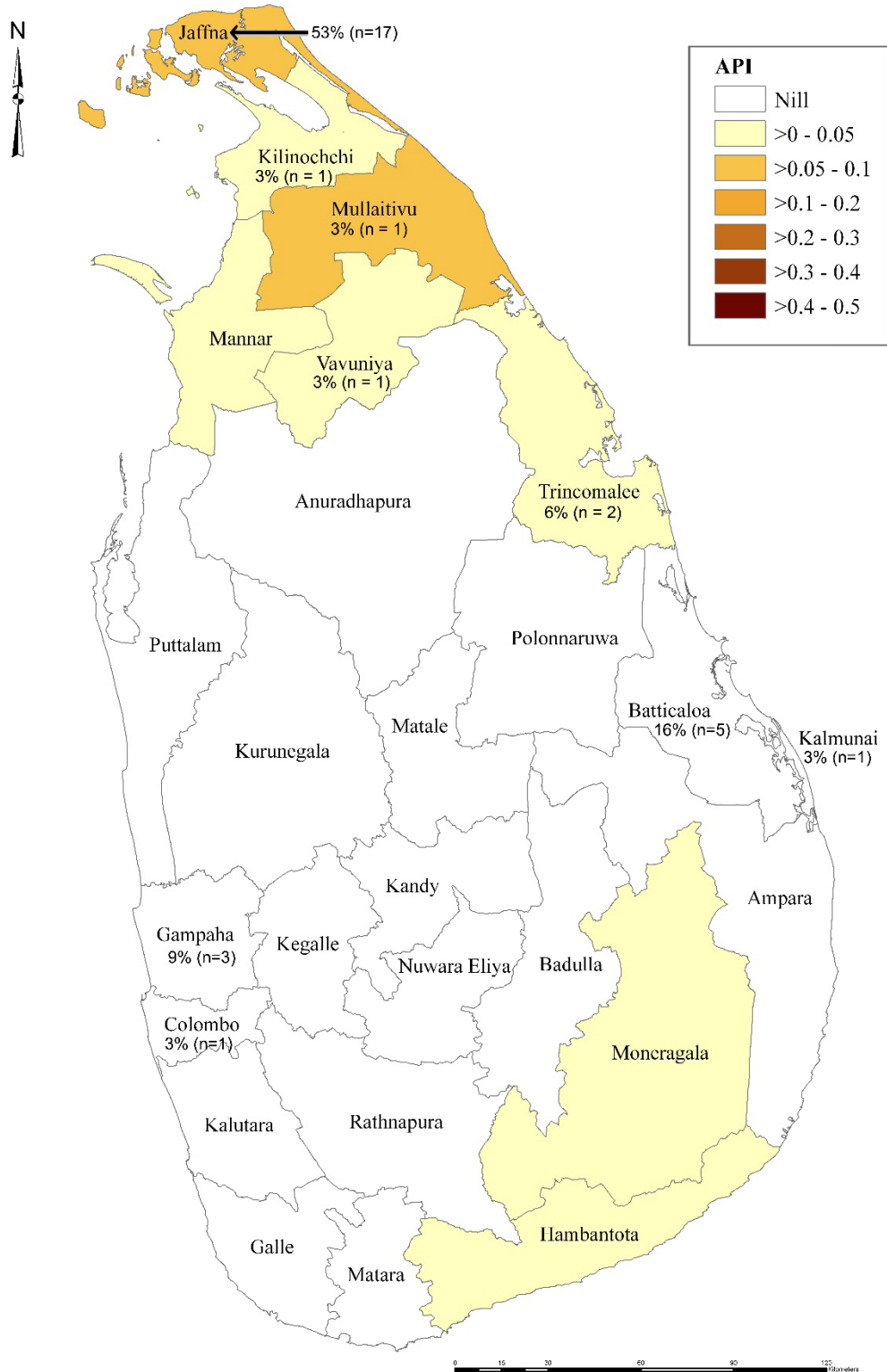


Figure 2: Irregular migration routes from Sri Lanka to Canada via West Africa



Blue indicates air routes and red markers represent the nine countries to which migrants entered before travelling via land routes to converge on a single port (Sierra Leone) to board a cargo vessel. Red dotted line represents the planned sea route.

(Image developed by corresponding author. Map derived by Google maps).

Irregular migration as a potential source of malaria reintroduction in Sri Lanka and use of malaria rapid diagnostic tests at point-of-entry screening

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ABSTRACT

Background

We describe an irregular migrant who returned to Sri Lanka after a failed people smuggling operation from West Africa.

Results

On-arrival screening by Anti-Malaria Campaign (AMC) officers using a rapid diagnostic test (RDT) (CareStart Malaria HRP2/PLDH) indicated a negative result. On day 3 after arrival, he presented with fever and chills but was managed as dengue (which is hyperendemic in Sri Lanka). Only on day 7, diagnosis of Plasmodium falciparum malaria was made by microscopy and CareStart RDT. The initially negative RDT was ascribed to a low parasite density. Irregular migration may be an unrecognized source of malaria reintroduction. Despite some limitations in detection, RDTs form an important point-of-entry assessment. As a consequence of this case, the AMC is now focused on repeat testing and close monitoring of all irregular migrants from malaria-endemic zones.

Conclusion

The present case study highlights the effective collaboration and coordination between inter- governmental agencies such as IOM and the Ministry of Health towards the goals of malaria elimination in Sri Lanka.

Keywords

malaria rapid diagnostic test, irregular migration, human smuggling, malaria elimination, Sri Lanka

Introduction

Malaria is an important disease along international and internal borders that continues to contribute to a large burden of disease in the South East Asian Region (SEAR). Due to extensive efforts progress is being made. During the 2000–2011 period, the number confirmed cases of malaria declined by 24%, and deaths by 68%. Of the 10 malaria-endemic countries in the Region, Sri Lanka has reached to elimination phase of malaria where as Bhutan is in pre-elimination phase.

Sri Lanka has been heralded as a success story in Malaria control in Asia (1). In 2008, Sri Lanka entered the pre-elimination phase of malaria control (2). The slide positivity rate declined from 2% in 1999 to less than 0.1% in 2011, indicating a significant reduction in transmission.

Infection is mostly encountered among travellers who return from endemic countries, or among military personnel serving in the Northeast of the country (3, 4). The present case-study highlights a newly recognized route of entry for malaria to Sri Lanka through returning 'irregular migrant' flows. In global context, term 'irregular migration' typically refers someone who, owing to illegal entry or the expiry of his or her legal basis for entering and residing, lacks legal status in a transit or host country. The term applies to migrants who infringe a country's admission rules and any other person not authorized to remain in the host country.

These routes may act as potential source of malaria reintroduction, retarding elimination goals of the Nation's Anti-Malaria Campaign (AMC). Rapid diagnostic tests (RDTs) for malaria if performed correctly offer excellent diagnostic capability for screening of 'at-risk' groups at ports of entry (5). However, as this case study illustrates, they have several limitations.

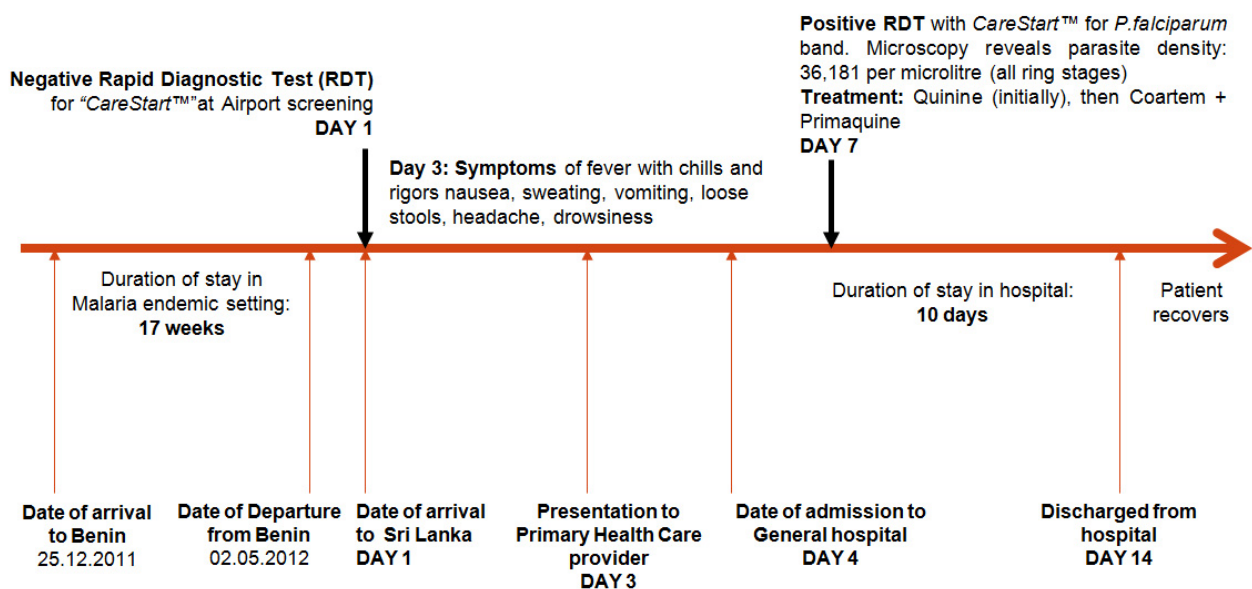
Case report

Background and travel history: A 42-year-old male farmer of Tamil ethnicity from the Eastern province of Sri Lanka joined a group of other irregular migrants that left on a

flight to Benin on December 2011. All had paid a large sums of money to a human smuggler, who had assured them safe passage to Canada and legal work permits on arrival. They arrived in Mali on 25th of December 2011 where another group of people smugglers arranged them to stay in a small shelter for one month. After a month, they travelled via flight to Benin, where they joined other cohorts of irregular migrants from Sri Lanka. The shelters they lived in had only basic facilities with no protection from mosquitoes. The smugglers intended to reach a quota of at least 900 people from Sri Lanka before charting a fishing vessel to enter Canadian ports. The scheme had already proven successful on previous occasions. During his time in Benin, the farmer recalled a heavy presence of mosquitoes and regular episodes of fever among the smuggled cohort. Smugglers had refused medical assistance in fear of alerting authorities. One death of a person due to 'fever like illness' was also reported although no medical details were available. The captives that managed to escape and had alerted domestic and international law enforcement authorities who eventually informed the International Organization for Migration (IOM) to support the safe return of all irregular migrants from West Africa to Sri Lanka.

Upon arrival at Bandaranayake International Airport in Colombo (day 1), all irregular migrants escorted by IOM were screened by Anti-Malaria Campaign officers (AMC) of the Ministry of Health. According to AMC standard procedure, screening for Malaria was done by a Rapid Diagnostic Test (RDT), CareStart™ Malaria HRP2/PLDH (AccessBio Inc., Monmouth, USA, further referred to as

Figure 1: A time-line indicating key events of the patient



CareStart) for the rapid qualitative determination of *Plasmodium falciparum*-specific Histidine-Rich Protein 2 (HRP2) and pan-*Plasmodium*-specific parasite lactate dehydrogenase (pLDH) performed on venous blood. For those with a positive RDT, the procedure prescribed further microscopic examination of blood smears at the National Malaria Reference Laboratory; patients with *P. falciparum* are treated with artemether-lumefantrine (Coartem) for 3 days and primaquine stat dose. For *Plasmodium vivax* infections, treatment consists of chloroquine for 3 days and primaquine for 14 days. All infected patients are treated at a specialist Infectious Disease Hospital in Colombo, and in case of children less than 12 years, at the Lady Ridgway Children's Hospital. Since the current patient showed a negative result for the CareStart RDT, he was allowed to proceed home.

On day 3 after arrival, the patient presented to a private clinic with symptoms of high fever, headache, chills, rigors and preceding cold sweats. He was referred on day 4 to a Government peripheral hospital with suspicion for dengue fever. In view of clinical suspicion for rapid dengue progression, the attending doctor transferred the patient to Batticaloa Teaching Hospital in line with current policy of dengue management in Sri Lanka (6). A time-line indicating key events of the patient is presented in Figure 1.

Hospital course: For 48 hours upon admission, the patient received supportive treatment for the presumed diagnosis of dengue infection. As part of treatment follow-up, platelet counts were daily measured. Due to low platelet counts during the first two to three days the initial suspicion was maintained for dengue. However, thrombocytopenia due to *Plasmodium* infection was suggested after the dengue antibody test showed a negative result and when the platelet count began to rise again after two days of hospital admission. By the end of day 7, venous blood was submitted to the hospital laboratory for RDT testing (CareStart) and microscopic examination. The slides were later sent to reference laboratory at AMC in Colombo for confirmation. Giemsa-stained thick and thin blood films were examined for the detection of malarial parasites. The RDT was positive for *P. falciparum* and was confirmed by the microscopy (double-chromatin ring stage and "appliqué" form of trophozoites), the parasite density was calculated as 36,180 asexual parasites/ μl , which equals 0.7% of red blood cell infected. Carestart RDT revealed the presence of a visible HRP2 and pan-pLDH test line.

Once the diagnosis of *P. falciparum* was made, intravenous quinine (800mg q8h) was administered. However this protocol was changed to treatment according to AMC

guidelines, that is, artemether-lumefantrine (Coartem) for 3 days and primaquine stat dose. Daily follow-up was carried out for the early detection of complications and the therapeutic response to drugs. Parasites disappeared within 5 days of treatment, and the patient recovered well and was discharged at day 14. There was no recrudescence at the follow-up 10 days after start of treatment.

Discussion

The present report highlights the delay of malaria diagnosis in an immigrant returning from a malaria-endemic region to a country in the near-elimination phase of malaria.

RDTs do not completely rule out malaria. Despite microscopy remaining the 'gold standard' for malaria diagnosis, studies in non-endemic and endemic countries have proven the effectiveness of RDTs (7). A recent Cochrane Systematic review concluded that RDTs 'can replace or extend the access' of diagnostic services for uncomplicated malaria (8). As some countries succeeded in reducing malaria prevalence and are moving towards malaria elimination, detection of low parasite densities has become increasingly important for diagnosis and clinical management (9). For this reason, RDT test performance at low parasite densities is particularly important. A laboratory evaluation of CareStart on stored clinical samples showed detection rates of 90% for both *P. falciparum* and *P. vivax*. at parasite densities of 200 asexual parasites/ μl (10). Another study in a reference setting showed diagnostic sensitivities for *P. falciparum* at parasite densities above 100 and 1,000/ μl to be 94.3% and 99.3% respectively; for the detection of *P. vivax*, overall sensitivity was 77.6%, increasing to 90.2% at parasite densities above 500/ μl (11).

Malaria RDTs are a cost-effective and convenient screening technology, particularly at use in 'point-of-entry' settings such as international airports. However, RDTs do have several limitations as described in this present case. We hypothesize the most likely cause for the initially negative CareStart RDT in the patient upon arrival at Colombo airport to be low parasite density. Indeed, the diagnostic sensitivity of CareStart RDT for the detection of *P. falciparum* dips to 69.9% at parasite densities below 100/ μl (11). At the time of testing at airport, the levels may well have been well below 100 parasites/ μl .

As a consequence of this case, the AMC revised its follow up procedure by undertaking repeat RDT testing of all irregular migrants channeled via IOM within 2 weeks of their arrival at home. This practice has since been

extended to Sri Lanka's United Nations Peace Keepers returning from endemic areas. A network of AMC program officers and IOM staff at district level also conduct follow up of the returnee cases.

Malaria should not be overlooked in patient management. Sri Lanka is also a hyper-endemic country for dengue with repeated outbreaks occurring throughout the year (12). Due to the rarity of malaria cases over the past decade, patients presenting with acute febrile illness and thrombocytopenia may lead clinicians to the diagnosis of dengue fever, or less commonly, leptospirosis (3). However, the present patient history illustrates that awareness of malaria should be maintained in order to keep the diagnostic delay as short as possible. Clinical and laboratory competence can be improved and awareness can be triggered by various means such as prompt notification, continuous medical education and external quality assessments.

Implications for malaria elimination: An increasing trend of irregular migrant flows has been reported in Sri Lanka since the end of civil conflict in 2009. IOM estimates a total of 900 Sri Lankans to be stranded in West Africa in 2012 alone. From January to July 2012, 14 cases of *Plasmodium falciparum* were detected in 437 returnees from people smuggling operations from West-Africa (13). Beyond the criminal and human rights implications for the victims of human smuggling/trafficking, there are serious public health concerns of malaria importation and re-emergence. Surveillance of in-bound migrant flows from endemic areas is vital to prevent re-introduction and re-emergence of malaria in Sri Lanka, especially since the country enters the malaria elimination phase. There has been limited attention to this route of importation by health authorities.

As a consequence of this case, AMC revised its follow-up procedure by undertaking repeat RDT testing of all irregular migrants channeled via IOM within 2 weeks of their arrival at home. This practice has since been extended to Sri Lanka's United Nations Peace Keepers returning from endemic areas. The case-study also highlights the importance of effective collaboration and coordination between inter-governmental agencies such as IOM and Ministry of Health towards the goals of malaria elimination by the end of 2012 (2).

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Mapping the use of malaria rapid diagnostic tests in a country entering elimination

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ABSTRACT

Background

As Sri Lanka marches towards the goal of malaria elimination, a major focus is for preventing the re-introduction of malaria where Rapid Diagnostic Tests (RDTs) can play a key role. Hitherto, no studies have been conducted on documenting the dynamics and practice of RDT use within Sri Lanka's health system.

Methods

Database and administrative records from Sri Lanka's Anti-Malaria Campaign were conducted to identify data on type of RDTs used, patterns of use, rationale for distribution, quality assurance and record keeping practices. An extensive review of published and gray literature was undertaken in order to search for information relating to RDT.

Results

RDTs are used in Sri Lanka by various personnel such as regional malaria officers, public health inspectors and clinicians within a wide variety of settings, ranging from airports to field military settings. Of the total allocation of RDTs for the reporting period, only 1% (n=251) were issued for purposes of routine 'point of entry' screening at airport. Some districts which had reported the highest number of malaria cases and with the highest annual parasite incidence also had the lowest allocation of RDTs. There are no nationally available guidelines and training tools for RDT use, quality assessment of end-user performance, result reporting system and routine testing of RDT kits.

Conclusions

Despite evidence of its effectiveness and increasing importance in capturing a large volume of imported cases, there is limited attention towards quality testing, training, reporting and information systems for RDT use in Sri Lanka.

Keywords

malaria elimination, rapid diagnostic tests, Sri Lanka

Journal reference

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Introduction

Rapid Diagnostic Tests (RDT) for malaria and use in elimination contexts

Rapid diagnostic tests for malaria (RDTs) use immunochromatographic techniques to identify target Plasmodium antigens. Studies in both endemic and non-endemic countries have shown RDTs provide a rapid and cost-effective tool for diagnosis (1–3). RDTs do not require refrigeration, can be performed in places without laboratories and are relatively easy to use with minimal training (4). However, important considerations need to be made in choosing an RDT. These include the Plasmodium species to be detected (5, 6); the accuracy (sensitivity and specificity) of the test product (2); false-negative test results that may occur due to gene deletions within the parasite diagnostic antigen (7–9); shelf-life and temperature stability during transport and storage (10); end-user performance and variability in reading based on format of the test (cassette, dipstick, and card)(11); and finally cost to malaria control and elimination programs (4). Training end-users and continuous product testing is therefore recommended to improve RDT use, especially due to varied RDT performance results (12–14).

As malaria transmission declines, accurate diagnosis becomes increasingly important for disease surveillance in elimination settings (14). Identification and treatment of individuals with asymptomatic malaria infections may become important to the success of elimination programmes. Therefore, the use of RDTs in elimination settings requires an understanding of the limitations of these tests in order to adjust diagnostic strategies when necessary. For instance, they do often not reliably detect low-density parasitaemia (<200 parasites/IL) which may occur in some symptomatic and many asymptomatic individuals (2, 13). These individuals then represent reservoirs of infection. RDTs have also been shown to be less sensitive for *P. vivax* infections of pLDH based RDTs (15, 16); and to *P. ovale* and *P. malariae* infections (17).

The Malaria Eradication Research Agenda Consultative Group on Diagnosis and Diagnostics suggests that, as countries shift from control to eradication, the emphasis may shift from light microscopy and RDTs to greater reliance on appropriate automated Nucleic acid-based tests and serology (18). As malaria transmission declines, the proportion of low-density infections among symptomatic and asymptomatic persons is likely to increase, which may limit the utility of RDTs. Monitoring malaria in elimination settings will probably depend on the use of more than one diagnostic tool in clinical-care

and surveillance activities, and the combination of tools utilized will need to be informed by regular monitoring of test performance through effective quality assurance (19).

RDT use in Sri Lanka's pre-elimination context

Sri Lanka has achieved remarkable progress in malaria control and elimination over the past decade (20). The published objectives of Sri Lanka's Anti-Malaria Campaign (AMC) outlined the elimination of indigenous *P. falciparum* malaria by 2012, elimination of indigenous *P. vivax* malaria by 2014 and maintenance of a zero mortality of malaria cases (21). Sustained intervention efforts have seen no indigenous malaria cases since 2013 (22).

Imported cases however overtook indigenously acquired cases of malaria for the first time in Sri Lanka in 2012, contributing to three-quarters of the total malaria burden (70/93). A major focus of AMC is now on preventing the re-introduction of malaria via migrant routes (21). RDTs may play a key role when focusing surveillance of imported malaria via international migration(14). The importance of RDT use as a point-of-entry screening was highlighted by the detection of 23 cases of *P. falciparum* in 437 Sri Lankan returnees from people smuggling operations from West-Africa in 2012 (23).

AMC guidelines stipulate that malaria diagnosis can be made using microscopy or RDTs, if the latter is subjected to confirmation by microscopy (21). RDT tests were first introduced by the AMC to Sri Lanka in 2001, although their systematic distribution within the health system occurred in the aftermath of the Tsunami disaster in 2004(20). The AMC procured 45,000 RDTs through the Global Fund during the 2004 – 2005 post-Tsunami disaster period (20). Since the disaster, RDTs procured has ranged from 21,600 kits in 2007; 27,900 in 2008 and 25,000 in both 2009 and 2010 (24). The rapid tests that have been evaluated within routine practice settings in Sri Lanka are the 'dipstick' ParaSight-F test in 1997 (25), and the ICT Malaria P.f/P.v test in 2004 (26).

RDTs play an increasingly important role in rapid screening and diagnosis in elimination settings, especially when focusing surveillance on inbound travellers (14). This scoping study was undertaken to determine the current patterns and rationale of RDT use throughout Sri Lanka, distribution dynamics and population groups currently screened. Such mapping of RDT use within Sri Lanka's elimination context has not been explored previously.

Methods

Existing AMC database records were searched for information relating to RDT usage and distribution. The research project was undertaken after seeking approval and endorsement from the Ministry of Health and with the AMC directorate. The AMC Director, Deputy Director and Senior Parasitologist assisted in providing access, analysis and verification of RDT data. Data on type of RDTs used, patterns of use, rationale for distribution, quality assurance and record keeping practices were also captured.

A review of published and gray literature was undertaken in order to identify studies pertaining to RDT kit testing and usage in Sri Lanka. Literature search was conducted using electronic databases (PubMed, Medline and Sri Lanka Journals online) using MeSH search terms: 'Diagnostic' OR 'Reagent Kits, Diagnostic' AND 'malaria' AND 'Sri Lanka'. Abstracts of English language papers were then assessed to determine relevance to discussion on RDT use and testing within the Sri Lankan context. The bibliographies of articles were also hand-searched to identify additional relevant literatures. Relevant reports such as administrative audits and donor grant reports were also obtained from Ministry of Health archives and assessed for information relevant to RDTs.

Results

Type of RDT Kit in use

The AMC is the sole provider of RDT test kits for use within Sri Lanka's public health system. Procurement and distribution is done through the AMC with funding from the Global Fund. The RDT kit currently used is the CareStart™ Malaria HRP2/PLDH (AccessBio Inc., Monmouth, USA, further referred to as CareStart) which includes antibodies to HRP2 and pan-specific pLDH (distinguishing *P. falciparum* and other Plasmodium species).

The AMC does not undertake systematic lot testing (batches) of RDT kits before deployment to the field, nor undertake any sensitivity testing. The review of literature also found no studies conducted in Sri Lanka that have measured the performance of the RDT kits currently in circulation. Of relevance was a case-report published in 2013 of a *P. falciparum* false-negative case that occurred using a CareStart™ RDT (27). AMC officials in partnership with the International Organization for Migration (IOM) established a screening process at Sri Lanka's main international airport for a large number of Sri Lankans returning from West Africa, that had exited through irregular channels. A returnee from Benin that was

Table 1: Use of RDT test in Sri Lanka classified by setting and rationale for use

Institution/ Setting	Persons undertaking test	Description	Rationale for use
Hospitals	Clinicians, Laboratory technicians	Used in routine clinical diagnosis of patient suspected with malaria based on history and symptomatic presentation.	Initial diagnosis. AMC recommends microscopy of blood films must be used in confirming diagnosis.
Preventative health care services at District level	AMC Regional malaria officers, Public health inspector (PHI's)	If a case of malaria is detected PHIs are deployed to test a 'buffer zone' of all people living within 1km of the incident case.	Screening and Surveillance.
Ports of entry (Airport/Seaport)	AMC staff and airport PHI's	For on-arrival testing at airport of selected risk populations (Sri Lankan nationals) from malaria endemic areas. These include 'irregular' migrants such as failed asylum seekers and undocumented migrant workers.	Point-of-entry Screening and Surveillance of a person/case-load from known inbound routes.
Military settings	PHIs and medical officers attached to armed forces	If a case of malaria is detected, PHIs that work within the armed forces are deployed to systematically test all army personnel in a selected setting. Sri Lankan United Nations Peace Keeping forces returning from West Africa as systematically screened for malaria using RDTs. Military personnel who have worked in the North and East Provinces of country are also screened before transfer to other regions in the country.	Screening and Surveillance. The armed forces link with the AMC reference laboratory for microscopic confirmation of all RDT positive cases.

screened at airport rapidly progressed to severe clinical disease upon return to residence with *p. falciparum* (27). The false-negative result was ascribed to the very low parasite density and detection thresholds of the RDT kit in use. As a consequence of this case, in addition to emphasizing the importance of microscopy, AMC revised its follow-up procedure by undertaking repeat RDT testing of all irregular migrants channelled within 2 weeks of their arrival at home destination.

Current Patterns of RDT use in Sri Lanka

RDTs are used in Sri Lanka by various personnel such as regional malaria officers, public health inspectors (PHI's) and clinicians within a variety of settings such as airports and field military settings (Table 1). RDTs are used for both rapid diagnostic screening and for public health surveillance. For instance, if an indigenous case of malaria is detected, the field level PHI's are deployed to test a 'buffer zone' of people living within 1km of the incident case.

Table 2 shows the results of RDT distribution and allocation dynamics for the most recent year of data collection (May 2012 to May 2013). Total RDTs procured by AMC was 35,040 kits. Of the total allocation of RDTs for the reporting period, only 1% (n=251) were issued for purposes of routine 'point of entry' screening at airport by AMC. Regional Malaria Officers at District level are the primary conduits for disseminating RDTs at government medical institutions (80%), followed by the military (15%).

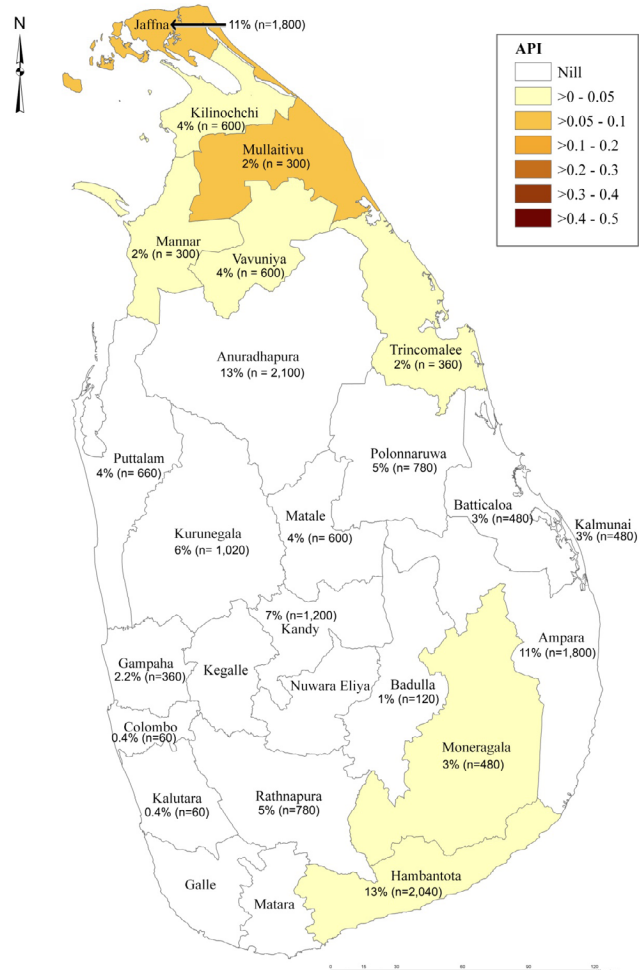
Table 2: RDT Distribution and allocation dynamics in Sri Lanka (2011–2012)

Conduit of RDT distribution	Amount issued	Allocative (%)
By Regional Malaria Officers at District level	16,980	80%
By AMC Central Lab	538	3%
By AMC Outreach unit	672	3%
Airport screening*	(251)	(1%)
By Army Outreach units	1,790	8%
By Army Hospital	1,200	6%
By Air Force	120	1%
Total RDTs issued	21,300	
Army (requested but in process of issuance)	5,000	
RDTs procured	35,040	

** During the reporting period a total of 251 RDTs (1% of total allocation) were issued for point of entry screening at airport for irregular migrant returnees.

Figure 1 presents a map of the RDT usage by regional malaria officers in each district (from May 2012 to May 2013), superimposed on the annual parasite incidence index (API) for each district in 2012. Hambantota (13%) and Jaffna (11%) districts had the highest number of kits issued. Despite having an API comparable to Jaffna (>0.05 – 0.1), Mullaitivu district in Sri Lanka's Northern Province had allocation of only 2% of total number of RDT issued.

Figure 1: RDT Distribution by district by regional malaria officers (RMOs) from May 2012 to May 2013



Whilst training on RDT use is provided through AMC experts, there are no readily published guidelines or checklists (in local languages) that have been developed for RDT use in Sri Lanka. No reporting mechanism and database has been established by to record the results of field level RDT tests that are conducted throughout the island, and more importantly if follow-up microscopy had been performed. Information on false-positive or negative rates are unknown as a result.

The current Monitoring and Evaluation Plan of the National Malaria Control Programme does not articulate the limitations of RDTs, nor emphasize the need to ensure and maintain routine testing and quality control of RDTs. There are no nationally available monitoring and evaluation tools for RDT use, nor external quality assessment programs to measure end-user performance. A country audit of the Global Fund Grants to Sri Lanka in 2011 revealed that RDTs had been out of stock for more than a year at both central and district levels (28). This was attributed to a lack of an effective procurement and supply management system for RDTs. A priority recommendation was for Sri Lanka to establish a quantification process for RDTs, where a management information system should be instituted at both central and regional/field offices.

Discussion

Results reveal that RDTs play an important role in screening and diagnosis of malaria in Sri Lanka's elimination phase, with port-of-entry detection of inbound migrants using RDTs being a key contributor to case identification. The fact that the current point-of-entry screening strategy only targets highly selective at-risk populations such as irregular migrants from West Africa may have to be revised in light of this evidence. The fact that the largest number of migrants returned to districts with the highest annual parasite indices reported nationally is also significant. Re-introduction and risk of spreading the parasites occurs when there is a long-term return into areas of endemicity with presence and prevalence of the mosquito vector.

When RDTs are introduced to health systems with no guidelines, little or no ongoing monitoring and support of staff after distribution or initial training phases, a higher degree of user error and variability of RDT readings have been observed (29-31). End user errors such as incorrect reading and interpretation of banding information (for instance, faint test lines) and incorrect sample and buffer volumes in RDT preparation may undermine its usefulness as a screening tool (10, 11, 32). As reported, no such training or guidelines on RDT exist and the number of users at the primary health care level trained in performing and interpreting RDTs is unavailable. There may be a need to improve training and ongoing support of relevant health care workers and establish feedback systems for results for quality control and 'troubleshooting'. Lot testing designed to detect RDTs that perform poorly before they are sent to the field and also provide the requesting institutions with rapid access to information on the quality of RDTs need to be embedded into AMC practice.

RDT test performance for detecting malaria at low-parasite densities becomes important for diagnosis as Sri Lanka moves towards sustaining malaria elimination. The varying precision of CareStart™ RDT to detect *P. vivax* infection at low parasitemias may warrant the need for internal quality testing and evaluation in Sri Lanka. Of growing concern are the regions of the world where malarial parasites that fail to produce HRP2 still cause bloodstream infections (19). Therefore, alongside research into endemicity profiles of inbound migrant flows to Sri Lanka, a better understanding of the dynamics of RDT effectiveness in relation to genetic polymorphisms within the parasite diagnostic antigen may also be a useful research area for Sri Lanka.

This paper contributes to the important yet surprisingly poorly explored discourse on RDT use in Sri Lanka's march towards malaria elimination. This scoping study outlined the current status and form of RDT use within the health system, distribution dynamics including gaps in existing practices. Despite evidence of its effectiveness in capturing a large volume of imported cases, there has been limited attention towards quality testing, training, reporting and information systems for RDT use in Sri Lanka.

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Ethical Considerations

Research was undertaken with the endorsement and joint collaboration of the Ministry of Health. The research did not involve any human or animal subjects.

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SECTION II

Migration and Infectious Diseases

MALARIA

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Malaria burden in irregular migrants returning to Sri Lanka from human smuggling operations in West Africa and implications for a country reaching malaria elimination

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ABSTRACT

Background

As Sri Lanka marches towards the goal of malaria elimination, a major focus is for preventing the re-introduction of malaria where Rapid Diagnostic Tests (RDTs) can play a key role. Hitherto, no studies have been conducted on documenting the dynamics and practice of RDT use within Sri Lanka's health system.

Methods

Database and administrative records from Sri Lanka's Anti-Malaria Campaign were conducted to identify data on type of RDTs used, patterns of use, rationale for distribution, quality assurance and record keeping practices. An extensive review of published and gray literature was undertaken in order to search for information relating to RDT.

Results

RDTs are used in Sri Lanka by various personnel such as regional malaria officers, public health inspectors and clinicians within a wide variety of settings, ranging from airports to field military settings. Of the total allocation of RDTs for the reporting period, only 1% (n=251) were issued for purposes of routine 'point of entry' screening at airport. Some districts which had reported the highest number of malaria cases and with the highest annual parasite incidence also had the lowest allocation of RDTs. There are no nationally available guidelines and training tools for RDT use, quality assessment of end-user performance, result reporting system and routine testing of RDT kits.

Conclusions

Despite evidence of its effectiveness and increasing importance in capturing a large volume of imported cases, there is limited attention towards quality testing, training, reporting and information systems for RDT use in Sri Lanka.

Keywords

malaria elimination, irregular migration, human smuggling, Sri Lanka, West Africa

Journal reference

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Multi-drug resistant tuberculosis in a foreign resident visa holder and implications of a growing inbound migrant flow to Sri Lanka

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ABSTRACT

Background

We present a case of an international labour migrant worker from India who acquired multiple-drug resistant tuberculosis (MDR-TB) as a result of poor treatment compliance throughout his work and travel history. The travel to Sri Lanka was made under the resident visa scheme. Currently there are no mandatory health assessment requirements for inbound migrants such as resident visa holders to Sri Lanka. The diagnosis of MDR-TB was made at a district level chest clinic and the National Tuberculosis Program (NTP). This is the first documented case of MDR-TB in a foreign born migrant worker in Sri Lanka. The volume of resident visa applicants and foreign migrant workers to Sri Lanka from high TB burden countries has increased dramatically over the past five years. We examine the rationale and public health impact for undertaking a health assessment of the growing numbers inbound migrant workers to Sri Lanka from high TB burden countries.

Keywords

migration health, tuberculosis, multi-drug resistance

Journal reference

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Introduction

International migration continues to be a major phenomenon of our modern era with more people on the move than any other time in human history.¹ Tuberculosis (TB) is one of the most important diseases among foreign populations.² Once infected with tubercle bacilli, a person has a lifetime risk of contracting the illness. Thus tuberculosis remains a major cause of ill health and death globally.³ The principal target of United Nations' Millennium Development Goals (MDGs) and the supplementary targets are to halve the TB prevalence and mortality rates by 2015, as compared to 1990. The most important intervention for the control of tuberculosis (TB) is effective treatment of infectious cases.⁴ Failure to complete treatment poses a significant public health risk through disease reactivation, increased transmission, and development of drug-resistance. About 24% of the world's population living in the South Asian region bears 30% of the disease burden in terms of incidence of TB cases. In India alone, about 1.8 million new episodes of disease accounted for one in every five cases in the world, making it first in the list of 22 High Burden Countries (HBCs) defined by WHO.⁵

Infection with *Mycobacterium tuberculosis* resistant to both rifampicin and isoniazid, with or without resistance to other anti-tuberculosis drugs, is defined as multi drug resistant tuberculosis (MDR-TB).⁶ MDR-TB is still relatively rare in Sri Lanka. Sri Lanka's success has been attributed to the effective National Tuberculosis Control Programme (NTP) which screens, diagnoses and treats the disease without incurring any cost to the patient. Sri Lanka has adopted the Directly Observed Treatment Short-course (DOTS) strategy in phases since 1997, covering the entire country by 2010. The central laboratory of the NTP has detected 25 cases of MDR-TB from year 2010 to 2012, all of which were indigenous cases. None of them were classified as extremely drug resistant TB (XDR-TB). There has been a reduction in the MDR-TB cases from 16 in 2005 to 4 cases in 2012. However, the threat still persists, since most cases of MDR-TB results from poor compliance and erratic treatment.^{7,8} A recent study also revealed the presence of evolved Beijing strains of *M. tuberculosis* among a relatively young cohort of patients.⁹ The Beijing strain is known for its ability to evade the protective effect of *Mycobacterium bovis* (BCG) vaccination,¹⁰ and be more prone to acquire drug resistance.¹¹

Case-report

We report a case of MDR-TB in a 31-year-old male ("SHR") from the district of Andhra Pradesh, India, who travelled to Kuwait as an international labour migrant worker in 2006 to work as a driver. There he met and married a Sri Lankan female labour migrant working as a house maid. After 2 years they returned to his home in Andhra Pradesh, where they lived for a year. While in India, SHR developed a long lasting cough, with intermittent low grade fever for which he did not seek any medical attention.

In the early months of 2009, with the intention of returning to Kuwait for work, SHR underwent mandatory medical screening as part of the work visa requirement at a GAMCA (Gulf Cooperation Council Approved Medical Centres' Association) approved medical center in India. Radiological findings revealed opacities suggestive of pulmonary TB. Sputum microscopic examination for acid fast bacilli (AFB) was also positive. Treatment with first line drugs (isoniazid, rifampicin, pyrazinamide and ethambutol (HRZE)) was initiated and continued for 2 months. The treatment was managed through a private sector provider in India. However the patient appears not to have completed the directly observed therapy (DOT) protocols for TB. At the end of the two months he was re-screened and as his sputum microscopy for AFB was negative, he was given the medical certificate to travel and work. According to his wife, he was not advised about continuing treatment up to 6 months, and they had

assumed that the disease was now cured. Thus, despite "defaulting" DOTs treatment after 2 months, he left for Kuwait to work as a driver in 2009.

SHR worked in Kuwait for nearly two years before he developed severe chest pain, cough and fever. On worsening of his condition, he consulted a doctor in a private clinic. Radiological investigation suggested reactivation of TB. The state of Kuwait which falls under the jurisdiction of Gulf Cooperation Council (GCC) preserves the right to deport foreign migrant workers diagnosed with specified conditions such as HIV and TB.^{12,13} SHR immediately resigned from work and returned to India in November 2010 to commence TB treatment from a private sector provider. He continued DOTS treatment for two weeks, until he travelled to Sri Lanka with his wife and family. Since he was a national of India, he entered Sri Lanka on a tourist visa, and subsequently successfully obtained a residence visa under the "spouse of Sri Lankan" category.

From the second day of his arrival in Sri Lanka, he developed severe chest pain and presented to a government chest clinic in the southern district of Matara, Sri Lanka. A chest x-ray taken on 22nd November 2010 showed a cavity in the mid zone of the right lung and opacity in the mid zone of the left lung. The three samples of sputum taken on 22nd and 23rd were AFB positive (with a '+' grading). Sputum for culture and drug susceptibility testing were done due to his previous "defaulter" status. Though category II treatment was recommended according to Sri Lankan guidelines of TB management,¹⁴ due to a nation-wide shortage of intra-muscular streptomycin, the patient was treated with the category I first line oral agents (fixed dose isoniazid, rifampicin, pyrazinamide and ethambutol) daily from 26th November 2010, given under direct medical observation at the nearest Government Hospital. On 29th December 2010, the patient was referred to the district chest clinic, and the regime was changed to Category II, i.e. 2 months HRZE (isoniazid, rifampicin, pyrazinamide and ethambutol), plus streptomycin (1g daily), followed by one month of HRZE and finally for 5 months of HRE.

Since the patient developed haemoptysis, repeated sputum samples for AFB, chest X-ray and CT scan chest were done which revealed endo-bronchial TB. The TB culture, using Lowenstein Jenson medium, reported growth of *Mycobacterium tuberculosis*, with confluent growth of (3+) on 1st March 2011. The drug sensitivity testing (DST) reported on 8th March 2011 revealed MDR-TB resistant to streptomycin, INAH, rifampicin and ethambutol.

Screening of family members and those with close and frequent contacts with SHR was done. This is important, especially as he was identified as having MDR TB. SHR was not employed during his short stay in Sri Lanka and did not associate with many people due to the language barrier, thereby reducing the number of potential contacts. His house, situated in a village in a remote area of Matara, had three bedrooms with good ventilation through multiple open windows and with areas of direct sunlight. The two children slept in the same room with their parents. Chest x-ray of the children (5-year-old boy, and 3-year-old girl) and mother was non-suggestive of TB.

According to TB management guidelines of Sri Lanka, the patient was referred to the National Chest Hospital at Welisara and counseled on the requirements for in-ward treatment at the same institution for a minimum of 6 months, including the requirement for follow up drug treatment for 18 – 24 months as an outpatient. The patient refused to be treated in Sri Lanka, and according to his spouse was unhappy to be isolated for a long duration in a foreign country. SHR returned to India within one week of his MDR diagnosis to continue his treatment at a private hospital in Vellore.

Discussion and Conclusions

We report the first case of MDR-TB in a foreign born resident visa holder of Sri Lanka identified through the NTP program. Whilst many recognize Sri Lanka as a ‘labour sending country’ with approximately 2 million migrant workers (or one in every ten Sri Lankans) working overseas, only a few are aware that the nation is increasingly becoming a ‘labour receiving country’ - needing foreign workers to fuel the demands of a post-war developmental boom.¹⁵ This case-report serves as an important catalyst to identify both effective and humane strategies for TB detection and management for those non-citizens with long stay resident visas.

Population mobility across the world is rapidly becoming a key determinant in the epidemiology of tuberculosis. A meta-review on active screening at entry for tuberculosis among new immigrants to Europe documented that the proportion of screened immigrants with active pulmonary tuberculosis ranged between 1 and 38 per 1,000, that is, between 10 to 100 times greater than the prevalence measured in the general population of the host country.¹⁶ Hence similar to this case, there may well be other cases of MDR-TB, considering the increasing volumes of inbound resident visa holders arriving in Sri Lanka to reside from TB endemic countries such as India and China. An analysis of data from the Immigration

Controller General on resident visa holders to Sri Lanka for the year 2010 showed 9,815 Chinese and 9,702 Indian visa holders, comprising of 23.1% and 22.84% of the total inbound resident visa caseload. More recently, in February 2013, the government announced a scheme to formally grant work visas for Indian nationals to work to harvest paddy fields in Sri Lanka due to domestic labour shortages,¹⁷ who will be provided with three-month visas for work.

This reported case was detected only due to the patient’s advanced clinical disease progression which led to a self-referral to a government chest clinic. The surveillance mechanism established by the NTP does not capture cases from foreign migrant populations. There are also no health assessment requirements established in Sri Lanka for assessing TB status of resident visa applicants (at time before departure and/or at port of entry and/or after settlement), such as those performed in other countries in the region such as Australia,¹⁸ Singapore¹⁹ and Malaysia. In the absence of a pre-departure health assessment at the country of origin of the migrant worker, an effective TB diagnostic screening capacity at peripheral locations, or through an outreach strategy where a mobile lab may enter work sites where large populations of foreign migrant workers are present, is essential.

Although the government is yet to enact a clear policy on treatment or screening of non-citizens for TB and other diseases of public health importance, at the time of writing, a cabinet paper for a health assessment for inbound resident visa holders was passed by Parliament. The cabinet paper provides a legal platform upon which to build technical instruction and outline a health assessment mechanism to ensure an evidence-based approach to manage health impacts due to inbound migration. The Ministry of Health in Sri Lanka is also in the process of developing a ‘National migration health policy’ through an inter-ministerial process, which seeks to ensure *the right to health* is protected for all migrant and mobile population groups, irrespective of legal status.²⁰

This case-report also highlights the need to determine clear policies and procedures on the consequences of a MDR-TB and XDR-TB management of foreign nationals detected with TB in Sri Lanka. The current practice adopted by the TB campaign is as per national treatment guidelines for which the foreign national will be required to undergo treatment at the specialist TB hospital at Welisara. The costs to Sri Lanka health care budget for treatment of a MDR-TB patient is approximately \$10,000 USD. The challenges /complications arise due to the need for housing and managing a foreign national for treatment

duration of at least 4 to 6 months in the same facility until the patient becomes non-infectious (sputum negative). The Government of Sri Lanka is currently developing a policy and legal framework through a National migration health policy agenda to address the health assessment protocols and conditions for inbound resident visa holders and non-citizens. There is also the possibility that SHR may well have acquired a drug resistant strain during his stay in the Middle East. There are nearly 2 million Sri Lankans working overseas as labour migrants, with a net outflow of approximately 300,000 per annum, or 730 leaving Sri Lanka per day.²¹ Ninety-three percent of migrant workers work in the Middle East, with the majority working in the Kingdom of Saudi Arabia. The large number of foreign workers in this region could also be a significant source of TB for Sri Lanka,²² particularly of drug resistant strains, due to exposure from co-workers from high incidence countries and inadequate access to health care. TB forms non-admissibility criteria for obtaining employment and/or resident visa status in many parts of the world.

TB is deeply rooted in poverty and low socioeconomic status as well as legal, structural and social barriers which prevent meaningful TB prevention, diagnosis, treatment and care.²³ TB screening for purposes of labour migration and immigration can indeed play a role in the early detection, treatment and care of those afflicted with the disease, if such health assessments are integrated with health systems and/or National TB programs of both sending/receiving countries.²⁴ In the increasingly globalized village, with rapid population mobility across borders, tuberculosis continues to be a major public health issue, and a disease which lies at the fulcrum of individual patient rights, societal rights and the state responsibility to protect. The legislation and regulations laid down for Sri Lankans have to be followed for foreigners as well, since both indigenous and foreign nationals have equal rights and duties. This case report reminds us that implementation of high-quality DOT programs is a collective and shared global responsibility. It is crucial to ensure proper treatment of all TB patients, in order to prevent the emergence of MDR and XDR *M tuberculosis* strains.

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“Don’t forget the migrants”: Exploring preparedness and response strategies to combat the potential spread of MERS-CoV virus through migrant workers in Sri Lanka

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ABSTRACT

Background

From September 2012 to July 2013, 81 laboratory-confirmed cases of infection with Middle East respiratory syndrome coronavirus (MERS-CoV), including 45 deaths (a case fatality ratio of 55%) have been reported from eight countries. Human-to-human transmission is now confirmed showing potential for another pandemic of zoonotic disease, with an extremely high mortality rate. Effective surveillance strategies are required in countries with a high influx of migrants from the Middle East to mitigate the probable importation of MERS-CoV. We discuss here the risk of MERS-CoV in major labour sending countries and list the probable strategies for control and prevention of MERS-CoV using Sri Lanka as an example. It is conservatively estimated that 10% of Sri Lanka’s population work as international labour migrants (1.8 to 2 million workers), with 93% residing in the Middle East. An average of 720 workers depart each day, with the majority of these workers (71%) departing to the Kingdom of Saudi Arabia (the country with 81.5% of total MERS-CoV cases). We also describe other inbound migration categories such as tourists and resident visa holders relevant to the context of preparedness and planning. The importance of partnerships between public health authorities at national and regional levels with labour migration networks to establish institutional and/or policy mechanisms are highlighted for ensuring effective preparedness and response planning. Strategies that can be taken by public health authorities working in both labour sending and labour receiving countries are also described. The strategies described here may be useful for other labour sending country contexts in Asia with a high frequency and volume of migrant workers to and from the Gulf region.

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Introduction

The global health community is experiencing one of the deadliest coronavirus outbreaks that has been reported in recent times. The first case of Middle East respiratory syndrome coronavirus (MERS-CoV) infection was reported in September 2012 from the Kingdom of Saudi Arabia (KSA)¹. Since then, 81 laboratory-confirmed cases of infection with 45 deaths were reported by eight countries, of which 66 (81.5%) were from the KSA² (Table 1). Even though France, Germany,

Italy, Tunisia and the United Kingdom have also reported laboratory-confirmed cases, these patients had been either transferred to these countries from hospitals in the Middle East for specialist care or had returned from the Middle East and subsequently became ill. Hitherto, there have been no cases reported in Asia.

Coronaviruses have long been known to cause widespread human infections such as the common cold and global pandemics such as severe acute respiratory syndrome (SARS)³. MERS-CoV has not been identified previously among humans⁴, thus knowledge about the natural history of the disease is still limited. The clinical syndrome of MERS-CoV is primarily a respiratory disease including fever, cough and shortness of breath, resembling SARS. More than half of cases develop life threatening complications, such as respiratory failure^{5,6}, acute respiratory distress syndrome (ARDS)⁶⁻⁸, renal failure^{4-6,8}, and consumptive coagulopathy.⁸ Studies of clusters of cases suggest that the spread may occur by both large and small aerosols and possibly via the faecal-oral route.⁹ The pathogenesis of MERS-CoV is not fully understood. It appears to cause respiratory problems by attacking and infecting the cells in the nasopharynx; laboratory studies show that the virus has the ability to cause profound apoptosis of human bronchial epithelial cells.¹⁰ All confirmed cases have had respiratory disease and most have developed pneumonia.¹¹ Complications during the course of illness have included severe pneumonia with respiratory failure requiring mechanical ventilations, ARDS with multi-organ failure, renal failure requiring dialysis, consumptive coagulopathy and pericarditis.¹¹ Hitherto, 45 out of 81 cases (55%) have died as a result of infection (Table 1). The rapid transmission and high attack rate in hospital settings have raised concerns about the risk of health care associated transmission of this virus.¹²

Although the transmission of the disease is still not as rapid as seen during the SARS epidemic in 2003,¹³ human to human transmission of MERS-CoV has now been established.⁵ Given the high case fatality rate compared to previous coronavirus pandemics, continued risk assessment, surveillance, and preparedness measures by all countries are required to minimize the impact of a probable global pandemic of MERS. The WHO encourages “all Member States to continue their surveillance for severe acute respiratory infections (SARI) and to carefully review any unusual pattern”.²

The annual Hajj pilgrimage, attended by 3 million pilgrims from all over the globe, has been identified as a potential threat for major spread.¹⁴ A recent study has shown evidence of rapid acquisition of respiratory viruses among pilgrims during their stay during the Hajj.

Table 1: Middle East respiratory syndrome coronavirus – cases and deaths, April 2012–11 July 2013²

Region and country	Cases	Deaths	Fatality (%)
Middle East			
Jordan	2	2	100
Qatar	2	0	0
Saudi Arabia	66	38	57
United Arab Emirates	1	1	100
North Africa			
Tunisia	2	1	50
Europe			
United Kingdom	3	2	67
France	2	1	50
Italy	3	0	0
Total	81	45	59

in the KSA, most notably rhinovirus.^{14,15} The authors highlight the potential of spreading these infections in the pilgrims’ home countries upon their return. Memish and colleagues also suggest a ‘high degree of clinical vigilance’ required for the possibility of MERS-CoV infection in patients with respiratory infections who have visited the Middle East in the preceding 10 days.⁶ Despite these concerns, the WHO does not recommend changing travel plans for Hajj or Umrah because of MERS-CoV. However, at a recent meeting organized by the WHO in Cairo (June, 2013), public health officials specifically emphasized the importance of preparedness and response at Hajj and contexts of mass gatherings ‘as a priority action’, with Member States of WHO agreeing to develop specific plans for MERS-CoV.¹⁶ No emphasis at this meeting or in peer-reviewed literature has been made in relation to the large volumes and frequent travel patterns of international labour migrant workers to the Middle Eastern countries, especially from Asia.¹⁷

International labour migrants in the Middle Eastern region

Labour migration from Asia to the Middle East involves the movement of contractual workers from many ‘labour sending’ nations such as the Philippines, India, Sri Lanka and Indonesia, to ‘labour receiving’ ones, mainly within the Middle Eastern region.¹⁸ Estimates of total migrant workers by the International Labour Organization for 2010 were 105.5 million, 30 million of which were from within Asia.¹⁹ It is estimated that there is a net annual outflow of two million migrant workers from the ‘top five’ South Asian labour sending countries of Sri Lanka, India,

Bangladesh, Nepal and Pakistan²⁰ (Table 2). Unregistered 'irregular' migrant workers also contribute to this outflow of contractual workers from Asia, although estimates are difficult to assess due to the clandestine nature of their travel. It is important to highlight that remittance from labour migrants contribute significantly to the

economic growth of most developing countries in Asia. The Sri Lankan economy is highly dependent on foreign exchange earnings from its migrant workforce, with remittance from workers in Middle Eastern countries alone contributing 58.9% of all total foreign exchange earned in 2011.²¹

Table 2: Outflow of workers from selected Asian countries to the Gulf Cooperation council countries in 2010²⁶

Labour sending country	Labour receiving country						Total
	Bahrain	Kuwait	Oman	Qatar	KSA	UAE	
Bangladesh	13,996	29	135,265	13,111	15,039	282,739	460,179
India	14,323	45,149	73,819	41,710	289,297	138,861	603,159
Nepal	4,647	15,187	2,442	102,966	71,116	44,464	240,822
Pakistan	5,940	6,251	37,580	10,171	138,495	222,097	420,534
Sri Lanka	7,057	48,105	6,370	53,632	70,896	42,198	228,258
Philippines	15,434	53,010	10,955	87,813	293,049	201,214	661,475
Indonesia	15,434	45,149	73,819	41,710	289,297	138,861	603,159
Total	75,720	212,880	340,250	351,113	1,167,189	1,070,434	

Preparedness measures and screening strategies relevant to Sri Lanka

Although the WHO has not yet issued a travel health warning for any country, nor recommended conducting on-arrival screenings at ports of entry, the infectious nature of MERS-CoV means that there is a risk of contracting the disease through infected individuals who have visited the Middle East in the preceding 10 to 14 days. Health authorities in some countries in the region have already begun making advanced arrangements for the diagnostic test kits developed by the CDC for MERS-CoV to be made available to National Reference Laboratories.¹⁶ Ensuring guidance for health care professionals regarding case definition, diagnosis and management for MERS-CoV infection, and establishing an active surveillance system for 'influenza-like' illnesses in hospitals are essential steps for surveillance. Elaborating pandemic preparedness and response measures are not the focus of this current paper since these have already been well described and indeed established in Sri Lanka through previous efforts against SARS and H1N122. Rather, this article will focus on understanding the importance of the large volumes of migration categories and their dynamics, which may yield more specific and targeted public health and screening interventions for MERS-CoV.

Inbound migration categories to Sri Lanka from the Middle East region

Inbound migration refers to the flow of persons travelling into a country.²³ We identify five major inbound migrant flows from the Middle East to Sri Lanka with the potential of introducing MERS-CoV (Figure 1).

KSA, Qatar, Kuwait, UAE and Jordan are the major destination (labour receiving) countries, encompassing 85% of Sri Lanka's total international labour migrant force (1.8 to 2 million workers in 2011).²¹ Each day, around 720 migrant workers leave Sri Lanka to the Middle East as labour migrants through Bandaranaike International airport.²⁴ Over 93% of the 262,960 labour migrants were employed in Middle Eastern countries in the year 2011 (Table 2). Female participation in foreign employment is 48.3% of the total departures during the same year, and 85% of them worked as domestic housemaid.²⁵ The recent evidence of virus spreading within family clusters may be a significant factor in determining household transmission.⁶

Data on patterns of returning migrant workers are not available since there is no registry of returning workers. However, inflow is expected to be greater than outflow considering both the cyclical nature of labour migration (where a worker usually returns to the country for a short period before departing again - a cycle which can last

10 years or more), and the large stock total of formally registered workers from Sri Lanka.

Every year, Muslims from all over the world converge in KSA to take part in the annual Hajj (pilgrimage). KSA hosted 2.5 million pilgrims in 2009 amidst the H1N1 pandemic.²⁷ In 2013, the Hajj is expected to fall between the 13–18 October. A quota system operates to limit the number of people from each country visiting Mecca each year based on the number of Muslims in each country. The Sri Lankan quota for 2013 is currently set at 2,800.²⁸

Tourist arrivals and resident visa holders

A residence visa is a permit for non-Sri Lankan citizens to obtain residence facilities for purposes of long stays, work and study. The numbers of both residency visa

holders and tourists visiting Sri Lanka from the Middle East, disaggregated by country of residence, are shown in Table 3. Both KSA and the UAE remain the primary source countries of migrants within this inbound category.

If a highly conservative estimate on the number of labour migrants returning from the Middle East is placed at 220,000 persons per year, then based on data from the five major categories of migrant flows presented here, an estimated 280,901 persons will travel from the Middle East to Sri Lanka. This number does not account for the number of returning Sri Lankan tourists and irregular migrants from the Middle Eastern region. Based on the fact that 71% of the current caseload of Sri Lankan migrant workers depart for the KSA, it is expected that the majority of inbound migrants will be travelling from the same country.

Figure 1: Categories of inbound travellers from the Middle East. This figure shows the different categories of inbound travellers arriving at the Bandaranaike International Airport, Sri Lanka

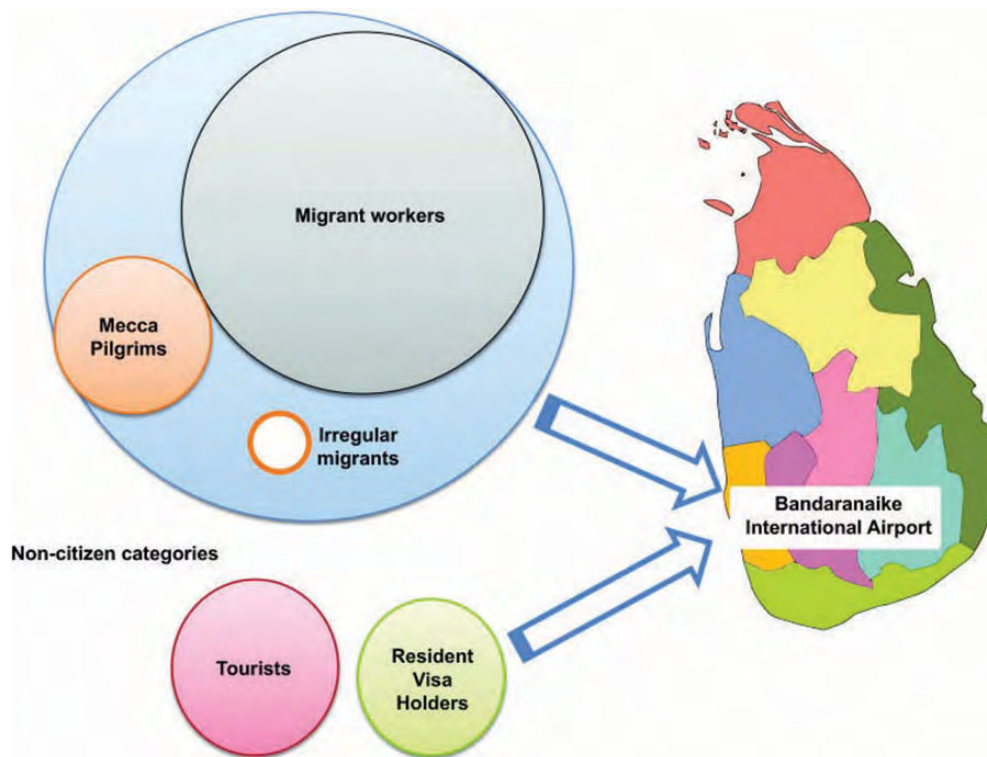


Table 3: Resident visa holders and tourist arrivals from the Middle East in 2010 and 2011

Country	2010		2011	
	Tourists	Residents	Tourists	Residents
Bahrain	1,459	3	1,819	2
Iran (Islamic Republic of)	1,900	75	2,223	139
Israel	3,919	18	6,164	15
Jordan	1,708	41	1,478	52
Kuwait	2,303	25	2,812	15
Lebanon	1,816	11	1,960	21
Oman	1,359	26	2,177	19
Kingdom of Saudi Arabia	9,301	20	15,081	51
Qatar	1,574	8	2,788	12
United Arab Emirates	9,825	18	17,664	18
Egypt	849	62	767	77
Turkey	664	41	1,171	86
Others*	863		1,397	93
Middle East (Total)	37,540	441	57,501	600

*Others: Yemen, Cyprus, Iraq, Palestinian Territories and the Syrian Arab Republic.

Preparedness and response strategies for labour migrants

It is important to note that the following recommendations are suggested as a way of enhancing, not substituting, existing frameworks on pandemic disaster preparedness and response. There are currently no established guidelines for MERS-CoV established at country level, unlike in other settings.²⁹

A number of prevention and screening strategies for migrant workers are presented here, classified according to the three phases of migration: 'pre-departure' (departing Sri Lanka), 'at destination' (time spent in the Gulf States) and 'upon-arrival' (arrival back in Sri Lanka). Each stage in the migration cycle offers unique opportunities for public health action/intervention based on enabling mechanisms and capacities harnessed in routine migrant worker pathways (Figure 2). These may be useful in refining into other country contexts.

A. Strategies at the 'pre-departure' phase. The majority of labour receiving countries require pre-departure health assessment as a pre-requisite for a work visa. Migrant workers to Gulf State countries are expected

to undertake a mandatory pre-departure medical examination in Sri Lanka to ensure their 'fitness to travel' and fulfillment of health assessment criteria set by the recipient country. Health care workers could provide health information on MERS-CoV to potential migrant workers during the medical examination.

Figure 2: Identifying the 'intervention space' within phases of the labour migration cycle

Potential places for interventions (intervention space) in relation to labour migration.

The Gulf-Approved Medical Centers Association (GAMCA) has a network of 13 private medical centers in Sri Lanka, which are accredited to conduct health assessments of Sri Lankan migrant workers prior to departure to the GAMCA countries KSA, Kuwait, Bahrain, Qatar, UAE and Oman. As a preparedness measure, medical staff at these health assessment centers can be trained with up-to date information on MERS-CoV and be encouraged to disseminate language specific information-exchange communication (IEC) materials on signs, symptoms and preventative actions for the migrant worker³⁰.

B. Strategies at the 'destination' phase. Sri Lankan embassies and diplomatic missions at destination countries could disseminate public health service messages in relation to MERS-CoV in Sinhalese/Tamil languages via embassy welfare programs, social networks and through ethno-specific radio programs. It is vital that local health authorities and employers provide access for migrant workers to seek primary health care and that they are supported with specialized/referral care within the health system in the Gulf States. The importance of health accessibility, irrespective of visa

status, for migrant workers to primary and specialized health care facilities in these destination countries also needs to be emphasized through state-to-state and regional advocacy mechanisms. It is recommended that public health authorities and global bodies such as the WHO and the International Organization for Migration utilize the support of existing inter-regional and trans-national migrant worker networks such as the members of the 'Colombo process' and 'Abu-Dhabi process' in order to promote effective public health messages and strategies.³¹

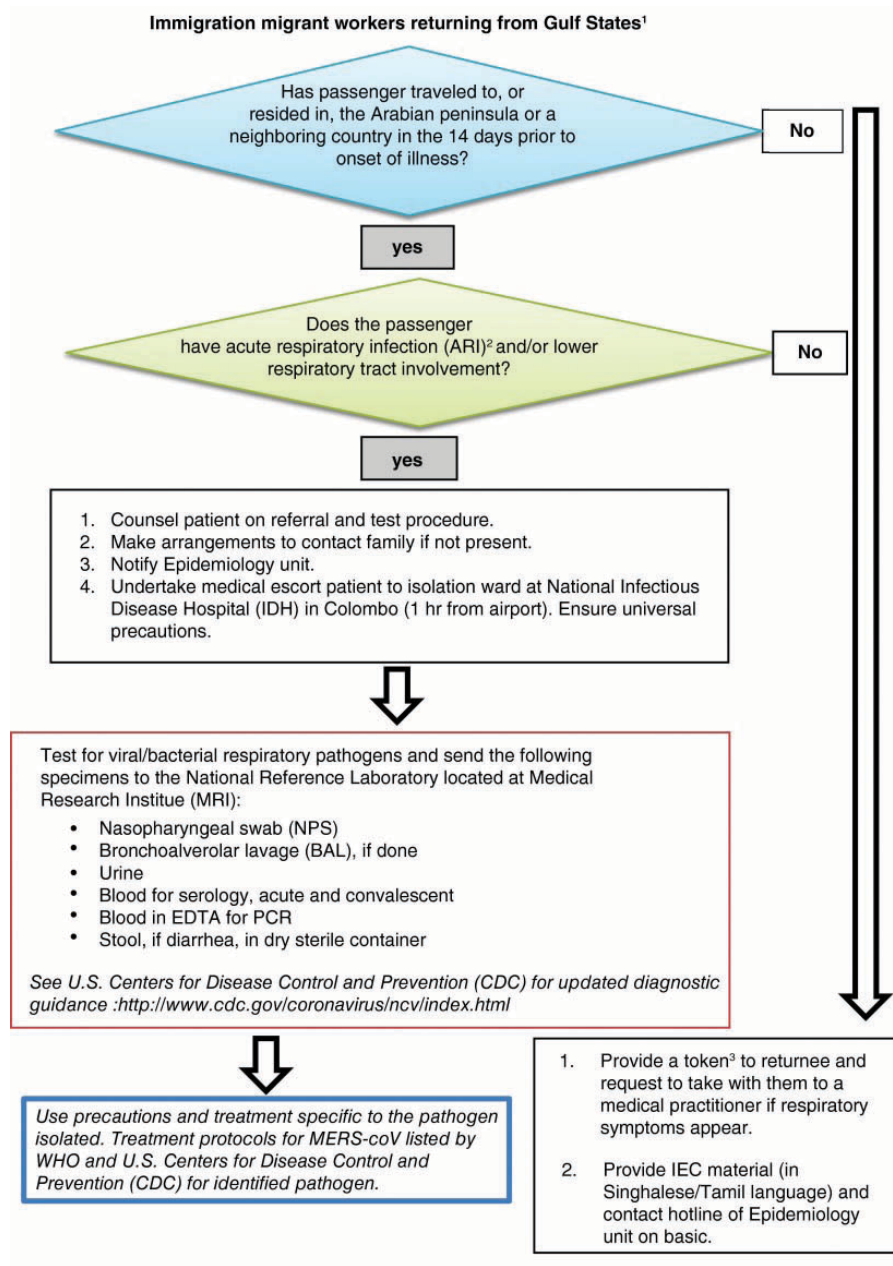
C. Strategies at the 'on-arrival' phase. The Sri Lanka Bureau of Foreign Employment (SLFBE) which provides policy direction and regulation of labour migrants has a dedicated 24-hour administrative desk at Sri Lanka's Bandaranaike International Airport, to manage grievances from returning migrant workers. A worker welfare center to house migrant workers in need of support managed by the SLFBE is also available near the airport. Currently there are no medical personnel attached to the SLFBE services for on-arrival phase. It is recommended that the Ministry of Health make arrangements to establish a coordination mechanism with the SLFBE and with airport health authorities, which currently have no linkage to migrant worker programs. A rotating roster of trained health professionals allocated at the health center at the airport could ensure each returning worker completes the rapid symptom checklist (see assessment algorithm in Figure 3). The algorithm was developed after augmenting the guidance frameworks for MERS-CoV created by the public health authorities in Canada²⁹ and the CDC.³² It is important for port health authorities to also build effective partnerships and protocols with immigration control officers at 'on arrival counters'. This will ensure referral of travellers returning from the Middle East where cases of MERS-CoV have been reported to the health screening desk. Leaflets advising travellers of symptoms of the influenza-like illness could also be distributed at the immigration counter to arriving passengers.

Managing risk communication also forms a vital strategy for any form of public health preparedness and response. Studies have shown that when responding to a novel infectious disease outbreak, policy and planning decisions can limit the ability to control the outbreak and result in unintended consequences including lack of public confidence.³³ Communication of risk to target populations needs to be carefully planned to avert maladaptive behaviors due to fear and defensive avoidance (the motivated resistance to the message, such as denial or minimization of the threat³⁴). Individuals may defensively avoid a message by being inattentive to the communication (e.g., looking away from the message), or by suppressing any thoughts about the threat over the long term. Mitigating such threats through targeted communication strategies to migrant workers and other categories such as those described above may be useful.³⁵ The strategies outlined above do not warrant large scale 'national level' awareness campaigns, which may exacerbate anxiety and induce maladaptive rather than positive health seeking behaviors.³⁶

Conclusion

It has been one year since MERS-CoV was discovered, yet many questions remain unanswered about its pathogenesis, host reservoirs and transmission dynamics. What is clear from global health authorities is that countries need to plan for preparedness and response planning.²⁹ We recommend partnerships between public health authorities, at national and regional levels, with the labour migration industry and migrant worker networks in establishing both institutional and policy mechanisms to ensure effective preparedness and response planning in response to a potential MERS-COV threat through labour migrants from South Asia.

Figure 3: Potential screening algorithm for Middle East respiratory syndrome (MERS-CoV) at Bandaranaike International airport



1. Immigration Counter Referral for those migrant workers returning from Arabian peninsula and neighboring Middle East countries (Saudi Arabia, Qatar, Jordan, United Arab Emirates, Bahrain, Islamic Republic of Iran, Iraq, Israel, Kuwait, Lebanon, Oman, Palestinian Territories, Yemen, Syrian Arab Republic). Referral to Airport health unit may also be directed from the SLFBE migrant worker arrival desk.
2. Acute Respiratory Infection (ARI): Any new onset acute respiratory infection that could potentially be spread by the droplet route (either upper or lower respiratory tract), which presents with symptoms of a new or worsening cough or shortness of breath and often fever (>38°Celsius).
3. This token will identify the migrant worker as a susceptible person for MERS-CoV.

Author contributions

KW conceived the paper and drafted the first version of the manuscript. SP contributed in the concept and manuscript preparation. SBA revised and edited and finalized the manuscript for submission.

Competing interests

No competing interests were disclosed.

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Is Sri Lanka prepared for yellow fever outbreaks? A case study

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ABSTRACT

Background

Re-emerging yellow fever (YF) epidemic is declared as a serious public health event, which warrants intensified national action and enhanced international support. One of the most important measures to stop entering YF to none endemic countries would be proper boarder surveillance. Purpose of this study was to assess the YF transmission risk through the analysis of volume and dynamics of travellers between YF endemic countries and Sri Lanka.

Methods

A mixed-method approach was applied. Descriptive analysis of relevant traveller databases were undertaken to map known patterns of inbound and outbound migrant flows from YF endemic countries. Routine procedures and practices pertaining to YF vaccination and reporting as per International Health Regulations were also undertaken.

Results

Analysis of paper-based records collected across a 13 year period (1998 to 2012) showed a total of 28,684 YF vaccinations administered to Sri Lankan travellers. The total burden of travellers to YF endemic zones increased by 129% from 2009 to 2012. Increase of inbound travellers from YF endemic countries was 142.8% during the same period. Returning 'illegal' (irregular) migrants accounted for more than 40% of inbound migrants from YF endemic countries. There were no standard operational procedures (SOPs), monitoring/regulatory mechanisms at points of entry that enabled immigration authorities or port health officers to check YF certification (ICVP). Traveller declaration forms upon arrival or disembarkation was absent. Reporting formats also differed across each points of entry, and the manual paper based system has not linked to centralized database.

Conclusions

This study reveals the need for non yellow fever endemic countries with high densities of *Aedes aegypti* such as Sri Lanka to be better prepared for possible yellow fever outbreaks through the establishment of effective border monitoring systems and regulatory controls. Assessing travellers YF vaccination status when arriving from, or departing to endemic countries remains a critical step.

Keywords

yellow fever, International Health Regulation, border health surveillance, migration health, Sri Lanka

Introduction

As of 25 May 2016, Angola reported 2536 suspected cases of yellow fever with 301 deaths with an alarming case fatality ratio of 11.9%[1]. This epidemic has spread to Democratic Republic of the Congo (48 cases) and Uganda (60 cases) and imported cases are reported from Kenya and China. WHO declared this outbreak as “a serious public health event which warrants intensified national action and enhanced international support” but did not consider this as a Public Health Emergency of International Concern (PHEIC)[2]. The present outbreak of yellow fever is unique, because this is the first time yellow fever was ever reported in Asia. Ten Laboratory-confirmed cases has been reported in China from air travellers from Angola. Six of these reside in Fujian Province, an area where dengue transmission has occurred, raising concerns of autochthonous transmission[3]. Though the cases from China are still imported[4], possible autochthonous transmission of yellow fever in Asia as well as in other regions has become a major global health concern[5][6].

Resurgence of yellow fever despite all global effort on controlling this disease is partially attributed to lack of funding for disease control activities[2]. According to the International Health Regulations (IHR), travellers departing to, or arriving from WHO listed countries within Africa or Latin America must have obtained the YF 17D vaccination. Though the vaccination is considered as the best strategy in yellow fever control, inadequate vaccine supply for a possible global epidemic is predicted due to Angola’s decision on vaccinating nearly 2 million at risk population[6]. In addition to the risk of inadequate vaccine stockpiles, lack of basic surveillance system optimized to control imported cases to none endemic countries may play a leading role of global pandemic of yellow fever. Even in countries with good communicable disease surveillance system, border health surveillance activities as specified in International Health Regulations are not fully adopted[7].

In published literature, proper assessment of YF related border health procedures are not available for none endemic countries. The volume and dynamics of travelers (both inbound and outbound) from yellow-fever (YF) endemic countries and the use of yellow fever vaccines is not systematically assessed. As a response to the current global threat of yellow fever and first ever threat of yellow fever entering Asia, we analysed the existing border health procedures pertaining to YF vaccination, epidemiological surveillance, regulation and control in Sri Lanka as a case study for all other none endemic countries, specially in Asia.

Methods

Study settings

While yellow fever has never been reported in Sri Lanka, the competent vector for the YF virus, the *Aedes aegypti* mosquito is abundant throughout Sri Lanka[8]. *A. aegypti* is the primary vector of the dengue virus, also of the Flaviviridae family. With the end of protracted civil conflict in 2009 and a rapid economic development agenda, Sri Lanka is experiencing an rapidly increasing flow of travelers via inbound, outbound and internal migration routes, more than ever before in the nation’s history. International travel plays a major role for the emergence, re-emergence and re-introduction of communicable diseases through travelers returning from endemic areas, especially when competent vectors are present for indigenous (autochthonous) transmission to occur. For instance, the threat of re-emergence of malaria due to inbound migrant flows from endemic countries to Sri Lanka, despite the country entering the malaria ‘elimination phase’ has been well documented [9,10].

This descriptive study had three components to capture YF vaccination data among inbound and outbound travelers and a qualitative inquiry to existing border health procedures. Inbound travelers to Sri Lanka are broadly characterized by the Department of Immigration and Emigration (DIE) as regular international migrants (tourists, international students and resident visa holders), and irregular migrants (refugees and asylum seekers, trafficked victims, and assisted voluntary returnees). Temporary outbound travelers are characterized as Sri Lankan tourists, students, international labour migrants, diplomatic personnel and military deployments.

To determine the volume of temporary outbound travelers from Sri Lanka to YF endemic countries, YF vaccination data for outbound travelers were collected from the traveler vaccination unit located at the National Medical Research Institute (MRI) and the Port Medical Office (PMO) located at Colombo seaport. MRI is the only certified centre in Sri Lanka where outbound travelers can receive the pre-departure YF vaccine. PMO provides YF vaccines to seafarers/maritime travelers. Both these settings have been designated by the health authorities to provide the *International certificate of vaccination or prophylaxis against Yellow Fever (ICVP)*. Two researchers independently scanned these paper based records and data entered into an electronic data-base.

To determine the volume and dynamics of inbound regular international migrants from YF endemic countries, data from the Sri Lanka Tourism Development authority (SLTDA) and the Department of Immigration and Emigration (DIE) databases were analysed. The International Organization for Migration (IOM) database on assisted voluntary returnees to Sri Lanka was examined to explore those specifically returning from YF endemic countries.

In addition, short interviews with medical staff from the vaccination center at MRI and Directorate of Quarantine of the Ministry of Health and border control authorities were conducted to determine routine practice, record keeping and standard operational procedures (SOPs) pertaining to YF vaccination and at points of entry.

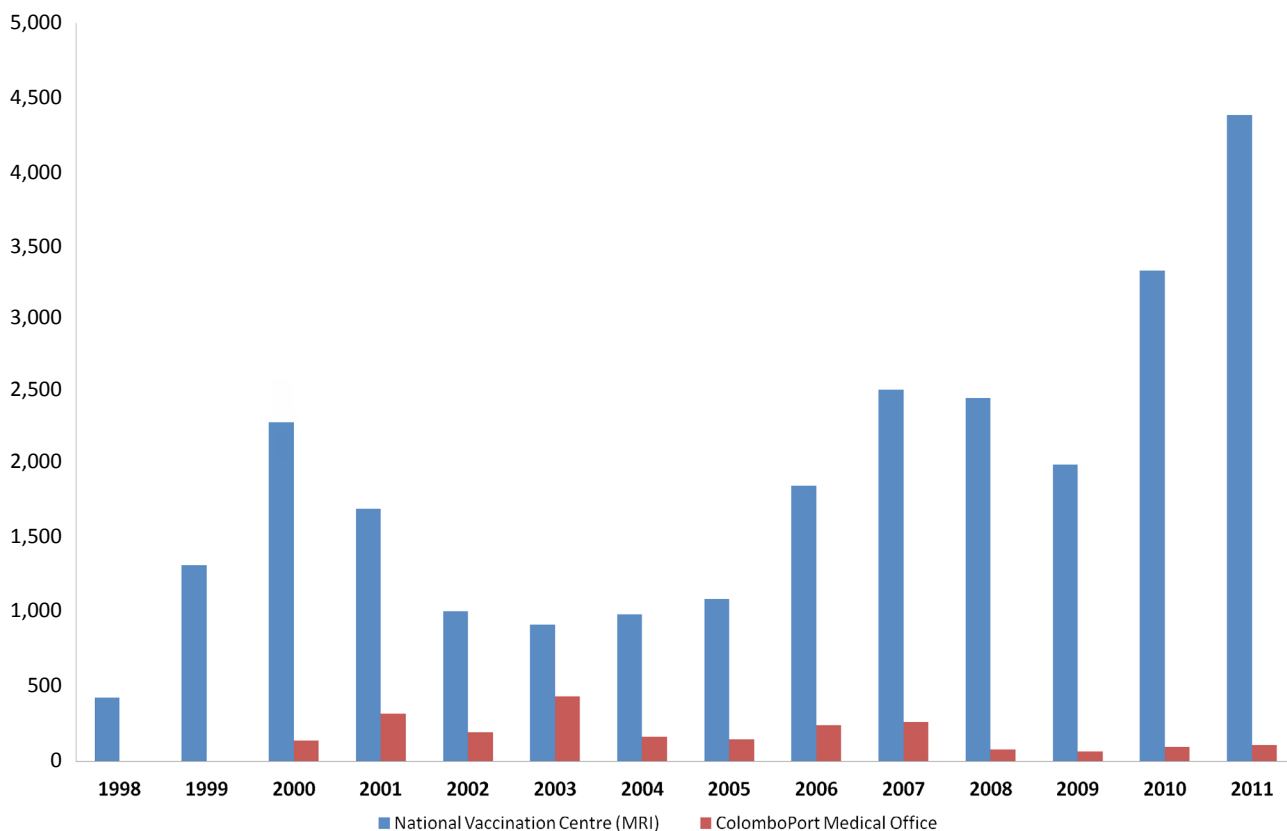
Results

Despite access and analysis of multiple databases from Government departments (Ministry of Health, DIE, SLTDA) and IOM, the full spectrum of all inbound

and outbound travelers to YF countries could not be comprehensively examined since data for select migrant categories were not captured and/or had incomplete reporting. International students, inbound resident visa holders, refugees, trafficked victims, diplomatic personnel and military deployments were categories for which information was not present.

A total of 28,684 YF vaccinations were administered to travelers from Sri Lanka across a 13 year period (1998 to 2011) (Figure 1). The annual number of vaccines administered was 1,731 for period 1998 to 2009, and rose by 129% to reach 3,958 in 2011. The paper based records examined had incomplete or missing data on nodes such as 'country of destination'. Analyses of the most complete socio-demographic data set of travelers were found only for the year 2011. Analysis of this data set indicated that majority of travelers were male (n=3850, 90%) with major reason (n=1840, 42%) for travel reported as 'tourism/leisure related'. Destination of Sri Lankan travelers who obtained YF vaccines were primarily to Africa (97%).

Figure 1: Number of YF annual vaccinations administered for outbound travelers to YF endemic countries from Sri Lanka (1998 to 2011)



The number of tourists to Sri Lanka from YF endemic countries showed increased since 2009 to 2011 (Table 1), with Kenya, Nigeria and Zambia contributing to highest number of 839 (61%) in 2011. According to the SLTDA, the average length of stay in Sri Lanka was 10 days. No disaggregated data on place of destination and duration of visit was available for both inbound and outbound travelers, and no information on ICVP records was available for inbound travelers.

Table 1: Tourist Arrivals (2008 to 2011) and asylum seeker returnees (2012) to Sri Lanka from Yellow fever endemic countries

Country of Residence	2009	2010	2011
African Continent			
Kenya	229	297	394
Nigeria	131	212	378
Zambia	51	63	67
Total	411	572	839
South American continent			
Argentina	75	133	148
Bolivia (Plurinational State of)	39	76	23
Brazil	157	217	362
French Guyana	229	86	8
Total	500	512	541
Grand Total	911	1,084	1,380
Returning irregular migrants (2012)			
Benin	193		
Ghana	18		
Guinea	98		
Mali	20		
Mauritania	1		
Nigeria	2		
Senegal	1		
Sierra Leone	5		
Togo	196		
Total	534		

IOM database on assisted voluntary returnees to Sri Lanka were examined for countries listed by WHO as being endemic to YF. Results showed the return of 534 Sri Lankans from failed smuggling operations to Canada during the 2012–2013 period. Sri Lankans returned from eight West African nations of Togo, Benin, Guinea, Sierra Leone, Mali, Ghana, Senegal and Mauritania. The largest group was from Togo (n=195, 36.6%) followed

by Benin (n=192, 36%), and Guinea (n=98, 18.4%). The average duration of stay in West Africa was 20.5 weeks. On arrival checks showed 98% of irregular migrants from West Africa had undertaken the YF vaccination (with certification). Eleven returnees from Togo and Benin had no valid or missing records.

Interviews with health officers at vaccination centers revealed that a large proportion of travelers ignored advice from border health medical staff with regards to the recommended 10-day non-travel period post-inoculation. The officers conservatively estimated that at least 3 in every 5 persons seeking YF vaccination admissions would depart within a week of receiving the inoculation, contrary to vaccination guidelines [14]. Some travelers were known to depart within 24 hours of receiving their YF vaccination.

Interviews conducted with the Directorate of Quarantine (DQ) and border officials revealed that there were no standard operational procedures (SOPs), monitoring/regulatory mechanisms at points of entry that enabled immigration authorities or port health officers to check YF certification (ICVP). Traveler declaration forms for both arrival/disembarkation to the country makes no reference to YF requirement or for other infectious diseases, as is the practice in other states.

The existing paper based record keeping system at points of entry was non-standardized, with different reporting forms kept at each setting. The reports were sent at various intervals to the Directorate of Quarantine for centralized data sorting and analysis. The Director of Quarantine also stated that the irregularities in reporting made routine analysis of data difficult. The lack of automation also meant planning for YF and Meningococcal vaccine procurement was based on subjective assessments rather than objectively linking data on travelers with vaccine registry. Real-time data analysis for decision making was also absent in current system and expressed as a need by the Directorate.

There is no integrated health information system linking immigration, aviation, naval and port authorities. Being a manual paper based system also meant data was fragmented with retrieval and analysis functions rendered cumbersome and non-practicable. Available reporting formats also differed across each points of entry. The current record keeping system is cited by DQ to be ineffective in providing meaningful and real-time border health disease surveillance, vaccination and other relevant border health information.

Discussion

Assessing the actual risk of introduction of YF to a none endemic country through infected travelers returning from disease endemic settings requires active surveillance of all travelers on their YF vaccination status and information pertaining to their place and duration of stay within the particular country. Integrating such data with vector density maps may also enhance risk assessment. Such analysis have already proved useful in investigating the potential for re-introduction and autochthonous spread of malaria from travelers in Sri Lanka[9]. However, the lack of comprehensive data on vaccination status of all categories of outbound and inbound migrant populations from YF countries makes any determination of risk difficult.

Nevertheless, our analysis of available datasets shows a growing volume of inbound and outbound migration flows to YF endemic countries. It may be hypothesized that tourists entering Sri Lanka from Kenya, Nigeria, Zambia, Argentina, Plurinational State of Bolivia, Brazil and French Guyana, and irregular migrants may pose the highest risk of infection. Though data not available, this may be the case in most of the countries in the region. However, the imported cases of YF in China were mainly due to Chinese workers from Angola, which shows that the high risk group for getting the disease in to country may be vary. Surveillance and monitoring measures should target and prioritize based on local situations after similar analysis in each country. As we observed in Sri Lanka, information on the prevalence of YF or the vaccination status of these risk population may not be available in many countries due to gaps in surveillance system. Without these data risk assessment would be partial and inaccurate.

The marked increase of Sri Lankan outbound travelers to YF endemic countries over past five years may be explained through high volumes of international travel to the Island following the resolution of Sri Lanka's protracted civil conflict (in early 2009). The post-conflict period has also seen a dramatic increase in irregular migrant flows in Sri Lanka. Re-introduction of vector born diseases via international migration is a critical global health challenge. Point of entry screening using Malaria Rapid Diagnostic test of the 534 irregular migrants from West Africa found 32 to be positive for *P. falciparum*. The West African cohort alone accounted for 76% of the total number malaria cases reported in 2012. Interestingly, most within this group had also obtained the YF vaccine from the MRI vaccination centre. The IHR requirement for YF checks at international airports may have been a

push factor prompting people smugglers to ensure the group undertakes pre-departure YF vaccinations.

Till 2016, YF has never been reported in Asia [11]. Protection arising from cross-immunity within Asian populations exposed to other circulating flaviviruses (such as dengue), coupled with factors relating to vectoral competency are some of the factor proposed for the historic absence of YF in Asia despite the abundance of competent vectors [12][13]. Details of these effects have been described in 2013, which concludes the possibility of autochthonous transmission via travel routes cannot be ignored [14]. Within 3 years of this analysis global health authorities are facing this threat showing that the transmission dynamics of emerging and reemerging infections are neither fully understood nor can it be predicted with certainty.

The study reveals a lack of a formal monitoring mechanism established at Sri Lanka's borders to assess a travelers YF vaccination status (ICVP) when arriving from, or departing to endemic countries. A quarter of all travelers were reported as departing to YF endemic countries well before the recommended 10 day post- vaccination period, thereby exposing them to transmission risk. Such practice will continue in the absence of clear regulatory measures and standard operation procedures (SOPs) for both health and immigration officers. IHR makes it mandatory for all travelers entering none endemic countries from YF endemic countries to produce proof of vaccination at airport immigration counters. However no procedures are in place by either immigration or health authorities for such entrants. Indeed, the experience in other settings have demonstrated that such inter-sectoral partnership are essential to harmonize and operate an effective border health system. The results highlighted the limitations of the existing manual paper based boarder health reporting system that was unlinked to a centralized database and non-integrated between relevant authorities. An effective electronic-health reporting system at points of entry or exit may be especially epidemiologically useful in instances where routine contact tracing becomes crucial or in case of a public health emergency of international concern (PHEIC). At the time of writing, following the yellow fever outbreak in Angola, the Directorate of Quarantine and Epidemiological Unit of the Ministry of Health, in partnership with airport authorities, are working to establish such measures.

States Parties to the IHR (2005) are required to develop, strengthen, and maintain core surveillance and response capacities to detect, assess, notify, and report public

health events, evaluate their public health capacities and to facilitate technical cooperation, logistical support, and the mobilization for building capacity in surveillance and response [21]. YF vaccination and surveillance is clearly stipulated in the *Quarantine and prevention of diseases Act 12 of 1952* and by Sri Lanka's ratification of the International Health Regulation (IHR), which also form the guiding legal instruments for border health control in Sri Lanka [22]. In light of increasing migration trends, this study iterates that Sri Lanka may benefit from enhancing border health information and surveillance capacities.

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Is there a risk of yellow fever virus transmission in South Asian countries with hyperendemic dengue?

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ABSTRACT

Background

The fact that yellow fever (YF) has never occurred in Asia remains an “unsolved mystery” in global health. Most countries in Asia with high *Aedes aegypti* mosquito density are considered “receptive” for YF transmission. Recently, health officials in Sri Lanka issued a public health alert on the potential spread of YF from a migrant group from West Africa. We performed an extensive review of literature pertaining to the risk of YF in Sri Lanka/South Asian region to understand the probability of actual risk and assist health authorities to form evidence informed public health policies/practices. Published data from epidemiological, historical, biological, molecular, and mathematical models were harnessed to assess the risk of YF in Asia. Using this data we examine a number of theories proposed to explain lack of YF in Asia. Considering the evidence available, we conclude that the probable risk of local transmission of YF is extremely low in Sri Lanka and for other South Asian countries despite a high *Aedes aegypti* density and associated dengue burden. This does not however exclude the future possibility of transmission in Asia, especially considering the rapid influx travelers from endemic areas, as we report, arriving in Sri Lanka.

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Introduction

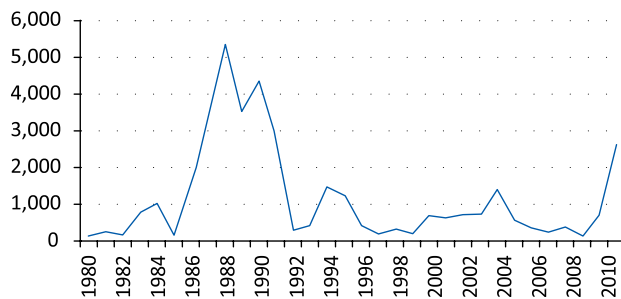
In February 2012, mainstream media reported that Sri Lanka faced a “threat” of local transmission of yellow fever (YF) due to the repatriation of clusters of Sri Lankans from West African countries where the disease was endemic [1]. Since January 2012, large numbers of Sri Lankans were intercepted as they tried to migrate to Canada through “irregular” means (via human smuggling operations). This incident was communicated to the media by a health official as a threat of YF transmission in Sri Lanka creating a major public health panic [2]. Sri Lanka is hyperendemic to dengue with the dengue virus causing 220 deaths and 44,855 cases in 2012 alone [3]. The transmission of dengue in Sri Lanka is mainly due to the vector mosquito *Aedes aegypti*, which is also the competent vector for YF. Since the mosquito vector *Aedes* is abundant in Sri Lanka, it appeared logical to conclude that Sri Lanka is a high risk country for YF transmission. The epidemiological unit of the Ministry of Health in Sri Lanka formally alerted the public health system of this risk [4].

However, an evidence-based public health practice requires rigorous synthesis of available scientific evidence to move beyond a singular plausible explanation [5]. We performed an extensive review of literature pertaining to the risk of YF transmission in the South Asian region, in order to understand the probability of actual risk and to assist evidence informed public health policies.

Disease History and Epidemiology

YF is viral hemorrhagic fever caused by the yellow fever virus, prototype member of the genus *Flavivirus* in the family *Flaviviridae*. It has a single serotype and five genotypes. The virus is transmitted by vector mosquito primarily by *Aedes* spp. in Africa and *Haemagogus* spp in South America. There are three epidemiologically different infectious cycles in which the YF virus is transmitted from mosquitoes to humans or other primates. In the sylvatic “Jungle” cycle, monkeys act as host and *A. africanus* and other *Aedes* spp as the vector. In the savanna (intermediate) cycle, noted only in Africa, monkeys and humans act as hosts with *Aedes* spp as vector. Finally, in the “Urban” cycle only *Ae. aegypti* is involved with human as hosts. *Ae. aegypti* mosquito is well adapted to urban centres and can also transmit other diseases such as dengue and chikungunya.

Figure 1: WHO surveillance data on reported cases of yellow fever 1980–2011.



The spectrum of the clinical disease may vary from mild flu like disease to classical triphasic hemorrhagic fever with hepatorenal involvement. Only around 15–25% of the cases progress to the period of intoxication and 20–50% of patients with end organ impairments die [6]. Before the development of YF vaccine, YF was one of the most feared death specially in the Atlantic trade route, which was known as “Yellow Jack” and also the basis for the legend “Flying Dutchman” [7]. The first documented outbreak of YF was reported from Guadeloupe and Yukatan in 1648 [8]. Though the disease originated from West African countries, devastating epidemics of YF were reported from tropical and subtropical Americas in the

18th and 19th centuries. It then spread to European countries through travel and trade routes, causing epidemics in France, Spain, England, and Italy [9]. A resurgence of the disease occurred in late 1920’s and early 1930’s due to heavy outmigration of nonimmune European populations to endemic countries and through trade routes [10].

The successful introduction of the YF vaccine and mass immunization campaigns in West Africa in 1940’s lead to a significant reduction of disease in high endemic countries. The largest recorded outbreak in the post-YF vaccine era occurred in Ethiopia during 1960–1962, with more than 100,000 people in the Omo and Didessa river valleys acquiring YF leading to 30,000 deaths [12]. Even though YF reemerged as a priority global agenda since this outbreak, it continued to cause epidemics in endemic countries, also spreading to West African countries where cases were never previously reported and to the Eastern Mediterranean region [7].

Of importance is the complete absence of yellow fever in South Asia before the introduction of the vaccine. The World Health Organization (WHO) YF surveillance database from 1981 to 2011 showed 42 countries reported YF during the last 30 years, with major outbreaks in 1987–1991 period (Figure 1). However, WHO estimates an annual caseload of 200,000 cases with 30,000 deaths due to underreporting. The “at risk” population is estimated at 900 million people living across 45 endemic countries (32 African and 13 Latin American). The revised global YF risk map in 2011 classified 27 of 32 endemic countries in Africa as having risk for YF transmission and five countries as having “low potential” for exposure to YF (Table 1) [11].

Despite the possibility of the spread of YF from East Africa to Asia being hypothesized as early as 1934 [13], YF has never been reported in Asia. WHO also cautions the “potential for outbreaks” to occur in Asia [14], especially in the context of growing migration flows and increasing *Aedes* mosquito densities across many countries such as India [13]. Different theories have presented to explain this “mystery.” These are explored with available evidence and in relation to Sri Lanka.

Mapping Theories and Evidence Base

Theory that YF was never introduced to Asia

The first theory postulates that YF has never been introduced to Asia. Some investigators have argued that

the absence in Asia could be due to failed introduction of YF in Asia prior to the modern transportation era [14]. However, during the 17th century, world trade and travel by Europeans involved mainly African and Asian nations. Though the majority of slave trades were not routed in the direction of Asia, the European nations involved in such trades that concurred in West Africa also travelled to Asia. The “Coolie trade” in the 18th and 19th centuries involved the migration flow of Indian and Chinese labourers towards African, Latin American, and Caribbean countries, where YF was endemic. This trade which opened both inbound and outbound human migration flows provided ample opportunities for the introduction of YF to Asia.

In the 20th century, world travel increased in exponential proportions. Further opportunities for the introduction and spread of YF to Asia from South America are linked to the opening of the Panama Canal in 1914, which brought Asiatic ports into contact with those in South America where YF is endemic [15, 16].

This argument may be contested in light of evidence that YF had spread to Latin America, become endemic, and resulted in outbreaks in North America and Europe even before the air travel has been invented. Spread of yellow fever from Africa to America was due to slave trade and the first documented outbreak outside Africa was reported from Yukatan in 1648 [9]. Spread of yellow fever to Europe was through sea ports and all initial outbreaks were reported from Spanish and Portuguese ports [17]. Spice trade in South and South East Asia was started as early as in 1498 by Portuguese and they controlled almost all sea ports of India (since 1498), Sri Lanka (since 1597), Maldives (since 1518), Malacca (since 1511), and several other countries over a century and half. During the same period they were extensively involved in slave trade in YF endemic African countries [18]. Subsequent colonial emperors in Asia (Dutch and English) also had large YF outbreaks in their own countries (specially in sea ports) during the 18th and 19th centuries [17] but Asia has not been affected. Further, restricted air travel was true for the African region while it was not so for central and Latin American regions where the YF was endemic.

Table 1: Classification of countries with risk of yellow fever transmission [11]

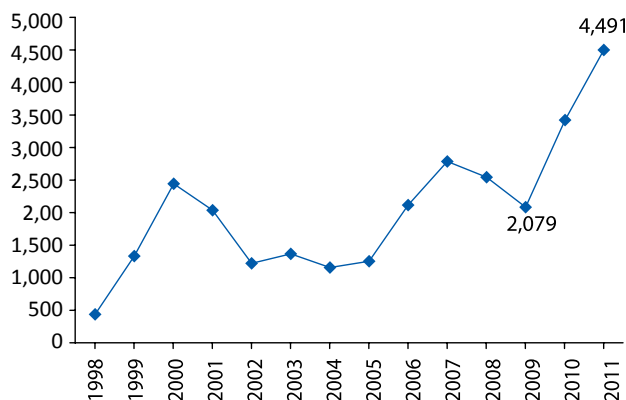
Africa		
Countries with risk of yellow fever virus transmission		
Angola	Ethiopia ¹	Niger ¹
Benin	Gabon	Nigeria
Burundi	The Gambia	Rwanda
Cameroon	Ghana	Senegal
Central African Republic	Guinea	Sierra Leone
Chad ¹	Guinea-Bissau	Sudan ¹
Congo, Republic of the	Kenya	Togo
Côte d'Ivoire	Liberia	Uganda
Democratic Republic of the Congo	Mali ¹	
Equatorial Guinea	Mauritania ¹	
Countries with low potential for exposure to yellow fever virus		
Eritrea ¹	Zambia ¹	Tanzania
São Tomé	Somalia ¹	
South America (countries with risk of yellow fever virus (YFV) transmission)		
Argentina ¹	Suriname	Panama ¹
Bolivia (Plurinational State of) ¹	Trinidad and Tobago ¹	Paraguay
Brazil ¹	Venezuela	Peru ¹
Colombia ¹	French Guiana	
Ecuador ¹	Guyana	

¹These countries are not holoendemic (only a portion of the country has risk of yellow fever transmission).

At present, countries in Asia have a combined population of more than 4 billion persons. Travel statistics are not available for proper estimation of travel dynamics between Asian and YF endemic countries. However, India reported more than 450,000 inbound travelers from Africa and central/south America in 2008, out of which more than 200,000 are estimated to be from countries with risk of YF virus transmission [19]. In Sri Lanka, during the 2007 to 2008 period, the total inbound migration from YF endemic regions was 12,542. The outbound migration from Sri Lanka to YF endemic countries increased rapidly from the end of civil conflict in 2009 (Figure 2), with travelers to Africa, South America, and Middle East comprising 97%, 2%, and 1%, respectively.

The lack of air travel from remote disease endemic areas was a strong alternative explanation to support the theory that YF was never introduced to Asia [6]. It is noteworthy that yellow fever never appeared in Asia even before the discovery of the YF vaccine by Max Theiler in 1937 [20]. Almost all countries in Asia require people travelling to and from YF endemic zones to undertake and/or produce YF vaccination records at ports of entry [21]. Although data for YF vaccination records in Asia are scarce, the literature revealed that 25% of the passengers travelling to Kolkata, India, during the 1982–1984 period possessed valid YF vaccination certificates [22]. As noted in introduction, irregular migration routes such as those stemming from human smuggling and trafficking, before the prevaccination era, provided multiple opportunities for introducing YF to the Asian continent via sea, land, and air routes.

Figure 2: Number of Sri Lankans travelling to yellow fever endemic countries based on registries at Port Health Medical Offices (1998 to 2011)



Beyond human hosts, mosquito vectors infected with YF virus may also bring the disease through aircraft or ships. Worldwide distribution of *Culex quinquefasciatus*, *Aedes aegypti*, *Aedes albopictus*, and *Anopheles gambiae* and several other mosquito species carried in ships, sailboats, and steamboats, which resulted in the spread of dengue, malaria, and yellow fever, has been well documented in medical literature [23]. Even in the modern world, countries with the highest levels of biosecurity have failed to stop introduction of exotic mosquitoes entering their countries [24]. The theory of failed introduction via migration routes is therefore weak in the context of growing migration flows, growing *Aedes* populations and zones of infestation, and around 200,000 annual cases of YF in endemic countries.

Protective Immunity from Dengue and Other Flavivirus Cross-Reactive Antibodies

Asia is considered to be a YF “receptive” area due to the abundance of the competent epidemic vector for urban YF, *Aedes aegypti* mosquitoes. Throughout Asia, especially in South Asian region, this vector is responsible for hyperendemic dengue. In Sri Lanka, the annual case number consistently exceeded 35,000 during last three years, showing a sustained epidemic of dengue fever. Reported seroprevalence of flavivirus infection among Sri Lankan children ranged from 34% to 51.4% [25–27]. However, the reported seroprevalence among children less than 11 years had risen to 51.4% in 2013. At the age of 11 years, the prevalence was 71.7%. Seroprevalence studies in India showed that a prevalence of dengue antibodies among adults population is as high as 100% [28].

A hypotheses for the lack of YF in Asia is due to protective immunity conferred from dengue and other *flavivirus* cross-reactive antibodies in populations due to the “original antigenic sin theory” first described by Thomas Francis in 1960 [29]. Cross-reactivity of *flavivirus* antibodies, antigenic properties responsible for this immunogenic property of *flaviviruses*, has been studied extensively [30–35]. During reinfection of dengue due to different serotypes, dengue responsive CD8+ T cells showed low affinity for the infecting serotype and higher affinity for other, probably previously encountered strains [36]. These studies lead to identification of epitopes recognized by dengue serotype-cross-reactive and *flavivirus*-cross-reactive CD4+ CTL [37]. Cross-reactivity of *flavivirus* antibodies created problems in diagnosis of dengue and YF infections [33]. Another study done among Malay soldiers showed that most of them were having antibodies that cross-reacted with YF assay [38]. Experimental hamster models confirmed that the prior

heterologous *flavivirus* infection including dengue could prevent fatal YF [39]. When challenged with YF virus, dengue-immune rhesus monkeys showed low viraemia compared to nonimmune monkeys under experimental settings [40]. A single study showed that previous exposure to dengue infection may not prevent yellow fever infection, though it induces an anamnestic immune response. Nevertheless, the study concluded that the severity of the disease could greatly be reduced [41].

Monath argued that dengue immunity could protect against clinical progression of YF infection by reducing viraemia and decreasing the possibility of secondary spread [42]. Historical reports and observational studies have provided supportive evidence for cross-reactivity of dengue and YF antibodies conferring relative protection for those from high dengue endemic areas. As summarized by Vainio and Cutts [7], during the YF epidemics in America in the 19th century, Indian labourers and British troops that served in India were less susceptible for YF [43]. So acute was this observation/realization amongst military leaders that during Napoleonic wars, it was suggested that troops be “seasoned in India” before they were dispatched to West Indies [44]. Further, Indian workers brought to sugar plantations in West Indies were minimally affected during the YF epidemics [45]. Based on a range of historical, experimental, and observational studies and epidemiological data, it appears that previous exposure to dengue and other *flavivirus* provide a compelling hypothesis on the absence of yellow fever in Asia.

Coexistence of Yellow Fever and Dengue Virus in West Africa and South America

Even though the protective immunity theory may partially explain the absence of YF in Asia, the dengue virus has been shown to continually occur in parts of Africa [46] and South America [47]. A challenge and unresolved mystery for scientists propagating the protective immunity hypothesis have been the failure to conclusively explain why dengue and (urban) yellow fever coexist in West Africa.

One explanation for this coexistence is known as the “African hypothesis” and relates to *Ae. albopictus*, an epidemic vector for dengue [48], but with limited capacity for YF transmission [49]. Using a complex mathematical model, Amaku and colleagues showed that the low prevalence of the oriental mosquito *Ae. albopictus* in Africa, combined with a high density of *Ae. aegypti*, could be an alternative explanation for this observation. This simulation model was based on the assumptions that the vector competence of *Ae. albopictus* had shown

limited potential to transmit YF [50], that *Ae. albopictus* competes with *Ae. aegypti* [51] with studies documenting a competitive reduction of *Ae. aegypti* by invasive *Ae. albopictus* [52], and that individuals who have recovered from dengue are partially immune to yellow fever. In their model they explained that if the cross-immunity is less than 93% in Africa, then dengue and urban YF could indeed coexist.

Vectorial Capacity

The ability of a mosquito species such as *Ae. aegypti* to serve as a disease vector is determined by its vectorial capacity [53]. Vectorial capacity is influenced by the density, longevity, and competence of the vector including associated environmental, behavioural, cellular, and biochemical factors that influence its association between virus type and host [54, 55]. Vector competence, is a subcomponent of vectorial capacity and is defined by genetic factors that influence the ability of a vector to transmit a pathogen and the inherent tolerance of the vector to ensure viral transmission, infection, and replication [55–57].

Reviews have described an interplay of factors such as mosquito morphology, viral genetics, and environment that govern the transmission of *Flaviviruses* in the *Ae. aegypti* vector [58]. *Ae. aegypti* has two distinct genetic clusters. The first cluster, domestic, and forest populations of *Ae. aegypti* in Africa are included within an ancestral form. The second genetic cluster contains all domestic populations outside Africa. Interestingly, all domestic forms could be assigned back to the human population which they are associated with [59]. Evolutionary aspect of flavivirus shows that YF virus as the prototype form with slower evolutionary dynamics compared to other *flaviviruses*, specially to dengue [60]. These two evolutionary pathways of vector and virus could have overlapped and the observed variation of vectorial competencies in harbouring different *flavivirus* could be a part of the evolutionary process. Polymorphism in the vector competence of *Aedes* mosquitoes in disease transmission that occur among geographical samples is largely attributed to such evolutionally pathways [61].

The role of vector competence has also been studied in relation to *flaviviruses* and *Ae. aegypti* [58]. *Flaviviruses*, such as yellow fever, dengue, and West Nile virus differ not only in their interactions with the *Ae. aegypti* mosquito, but also in interactions within viral genotypes [62]. Dengue virus genotypes of Southeast Asian origin have been significantly associated with higher virulence and transmission compared to those from other regions [63, 64]. *Ae. aegypti* is the primary vector for transmission of dengue in Asia which is considered as a possible

vector for YF if it ever occurred in Asia. A worldwide genetic variation study of *Ae. aegypti* using 34 mosquito populations showed clearly distinct two major groups of *Ae. aegypti* in Africa and America. Genetic variations of Asian strains were significantly lower compared to African and American strains, which were attributed to historical absences of YF in Asia [65]. Oral susceptibility studies using large number of mosquito populations confirmed the genetic variation of *Ae. aegypti* in YF transmission [66]. Few studies showed genetic foci as well as nongenetic factors in different mosquito populations that determine the susceptibility of *Ae. aegypti* to YF virus [67]. This was further studied and colonization was also shown to have an effect on vector competency through genetic and phenotypic variations [68] which is largely geographically determined. Asian strain was shown to have significantly low competency of YF transmission compared to African and American counterparts in some other studies. Studies done within the African continent also show varying vectorial competencies. As an example, South African strains *Ae. aegypti* were shown as potentially poor vector of YF [69]. Even in high endemic African countries, some strains of *Ae. aegypti* were shown to be less efficient in transmitting YF virus [70]. Noteworthy is the fact that a few laboratory experiments have shown the Asian strains of *Ae. aegypti* as having the highest infection rates and oral susceptibility to YF [71]. However, YF epidemics such as the 1987 epidemic in Africa, in particular Nigeria, have also been shown to occur with relatively incompetent vector strains, where vector was relatively resistant to infection and transmitted the virus inefficiently [72]. Gubler also reported that Asian vectors could acquire and transmit yellow fever virus [73].

Though some of these molecular evidence and laboratory experiments providing evidence to suggest that vectorial competence may be an alternative explanation for lack of YF in Asia, some studies showed definitive evidence that Asian vectors could acquire and transmit the disease. Thus, this theory is not a strong explanation of absence of YF in Asia.

Genetically Determined Immunity against YF Virus

A large body of evidence, mostly based on laboratory studies and animal models, shows greater range of genetic variation of *flavivirus* infections and genetic determinants [74–77]. In mouse models, innate resistance to *flavivirus* was experimentally shown due to variation in cluster of genes on chromosome 5 and the investigators speculated a possible role for OAS1 in human susceptibility to flavivirus viral infections [78]. Recent studies on dengue have clearly shown genetic

determinants of DENV susceptibility, including human leukocyte antigens, blood type, and single nucleotide polymorphisms in immune response genes [79, 80]. Human predisposition to Tick-borne encephalitis virus (another *flavivirus*) was also shown to be associated with SNPs [81, 82]. Though laboratory evidence may indicate a possible genetic determination of yellow fever infection and susceptibility, there is no clear evidence to suggest that the lack of disease in Asian continent is due to human genetic factors. Epi-demiological as well as genetic studies targeting this specific objective are needed to confirm the hypothesis.

Viral Interference: Competition of YFV and DENV within Mosquito Cell

Recent in-vitro studies suggest that DENV interferes with the YF virus replication within the mosquito cells, especially where there is a competition between two *flavivirus*. Highly adaptive and evolutionary more advanced, dengue viruses were shown to “win” this competition [83–85]. While no report of dengue and YF coinfection in human beings has been reported hitherto, results from in-vitro studies showing the presence of viral interference may add to the hypothesis of the dominant role DENV serotypes play in the Asian context. One argument against this in-vitro studies is that even during epidemics DENV infected vectors are around 20% [16].

Competitive Exclusion Principle

Combining the evidence from cross-immunity and viral interference within mosquito cells, a generalization of previously suggested competitive expulsion principal [86–88] has also been suggested to explain the absence of YF in Asia. The competitive exclusion principle represents an extreme idealized situation in which only one disease prevails [49]. The principal assumes that mosquitoes and/or humans can be infected by dengue or yellow fever but not by both. Each infection serves as a perfect vaccine for the other infection in both human hosts and mosquito vectors. Based on the evidence described, this exclusion should always favour dengue within hyperendemic Asian countries.

Evidence from Mathematical Modeling

Beyond basic and applied research on YF, mathematical modelling has also been utilized in explaining the mystery of YF in Asia. Amaku and colleges tested several hypothesis in their differential equation model which included the following assumption: Asian *Ae. aegypti* is relatively incompetent to transmit yellow fever; competition between dengue and yellow fever viruses existing within the mosquitoes; when an *Ae. aegypti* mosquito is infected

by yellow fever and then acquires dengue, it becomes latent for dengue due to internal competition within the mosquito between the two viruses; cross-immunity between yellow fever and dengue leads to diminished susceptibility to yellow fever in dengue epidemic regions [49]. The model showed an additive effect from all four hypothesis, but the predominant contributing effect was from the cross-immunity hypothesis [88]. A limitation of the model was that it did not consider the genetic susceptibility theory.

Conclusion

The probability of “yellow fever never introduced to Asia” and related explanation of geographical barriers are highly unlikely to explain the mystery of YF. Considering other theories we conclude that the probability of risk of local transmission of YF is extremely low in Sri Lanka where dengue is hyperendemic. This does not however exclude the possibility of importation and autochthonous transmission due to factors such as rapidly increasing migrant flows, vector habitat expansion with the forging of new sylvatic territories through climate change, and disrupted or poor vaccination coverage. The H1N1 pandemic proved that despite enhanced surveillance, disease control activities, and travel restrictions, there were many failures in the public health community failing in containing the outbreak.

The current epidemiology shows dengue is mainly transmitted by urban mosquitoes *Ae. aegypti* and *Ae. albopictus*, whilst YF circulates in Africa within predominantly rural areas and mainly within sylvatic mosquitoes. Based on such epidemiological data and those historical, experimental, mathematical modelling and observational studies described here, provide a compelling argument for the absence of yellow fever in Asia.

Despite what has been described by both media and health administrators as a “conducive” and “enabling environment” for YF transmission in Sri Lanka with rapid population movements from endemic countries and an abundance of the *Ae. aegypti* vector, no evidence of YF transmission has ever been described. Public health awareness and risk communication form a vital function of any health authority. We recommend the use of evidence-based public health approaches rather than a reliance of “simple logic” in determining disease transmission risk. The use of evidence should be a prerequisite in formulating public health announcements and averting potential panic or fear psychosis within general public on autochthonous transmission and outbreaks. A focus on strategies such as ensuring

that outbound travelers receive YF vaccination upon receipt of their travel itinerary at least ten days prior to departure and the active surveillance at ports of entry are required. Such approaches have been effective in malaria elimination activities in Sri Lanka [89].

Key Learning Points

1. Yellow fever transmission cycle requires a susceptible human host, vector mosquito, YF virus, and primate hosts (in sylvatic and savanna cycles).
2. With the exception of the YF virus, all components to facilitate disease transmission cycle are present in Asia. The disease has never been reported despite such enabling components and presence of abundant vectors.
3. Different theories have been used to explain lack of YF in Asia, such as protective immunity acquired from dengue and other flavivirus cross-reactive antibodies, vectorial capacity, genetically determined resistance, competition of YF and dengue within mosquito cells, and the competitive exclusion principle.
4. Theory of geographical barriers and YF never introduced to Asia seems unlikely to explain the mystery of YF in ever-increasing flows of migrants from endemic zones.
5. Theories on immunity to dengue, providing a barrier to interhuman transmission by mosquitoes and less efficient Asian strains of *Ae. aegypti* compared to strains from Africa and Latin America are more likely to explain lack of YF in Asia.

Conflict of Interests

The authors declare that they have no conflict of interests.

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YELLOW FEVER

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SECTION II

Migration and Infectious Diseases

YELLOW FEVER

Globalization of leptospirosis through travel and migration

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ABSTRACT

Background

Leptospirosis remains the most widespread zoonotic disease in the world, commonly found in tropical or temperate climates. While previous studies have offered insight into intra-national and intra-regional transmission, few have analysed transmission across international borders. Our review aimed at examining the impact of human travel and migration on the re-emergence of Leptospirosis. Results suggest that alongside regional environmental and occupational exposure, international travel now constitute a major independent risk factor for disease acquisition. Contribution of travel associated leptospirosis to total caseload is as high as 41.7% in some countries. In countries where longitudinal data is available, a clear increase of proportion of travel-associated leptospirosis over the time is noted. Reporting patterns is clearly showing a gross underestimation of this disease due to lack of diagnostic facilities. The rise in global travel and eco-tourism has led to dramatic changes in the epidemiology of Leptospirosis. We explore the obstacles to prevention, screening and diagnosis of Leptospirosis in health systems of endemic countries and of the returning migrant or traveler. We highlight the need for developing guidelines and preventive strategies of Leptospirosis related to travel and migration, including enhancing awareness of the disease among health professionals in high-income countries.

Keywords

leptospirosis, travel, migration

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Authors' contribution

S Agampodi and K Wickramage conceived the study, designed the methodology, revised the final manuscript and coordinated the review process. M Bandara and M Ananda carried out the literature search, data extraction and table preparation. MB and EB analysed and interpreted data and prepared the draft manuscript. E Berger completed the manuscript writing. All authors read and approved the final manuscript.



SECTION III

Health Status of Migrants and their Families

PART I

Outbound migrants and their left-behind families

What effect does international migration have on the nutritional status and child care practices of children left behind?

Renuka Jayatissa¹

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ABSTRACT

Background

Despite an increasing trend in labour migration and economic dependence on foreign migrant workers in Sri Lanka, very little is known about the child care and nutritional status of “children left behind”. The aim of this study was to examine the factors influencing the nutritional status and care practices of children left behind. A sample of 321 children, 6–59 months old of international migrant workers from a cross-sectional nationally represented study were included. Care practices were assessed using ten caregiving behaviours on personal hygiene, feeding, and use of health services. Results revealed the prevalence of stunting, wasting and underweight to be 11.6, 18.2 and 24.0 percent, respectively. Father being a migrant worker has a positive effect on childcare practices and birthweight of the child. This study indicates that undernutrition remains a major concern, particularly in the poorest households where the mother is a migrant worker, also each additional 100 g increase in the birthweight of a child in a migrant household, decreases the probability of being wasted, stunted and underweight by 6%, 8% and 23% respectively. In depth study is needed to understand how labour migration affects household level outcomes related to child nutrition and childcare in order to build skills and capacities of migrant families.

Keywords

labour migration, migrant families, nutritional status, children left behind, child care

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Introduction

International labour migration is a critical determinant of economic development for many low to middle income countries. It also plays a part in transforming traditional roles of parenting and caregiving practices for millions of “children left behind” by migrant workers [1]. Though migration is important within the global development agenda, health and migration policies recognising family interest and child health outcomes have not yet been adopted, especially in low to middle income countries [2]. The critical need for global health researchers to harness greater empirical evidence on the health status of migrants and mobile populations has also been highlighted [3,4].

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Understanding how parental migration affects household poverty, food security, child care and other welfare indicators which underlie child nutrition is vital. Exploring the effects of parental migration on malnutrition of children left-behind also becomes a key health policy issue for many nations of the world, which are major source countries for labour migrants. The United Nations Children Fund (UNICEF) conceptual framework identifies three layers of causal factors; immediate (diet and disease), underlying (food security, child care and healthy environment) and basic causes of child undernutrition [5]. Childcare forms an important, yet complex concept within this framework that includes a range of behaviors and practices of caregivers which provide food, healthcare, stimulation, and emotional support necessary for the child's healthy survival, growth and development [6]. Parental migration and the remittances they send to families left behind influence the child through at least two broad pathways at the household level. Firstly, the increased household income may increase purchasing power of food, better health care and supplies for a cleaner environment (soap, clean water, *etc.*), which may result in better improvements in child nutrition. Secondly, by increasing the labour and household burdens of the remaining parent or caretaker thereby limiting his/her time to devote to childcare practices, *i.e.*, reducing the time spent to prepare food and/or to care for the child's nutritional needs [7].

Labour migration continues to be an integral factor of Sri Lanka's economic development with more people "on the move" than at any other time in recorded history. It is currently estimated that 1.7 million (8.5% of the total population) are working overseas and annually more than 200,000 persons are moving abroad for employment. The migrant workers remittances remain the highest foreign exchange earner to the national economy which is estimated to be 8% of Gross Domestic Products (GDP) [8]. Sri Lanka follows Asia's labour migration trends which consist mainly of movement of workers to the Middle East—primarily to the Gulf Cooperation Council (GCC) countries, where many work in low-skilled jobs within precarious employment settings. The majority of migrant workers belong to the 25–29 age group, with 63.2% being male [8]. Many workers take continuous cycles of re-migration to increase savings and pay off recruitment fees of migration agents as well as other hidden costs of migration [9]. After adopting the National Migration Health Policy in 2014, the Government of Sri Lanka has committed to provide an enabling policy and a program platform to balance monetary gains from migrant worker remittances for poverty alleviation in order to ensure health, nutrition and social protection of migrant workers and their families [10]. To do so, the Ministry of Health

has embarked on an evidence based process of policy and program planning.

In Sri Lanka, there is a persistent high prevalence of under nutrition among children, despite good indicators related to areas of maternal and child health [11]. However, there has been limited research on the topic of migration and the nutritional status of children left behind and caregiving practices within migrant households [12–15]. Hence the aim of this study was to examine the factors influencing the care practices and nutritional status of Sri Lankan children left behind when at least one parent migrates abroad for work.

Methods

Data Sources

Data of the Sri Lanka national nutrition and micronutrient survey were used for analysis [16]. This was a representative cross-sectional household survey conducted in 2012 and included 7,500 children between 6–59 months. Sample size was calculated for this survey based on the 40% prevalence of micronutrient deficiency, to have a 95% confidence interval with a 5% margin of error considering a 10% non-response rate and a design effect of 1.5. The calculated sample size was 300 from each district. The smallest administrative unit in a district, "Gramasevaka area", consisting of a population of approximately 1,000, was taken as the Primary Sampling Units (PSUs). Thirty PSUs from each district were selected proportionate to the population. The starting point of each PSU was randomly identified using the map superimposing the numbered grid. Considering the household composition, 30–35 households were listed from that point and 10 randomly selected households with children 6–59 months in age were included in the survey. Food intake data was collected using un-weighted 24 hour food recall questionnaire and 7 day semi-quantitative food frequency questionnaire using the standard methodology. The child's mother or in the absence of the mother, the immediate caretaker was interviewed. Survey duration was August to December 2012.

In the survey, children's weight and height were measured by standardized trained staff using UNICEF UNISCALES and stadiometers [17]. Weights and heights were taken to the nearest 0.1 kg and 0.1 cm respectively. Measures created were *height for age z-score (HAZ)*, which measures long-term undernutrition, *weight for height z-score (WHZ)*, which reflects acute undernutrition, and *weight for age z-score (WAZ)*, which tends to assess both chronic and acute undernutrition [18].

The cut-off point for stunting, wasting and underweight was a standard deviation (SD) score (z-score) below $-2SD$ of the reference value, according to World Health Organisation (WHO) guidelines [17]. All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of Medical Research Institute, Colombo (project 12/2010).

Measures of Child Caregiving Behaviour

Three kinds of caregiving practices, resulting in 10 separate behaviors were examined based on reported data considering the scoring system provided by Engle *et al.* [19], which has been used multiple times in other countries, based on personal hygiene (four variables), food and feeding (five variables), and use of health services (one variable).

The hygiene variables were whether the caregiver was always washing hands with soap, before cooking, before feeding the child, before eating and after using the toilet. These responses were collected under five categories (always with soap, sometimes with soap, without soap, do not wash and no answer). The five food and feeding variables were currently breastfeeding, usage of bottles, past 24 hours dietary diversity, past 24 hours frequency of feeding solids and semi-solid food, and past 7 days food frequency of feeding from different food groups [20].

The variable used for health care was giving Vitamin A supplementation during last 6 months [21]. A childcare practice score (a total of 10 point scale) was created using the scoring system defined by Ruel *et al.* [22]. It was used as a continuous variable for analysis.

Data Analysis

In the original dataset, age was calculated with birthdays extracted from the child's health records or birth certificate that was available for all the children. Health status during the past 2 weeks was assessed by identifying the prevalence of diarrhea (three or more loose stools per day), acute respiratory tract infections (ARI-cough with or without fever) and fever (viral fever diagnosed by a doctor). Household wealth index was developed using housing characteristics, household possessions, availability of water and sanitation facilities. After which they were divided into five equal groups from

the poorest to richest. Stunting, wasting and underweight were defined as height-for-age, weight-for-height and weight-for-age z-scores each being less than 2, using the WHO growth standards in AnthroPlus 2009 software [23]. Migrant households were defined as those in which one or both parents of the survey index child had migrated internationally for labour at the time of the survey, otherwise the household was considered as non-migrant. Descriptive analysis by migrant households was examined. Explanatory variables used in the analysis included: household-level variables on maternal education; wealth; urban/rural residency; number of household members and child-level variables of sex, age, birth weight, care practices and health status (presence of diarrhoea, cough, fever) prior to two weeks. Poorest wealth quintile, urban residency, male, birthweight $<2,500$ g, presence of diarrhoea, ARI and fever were considered as a value of 1. Aim of this study was to estimate the likelihood of being a stunted/wasted/underweight child to changes in the explanatory variables, based on the migrant status and factors associated with this. The appropriate model to use would be the Probit model, which is a linear probability model with the binary dependent variable taking value 1 if the child is stunted and 0 otherwise. This same model was used to estimate the likelihood of being wasted or not; underweight or not.

The forward step-wise regression technique is used to select the significant variables to a child's nutritional status adjusting for potential confounders based on UNICEF's conceptual framework. Correlation matrix was prepared to identify the association of childcare practices with the explanatory variables.

Results

In the national dataset of children aged 6 to 59 months, 321 and 6,985 belonged to migrant and non-migrant households respectively. In the migrant sample, 83.2% had a migrant father, 14.3% had a migrant mother and 2.5% had both parents working abroad. As shown in Table 1, migrant sample had older children (35.1 months vs. 32.8 months), more boys (53.3% vs. 50.1%), more living in urban locations (15% vs. 11.7%), more from the poorest and poor wealth quintiles (24% vs. 20.4% and 28.7% vs. 20.2%) than the non-migrant sample. The prevalence of stunting, wasting and underweight was lower in the migrant than non-migrant (11.5% vs. 14.8%, 18.1% vs. 21.5% and 24.3% vs. 26.2% respectively).

Table 1: Child and household characteristics for migrant and non-migrant households¹

Child and Household Characteristics	Overall N = 7306	Migrant N = 321	Non-Migrant N = 6985
	Mean (SD)/(%)		
Nutritional status of children			
Stunting	11.5	11.5	14.8
Wasting	19.1	18.1	21.5
Underweight	23.1	24.3	26.2
HAZ	-0.9 (1.1)	-0.8 (1.2)	-0.9 (1.1)
WHZ	-1.2 (1.0)	-1.1 (1.1)	-1.2 (1.0)
WAZ	-1.3 (1.0)	-1.2 (1.1)	-1.3 (1.0)
Child's factors			
Age of the child (months) ^{***}	32.9 (14.7)	35.1 (14.2)	32.8 (14.8)
Child's sex: boy	50.2	53.3	50.1
Birth weight (kg)	2.9 (1.3)	2.9 (0.5)	2.9 (1.3)
Child's health status in prior 2 weeks			
Diarrhoea	7.5	5.9	7.6
Cough and cold	32.0	33.0	31.9
Fever	23.1	22.4	23.2
Maternal education¹			
No schooling	0.5	0.3	0.6
Primary school	3.5	7.6	5.0
Secondary school	19.4	60.1	66.9
High school	66.5	26.0	22.8
Beyond high school	5.3	5.9	4.6
Residency: urban	17.3	15.0	11.7
Wealth Index^{***}			
Poorest	20.0	24.0	20.4
Poor	20.0	28.7	20.2
Middle	21.0	20.6	19.2
Rich	20.0	13.1	20.5
Richest	19.0	13.7	19.6
Household members	4.4 (1.2)	4.4 (1.5)	4.4 (1.2)

¹33 missing: due to the absence of mother and caretaker not being aware of mother's education);

^{***}Significant at the 1% level.

As presented in Table 2, stunting and underweight is higher among children whose mother is a migrant worker. Households with only a migrant father were observed to have children with higher birthweight and younger children, while households with only a mother being a migrant worker were the poorest.

In this sample, there is a statistically significant negative association between child care practices and the younger age of a child as well as if the father is a migrant worker. In addition, there is a statistically significant positive association between childcare practices and HAZ, WAZ,

birth weight, mother's education and wealth index (Table 3).

Table 4 presents the association of child, household variables, care practices and migrant status with the nutritional status of the child using the probit model. The area under the receiver operating characteristic curve (not presented here) is found to be 0.6596, 0.722, 0.7228 for stunting, wasting and underweight respectively, indicating that the estimated probit model fits efficiently. When the coefficient estimates of birthweight and wealth decrease stunting was observed

SECTION III

Health Status of Migrants and their Families

PART I: OUTBOUND MIGRANTS AND LEFT-BEHIND FAMILIES

to increase while stunting was seen to decrease with the increase in caregiving practices and when the father was a migrant worker. Birthweight and diarrhea have a negative association on wasting. Birthweight and poorest wealth have a negative association with underweight. The marginal effects highlight that, for each additional 100 gram increase in birthweight of children in the migrant household, the probability of being wasted, stunted and underweight decreased by 6, 8 and 24 percentage points respectively. Marginal effects of father being a migrant worker and improved childcare practices show that the likelihood of being stunted will be 0.11 and 0.02 percentage points lower. Considering the marginal effects it shows that the child having diarrhea

during the past 2 weeks increases the probability of being wasted by 0.18 percentage points.

Discussion

This study, aimed to explore the nutritional status and childcare practices of children left-behind in migrant households in Sri Lanka. Less than 5% of the study population had a parent who had migrated abroad for labour. Among those, in four out of five cases it was the father who was based abroad as a migrant worker. National labour migration statistics for 2014 indicated that of migrants working abroad, 63% are males and 37% are females [8].

Table 2: Association of child and household variables by the migrant status of the parents¹

Child and Household Variables	Mean (SD)/(%w		
	Father Abroad	Mother Abroad	Both Abroad
Nutritional status of children			
Stunting	9.7	21.7	12.5
Wasting	18.0	17.4	25.0
Underweight	22.8	34.8	12.5
HAZ	-0.8 (1.2)	-1.1 (1.2)	-1.3 (1.5)
WHZ	-1.1 (1.0)	-1.3 (1.3)	-1.3 (1.5)
WAZ	-1.2 (1.0)	-1.1 (1.2)	-0.6 (0.1)
Child's factors			
Age of the child (months)***	33.4 (14.1)	44.5 (11.3)	36.3 (14.5)
Child's sex: boy	55.1	43.5	50.0
Birth weight (kg)***	2.9 (0.5)	2.7 (0.5)	2.5 (0.5)
Child's health status in prior 2 weeks			
Diarrhoea	9.8	0.0	0.0
Cough and cold	26.3	28.3	62.5
Fever	23.7	17.4	50.0
Maternal education¹			
No schooling	0.0	2.6	0.0
Primary school	4.1	30.8	0.0
Secondary school	61.0	53.8	62.5
High school	28.6	10.3	25.0
Beyond high school	6.2	2.6	12.5
Residency: urban	16.5	8.7	0.0
Wealth Index			
Poorest	20.6	43.8	25.0
Poor	28.5	30.4	25.0
Middle	22.1	13.0	12.5
Rich	13.1	8.7	37.5
Richest	15.7	4.3	0.0
Household members	4.3 (1.4)	4.7(1.8)	5.1 (1)
Total	267 (83.6)	46 (16.4)	8 (2.5)

¹ 33 missing; ***Significant at the 1% level.

Our study sample does not correlate to this ratio and the mean age of the child was higher in the migrant sample. This may be due to our study using the data from the national nutritional survey among children between 6–59 months and due to the law in Sri Lanka to ban international migration of women who have children younger than 3 years.

Our study found the lower level of mean z scores (HAZ, WHZ and WAZ) and lower prevalence of wasting, stunting and underweight among children in migrant households than in the non-migrant children and the overall sample.

Mixed results were reported from available studies. In Tonga, HAZ was lower among children younger than 18 years old left behind by migrants to New Zealand but no impact on WAZ. There was a positive impact on HAZ scores among Guatemalan children left behind by immigrants to the United States. Evidence from Tajikistan shows that children in communities with more migrants have higher HAZ-scores [7]. A 2006 survey conducted in migrant households of rural settings in selected areas of Pakistan suggests that migration is positively associated with the weight and height of both boys and girls, moreover among young children, the height was only significant for girls [24]. Evidence from a study in Tajikistan (2011) [25] suggests that the increase in household income due to remittances reduces malnutrition among children. Another study highlighted that the absence of a parent in a migrant household has a negative association on weight-for-height [26]. A longitudinal study in Mexico revealed that parental migration has a negative association on height-for-age [27]. It revealed that differences in data, country contexts, child age definitions, empirical specifications, and methods all may have contributed to the differences in these results, but they also highlight the complex relationship between migration and child nutrition, indicating further investigation [6].

Table 3: Correlation of child and household variables (independent variables) with child care practices (dependent variable) ($n = 272$)

Independent Variables	Correlation Coefficient
Nutritional status of children	
Stunted	0.0319
Wasted	-0.0028
Underweight	-0.0611
HAZ	0.0932**
WAZ	0.0947**
WHZ	0.0635
Child's factors	
Average age of the child (months)	-0.5372**
Child's sex: boy	-0.0175
Average birth weight (kg)	0.1122**
Child's health status in prior 2 weeks	
Diarrhoea	-0.0542
Cough and cold	-0.0150
Fever	-0.0011
Average years of mother's education	0.1355**
Residency: urban	0.0296
Wealth Index: poorest	0.1479**
Migrant status: father abroad	-0.2387**

**Significant at the 5% level.

Results revealed that childcare practices would decrease with younger children and when the father is a migrant worker. This may be associated with the limited time devoted to childcare practices by the remaining parent or caretaker [7]. This information is to be considered in developing policies on migrant workers. In addition childcare practices will increase with birth weight and wealth index suggesting that an increased household income may result in better improvements in socioeconomic status [28]. Our study shows that there is a positive relationship between mothers' educational attainment and their children's nutritional status. Higher level of education shows low wasting level of children. Previous studies have shown a similar observation [29].

Results from our analysis showed that stunting of children was significantly associated with wealth index of the migrant families. Proxy indicators of socioeconomic status used in the analysis and categorization of the wealth index was housing status and availability of electricity, television, refrigerator, mobile phones, sewing machine, radio and clock. Lower levels of stunting are seen in children with higher birthweight, better child care practices and a migrant father. Higher levels of stunting are seen in poorest households. Results from our analysis further highlight the need of better public policies towards migrant children. Although migrant workers migrate from their impoverished communities

to improve socioeconomic status of their families, their children's inadequate nutrition is an indicator of poor socioeconomic attainment. This needs further analysis.

Growth impairment during childhood has several consequences on physical and cognitive development. These consequences include decreased school performance and overall productivity, in addition to being a risk factor for chronic diseases later in life [10]. Migrant children living in poverty will have similar labour and productivity outcomes as their parents, thereby perpetuating the poverty and malnutrition cycle. Moreover, children with stunting, poor performance and scarce education opportunities, will have low productivity and poorer overall health as future adults [30].

Table 4: Association of child, household variables and care practices by nutritional status—probit model estimation ($n = 272$)

Child and Household Variables	Estimate	Robust SE	Marginal Effect (In Percentages)
Stunting			
Constant	-1.2539	1.4285	
Birthweight	-0.3661*	0.2241	-0.0613
Had diarrhoea	-0.4056	0.3802	-0.0679
Average caring practices	0.1313*	0.0795	0.0220
Urban sector	0.3573	0.3432	0.0598
Average number of household members	-0.0917	0.0766	-0.0153
Poorest wealth	-0.1599*	0.0893	-0.0268
Migrant father	0.6860**	0.2739	0.1150
Log likelihood		-87.6	
Wasting			
Constant	1.7759	0.9939	
Average birthweight	-0.3649*	0.2270	-0.0865
Had diarrhoea	-0.7778**	0.3174	-0.1845
Average education of mother	-0.0450	0.0309	-0.0106
Log likelihood		-114.9	
Underweight			
Constant	1.3010	0.7204	
Average birthweight	-0.8005***	0.2073	-0.2303
Had cough and cold	0.2430	0.1230	0.0699
Being a girl	0.1738	0.1355	0.0500
Poorest wealth	-0.1883**	0.0700	-0.0541
Log likelihood		-130.3	

***Significant at the 1% level, **significant at the 5% level, *significant at the 10% level.

Child's birthweight is an important factor which affects nutritional status. This study shows that there is a positive relationship between birthweight and the child's nutritional status, childcare practices and father being a migrant worker. Higher birthweight was associated with a low wasting, stunting and underweight level among children. Increase of 100 g of birthweight will decrease underweight by 23% in children of migrant households. A cross sectional study from Mexico identified that migration positively affects 364 g higher birthweight, and lowers the probability of children being underweight by 6.9%, controlling for other factors [31]. There is a known interaction between maternal height and birthweight and it is a known fact that breaking this intergenerational cycle will help to improve nutrition of children.

One of the goals of the migration as a determinant of development is to interrupt the intergenerational cycle of poverty by favouring the development of human capital, and by providing economic incentives for families to invest in their own future through education, health, and nutrition. However, this study highlights the importance of focusing on these issues developing favourable policies for children left-behind in migrant households [32].

The limitations to this study need to be considered. In the national survey, occupation of fathers and mothers of the children were collected during the last year. Although children 6–59 and 6–23 months of age have different care practices, analyses was done for 6–59 months due to low sample (n = 78) of 6–23 months even though the global norm of feeding practices for children 6–59 months of age is not available. The mother's/caregiver's reported personal hygiene and feeding practices were determined based on self-reported data as opposed to actual practice and may lead to problems in validity. Important variables to consider such as the number of children under five in the household, maternal height, duration of migration, internally migrated households and remittances were not included in the analysis, as the information was not available in the national survey. Despite these limitations, assessing the effects on nutritional status and care practices of children left-behind using nationally representative survey data in Sri Lanka is a critical step in strengthening the relevant evidence base and developing appropriate interventions for optimal child growth.

Conclusions

It appears that poor care giving practices and undernutrition that is commonly associated with poverty remains a major concern for child welfare in migrant families. Results from our analysis highlight the need

for targeted nutritional programs towards potentially vulnerable and at risk children left-behind from migrant households, particularly from the poorest strata where the mother is the overseas based migrant worker and for low birth weight children. There is a need to build skills, capacities and preparedness for migrant families not only in terms of care provision for children left-behind but in better utilizing and investing remittances for poverty alleviation. The nutritional status of children left-behind may be influenced by a complex interplay of underlying social determinants and cultural gradients that extend beyond the effects of enhancing purchasing power for food due to remittance income, child care demands and food-preparation dynamics at the household level. Key areas to improve nutritional status of children are actions of nutritional surveillance and nutrition promotion among migrant families. Further representative and in depth studies are needed in the future to explore more factors associated with nutritional status of children left-behind in migrant families and how labour migration affect household level outcomes related to poverty, child nutrition and child care.

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Author Contributions

Renuka Jayatissa and Kolitha Wickramage conceptualised, designed and wrote the paper. Renuka Jayatissa conducted the national survey and analysed the data set. Both authors read the manuscript, made a substantial contribution to the revision and approved the final manuscript.

Conflicts of Interest

The opinions expressed are those of the authors do not necessarily reflect the views of the institutions that they are affiliated with.

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Risk of mental health and nutritional problems for left-behind children of international labour migrants

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ABSTRACT

Background

One-in-ten Sri Lankans are employed abroad as International Labor Migrants (ILM), mainly as domestic maids or low-skilled labourers. Little is known about the impact their migration has on the health status of the children they 'leave behind'. This national study explored associations between the health status of 'left-behind' children of ILM's with those from comparative non-migrant families.

Methods

A cross-sectional study design with multi-stage random sampling was used to survey a total of 820 children matched for both age and sex. Socio-demographic and health status data were derived using standardized pre-validated instruments. Univariate and multivariate analyses were used to estimate the differences in mental health outcomes between children of migrant vs. non-migrant families, and in left-behind children in single parent families vs. those having both parents.

Results

Two in every five left-behind children were shown to have mental disorders [95%CI: 37.4–49.2, $p < 0.05$], suggesting that socio-emotional maladjustment and behavioural problems may occur in absence of a parent in left-behind children. Male left-behind children were more vulnerable to psychopathology. In the adjusted analyses, significant associations between child psychopathological outcomes, child gender and parent's mental health status were observed. Over a quarter (30%) of the left-behind children aged 6–59 months were 'underweight or severely underweight' compared to 17.7% of non-migrant children.

Conclusions

Findings provide evidence on health consequences for children of migrant worker families in a country experiencing heavy out-migration of labour, where remittances from ILM's remain as the single highest contributor to the economy. These findings may be relevant for other labour 'sending countries' in Asia relying on contractual labour migration for economic gain. Further studies are needed to assess longitudinal health impacts on the children left-behind.

Keywords

labour migration, migrant families, nutritional status, children left behind, child care

Introduction

International labour migration has become a crucial engine for economic development for many countries worldwide [1,2]. The growing economic aspirations of International Labor Migrants (ILM's) are driven by labour market demands of rapidly developing regions of the world. 'Source' countries for migrants from Asia, particularly female domestic 'maids' include Sri Lanka, Philippines, Pakistan, Indonesia, India and Bangladesh [3]. 'Destination' countries consist of mainly the Gulf States, followed by emerging economies in Asia such as Singapore.

ILMs from Sri Lanka has grown ten-fold during the past decade, with 90% employed in the Gulf, and 730 registered workers departing Sri Lanka each day [4]. In what was once a highly feminized labour force, today 49% percent of ILMs are women, and of these 86% are employed as 'domestic housemaids' [4]. Remittances by migrant workers remained the single highest contributor to the Sri Lankan economy in 2012, with earnings expected to increase to 7bn USD by 2016 [5]. Despite these clear monetary benefits for the State, studies examining household savings and socio-economic status of returning Sri Lankan ILMs show mixed individual economic gains [6,7]. Due to this, most workers choose continuous cycles of re-migration ('circular migration') to increase their savings. The 'balance sheet' of labour migration typically involves a trade-off between economic well-being and family proximity [8,9]. Through an economic lens, remittances may directly benefit a majority of poorer migrant households by increasing income. However, the reliance on remittance alone as a measure of poverty alleviation remains unclear. Its utility for human capital formation in migrant households through greater spending on health care, food and education also requires empirical exploration [7,10].

United Nations (UN) agencies have articulated the need for migration-related determinants of health to be explicitly included in the post-2015 Millennium Development Agenda through the UN general assembly's High Level Dialogue on International Migration and Development, and through the Global Migration Group [11]. The International Organization for Migration (IOM) and the World Health Organization (WHO) have led global efforts to stimulate member states to adopt migrant sensitive health systems and enable policies and practices to ensure realization of the right to health for migrant and mobile populations [12]. The UN Committee on the rights of the child have advocated for protection of child rights in the context of international migration, and the United Nations Children Fund (UNICEF) has also

articulated the scarcity of research on consequences of migration on child health and well-being worldwide [13].

Effects on child psychological well-being

The adverse effects on the psychological well-being and development outcomes of children due to separation from a parent for extended periods has been characterized by a number of researchers [14-17]. However, such research examining transnational parental effects has focused on immigrant groups within industrialized countries rather than temporary labour migrant populations [18,19]. Only a few studies have examined the psychological impact on children of temporary labour migrant families from developing nations. A study by Graham and Jordan (2011) measured psychological well-being among children of labour migrants under the age of 12. They showed that children of households in Indonesia and Thailand where mothers were labour migrants had poorer psychological well-being indices than children from non-migrant households [20]. A study of school children in Philippines by Battistella and Conaco (1998) found little or no evidence that children of migrant families had greater psychological problems than children of non-migrants [21].

Three studies from Sri Lanka examined health status of left-behind children utilizing standardized psychometric measures [22-24]. Results from all three indicated that absence of the mother was significantly associated with adverse behavioural problems in left-behind children. However, the following limitations were common in all the studies. First, they focused exclusively on male-headed households (where the mother was the overseas worker) and did not include female-headed households. Considering that 52% of migrant workers are male [4], this left a significant gap in assessing health impact of children in such families. All studies used purposive samples obtained entirely from selected schools in an urbanized setting from a single district, and children of only one ethnic group (Sinhalese) were included. In order for policy makers and planners to make informed decisions on the impact of migration on children's well-being, more representative studies are needed from areas that supply large number of ILM's.

Effects on child nutrition

A number of studies have investigated the relationship between international labour migration and child malnutrition [25-27]. Remittances flowing from ILM's may affect child nutrition through two broad pathways. First, increased household income from the migrant parent sending back remittances may be used to enhance purchasing power for food and other goods. Secondly, by

changing time and task allocations within the household, as the loss of a parent may reduce the time available to prepare food and/or to care for the child's nutritional needs. A review of literature identified only a few studies that examined nutritional outcomes in children left behind due to ILM. A study by Cameron and Lin (2007) highlighted that the absence of a parent in migrant households had a negative effect on short-term child nutrition in Thailand [28]. However, authors suggested increasing levels of household remittances may help lessen the negative effect on child nutrition. A nationally-representative longitudinal study by Nobels (2007) in Mexico examined the effect of parental migration on child health by comparing children within households who are exposed to migration at critical periods of child development [29]. Results suggested that parental migration negatively effects child height-for-age, a long-term measure of child nutritional status and illness. The same pattern did not emerge from comparisons of children in non-migrant households. Frank and Hummer (2002) who also studied Mexican migrant and non-migrant households found that membership in a migrant household reduced the risk of low birth weight, largely through the receipt of remittances [26]. Though few in number, these studies highlight the complex relationship between temporary labour migration and child nutrition.

With high rates of malnutrition in developing nations that are also major source countries for ILMs, and with the growing evidence base linking child nutritional deficiencies with mental health problems [30,31] exploring child nutrition remains an important policy area.

Research objective

Despite the political discourse on migration moving up the global development agenda [1,12], the public health implications for migrants and their families have received little attention. Analysts have also argued that Global Migration policy strategies have failed to recognize and adopt a family perspective [32,33]. A PLoS medicine series on *Migration & Health* in 2011 prompted public health attention and called for an evidence-based research agenda on health of migrants [34]. As described, there have been relatively few studies from countries, which 'supply' labour that considered the effects of international labour migration on children left-behind. This paper addresses the question of whether migrant children face an increased risk for adverse mental health and nutritional outcomes in Sri Lanka.

Methods

Study Design and participants

A cross-sectional survey was conducted in six districts of Sri Lanka with the highest number of outbound ILMs. The study population included the families of migrant workers (employed abroad for at least six months), residing in one of the selected districts. The inclusion criteria for the study group were households where one or both parents were ILMs, who had their own or adopted child/children under 18 years of age living at the same residential address for a period of (at least) six months prior to the time of data collection. Children from families without a history of migration abroad were considered as the non-migrant 'comparative group'. The inclusion and exclusion criteria was adopted to ensure an accurate comparison of the effect of migration on left-behind families of ILMs is presented below. Our study included analysis of both adult and child members from these families, however, this paper only describes the child sample. We also undertook a comprehensive qualitative research study to explore the perceptions of left-behind migrant families, which has been published separately [35].

Definitions of participant categories and their inclusion and exclusion criteria

- **Migrant Family:** Inclusion criteria: a family where either one or both spouses have departed for employment abroad as a labour migrant for period of at least six months, have their own or adopted child/children under 18 years of age, and the left-behind family been living at the same residence for a period of at least six months at the time of data collection. Exclusion Criteria: families in which the migrant worker was continuously absent in the preceding six months prior to leaving the country on assignment.
- **Migrant Spouse:** the spouse of the overseas-based migrant worker living in the migrant family household for at least six months.
- **Child 'left-behind' (or "left-behind child"):** a child under 18 years (at the time of data collection) who is living in the migrant family household for a period of at least last six months, and who's parent/parents are international labour migrant workers currently working abroad for a period of at least 6 months.
- **Caregiver:** a person living in the migrant family household who is not the biological mother/father, but who is responsible for taking on the burden of care for the left-behind child on a daily basis, for a period of at least six months. Care consists of activities such as; arranging daily schedules, preparing or ensuring access to meals, assisting the child's educational and social needs (including play),

washing clothes, looking after the child when he/she is sick, guardianship and representation to health and/or education authorities.

- **Comparative (Non-Migrant) Family:** Inclusion criteria: A family where both parents are present, which neither spouse has a history of labour migration (both internal and outbound), have their own or adopted child/children under 18 years of age in the family unit. Exclusion criteria: one or both parents being absent from the same house for more than 60 days (average more than 2 days per week) continuously or alternatively for the preceding six months.

Sampling

A multi-stage random sampling method was used in the selection of ILM households. Grama Niladhari Divisions (GND) or 'village unit' is the smallest administrative population unit in Sri Lanka. Divisional Secretariat Divisions (DSD) administrates a cluster of GNDs, and is responsible for coordinating social services in these villages [36]. A total of 41 DSDs were included in six districts with the highest number of ILMs (Colombo, Gampaha, Kandy, Kalutara, Kurunegala and Puttalam). All GND in each 41 DSDs were listed and one GND was randomly selected from each DSD using a random number generation tool totaling 41 GNDs. A registry of all migrant households in each selected GND was created according to the information obtained from the Grama Niladhari (village administrator), Public Health Midwife (PHM), and "Samurdhi Niyamaka" (government appointed village welfare worker). Subsequently, ten migrant family households were selected randomly from each GND. Each randomly selected household was checked for inclusion and exclusion criteria, and to compensate for ineligible households, another household was selected randomly from the remaining list in the GND. The sample size was estimated using standard sampling power calculations [37].

A total of 410 migrant worker families and 410 families with no migration experience were included in study. Children between 12 to 17 years of age from migrant households were individually matched with children from the same school and class to find a comparative child from a non-migrant household within each GND. Children were then matched according to gender and age, and a list of children from families with no migration history were obtained from the attendance register available in the classroom with the responsible teacher. Similarly, pre-school children (under 5 years of age) were also matched according to gender and age, from the list obtained from the PHM registry.

Of the six districts, Colombo and Kandy have the vast majority of population living in densely populated urban centres with some peri-urban zones. Kurunegala and Gampaha districts have a population within a mix of urban, peri-urban and rural population catchments. Population in Puttalam district is concentrated in predominantly rural settings, with small urban centres. Rural populations are characterized by their dependence on agriculture for their livelihood, with an estimated 90% of the nation's poor living in rural settings.

Standardized health instruments and outcome measures

The study instruments were extensively validated using nominal group techniques and were previously used by authors in a large-scale national study on adult and child mental health in Sri Lanka [38].

The *Questionnaire for socio-demographic data* aimed at capturing basic social, economic, environmental and demographic indicators. Variables included gender, ethnicity, family size, employment type, educational status, home ownership status, household setting/conditions, household goods, income and expenditure. Measures such as migration history, frequency of ILM return from country of labour migration, household indebtedness, and frequency of remittance sent home were also captured. The questionnaire was administered to both the spouse/caregiver of the migrant family and to one adult member (parent of selected child) of the comparative non-migrant family.

The *Strengths and Difficulties Questionnaire (SDQ)* is a reliable measure of the adjustment and psychopathology of children and adolescents. It indicates emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems and pro-social behaviour. A computerised predictive algorithm generates "unlikely", "possible" or "probable" ratings for four broad categories of disorders, namely conduct disorder, emotional disorder, hyperactivity disorder, and any psychiatric disorder. The algorithm has been deemed to be sufficiently accurate and robust to be of practical value, and the level of chance-corrected agreement between SDQ prediction and independent clinical diagnosis considered substantial and highly significant (Kendall's tau-b between 0.49 and 0.73; $p < 0.001$) [39]. The composite score from both 'abnormal' and 'borderline' scores were calculated to assess the risk potential in left-behind children to develop psychopathology. A 'borderline' or probable SDQ prediction for any given disorder correctly identified 81-91% of the children who definitely had that clinical diagnosis [39].

The three versions of the SDQ, for children, parents and teachers were used in the study. The instrument was adapted from original screening questionnaires [39], translated to both Sinhalese and Tamil languages and identical to one successfully used in a national child mental health survey in Sri Lanka [38]. The SDQ versions for teachers, parents, and for children between 6 to 17 years of age were administered to both migrant and comparative families. For each selected child or adolescent between the ages of 6 to 11 years, the child's parent/care-giver and their schoolteacher completed the SDQ, assisted by a trained field researcher. Children between the ages of 12 to 17 years also completed the SDQ and the composite score triangulated with results obtained by their parent and schoolteacher.

The *Check list for growth development and immunization (CHDR)* was used to collect data from children under 5 years of age that were matched by age and gender from both migrant and comparative families. We focused on capturing nutritional status of young children aged 0 to 5 years, as these formative years are crucial for child growth and development [40]. Anthropometric data on child's growth, development milestones and immunization history were captured from individual Child Health Development Records (CHDR) issued by the Ministry of Health. PHM at the village level regularly recorded these measures at child health clinics, and records were also held by the parent/care-giver of the child. The CHDR registers the growth for children from birth to 5 years of age by body mass relative to age (Weight-for-age). Weight-for-age (WFA) is commonly used for monitoring growth to assess changes in the magnitude of malnutrition over time. A child's 'underweight' status reflects both chronic and acute malnutrition (underweight is defined by a WFA Z-score between < -2 and ≥ -3 SD from mean). Child nutritional status (using Z-score measures) and immunization history were recorded from CHDR records maintained by PHM from birth.

Ethics, data collection and analysis

The Ethics Review Committee of the Faculty of Medicine, University of Colombo, granted ethical approval. Data collection was conducted using a team of 22 trained field research assistants under the guidance of a psychiatrist, physician and two public health specialists. Permission to collect data was obtained from the regional education authorities, principals and teachers of each school. Participant information leaflets were sent to the parents through the selected school children. Later, the study was fully explained and written consent obtained from the parent or guardian. The study was also explained to all children and their assent was obtained.

Data collection was supervised and managed by two dedicated project coordinators and a statistician. Double data entry and data analysis was conducted using SPSS (Statistical Package for Social Sciences) version 17 and STATA. Statistical analysis included descriptive analysis to determine demographic information and frequency of the exposure and outcome variables. Chi-square tests were performed to ascertain differences between migrant and comparative children. We used standard multivariable linear regression models for continuous outcomes and multivariable logistic regression models for dichotomous outcomes. Univariable and multivariable analyses were used to investigate psychological outcomes of children of migrant vs. non-migrant families. Multivariable models were adjusted for child age and gender.

Results

Socio-demographic characteristics

A total 410 children from migrant families were matched with 410 children from comparative households (228 children were less than 5 years of age, and 592 were aged 12 to 17 years). A response rate 94% ($n = 770$) was achieved from the total of 820 families that were recruited for the study (385 children from migrant families were matched with 385 children from comparative households) (Table 1). A similar gender disaggregation profile was observed in children of both migrant and non-migrant families (49.4% for males and 46.8% for females). Vaccination status according to the Ministry of Health guidelines of the expanded program in immunization schedule (EPI) showed a high level of coverage, with the migrant children having a 95.4% completion rate.

Table 1: Demographic characteristics of children from migrant and comparative non-migrant households

	Left-behind Children (%)	Comparative Children (%)	Group difference (chi2, df, p-value)
Age			0.12 (3), p = 0.950
1-4 yrs	77(20.0)	83(21.6)	
5-8 yrs	104(27.0)	99(25.7)	
9-12 yrs	91(23.6)	91(23.6)	
13-17 yrs	113(29.4)	112(29.1)	
Gender			0.52 (1), p = 0.471
Male	195(50.6)	205(53.2)	
Female	190(49.4)	180(46.8)	
Vaccination Status^a			0.65 (1), p = 0.422
Completed	103(95.4)	103(92.8)	
Not completed	5(4.6)	8(7.2)	
Children with special needs^b			1.41 (1), p = 0.236
Need of special care	5(4.6)	2(1.8)	

- a. Vaccination status of children under 5 years according to National Expanded Program in Immunization (EPI) schedule.
- b. Children with special needs are defined as those having a chronic physical, developmental, behavioral, or emotional condition and require health and rehabilitative services of a type or amount beyond that required by children generally.

Nutritional status of children under 5 years of age

The measure of ‘underweight’ contained in the CHDR reflects both chronic and acute malnutrition, and is measured by weight relative to age. The proportion of children that were in normal weight range (z-score of

< + 2 to – 1 SD) in the migrant households was 38.2%, while the frequency in comparative households was higher at 46.9% (Table 2). Over a quarter (30%) of the left-behind children were underweight or severely underweight, compared to 17.7% of non-migrant children. However these effects were not statistically significant (p = 0.061).

Table 2: Nutritional and psychological status of children from migrant and comparative non-migrant households

	Left-behind Children (%)	Comparative Children (%)	Group difference (chi2, df, p-value)
Nutritional status of children aged 6–59 months^c			2.28 (4), p = 0.061
Overweight	4(3.6)	3(2.7)	
Normal weight	42(38.2)	53(46.9)	
Risk of Underweight	31(28.2)	37(32.7)	
Underweight	27(24.5)	20(17.7)	
Severely underweight	6(5.5)	0	
Child psychopathology scores (SDQ Domains)^d			
Emotional problems	30 (10.9)	9(3.4)	6.60 (1), p = 0.010
Conduct problems	108(39.3)	84(31.3)	3.75 (1), p = 0.053
Hyperactivity disorder	22(8.0)	8(3.0)	11.82 (1), p = 0.001
Any psychiatric diagnosis	119(43.3)	90(33.6)	5.42 (1), p = 0.020

- c. Underweight reflects both chronic malnutrition and acute malnutrition. It is measured by weight relative to age (WFA). Normal weight is defined as a WFA z-score of + 2 to – 1 SD. Underweight is defined for a z-score of < –2 and ≥ –3 SD. Severely underweight a z-score < –3 SD. Overweight represents excessive fat accumulation that presents a risk to health, and is measured by calculating the child’s Body Mass Index against their age - labelled ‘weight for height’ (WFH). The range for ‘overweight’ is a z-score > +2 and ≤ +3 SD.
- d. The SDQ domain ‘any psychiatric diagnosis’ aggregates emotional, conduct and behavioural scores to provide a potential measure a person has to develop or have a psychiatric disorder.

Mental health burden of children

The dimensions of child psychopathology (emotional problems, hyperactivity disorder, conduct problems and having any psychiatric diagnosis) of children 6 to 17 years of age was measured through the Strengths and Difficulties (SDQ) scale, and predicted children of migrant families would experience greater emotional problems following parent-child separation than non-migrants. The burden of emotional problems [10.9%, 95%CI: 7.2-14.6, $p < 0.05$] and hyperactivity disorders [8%, 95%CI: 4.7-11.2, $p < 0.005$] is highest in children from migrant families than from children in comparative families (Table 2). Two in every five left-behind children (43.3%) had clinically relevant child psychiatric disorders [95%CI: 37.4-49.2, $p < 0.05$]. Whilst child conduct problems were higher in left-behind children (39.4%) than those in non-migrant households (31.3%), these were not statistically significant ($p = 0.053$).

The mental health status of the parent/caregiver of a child was strongly associated with child psychopathology. This effect was observed in both migrant [Adjusted OR 1.63 (95%CI: 0.89-2.96)] and non-migrant families [Adjusted OR 2.44 (95%CI: 1.03-5.80), $p < 0.005$].

Migration and health related factors of parents and caregivers

The ethnic profile of the study sample closely matched national population ratios from the 2001 national population census, with 74.5% of migrant families and 78.2% of non-migrant groups being of Sinhalese ethnicity [41]. The mean age of parents of left-behind children was 37.9 years, with the majority of families living within rural settings (69%). There were twice as many fathers taking the role as the primary carer of left-behind children in the migrant family group (28.8%) than of the comparative non-migrant group (13.2%) ($p < 0.001$). The results show the proportion widowed/divorced parent to be greater (3.7 fold) in the migrant family group than in comparative families ($p < 0.001$).

Typology of employment of the migrant worker was assessed according to the Sri Lanka Bureau of Foreign Employment (SLBFE) classification of occupations [4]. The majority (66%) belonged to the low-skilled occupation classification of 'manual labourers' and 'domestic housemaids' (Table 3). More than half (55.6%) of migrant workers were reported by their spouses as having not returned to Sri Lanka since going abroad for work. Only 42.9% of the spouses of migrant workers reported receiving some form of monthly monetary remittances.

Table 3: Socio-demographic, migration and health related characteristics of parents in migrant and non-migrant households

	Migrant Spouse (%)	Comparative Spouse (%)	Group difference (chi2, df, p-value)
Gender			18.64 (2), $p = 0.001$
Male	111 (28.8)	51 (13.2)	
Female	274 (71.2)	334 (86.8)	
Age			29.14 (1), $p = 0.001$
Spouse Age (mean)	37.9 (0.49)	37.0 (0.39)	
18-30	54(14.1)	77(18.3)	
31-60	293(76.3)	305(72.4)	
above 61	37(9.6)	39(9.3)	
Ethnicity			0.86 (3), $p = 0.461$
Sinhala	286(74.5)	301(78.2)	
Tamil	27(7.0)	23(6.0)	
Muslim	61(15.9)	56(14.5)	
Other	10(2.6)	5(1.3)	
Education			22.55 (2), $p = 0.001$
No education	27(7.0)	4(1.0)	
Primary	95(24.7)	46(11.9)	

	Migrant Spouse (%)	Comparative Spouse (%)	Group difference (chi2, df, p-value)
Secondary	263(68.3)	335(87.0)	
Civil status			9.00 (2), p = 0.001
Married	345(89.6)	374(97.1)	
Unmarried	7(1.8)	2(0.5)	
Divorced	33(8.6)	9(2.3)	
Employment			0.97 (1), p = 0.323
Non-employed	247(64.2)	260(67.5)	
Employed	138(35.8)	125(32.5)	
Family indebtedness			1.08 (2), p = 0.339
No (little or no debt)	214(55.6)	229(59.6)	
Yes (significant levels of debt)	171(44.4)	155(40.4)	
Area of residence			0.15 (1), p = 0.696
Rural	264(68.6)	269(69.9)	
Urban	121(31.4)	116(30.1)	
Employment type of Labour migrant*			
Labourer/domestic maid	249(65.5)	Not applicable	
Services	78(20.5)	Not applicable	
Technical	17(4.5)	Not applicable	
Professional/other	36(9.5)	Not applicable	
Return frequency of Labour migrant			
Every year	61(15.8)	Not applicable	
Every 2–5 years	110(28.6)	Not applicable	
Never returned/missing	214(55.6)	Not applicable	
In-bound remittance			
Every month	144(42.9)	Not applicable	
Every 2–6 months/more	192(57.1)	Not applicable	
Health-related factors			
General health			9.97 (2), p = 0.001
Excellent	17(4.4)	19(5.0)	
Fair	319(82.9)	349(91.1)	
Poor	49(12.7)	15(3.9)	
Current illness			27.94 (1), p = 0.001
Current diagnosed illness	133(34.7)	70(18.2)	
No current illness	250(65.3)	315(81.8)	
Prevalence of Common Mental Disorders (CMD)			
Any CMD	74(19.2)	35(9.1)	16.56 (1), p = 0.001
Depression	65(16.9)	30(7.8)	
Somatoform disorder	22(5.7)	12(3.1)	
Anxiety	8(2.1)	2(0.5)	

*The categories of migrant worker employment were classified according to the Sri Lanka Bureau of Foreign Employment.

General health was perceived to be three fold poorer in parents of migrant children (12.7%) than compared to the non-migrant families (3.9%), $p < 0.001$. There were also nearly twice as many migrant parents currently diagnosed with illness (34.7%) than comparative parents from non-migrant households (18.2%) $p < 0.001$.

Overall prevalence of common mental disorders in adults (depression, somatoform disorder and anxiety) was higher in left-behind parents/caregivers of migrant children [19.2% (95%CI 15.3-23.2)] than the non-migrant parent group [9.1% (95%CI 6.2-11.9)]. Prevalence of depression was doubled in the migrant group (16.9%; 95%CI 13.1-20.6), compared with non-migrant parents (7.8%; 95%CI 5.1-10.5). Prevalence of somatoform disorder (5.7%; 95%CI 3.4-8.0) and anxiety disorder (2.1%; 95%CI 0.6-3.5)

was marginally higher in spouses of migrant families than that of non-migrant counterparts (3.1%; 95%CI 1.3-4.9 and 0.5%; 95%CI 0.02-1.2 respectively).

Mental health outcome associations with demographic, economic, migration-related and health-related factors

Table 4 describes the unadjusted and adjusted associations between the primary SDQ outcome (any psychiatric diagnosis) with selected child and parental socio-economic and health indicators. In the adjusted analyses, significant associations were observed between child psychopathological outcomes and gender of child, parent/caregiver's educational attainment and their mental health status.

Table 4: Unadjusted and adjusted associations between SDQ outcome (any psychiatric diagnosis) with child and parent socio-economic and health indicators

	Unadjusted		Adjusted*	
	Left-behind Children	Comparative Children	Left-behind Children	Comparative Children
	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Child age				
6–11 yrs	1	1	1	1
12–17 yrs	1.06 (0.98–1.13)	0.97 (0.90–1.05)	1.05 (0.98–1.13)	0.97 (0.90–1.04)
Child gender				
Male	1	1	1	1
Female	0.58 (0.36–0.94)	0.54 (0.32–0.91)	0.60 (0.37–0.98)	0.54 (0.32–0.90)
Parent gender				
Male	1	1	1	1
Female	0.70 (0.41–1.17)	0.75 (0.38–1.50)	0.72 (0.43–1.23)	0.80 (0.40–1.60)
Parent age				
18–30	1	1	1	1
31–60	1.15 (0.46–2.90)	0.69 (0.32–1.47)	0.83 (0.31–2.20)	0.73 (0.31–1.72)
61-above	2.37 (0.76–7.34)	1.46 (0.10–25.52)	1.65 (0.50–5.37)	1.61 (0.10–30.36)
Parent education				
Secondary education	1	1	1	1
Primary education	1.26 (0.73–2.17)	1.25 (0.61–2.58)	1.19 (0.68–2.07)	1.30 (0.62–2.72)
No education	3.04 (1.17–7.90)	2.06 (0.28–14.96)	2.67 (1.01–7.02)	2.28 (0.30–17.07)
Parent employment				
Employed	1	1	1	1
Unemployed	1.13 (1.00–1.27)	1.10 (0.97–1.25)	1.11 (0.98–1.25)	1.09 (0.95–1.24)

	Unadjusted		Adjusted*	
	Left-behind Children	Comparative Children	Left-behind Children	Comparative Children
	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Family indebtedness				
No (little or no debt)	1	1	1	1
Yes (significant levels of debt)	0.91 (0.56–1.47)	0.62 (0.38–1.02)	0.91 (0.56–1.48)	0.62 (0.37–1.02)
Parent general health				
Excellent	1	1	1	1
Fair	0.67 (0.22–1.98)	2.13 (0.44–10.28)	0.57 (0.19–1.74)	2.18 (0.44–10.70)
Poor	1.33 (0.39–4.48)	0.88 (0.10–7.85)	1.04 (0.30–3.61) _x	1.05 (0.11–9.65)
Parent current illness				
Current diagnosed illness	1	1	1	1
No current illness	0.94 (0.83–1.06)	1.15 (0.97–1.36)	0.96 (0.84–1.08)	1.15 (0.97–1.37)
Parent mental illness				
No mental illness	1	1	1	1
Having a mental illness	1.76 (1.00–3.16)	2.56 (1.09–5.97)	1.63 (0.89–2.96)	2.44 (1.03–5.80)

Bold values are significant at $p < 0.001$.

*Adjusted for child age and child gender.

The adjusted odds ratio showed presentation of any child psychiatric diagnosis is 40% less likely in female children as compared to male children in left-behind families [OR 0.60 (95%CI:0.37-0.98), $p < 0.05$]. A similar association was observed in children from non-migrant families [OR 0.54 (95%CI:0.32-0.90), $p < 0.05$]. Educational status and employment status of the parents/giver of the child also influenced child psychopathological outcomes. The adjusted odds ratio of having any psychiatric diagnosis was 2.67 times more likely in left-behind children whose parents had not attended school [OR 2.67 (95%CI: 1.01-7.02), $p < 0.05$].

In children from migrant families whose left-behind parents were unemployed, the likelihood of having any psychiatric diagnosis was 1.13 times higher than those employed [OR 1.13 (95%CI:1.00-1.27)]. However, this result was observed only before adjustment for child age and gender.

Discussion

This study addresses the question of whether left-behind children of migrant workers are at increased risk for mental health problems and adverse nutritional status. Whilst observational studies cannot determine causality, the evidence suggests overall negative associations at the

intersection of labour migration and child mental health, but a weak association with nutritional status.

Effects on child mental health and well-being

A number of researchers have theorized that migration of a parent for extended periods may transform family relationships and functioning [42,43]. For left-behind children, the main concerns centre on how separation from parents affects their social, behavioural and psychological development. In our study, two in every five left-behind children were shown to have clinically relevant child psychiatric disorders. These results suggest that socio-emotional maladjustment and behavioural problems may occur among left-behind children in the absence of a parent. Findings from this nationally representative study corroborates with findings from smaller scale studies conducted in Sri Lanka that showed adverse behavioural outcomes, emotional and conduct disorders in school aged children of female migrant workers [22-24]. The crucial finding was that the psychological impact on families was also observed in families where the father is the overseas migrant worker. Qualitative studies have suggested that it is more challenging to achieve intimacy with children for migrant fathers than mothers [19,44]. Our results also revealed that male left-behind children were more vulnerable

to psychopathology. This finding may need further exploration to specifically ascertain gender dimensions of transnational parenting, and measure child resiliency. In the adjusted analyses, significant associations were observed between child psychopathological outcomes and the gender of the child, parental education and their mental health status.

Studies from other Asian countries show mixed patterns of psychological well-being of left-behind children. A study by Graham and Jordan (2011) revealed that children of migrant fathers in Indonesia and Thailand are more likely to have poorer scores of psychological well-being than children in non-migrant households [20]. However, this finding was not replicated for children of migrant households in the Philippines or Viet Nam. The authors argued for more contextualized understandings in light of results showing divergent mental health outcomes. A study of school children in Philippines by Battistella and Conaco (1998) found little evidence that children of migrant families had greater psychological problems than children of non-migrants [21]. A multi-site study in the Philippines (2006) concluded that Filipino children in transnational families were found to be 'no less anxious or lonely' than their counterparts in non-migrant families [45]. Acceptance by communities of the 'normalcy' of transnational migrant families and for transnational parenting may act as a determinant to reduce vulnerability and enable resiliency of the left-behind child [46]. The anxieties of a child arising from parental separation may be 'less traumatic' if the migration experience is shared collectively and is normalized within social structures [46]. It is hypothesized that as international out-migration becomes more normative within high out-migration communities, certain child behavioral problems may decrease [20], with children developing along adaptive trajectories [47]. Since resilience is characterized as consisting of multiple dimensions that may change over time [48], vulnerability may lie upon a continuum that could be exacerbated by extended periods in the 'left-behind experience' of a child. Further research, which identifies resilience factors in left-behind children, will therefore be useful.

The Philippines has been recognized for its pro-active policy and program efforts in protecting the rights of its labour migrants and enabling a culture of support to families through a network of civil society and non-governmental organizations [49]. These institutional programs and informal support schemes may also serve to directly and indirectly support the normalization of migration within the social fabric. More research is needed to establish the process and extent to which such

programs enable a safe and dignified labour migration experience and how they may be protective for left-behind children.

Effects on child nutrition

Over a quarter of children aged 6–59 months of migrant households were found to be underweight or severely underweight. The findings of our study revealed that the comparative non-migrant child groups also have a high risk of being underweight (32.7%). These findings are consistent with the underlying nutritional trend in Sri Lankan children that shows an overall prevalence of underweight children in 2009 to be 22.1% [50]. The few studies that describe nutritional outcomes in children left-behind have shown mixed effects; with Gibson (2011) and Nobles (2007) finding an overall negative effect [25,29], while Frank and Hummer (2002) attributing a positive effect on child nutrition, especially with high levels of household remittances [26]. The nutritional status of left-behind children may be influenced by a complex inter-play of underlying social determinants and cultural gradients that extend beyond the effects of enhancing purchasing power of food due to remittance income, child care-demands and food-preparation dynamics at household level. Further research is required not only to 'unpack' these factors and their associated interrelationships, but also to explore the nutritional impact on child mental health and development [31,32].

Strengths, limitations and future research directions

A major strength of the study is its representativeness. Previous small scale studies focussed on only male-headed migrant households, derived from a single ethnic group (Sinhalese), and from an urban setting within a capital city (Colombo). Our sample was derived from a true cross-section of the left-behind families of migrant workers in Sri Lanka. The generalizability of our findings is therefore enhanced. Our sample was also reflective of the true pattern of work categories published by the SLFBE data: seventy-five percent of labour migrants worked in the 'unskilled' labour sector, with professional categories comprising of less than ten-percent of departures.

Our study primarily focused on child psychopathology, however, resilience and protective factors were not adequately explored. Identifying such enabling factors and resilience trajectories in left-behind children is crucial for formulating policies and programs to effectively manage migration and address health and social impact.

Whilst this study provides an insight into how migration effects health status of left-behind children, further research is needed to explore how intra-household power dynamics, transnational parenting, relationship outcomes, and whether male versus female headed households have an effect on child health outcomes. Research is needed to assess how factors such as the duration and frequency of an often cyclical pattern of migration affects health outcomes; how household remittances are actually spent to promote child development outcomes; children's own experiences/expectations; abuse and violence within migrant families; and, how left-behind families access support services at community level.

Cross-sectional studies may only suggest but not determine causality. Prospective cohort and longitudinal studies are needed to assess if children left-behind truly recover from the experience of parental migration. The re-integration of migrant parents after a long-term absence from child may cause problems due to acculturation issues, family conflicts and re-establishment of livelihoods [51]. The impact of parent-child separation among left-behind children may also need comparison of mental health conditions before and after the separation. From a socio-ecological perspective, those 'left-behind' may not only effect migrant children and families but also extend to entire communities [52]. Longitudinal studies are needed to establish if migration actually leads to enhancing health outcomes and aids meaningful social and economic prosperity.

Conclusions

The findings from this study contribute to an evidence-based approach to developing Sri Lanka's Migration Health policy and program processors. In our study, two in every five left-behind children were shown to have mental disorders, with a significant burden of socio-emotional maladjustment and behavioural problems. Concerns centre on how separation from parents may effect nutritional, behavioural and psychological development of left-behind children. Community programs to strengthen the capacity of relevant government workers such as public health midwives (responsible for providing maternal and child health care at domiciliary level), child protection officers, school counsellors and foreign employment agency welfare officers to identify and address social, health and nutrition issues of families left behind are needed. Programs may involve undertaking mapping and vulnerability assessments of migrant families through a coordinated network of such village level

workers; development of case management or care plans for left-behind children using community participatory approaches; providing awareness and information to prospective migrant families; and providing guidance for primary caregivers of left-behind children.

As contractual labour migration to places like the Middle East remain a pervasive phenomenon, the impact on children left-behind leaves many unanswered questions. The consequences of long-term migration on family relationship structures, parenting and health vulnerabilities have complex associations that require further longitudinal analysis.

The World Health Assembly resolution on *health of migrants* promotes a 'safe, dignified and healthy migration' process for the benefit of both migrants and their families [53]. Though further research is required, this study shows a need to address the social determinants of health affecting migrant families. The finding that almost one-third of the sample were single parent families, that child psychopathology scores were highest in these left-behind families, a growing reliance on elderly care-givers and impacts of trans-national parenting pose complex challenges for policy makers, and raises debate at the nexus of *rights, remittances* and *responsibilities* for both State and ILM. The high levels of malnutrition in many labour sending countries within the developing world and the complex interplay between migrant remittances and child nutrition also form an important yet unexplored policy area. Balancing human rights discourses (for instance, the right of a single mother to migrate for economic reasons), in the context of social and health impact to both families and remittance dependent economies form formidable policy challenges for governments seeking to 'manage' migration and development.

Competing interests

The authors declare that they have no competing interests. The authors alone are responsible for the content and writing of the paper.

Authors' contributions

KW, CS, AS, SS, SP and PV conceived the study and were involved in study design. CS, SS, AA, KJ, BJ and SW contributed to the coordination and supervision of field teams and data collection and management. KW, CS, AS, SS and GP analysed the data and contributed to interpretation of data. KW and CS conceived the paper and KW wrote the first draft. KW and CS finalized the manuscript. All authors read, critiqued and approved the final manuscript. We would also like to thank the reviewers for their valuable comments in improving the manuscript.

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SECTION III

Health Status of Migrants and their Families

PART I: OUTBOUND MIGRANTS AND LEFT-BEHIND FAMILIES

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Common mental disorders among adult members of 'left-behind' international migrant worker families in Sri Lanka

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ABSTRACT

Background

Nearly one-in-ten Sri Lankans are employed abroad as International migrant workers (IMW). Very little is known about the mental health of adult members in families left-behind. This study aimed to explore the impact of economic migration on mental health (common mental disorders) of left-behind families in Sri Lanka.

Methods

A cross-sectional survey using multistage sampling was conducted in six districts (representing 62% of outbound IMW population) of Sri Lanka. Spouses and non-spouse caregivers (those providing substantial care for children) from families of economic migrants were recruited. Adult mental health was measured using the Patient Health Questionnaire. Demographic, socio-economic, migration-specific and health utilization information were gathered.

Results

A total of 410 IMW families were recruited (response rate: 95.1%). Both spouse and a non-spouse caregiver were recruited for 55 families with a total of 277 spouses and 188 caregivers included. Poor general health, current diagnosed illness and healthcare visit frequency was higher in the non-spouse caregiver group. Overall prevalence of common mental disorder (CMD; Depression, somatoform disorder, anxiety) was 20.7% (95%CI 16.9-24.3) with 14.4% (95%CI 10.3-18.6) among spouses and 29.8% (95%CI 23.2-36.4) among non-spouse caregivers. Prevalence of depression (25.5%; 95%CI 19.2-31.8) and somatoform disorder 11.7% (95%CI 7.0-16.3) was higher in non-spouse caregiver group. When adjusted for age and gender, non-returning IMW in family, primary education and low in-bound remittance frequency was associated with CMD for spouses while no education, poor general health and increased healthcare visits was significantly associated in the non-spouse caregiver group.

Conclusions

To our knowledge, this is one of the first studies to explore specific mental health outcomes among adult left-behind family members of IMW through standardized diagnostic instruments in Sri Lanka and in South Asian region. Negative impact of economic migration is highlighted by the considerably high prevalence of CMD among adults in left-behind families. A policy framework that enables health protection whilst promoting migration for development remains a key challenge for labour-sending nations.

Keywords

international migrant workers, economic migration, migration health, mental health, left-behind families, health policy, labour sending country, developing world, Sri Lanka

Introduction

Migration for economic reasons has become an important geo-political phenomenon of the modern era [1,2]. The growing aspirations of economic migrants are driven by the market demands of rapidly developing economies in the world. International migrant workers (IMW) from Sri Lanka have grown ten-fold during the past decade and around 17% of Sri Lanka's total labour force is currently working outside its borders [3]. Middle Eastern region is the main destination for Sri Lankan IMWs, and an average of 720 registered migrant workers departed Sri Lanka each day for foreign employment in 2011 [4]. This figure may be considerably higher if volumes of irregular and unregistered migrant workers can be estimated. Majority of Sri Lankans are employed abroad as 'domestic maids or labourers' [4]. Overall contribution from the economic migrant remittances to the Sri Lankan economy equals up to 8% of the total GDP [3,5].

Despite the monetary benefits to migrants, their families and to the country, evidence is emerging about numerous unfavorable effects of economic migration, including adverse health outcomes for IMWs and their left-behind families [6,7]. Although several studies have provided insights into the social, legal and economic impacts of economic migration in Sri Lanka, empirical evidence about the true scale of nation-wide health impact of economic migration is scarce [8–11]. A review of literature found three published studies from Sri Lanka which examined health status of left-behind children of migrant households [12–14]. There is no existing evidence of studies exploring health status of left-behind spouses or non-spouse caregivers, who has a role in providing care for children and other members of left-behind families. Although sparse, there is some evidence that migration of adult children for economic reasons can negatively affect both mental and physical health of aging parents [15]. In

most extended and traditional family units in developing countries, the aging parents of migrant workers may be additionally tasked with caring for the grandchildren of the left-behind family, precipitating increased health problems [15]. Other studies have shown that spouses of out-migrants have increased physical and mental health problems, including depression [16]. Some studies on the impact of migration among left-behind parents of emigrants moving to developed countries have shown mixed results. Some studies reported that the adult left-behind family members have better living standards and does not have any negative effects on their health while others reported that parents of migrants have worse self-reported health [17–19].

In the global context, despite the political discourse on migration becoming an important issue in the global development agenda, the public health implications for migrants and their families have received little attention [20–22]. A PLoS medicine series on Migration & Health in 2011 prompted public health attention and called for an evidence-based research agenda on health of migrants [23]. The health impact of economic out-migration and families left-behind is especially salient for majority of labour-sending countries including Sri Lanka, which are mostly low and middle income countries (LMIC) without adequate health system resources to counter the interlinked public health issues [23,24]. Demographic and epidemiological shifts combined with international migration affect family structures, health and long-term care provision, labour force participation, retirement and financial security [25]. There remains a scarcity of studies on this topic despite an ever-growing international labour migration market.

The study described here aimed to explore the impact of economic migration on mental health of adult left-behind family members in Sri Lanka by establishing

the prevalence of common mental disorders (CMD; depression, anxiety, somatoform disorder). It also aimed to explore associations between CMD and demographic, economic, social, migration-related and general health-related factors using standardized and culturally validated instruments.

Methods

Study setting, design and participants

A national study was conducted by the Institute for Research & Development in partnership with the International Organization of Migration and the Ministry of Health as part of the 'National Migration Health Research' agenda. It was recommended by the Government of Sri Lanka's 'Inter-Ministerial Taskforce on Migration Health', and sought to contribute to an evidence-based 'National Migration Health Policy' formulation process. This larger commissioned study on 'left-behind families' contained both quantitative and qualitative components and included both adult and child members. The qualitative and child population findings are presented elsewhere [8,26].

This manuscript presents findings from the cross-sectional survey component conducted among adult family members in six districts (Colombo, Gampaha, Kurunegala, Kandy, Kalutara and Puttalam) with the highest number of outbound departures for foreign employment in Sri Lanka, representing 62% of the total migrant worker population [4,5]. The study included the family members of migrant workers (employed abroad for at least six months prior to recruitment), residing in one of the selected six districts. A migrant family was defined as a family unit where either one or both spouses have departed for employment abroad as an IMW, with their own or adopted child/children under 18 years of age, and residing at an address for at least a six month period at the time of data collection. The six month period was considered as a minimal threshold for continuity regarding employment abroad or residence at a given address. Left-behind family members recruited for the study included the spouse of the IMW and/or a non-spouse caregiver (defined for the study purposes as a person living in the migrant family household, not a parent of the child/children in the family but responsible for providing a significant amount of care for them on a daily basis). Non-spouse caregiver was further assessed for activities related to basic care of children such as; arranging schedules, preparing or ensuring meals, assisting in educational, social and health needs (including play), and providing guardianship and representation to authorities.

Sampling and data collection

A multi-stage random sampling method was used to select left-behind families. In Sri Lanka, the smallest administrative units are called Grama Niladhari Divisions (GND)/ village units. Larger Divisional Secretariat Divisions (DSD) are made up from multiple GNDs. Several DSDs make up a district and Sri Lanka is divided into a total of 25 administrative districts. A total of 41 GNDs were randomly selected (1 GND from a DSD) from the six districts with the highest percentage of migrant worker representations. A probability proportionate to size sampling frame was adopted to capture the different rates of out-migration within the six districts.

In each selected GND, a list of all migrant families was compiled using information obtained through Grama Niladhari (GND/village administrator), Public Health Midwife (PHM), and Samurधि Niyamaka (GND/village welfare worker). Lists were cross-checked with each other for accuracy and a final, verified list was prepared. Subsequently, using these finalized versions, ten migrant worker families were randomly selected from each GND. A total of 410 families were recruited for the study in accordance with the sampling calculations [27]. To mitigate limitations in sampling such as inaccurately maintained village registries, or in situations where selected families were not available, a single new GND or a family was randomly selected as the substitute. In migrant families where a spouse and non-spouse caregiver were available, both were approached for consent and subsequently recruited if consented. If there was more than one non-spouse caregiver available, the one who was mostly involved in the provision of care was approached.

Data collection was supervised and managed by two dedicated project coordinators and a statistician. Field work was conducted by a team of 22 trained field research assistants under the supervision and guidance from a team of experts consisting of a psychiatrist, physician, epidemiologist and two public health specialists. Interviews were administered by the research assistants using instruments described in the section below. Participant responses were recorded on the printed questionnaire booklet by the research assistants. In instances where participants faced difficulties in understanding questions asked, the research assistants were trained to explain the meaning of the question in lay language to the participants. Double data entry was conducted using the Statistical Package for Social Sciences (SPSS version 17) [28]. Ethical approval was granted by the Ethical Review Committee of Faculty of Medicine, University of Colombo. Informed written consent was obtained from all participants.

SECTION III

Health Status of Migrants and their Families

PART I: OUTBOUND MIGRANTS AND LEFT-BEHIND FAMILIES

Measurements

Basic social, economic, environmental and demographic indicators were captured. Variables included gender, ethnicity, family size, employment type, educational status, home ownership status, household setting/conditions, household goods, income and debt. Additional variables directly related to migration such as IMW return history, frequency of remittances from the IMW and type of employment of the IMW were measured. The categories of migrant worker employment were classified according to Sri Lanka Bureau of Foreign Employment definitions [4].

CMD (depression, anxiety and somatoform disorder) prevalence was measured using the Patient Health Questionnaire (PHQ). It is a scale derived from Primary Care Evaluation of Mental Disorders (PRIME-MD), with demonstrated diagnostic performance (sensitivity - 83%; specificity - 88%) for the diagnosis of most CMD (somatoform, depressive, anxiety, eating and alcohol disorders) in primary health care according to Diagnostic and Statistical Manual-IV (DSM-IV) criteria [29,30]. However, it has also been used for estimating CMD prevalence in research populations, and has been translated, validated and applied widely in cross-cultural research [30–32]. A computer algorithm is used to generate ‘positive’ or ‘negative’ outcomes for each constituent disorder category in the PHQ [33]. A score between 10–15 is considered as clinically significant severity level with the upper limit requiring possible treatment [33].

The PHQ was used in this study as it has been previously validated using nominal techniques [34] and utilised in Sri Lanka for a number of epidemiological studies (National Mental Health Survey with a sample of 6000 participants, Colombo Twin and Singleton Study with a sample size of 6000, a study measuring CMD among displaced populations with a 450 sample) [35–37]. General health status, presence of current illness (clinically significant, diagnosed chronic conditions; e.g. Diabetes) and the number of visits to healthcare providers were ascertained from participants by using an adapted version of Client Service Receipt Inventory (CSRI) [38,39].

Data analysis

Statistical analysis was conducted using STATA version 11 [40]. The data were weighted to account for the cluster sampling design and population size variations. Missing data were accounted for by using complete case analysis, which is default in STATA. Descriptive analyses

were carried out to describe the sample characteristics and CMD prevalence. For analytical purposes, positive diagnoses for CMD constituent disorders (depression, anxiety, somatoform disorder) were grouped together to form the any CMD variable. A correlation matrix was generated using all variables to guide the analysis. Univariable logistic regression analyses were carried out to explore associations between CMD, sociodemographic, economic, migration-related and health-related variables. Multivariable logistic regression analyses for associations between CMD and the above mentioned variables were adjusted for age and gender.

Results

Tables 1 and 2 summarize key demographic, economic, migration-related and health-related characteristics. A total of 410 migrant worker families were recruited for the study. Within those, only spouses were recruited from 222 families and only non-spouse caregivers from 133 families. Both a spouse and a non-spouse caregiver were recruited from 55 families. In total, 277 migrant worker spouses and 188 non-spouse care givers were recruited with a total sample of 465 individuals. Mean ages (SD) of the spouse and non-spouse caregiver groups were 37.8 (0.46) and 54.1 (0.86) respectively. Non-spouse caregiver group was predominantly female (95.7%), with approximately a third over 60 years of age (29.3%). Forty five percent of recruited migrant families indicated significant current debt. The majority of migrant families were found to live in rural areas.

Typology of employment of the migrant worker was assessed according to the Sri Lanka Bureau of Foreign Employment (SLBFE) classification of occupations [4]. Majority (66%) belonged to the low-skilled occupation classification of ‘manual labourers’ and ‘housemaids’. Duration of employment abroad varied; 95 (23.2%) were employed for one year or less, 218 (53.2%) were employed for 1-5 years, 66 (16.1%) for 5–10 years and 29 (7.1%) were employed for over 10 years. More than half (55%) of migrant workers were reported having not returned to Sri Lanka since going abroad for work. Of those who visited, majority (29.5%) returned every two to five years. Monthly remittances in some form were received by 58% of the left-behind migrant worker families. General health was perceived to be poor by 45 (23.9%) non-spouse caregivers. Having a current diagnosed illness was reported by 100 non-spouse caregivers (53.2%). Thirty Percent of non-spouse caregivers reported of more than two visits to health care providers.

Mental disorder prevalence

Table 3 summarizes the prevalence of CMD and constituent disorders across the groups. Overall prevalence of CMD (Depression, somatoform disorder and anxiety) was 20.7% (95%CI 16.9–24.3) in the whole sample with 14.4% (95%CI 10.3–18.6) for the spouse group and 29.8% (95%CI 23.2–36.4) for non-spouse caregiver group. Prevalence of depression was higher in the non-spouse caregiver group with 25.5% (95%CI 19.2–31.8), than in the spouse group (12.3%; 95%CI 8.3–16.1). Prevalence of Somatoform disorder in spouses was 3.6% (95%CI 1.4–5.8) and 11.7% (95%CI 7.0–16.3) in non-spouse caregivers. In the non-spouse caregiver group, 47 (25.0%) females and 1 (0.5%) male had depression. Somatoform disorder (22; 11.7%) and anxiety (7; 3.7%) was only present among the females in this group. In the spouse group, 20 (7.2%) females and 14 (5.0%) males had depression. Somatoform disorder was present among 7 (2.5%) females and 3 (1.1%) males while anxiety was present among 1 (0.4%) females and 2 (0.7%) males.

CMD associations with demographic, economic, migration-related and health-related factors

Table 4 describes the models of associations explored in the current analysis. In the unadjusted analyses, significant associations were observed between CMD and having only primary education, significant debts, in-bound remittance frequency every 2–6 months or more and poor general health for the migrant worker spouse group. Having no education, being unmarried/widowed/divorced, poor general health and 2 or more visits to a healthcare provider (during the last three months) were significantly associated with CMD in the caregiver group. Notably, having a migrant worker spouse who had not returned home since going abroad for work was significantly associated (OR 3.4; 95%CI 1.1–11.1) with CMD in the spouse group after being adjusted for age and gender. Having primary education and an in-bound remittance frequency every 2–6 months or more had slightly increased in strength after adjustment, while significant debts and poor general health showed very slight decreases in strength in the spouse group. The association between CMD and being unmarried/widowed/divorced in the caregiver group was shown to become non-significant when adjusted for age and gender. Having no education, poor general health and healthcare visits of more than 2 times (during the last three months) were still significant after adjustment, albeit decreased in strength.

Table 1: Socio-demographic characteristics and health-related factors among spouses and non-spouse caregivers of left-behind families

Characteristic	IMW spouse (n,%) N = 277	IMW non-spouse caregiver (n,%) N = 188
Socio-demographic factors		
Gender		
Male	119 (42.9)	8 (4.3)
Female	158 (57.0)	180 (95.7)
Age		
18-30	51 (18.5)	11 (5.9)
31-60	224 (81.2)	121 (64.7)
61-above	1 (0.7)	55 (29.4)
Ethnicity		
Sinhala	201 (72.6)	151 (81.2)
Tamil	15 (5.4)	20 (10.7)
Muslim	51 (18.4)	14 (7.5)
Other	10 (3.6)	1 (0.5)
Education		
No education	6 (2.2)	31 (16.6)
Primary	48 (17.3)	75 (40.1)
Secondary	223 (80.5)	81 (43.3)
Civil status		
Married	274 (98.9)	133 (71.1)
Unmarried	2 (0.7)	8 (4.3)
Widowed/divorced	1 (0.4)	46 (24.6)
Employment		
Non-employed	156 (56.3)	141 (75.4)
Employed	121 (43.7)	46 (24.6)
Family debt		
Little or no debts	153 (55.2)	102 (54.3)
Significant debts	124 (44.8)	84 (44.7)
Area of residence		
Rural	185 (66.8)	140 (74.9)
Urban	92 (33.2)	47 (25.1)
Health-related factors		
General health		
Excellent	35 (12.6)	12 (6.4)
Fair	222 (80.1)	131 (69.7)
Poor	20 (7.2)	45 (23.9)
Current illness		
Current diagnosed illness	72 (26.0)	100 (53.2)
No current illness	204 (73.6)	88 (46.8)
Healthcare visits-3 months		
No visits	148 (53.4)	65 (34.6)
One or two visits	78 (28.2)	64 (34.0)
More than two visits	47 (17.0)	58 (30.8)

IMW: International Migrant Worker.

Discussion

This is the first study in Sri Lanka to report on the mental health of adult left-behind family members (spouse and non-spouse caregivers) of IMWs. To our knowledge, this is one of the first studies exploring the broader topic in the South Asian region, measuring mental health through standardized diagnostic instruments. Some previous studies in Asia have looked at general health and psychosocial health, albeit limited to internal economic migration and elderly populations [15,20,41]. Our study, in contrast, has captured a wider representative sample of left-behind families of IMWs, highlighting both positive and negative associations at the intersection of migration and health.

Mental disorder burden

Our findings show an increased prevalence of CMD including depression among the adult left-behind family member population, when compared to Sri Lankan national prevalence levels (CMD; 13.8%, depression; 9.1%) [35]. More importantly, the non-spouse caregiver group in the left-behind families showed more than double the burden of CMD and its constituent disorders than the spouse group. The non-spouse caregivers are older and predominantly female in according to our findings. Other studies in the Asian region have also shown high levels of depression among females and elderly left-behind family members of migrants [15,20]. However, dearth of empirical evidence on prevalence of CMD among similar populations from other countries prevent an accurate comparison and evaluation of disease burden and associated factors.

General health and health care utilization

In the current study, the negative effects of economic migration are reflected through the high levels of CMD amongst left-behind spouses and non-spouse caregivers. The burden of providing care may come at the cost of poor mental and general health outcomes, which in turn may increase the utilization of health services. A study in Thailand linked out-migration of adult children to increased health service utilization among elderly left-behind family members, independent of socioeconomic factors [15]. It is also well established that those suffering from somatoform disorders cause increased burden on health care systems [42,43]. This is especially relevant to the Sri Lankan health system, which is fully state funded and heavily subsidized.

Table 2: Migration-related factors among spouses and non-spouse caregivers of left-behind families

Characteristic	IMW spouse (n,%) N = 277	IMW non-spouse caregiver(n,%) N = 188
Type of IMW employment		
Labourer/domestic maid	164 (59.2)	106 (56.4)
Services	69 (24.9)	12 (6.4)
Technical	15 (5.4)	2 (1.1)
Professional/other	28 (10.1)	11 (5.8)
IMW return frequency		
Every year	53 (19.1)	10 (5.3)
Every 2-5 years	75 (27.1)	44 (23.4)
Never returned/missing	144 (52.0)	77 (40.9)
In-bound remittance		
Every month	155 (55.9)	53 (28.2)
Every 2-6 months/more	97 (35.0)	54 (28.7)

IMW-International Migrant Worker.

Notably, our findings show that spouses are at increased risk of CMD when their migrant worker spouses have not returned home since going abroad. This may be due to chronic stressors linked to marital breakdown that stems from enforced separation. Together with increased burden of care for children, such enforced absences of a migrant worker spouse may lead to depression or anxiety in the left-behind spouse. However, in our study, we did not directly explore linkages between duration of separation and psychological distress. Although not directly comparable to this study on IMWs, the negative health consequences on adult members of families left-behind are similar to the study reported by Lu [2012] in an Indonesian population [20]. In addition, care-giving arrangements in left-behind families have been linked with high 'emotional cost' [44].

Social, economic and migration-related factors

Most IMWs seek overseas employment with the hope of obtaining higher incomes to alleviate poverty and develop their household capital. However, at the onset of the migratory process they may incur debt. Household remittance studies have revealed the pre-migration pathways result in significant financial costs (including hidden costs due to agent exploitation) to most economic migrants and their families, especially those within low-skilled worker categories [5]. Our findings show that significant debt and decreased frequency of remittances

are associated with increased CMD levels among the spouses of migrant workers, which interestingly is not observed in the non-spouse caregiver group. This may be due to the fact that spouses may have the sole responsibility in handling family finances in the absence of their wife or husband, and non-spouse caregivers may not be usually involved in managing daily economic affairs. Positive effects due to remittance sent to left-

behind families may be instrumental in reducing the levels of indebtedness that prompts economic migration. Research has shown that the average wages earned by either male or female migrant workers during the first cycle of migration of two years is insufficient to cover pre-migration debts; hence the need for repeated migratory movements [45,46].

Table 3: Prevalence of CMD among spouses and non-spouse caregivers of left-behind families

Disorder	Whole sample	IMW spouse	IMW family caregiver
	(95%CI)	(95%CI)	(95%CI)
	N = 410	N = 277	N = 188
Any CMD	20.7 (16.9-24.3)	14.4 (10.3-18.6)	29.8 (23.2-36.4)
Depression	17.6 (14.1-21.1)	12.3 (8.3-16.1)	25.5 (19.2-31.8)
Somatoform disorder	6.9 (4.5-9.1)	3.6 (1.4-5.8)	11.7 (7.0-16.3)
Anxiety	2.1 (0.8-3.4)	1.1 (0.1-2.3)	3.7 (1.0-6.4)

IMW- International Migrant Worker.

Table 4: Models of association between CMD and socio-economic, migration-related and health-related factors among spouse and non-spouse caregivers of left-behind families

Characteristic	IMW spouse			IMW non-spouse caregiver		
	Any CMD	Unadjusted	Adjusted*	Any CMD	Unadjusted	Adjusted*
		OR (95%CI)	OR (95%CI)		OR (95%CI)	OR (95%CI)
	N = 40	N = 277	N = 277	N = 56	N = 188	N = 188
Gender						
Male	17 (6.1)	Reference	Reference	1 (0.5)	Reference	Reference
Female	23 (8.3)	1.0 (0.5-2.0)	1.1 (0.6-2.2)	55 (29.2)	3.1 (0.4-25.6)	3.0 (0.4- 25.2)
Age						
18-30	4 (1.4)	Reference	Reference	2 (1.1)	Reference	Reference
31-60	36 (13.0)	2.2 (0.8-6.6)	2.3 (0.8-6.9)	32 (17.0)	1.6 (0.3-7.9)	1.6 (0.3-7.7)
61-above	0 (0.0)	-	-	22 (11.7)	3.0 (0.6-15.2)	2.9 (0.6-14.8)
Education						
No education	0 (0.0)	-	-	15 (8.0)	3.5 (1.4-8.5)	3.0 (1.2-7.5)
Primary	28 (10.1)	2.3 (1.1-5.0)	2.7 (1.1-6.4)	24 (12.8)	1.8 (0.9-3.6)	1.6 (0.8-3.4)
Secondary	12 (4.3)	Reference	Reference	17 (9.0)	Reference	Reference
Civil status						
Married	39 (14.1)	Reference	Reference	34 (18.1)	Reference	Reference
Unmarried/widowed/divorced	1 (0.4)	-	-	22 (11.7)	2.0 (1.0-3.9)	1.7 (0.9-3.5)
Employment						
Non-employed	21 (7.6)	1.2 (0.6-2.3)	1.6 (0.6-4.2)	45 (23.9)	0.7 (0.3-1.4)	0.8 (0.4-1.8)
Employed	19 (6.8)	Reference	Reference	11 (5.8)	Reference	Reference
Family debt						
Little or no debts	14 (5.0)	Reference	Reference	31 (16.5)	Reference	Reference
Significant debts	26 (9.4)	2.6 (1.3-5.3)	2.6 (1.3-5.2)	24 (12.8)	0.9 (0.5-1.7)	0.9 (0.5-1.8)

Characteristic	IMW spouse			IMW non-spouse caregiver		
	Any CMD	Unadjusted	Adjusted*	Any CMD	Unadjusted	Adjusted*
		OR (95%CI)	OR (95%CI)		OR (95%CI)	OR (95%CI)
	N = 40	N = 277	N = 277	N = 56	N = 188	N = 188
IMW return frequency						
Every year	4 (1.4)	Reference	Reference	3 (1.6)	Reference	Reference
Every 2-5 years	10 (3.6)	1.9 (0.6–6.4)	2.1 (0.6–7.1)	11 (5.8)	0.8 (0.2–3.5)	0.9 (0.2– 4.4)
Never returned/missing	26 (9.4)	2.7 (0.9–8.1)	3.4 (1.1–11.1)	24 (12.8)	1.1 (0.2–4.4)	1.2 (0.3–5.6)
In-bound remittance						
Every month	15 (5.4)	Reference	Reference	15 (8.0)	Reference	Reference
Every 2-6 months/more	19 (6.8)	2.3 (1.1–4.7)	2.7 (1.2–6.0)	18 (9.6)	1.3 (0.6–2.9)	1.2 (0.5– 2.9)
General health						
Excellent/good	29 (10.5)	Reference	Reference	30 (15.9)	Reference	Reference
Poor	11 (4.0)	9.6 (3.7–25.1)	9.0 (3.4–23.8)	26 (13.8)	5.1 (2.5–10.5)	4.6 (2.2–9.7)
Healthcare visits-3 months						
No visits	18 (6.5)	Reference	Reference	10 (5.3)	Reference	Reference
One or two visits	13 (4.7)	1.4 (0.7–3.1)	1.5 (0.7–3.2)	16 (8.5)	1.8 (0.8–4.4)	1.6 (0.7– 4.0)
More than two visits	9 (3.2)	1.7 (0.7– 4.1)	1.6 (0.6–3.8)	30 (15.9)	5.9 (2.5–13.8)	5.1 (2.2–12.1)

IMW- International Migrant Worker *Adjusted for age and gender. Bold values are significant at $p < 0.001$.

Recently, the Sri Lankan government has been promoting a more 'skilled' international migrant workforce. However, as yet, the vast majority of Sri Lankans entering into international labour markets are over-represented in low-skilled employment categories such as labourers and domestic maids [4,5]. Our study findings confirm this over-representation of low-skilled migrant categories, highlighting the need for a more robust action plan from the government to increase the 'skilled' migrant numbers.

Currently, there are no existing mechanisms to monitor the health of left-behind families of IMWs, either through public health and education systems or labour migration industry in Sri Lanka. There are no specific provisions offering mental health services to affected adult members of left-behind families. We advocate a multisectoral approach for monitoring the health of IMW left-behind families to be adopted at district and national levels with involvement of all relevant stake holders such as the Ministry of Health, SLBFE, provincial ministries of health, social services and public health agencies. The government and multiple stakeholders can also play a role in providing educational sessions on potential mental health issues for IMW families during SLBFE's mandatory pre-departure training programs. We also advocate that the national migration health policy to be linked with relevant sections of national mental health policy, to enable seamless provision of mental health care for left-behind families of IMWs.

Strengths and limitations

As the study cannot determine causality due to the cross sectional nature, prospective cohort and longitudinal studies are needed to reveal true impact of migration on physical well-being and mental health outcomes, and whether the workers and their families left-behind truly recover from the migration experience. The ethnic profile of the study sample closely matched national population ratios from the 2001 national population census, with 73% of migrant families being of Sinhalese ethnicity [47]. As mentioned before, the study sample represents a true cross-section of the left-behind families of migrant workers in Sri Lanka, which increases the generalisability of findings. However, the professional migrant category may be somewhat underrepresented in our sample as the SLBFE statistics does not fully cover all professional groups who migrate for work abroad. This fact and apparent sample size limitations should be considered in interpreting the associations shown. In addition, lack of a control group in our study (e.g. comparison with families without a migration history) prevents wider interpretation of findings. Whilst this study provided an insight into mental health issues faced by adult left-behind family members of migrant workers, further research is needed to explore the impact of migration on male versus female headed households, and how migration affects intrahousehold power dynamics and relationship outcomes.

Conclusions

As labour migration flow increase in a rapidly developing post-conflict Sri Lanka [4,5], the impact on families left-behind leave many unanswered questions. Promoting migration for economic prosperity and ensuring health and social protection for migrants and their families remains a formidable policy challenge [48-51]. This study provides evidence on health issues among non-spouse caregivers in migrant families in Sri Lanka. Contributions from non-spouse caregivers to support the migratory process is often unrecognized by the stakeholders involved in the labour migration process and in the border discourse on migration for development. A policy process which seeks to promote the well-being of the left-behind families also needs to ensure 'care for the caregiver'. The findings from this and other commissioned studies have been used to inform an evidence-based approach in formulating the National Migration Health Policy for Sri Lanka [52]. We advocate for migrant sensitive health policies as espoused within the World Health Assembly resolution (WHA 61.17), to promote migration for the benefit of all.

Competing interests

This study was funded by the International Organization of Migration (IOM-Sri Lanka), with approval and endorsement from the Ministry of Health and the Inter-Ministerial Taskforce on Migration Health. CS is employed at Anglia Ruskin University. PV, SW & BJ were employed as project coordinators for the study. AA, KJ & GP are employed at the Institute for Research & Development (IRD). SS is attached to Rajarata University of Sri Lanka. AS is the honorary director of IRD. KW and SP are employed at International Organization of Migration. Funding body did not have any role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Authors' contributions

CS analysed the data and wrote the first draft. KW, CS, AS and SS conceived the main study and participated the study management. KW reviewed and edited the manuscript. PV, SW, BJ, AA and KJ were involved in the study design and data collection. GP is the study data manager. AS, SS, SP reviewed the manuscript. All authors read and approved the final draft.

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Impact of economic labour migration: A qualitative exploration of left-behind family member perspectives in Sri Lanka

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ABSTRACT

Background

Sri Lanka is a major labour sending country in Asia, with a high proportion of female labour migrants employed as domestic housemaids in the Middle East with increasing remittances. Despite such financial gains for families and national economy, health and social effects on the left-behind families have had limited exploration. This qualitative study was carried out across five districts with high labour migration rates in Sri Lanka. Twenty in-depth interviews were conducted with participants recruited through purposive sampling. Data was analysed using content and thematic analysis and emerging themes were mapped. Pre-migration socio-economic situation, economic difficulties and higher earning possibilities abroad were considered to be the major push & pull factors for labour migration. Post-migration periods were shown to be of mixed benefit to left-behind families and children suffer the negative effects of parental absence. The absence of support mechanisms for dealing with adverse events such as serious injury, death, abuse or imprisonment were cited as major concerns. Post-migration periods affect the health, well-being and family structures of left-behind families. Promoting economic prosperity while ensuring health and social protection is a formidable policy challenge for 'labour sending' countries such as Sri Lanka.

Keywords

international labour migration, left-behind families, labour-sending countries, Sri Lanka

Introduction

Sri Lanka, a low-middle income country with a total population of 20 million, is currently considered one of the foremost labour sending countries in the Asian region, with 24% of its total labour force employed abroad [1,2]. Sri Lanka's current migrant work force numbers approximately 1.8 million, without accounting for irregular and unregistered migrant workers. Approximately 250,000 migrant workers leave for employment abroad every year [3,4]. International labour migrant (ILM) numbers from Sri Lanka have rapidly increased during the past 10 years, with a majority (86%) of female labour migrants employed as domestic

housemaids in the Middle Eastern region [3,4]. Sri Lankan economy extensively benefits from ILM remittances, and foreign employment revenues rank as the number one source of foreign currency income (4.1 billion USD in 2011) for the country [3]. However, despite these financial gains, research has shown mixed economic benefits for returning ILMs, while migration-related negative impacts from social, cultural and health issues are threatening to overtake positive outcomes [5,6].

Negative impacts such as employer abuse, death, circular migration, extended periods of separation from family (more than 10 years), physical/mental ill health and culture shock affect many ILMs while working abroad. Furthermore, their 'left-behind families', defined as 'families where one or both spouses are ILM workers (non-migrant spouse if available, children, caregivers such as grandparents or relatives)', are increasingly found to be affected by a myriad of adverse outcomes [5-7]. Family breakdown, child abuse, increased child malnutrition, alcohol abuse by the non-migrant spouse, and breakdown of social and cultural norms are some of the negative impacts of international labour migration on left-behind families [8,9]. Effects of international labour migration have been researched using quantitative and qualitative methodologies in Asian labour sending countries [5,10]. These studies have explored both ILMs and their left-behind families. However, empirical research on the impact of labour migration on left-behind families is still in its infancy and the evidence is sometimes contradictory and country-specific, especially regarding actual health impacts. As migration and mobility become extended phenomena, their impact on those left-behind is still an unanswered question [11]. An evidence-based research agenda focusing on health of migrants to counter the dearth of global evidence has been advocated [12-14].

In Sri Lanka, various research institutions, individual researchers, government bodies, and international and local non-governmental agencies have conducted studies on ILMs and left-behind families. These studies show evidence of mental and physical health problems among children of left-behind families, difficulties of role-reversal for male left-behind spouses, and sexual and other abuse of children in left-behind families associated with international labour migration [5-7, 15-17]. Although the frequency of such studies have increased in parallel with the increase of Sri Lankan ILM numbers employed abroad during the last three decades, the majority have been small-scaled and of limited focus, mainly concentrating on left-behind children in the urban Colombo district [5, 18].

A qualitative study conducted among 'substitute-mothers' for children of female ILMs has shown increased physical and mental health problems attributed to providing care [7]. This study also showed that these primary carers of ILM children considered their care provision to be a formidable burden considerably affecting socio-cultural and socio-economic aspects of their lives [7]. Another study explored gender roles and support networks of left-behind family members of ILMs [17]. This study concluded that both male and female left-behind spouses of ILMs experience gender-role reversals in order to provide care for children and other left-behind family members, sometimes creating tensions between spouses. The study also concluded that support often comes from the immediate extended families of ILMs [17]. Other studies, not directly focusing on ILMs, have found that migration of parents for work (locally or internationally) is a key risk factor for potential child abuse [19].

However, an in-depth exploration of the impact of labour migration on left-behind families has not been carried out in Sri Lanka. This paper describes a qualitative study designed to address the lack of insight and understanding of the impact of labour migration on 'left-behind' family members. It also aims to describe knowledge & practices of the left-behind family members about dealing with situations of death, illness, abuse or imprisonment of an ILM while working abroad. Diverse migrant family types across ethnic, religious and socio-economic strata were included in the sample, enriching the research questions explored through qualitative methodology.

Methodology

Study design, setting and participants

The study presented here forms part of a larger national (mixed-method) research programme in Sri Lanka aiming to generate an evidence base for the 'National Migration Health Policy'. The overall research programme was a collaboration of multiple governmental and international non-governmental organizations affiliated to the National Migration Health Task Force of Sri Lanka [20]. Institute for Research & Development conducted a cross-sectional survey (reported separately) and the qualitative research component reported here themed 'Impact of economic labour migration on left-behind families' commissioned by Sri Lanka's Ministry of Health in 2011 and funded by the International Organization of Migration (IoM Sri Lanka). The quantitative component was carried in six districts with the highest recorded departure rates for labour migration in the country (Colombo, Gampaha, Kandy, Kurunegala, Puttalam, Kalutara) which, according to official statistics in 2009, accounted for 62% of the

total migrant work force in Sri Lanka [3]. The qualitative component was conducted in parallel among participants from five districts (Colombo, Kandy, Kurunegala, Puttalam, Kalutara).

Twenty participants were interviewed. Each of them was responsible for managing family finances and caring for the children of respective left-behind families. All participants were selected from the list of ILM families originally consenting for the cross-sectional survey and approached for additional consent for the qualitative component. Purposive sampling was used and designed to include maximum variation in terms of ethnicity, gender, geographical region, family size, age, and education level of the participant heads of left-behind households. A critical realist perspective was adopted in the design of the qualitative study aimed at the identification of causal mechanisms, observable events, processes, phenomena, perceptions, meanings and representations linked to labour migration of ILMs and subsequent life events of left-behind families [21, 22].

Data collection, data analysis and ethics

Two researchers conducted in-depth, face-to-face interviews with participants using a semi-structured interview guide. Another study team member acted as the observer for the interviews. The researchers were medical graduates trained in conducting qualitative research and consent procedures. However, steps were undertaken to minimize any potential therapeutic misconceptions by informing the participants that the interviews did not constitute as psychological therapy, medical history taking or diagnostic interviews. The medically trained interviewers were trained to avoid following 'clinical interview' formats and to avoid potential clinically-driven misconceptions. After an initial telephone appointment, in-depth interviews were conducted at a location convenient for and selected by the participants, minimizing any impact of 'unfamiliar' backdrops. Interviews were conducted in Sinhalese, one of the primary languages spoken in Sri Lanka, and audio-recorded with the consent of the participants. There was no probing nor leading questions asked outside the topic guide and the interviewers strictly made sure that the information flow was not disturbed. Furthermore, at the end of each interview, all participants was given extra time for additional comments or thoughts. Maximum care was taken to assure that the privacy and dignity of participants were not affected.

At the beginning of each interview, basic socio-demographic information was gathered. The topic guide explored rationale and push-and-pull factors for migration, type of work of the ILM, health impact,

benefits from remittance, child care and education, family harmony, spousal role reversal, impact of death, illness or injury to ILM while abroad and patterns of ILM migration. These broad questions were selected and agreed on by the research team; the topic guide was approved by the ethics committee. Each interview lasted approximately forty five minutes to one hour.

The audio-recorded interviews were transcribed verbatim and then translated from Sinhalese into English. During transcription, data was made completely anonymous removing any identifiable personal information. Audio recordings were destroyed immediately upon completion of transcription. Transcribed interviews were verified by the interviewers, and supplemented from the interviewer notes and comments to ensure data accuracy. Each transcript was then analysed by two independent researchers, using the line-by-line content and thematic analysis method with a non-frequency based approach. Manual coding was used instead of computer programme based coding due to unavailability and high cost of qualitative analytic software. Information in each section of text was compared and grouped until similar thematic groups were formulated. The analysis process used 'method of constant comparison' to triangulate the thematic coding. The final thematic coding framework was discussed within the research team for consensus. The emerging themes and underlying broader concepts were mapped together to formulate the foundation of key thematic findings.

Ethical approval for the study was received from the Ethics Review Committee of the Faculty of Medicine at the University of Colombo. Informed written consent was obtained from all participants for both the in-depth interview and concurrent audio-recording.

Results & Discussion

A total of twenty participants from Colombo, Kandy, Kurunegala, Puttalam and Kalutara districts of Sri Lanka were interviewed (see table 1). The sample had an equal gender representation with ten males and ten females. Sixteen respondents were left-behind spouses of ILMs (seven wives and nine husbands), three were mothers (caregiver) of ILMs and one was recruited for the specific reason of having experienced the loss of the sibling ILM abroad. Eight participants (six spouses and two caregivers) were unemployed, seven of them female. The unemployed male was physically disabled. Out of the twelve employed participants, four were self employed, seven in the agricultural sector and one in trade. The participants were equally representative of nuclear and extended family set-ups. During the thematic content

analysis of the data, several main themes of interest emerged and are discussed below. Supporting quotes are used to illustrate the original views of participants.

Rationale for migration, push & pull factors

Participants viewed international labour migration as a path to economic prosperity. Push and pull factors varied according to the specific individual and family needs. The main rationale for going abroad was almost always the economic impediments which rise with an increase in the number of family members. Interlinked financial-debt was another push factor. Low levels of education were indicated as barriers in finding suitably paid jobs in Sri Lanka whilst, with the same levels of education, better paid jobs could be found in foreign employment, especially as domestic helpers. Further, some participants indicated that they wanted to provide for their children's education while for others peer pressure acted as a push factor. Foreign employment is perceived to be the best possible option for gaining higher income, which can be influenced by narratives of relatives and neighbours who seemingly improved their quality of life by working abroad. These may act as pull factors "in deciding" to migrate for economic reasons.

"The money he earned here was not enough to clear the debts and to educate the children." (female spouse)

"She was a manual labourer, she did not finish school. So she said that she could not earn enough with that work." (mother of migrant worker)

"My elder sister also went abroad and built her house. So my wife thought we would also be able to live better if she worked abroad." (male spouse)

Perception of life after migrant worker went abroad

It is worthwhile to consider how left-behind families are affected by one parent leaving for foreign employment. Inquiry into participants' feelings about their family member working abroad indicated that they reluctantly accepted the situation but that both spouse and children were emotionally affected and missed ILM family member despite receiving financial benefits. Others expressed unhappiness because they were not only missing their spouse but were also finding it difficult to manage the family by themselves.

"....they miss him (father) very much, specially my daughter..... when he's abroad we have fewer problems, we are able to eat three meals a day,

but we still need money for the children's clothes and education." (female spouse)

Some spouses were unemployed and were fully dependent on the remittances from the ILM. The responses on how they perceived life was mainly positive based on their financial situation, emotions or future expectations.

"I feel happy since my wife can bring some money to do something of our own." (male spouse)

Participants' opinions of their ILM family member being abroad varied depending on their relationship with them and the levels of financial and other support given to the left behind family. Some of the left-behind spouses thought it beneficial for their partner to work abroad whilst others, the majority being male, saw it as a disadvantage. The main explanations offered by the study participants for these disadvantages were; not receiving enough remittances, lack of improvement/worsened quality of life. Some male respondents indicated a mixed situation with both advantages (economic benefit) and disadvantageous (emotional isolation, increased responsibilities, role reversal) linked to their spouse working abroad. Mothers of ILMs were undecided on how they felt about their children working abroad, some seeing it as disadvantageous.

Many participants expressed the view that the quality of life of the left behind family had improved since the ILM went abroad. Some thought that there had been no change in quality of life. A male, whose ILM wife had abandoned him, stated that the quality of life had clearly worsened for him and his two children.

"..... I am unable to do a job now, I have two children, and I have to look after them so I can't do anything else, my siblings help me... Since my wife went abroad, I have not heard from her, she doesn't even check on her children.... until I hear from my wife, I will look after these two children I have to take them to school, feed them, I do everything alone.....my wife has been abroad for eight years..... she left when my daughter was ten months old.....she never calls us, I'm upset because she doesn't check on them. My children feel hurt" (male spouse)

Most people appeared to live in a nuclear family set up and indicated that they expected the help of extended family with the migration of the ILM family member. In situations of ILM being a mother, maternal relatives became predominantly responsible for caring for her left-behind family, mainly due to cultural practices that

exist in society. In such situations, the left-behind spouse may have been unable or unwilling to step-in to fill the void and fulfil responsibilities previously carried out by the ILM such as taking care of children, preparation of meals or housekeeping. Extended family, particularly the grandparents, struggle to fulfil such responsibilities and often become an additional burden on household expenditure, particularly in cases of economic non-contribution. Similarly, domestic disturbances can be caused due to limitation of space and privacy within the family.

ILM spouses also contribute to the family economy in various ways, mostly involved in self-employment. These spouses usually attempt to manage daily expenses through their earnings whilst saving ILM remittances for future. When left-behind spouses are unemployed due to a physical disability, overwhelmed by household responsibilities or personal preference, remittances sent by the ILM are usually utilized for daily expenditure, effectively slowing the rate of expected financial improvement. The burden of domestic responsibilities, previously shared by both spouses and becoming the responsibility of the left-behind spouse subsequent to migration of the ILM, is seen to cause significant stress within families. This can be further aggravated by the long-term absence of intimacy between the ILM and left-behind spouse. However, frequent contacts with the family from the ILM showed to relieve the pressure on left-behind spouses. Certain ILM's were in better paid employment where the income exceeded the family expenses, allowing left-behind spouses to use the surplus for capital expenditure. Participants in nuclear family setups reported to be more capable of adequately balancing their daily expenses.

Health impact of ILM migration on their left-behind family
Reported feedback of participants indicates that on the whole, the migration of the ILM family member was perceived to have a negative impact on the overall health and well-being of the left-behind family. The interviewed spouses indicated a decrease in their mental well-being linked to an increase in daily stressors and worry over the well-being of their ILM partner. Most interviewed left-behind family members referred to low mood, cheerlessness, anxiety, and depressive symptoms. Childcare was highlighted as a significant worry and stressor whilst reference was made to children suffering from the absence of their ILM parent. Children growing up with single parents were reported to develop psychological problems and become stubborn and aggressive. Most male interviewees referred to household chores as a significant cause of psychological burden.

"My wife not being here affects me about 90%, there are other problems, with those problems, problems at work, and all these things when they add up, I feel psychologically down."(male spouse)

"...the youngest keeps asking when the mother is coming back..."(male spouse)

Elderly caregivers (mostly parents of ILMs) felt that their overall health was significantly affected by the absence of the ILM. This was mainly due to having the added responsibility of caring for their young grandchildren. They reported a significant reduction in both their physical and mental health and well-being. They felt that they did not have the physical nor psychological ability to cope with various challenges, stresses and strains in caring for young children and felt ill-equipped to deal with the rapidly changing social demands associated with growing children. This 'generational gap' indicated by grandparents show that they are unfamiliar with and have difficulties grasping the new social concepts of younger generations (especially in relation to the school environment) and modern-day technology (such as mobile phones) in a rapidly changing and technologically advancing world. All these were perceived to add to the increased mental burden. The burden of caring for their grandchildren was seen as a reason for preventing them from seeking medical care for their age-related existing health problems which in turn was linked to exacerbating the feeling of ill health.

Children of left-behind families

In most the cases, children were looked after by the spouse of the ILM and in some families, the grandmother (mother of the ILM) fulfilled the role of a caregiver. However, in one particular family, the sibling of the ILM was the caregiver. In a few cases, children were solely cared for by the grandparents because the left-behind spouse had either died or abandoned the children. One spouse, whose children were being looked after by the grandmother, expressed the view that it would be better for the ILM to look after the children.

"My mother-in-law is not like my wife. She doesn't send them to school on time. She is old, so by the time she cooks for them and sends them to school, it's late." (male spouse)

The majority of the participants declared that their children's school performances were good, whilst one particular participant thought his children were performing averagely, another admitted that his children's performances were poor and that one of his children had dropped out of school.

“We put her into an Arabic college (a type of private school), which we have to pay for. We had money problems, so we could not pay, so she dropped out of Arabic college and did not want to go back to the government school, since she was too old.” (male spouse)

Younger children who were not attending school were looked after by the spouse or elder (mostly female) children and family members of the ILM. In cases where the ILM was female, the male left-behind spouse had to give up his job to look after children. In most cases the remittances sent home by the female ILM was sufficient enough, allowing the husband to stay at home with children. Where remittances were not sufficient, the husband went out to work during the day whilst the children were left in care of grandparents until his return. The majority of the spouses admitted that their children miss their ILM parent while some claimed that the care and love given by the left-behind parent was sufficient to compensate for the absence of the ILM parent. One participant, a sibling of an ILM, stated that although there are financial benefits, separation from the parents has a negative impact on the children.

“But the son says that this time when the mother(ILM) comes, he won’t let her go back. No matter how much we do, he still misses the mother. He says that the family is separated.” (sibling of migrant worker)

ILM departures cause considerable impact on children of left-behind families, especially when the mother goes abroad. These include emotional issues as well as hindrances to education in certain cases. Children living in extended family setups were hindered in receiving education due to domestic problems and due to the limited space at home. In one instance where the grandparents were looking after their two granddaughters, the participant grandparent was of the opinion that the girls did not miss their parents. Several of the interviewed fathers were of the opinion that they were unable to balance their occupations, household chores and looking after children, and strongly expressed that mothers do need to be at home to look after the children.

“He misses his mother. But he misses me most, because I am close to him. He talks about her, but I try to fill in the position of the mother and do those duties as well.” (male spouse)

Remittances and support to the left behind family

Support of the left-behind family by the ILM was evaluated through the amount and quality of contact with their family and the sufficiency of their sent remittances. The majority of the ILMs contacted their family members frequently, yet some of them kept in touch less frequently and one ILM had never contacted home. Families having frequent contacts with ILM appeared to be more satisfied.

“I didn’t hear any news from him for seven months. I had two children; my father was living with me. I suffered a lot and I ate only one meal a day. I thought he was dead. After seven months he called me and I was very happy.” (female spouse)

The majority of the participants were of the opinion that their ILM sent sufficient funds back home, yet a few indicated otherwise. Several participants mentioned investing the remittances in capital expenditure (such as building a house, buying furniture and vehicles) whilst others only spent the money on daily expenses. A few families even saved all the remittances for future use whilst the daily expenses were covered using the left-behind spouse’s income. Even though the physical absence of the ILM was perceived as a negative impact on the family, participants who received sufficient funds indicated that the ILM being abroad is beneficial. They used physical evidence in the improvement of quality of life such as improved housing and other amenities. Those who were not receiving sufficient remittances expressed regret at being unable to improve their quality of life and perceived negative impacts of ILM working abroad.

“.....it isn’t enough. It will be a problem when she comes back, the house isn’t fully built yet, and she will want to go back, otherwise the house won’t get built..... we have made a small house with 2 rooms, and it’s not finished.... it would be better if she was here.....” (male spouse)

Expenses in extended families tend to be higher since not all of the family members contribute to daily expenses, creating more difficulty in building up savings. Participants from extended family units had to work to gain extra income and linked this to less-improved quality of life.

“We have money problems. My husband sends money once a month. When that money comes I have to pay the children’s class fees, electricity, water and tax bills, after that is all over, I can spend on the children, that’s why I sell food parcels.” (female spouse, living in an extended family setting)

Migration process, death, illness, abuse or imprisonment of an ILM abroad

The lack of decision space prior to migration and the need for greater discourse on the spousal migration choice was an important issue raised by the interviewees. Some participants felt that chances for more proactive engagement with the Sri Lanka Bureau of Foreign Employment (SLBFE - the main responsible government authority for employment abroad) was required along with expanded role of SLBFE to take the lead in facilitating information/discussion. Interviewed spouses and caregivers mentioned that they were not allowed inside the SLBFE when they accompanied the ILM family member prior to migration.

“There should be room for more dialogue between us [migrants and their family members] and with the Government agency which registers all ILMs at pre-departure phase.” (female caregiver)

“...they [SLBFE] should do some sort of talk session [counselling] with us [prospective migrant and family members] not just those going [abroad]... there’s lots of issues we are not aware.” (male spouse)

While participants were aware of the compulsory requirement for ILM registration with the SLBFE, some indicated they did not know about legal and other requirements admitting that their ILM family member had gone abroad unregistered.

Participants were asked as to how to act in case of an emergency with their ILM abroad such as illness, abuse, imprisonment or death. The majority responded that, in case of emergency, they would go directly to the private employment agency (which usually facilitates foreign employment) and request help. Some interviewees knew that agencies are linked to the SLBFE and that the bureau would subsequently get involved. Several participants indicated that they had been previously helped by the agencies during minor crises such as not being able to contact the ILM after going abroad.

“I would go to the agency, when she went abroad the first time, I wasn’t able to contact her, so I went to the agency and they called the house she worked in and I got the phone number.” (male spouse)

“We went through an agency. We were given papers, I was told to take those papers to the Sri Lankan bureau of foreign employment in an emergency.” (female spouse)

Some respondents were unaware of what to do in case of emergency. These were mostly the parents of ILMs who were also the caregivers of the left-behind children and who were from small villages far away from Colombo, the Sri Lankan capital. In these cases, ILMs had mostly gone abroad via small sub-contractor agencies who took the ILM to Colombo for necessary documentation work leaving the left-behind families in remote villages without any instructions or information on what to do in case of an emergency.

“..... I don’t know, a person from this village took her to Colombo to talk to the people at the agency.” (male spouse)

A few participants who did not like their spouses working abroad had not been involved in the migration process and had no knowledge of which actions to be taken in case of an emergency.

“I don’t know. I didn’t like her going abroad, so I didn’t get involved, I didn’t ask how much she was getting paid or what sort of work she was going to do.” (male spouse)

One person, who himself had been an ILM, was interviewed specifically because he had lost a sibling migrant worker abroad. During the interview he stated that his sibling’s family had not received any compensation from any organization or from the foreign employer.

“I went to the foreign ministry. There I was asked to bring a ‘legal affidavit’ to prove that the dead person is my own brother. His wife was also asked to bring a letter. I got a letter from the ‘grama niladhari’ (village level administrative officer) as well. Then I handed over all the documents to the ministry.... they sent back all the documents related to my brother’s illness including medical records to me. Governmental officers at foreign ministry helped us a lot until we got the body, which took one week. I went to the agency through which he went abroad; they did not help at all. They said – if you want to get down the body, you have to pay to the agency.” (male sibling)

Participants demonstrated very poor knowledge regarding interventions by government agencies in case of an emergency concerning the ILM. They had heard about numerous media reports on problems faced by ILMs but lacked clear understanding of what to do in case of a similar situation occurring with their ILM family member. Most participants knew only to go to the employment agency when they needed help. These agencies had not informed the ILMs, their spouses and families about the SLBFE or other government agencies which would

SECTION III

Health Status of Migrants and their Families

PART I: OUTBOUND MIGRANTS AND LEFT-BEHIND FAMILIES

intervene in times of need nor about the many benefits of registering in the SLBFE. The implications of not knowing what to do in times of crisis may lead to many problems within the household of the left-behind family including significant emotional distress and financial difficulties.

Conclusion

This paper presents the qualitative findings from interviews conducted with adult members of left-behind families of ILMs in Sri Lanka. The findings show that pre-migration socio-economic situation, economic difficulties and chances of gaining higher income can be considered as the major push & pull factors for labour migration. The post-migration period has demonstrated to be of mixed benefit to left-behind families dependent on numerous factors such as the amount of remittances sent home, family structures, and the amount and quality of support available. Indication was made towards a decreased overall health and well-being of left-behind families with children of ILMs suffering negative effects of parental absence and lack of care. There was also a clear lack of knowledge about how to act in emergency situations affecting the ILM and lack of support from concerned agencies.

As labour migration flow increases in a rapidly developing post-conflict Sri Lanka, the impact on those left-behind families leave many unanswered questions. The delicate balance between promoting ILM for economic prosperity and ensuring health and social protection is a formidable policy challenge and one that has largely been ignored. Through an economic lens, remittances benefit a majority of poorer households by increasing income and standards of living. However, as revealed in current and previous other studies, this benefit was inconsistent across most families [5, 8]. Reliance on remittances alone as a measure of poverty alleviation has also been challenged [23].

From an economic perspective, the 'left-behind' do not simply extend to families but extend to entire communities. Despite the Government's push towards skilled migration via a 'knowledge' economy, the vast majority of Sri Lankans entering into international labour markets are represented in low-skilled employment categories and stem from rural settings [3]. Ensuring a safe, healthy and productive migration journey begins with the provision of tailored information and family orientation during the 'migration contemplation' phase, with a quality health assessment at pre-migration phase all the way through to health protection and service access at destination and return phases [24]. A meaningful realization of the overall health of migrants requires the

commitment from both sending and receiving countries. In most cases the choice to migrate is not taken collectively within families. For the individual migrant and their families, ensuring 'informed choice' through meaningful dialogue on costs and benefits of migration at pre-departure phase, including ensuring a care-plan for children, are crucial. This process has been termed 'the social contract' in migrant families. The state can also play a role in stimulating 'informed choice' in sessions involving potential migrant worker families at SLBFE's mandatory pre-departure training program. Identifying left-behind families with increased risks of developing social, financial and health problems using a case-management strategy by education, health and social services at local community/district level in partnership with families may be highly effective. Specific interventions are required such as campaigns to enable informed choice for families, pre-departure orientation programmes which meaningfully engages family members, provision of respite support for elderly caregivers, and capacitating families in financial planning and investment to maximise use of remittances.

Whilst it is clear that remittances do play a role in enhancing the migrant families' monetary gains and have led to upgraded living conditions, the social impacts also persist. This study raises important issues in relation to the role parenting (or grand parenting) plays in social, emotional and physical well-being of the 'left-behind' ILM child. Whilst this study did not explore specific illness perceptions or behaviour, the findings show perceived impact on child nutritional and cognitive development.

A number studies have shown migration requires the reconfiguration or renegotiation of familial and gender roles [25], and that transnational family arrangements exact a high 'emotional cost' due to multiple layers of parental authority and reshaping of care-giving arrangements [26-28]. The link between transnational migration and marital conflict, which in turn cause difficulties for children have also been documented [29, 30]. The trajectories of migration impact on families, and especially on the child, have a gender dimension with differing vulnerabilities in male vs. female headed households. A study in Philippines showed intimacy with children is more challenging for migrant men to achieve than it is for migrating women [31]. Change in gender roles is complex and requires contextual analysis. Studies in Philippines and Moldova have shown that women assume men's responsibilities when the men migrate, but men do not as readily take up care-giving duties when women migrate [32], an indication that traditional gender roles influence duties and responsibilities within the family, even if migration may contribute to the

empowerment and emancipation of women [33]. In recognizing the transnational parenting role of mainly female ILMs, linking welfare support services and respite care for caregivers is crucial [5, 8,9, 23].

In addition to outbound migrant workers, there are other internal economic migrant groups in Sri Lanka, who stay away from their families and households for considerable amounts of time. Approximately 400,000, mainly female workers are currently employed in the garment manufacturing sector, with majority having temporary residency in areas closer to factories and away from home. Sri Lanka also has internally displaced people/forced migrants due to the recently concluded conflict or due to large-scale natural disasters such as the 2004 tsunami. These internal migrant population numbers are highly fluctuant and depend on various economic, logistical and other factors. However, most of the forced migrant populations are displaced as whole family units, and do not involve parental migration in many instances [34]. The migration health policy research programme also included research into the internal migration related health issues, and the findings have been incorporated in to the policy formulation process.

The migration health policy (launched in 2012) sets the tone for policy and practice reform agenda to create an enabling environment to make migration a safe, healthy and dignified process for around 1.8 million labour migrants and their families. However, further research is needed to explore the long term impacts and implications of ILM on the migrants, their families and communities in countries such as Sri Lanka, which are highly dependent upon migration for livelihood sustainability and development. The true health, social and cultural cost of ILM can only be realized through dedicated research and practice efforts.

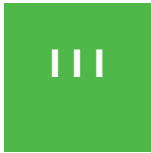
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SECTION III

Health Status of Migrants and their Families

PART I: OUTBOUND MIGRANTS AND LEFT-BEHIND FAMILIES



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Mental health of migrants in low-skilled work and the families they leave behind

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Chesmal Siriwardhana²

ABSTRACT

Background

Migration is rapidly reshaping the world. Low-skilled labour migration, in particular, is driven by disparities in income, wealth, and work opportunities. Labour migrants are increasingly flowing among low-income and middle-income nations in Asia, Africa, and the Middle East.¹ Migrant workers and the family members they leave behind number about 193 million,¹ of whom 52–100 million people are domestic workers in low-skilled, so-called difficult, degrading, and dangerous jobs. 83% of these workers are women, most of whom have restricted or no access to legal, social, or health protection, including basic reproductive health rights.

Keywords

migration health, mental health, migrant families

Access full article at: [www.thelancet.com/journals/lanpsy/article/PIIS2215-0366\(15\)00469-1/abstract](http://www.thelancet.com/journals/lanpsy/article/PIIS2215-0366(15)00469-1/abstract)

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Medico-legal study on patterns of abuse amongst returning female migrant workers to Sri Lanka

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Malintha De Silva²

Sharika Peiris³

ABSTRACT

Background

Objective: Sri Lanka has over 2 million of its citizens employed overseas as international labour migrants. Migrant worker abuse is well recognised, but poorly characterised within the scientific literature. This study aimed to explore patterns of abuse amongst Sri Lankan women returning home after working as domestic maids.

Methods

A cross-sectional study was conducted on Sri Lankan female domestic maids returning from the Middle East region who were referred for medico-legal opinion.

Results

A total of 20 women were included in the study. Average length of their employment overseas was 14 months. Complaints of physical violence directed mainly through their employers were made by 60% of women. Upon physical examination, two-thirds had evidence of injuries, with a third being subjected to repetitive/systematic violence. Eighty percent suffered some form of psychological trauma. Personal identity papers and travel documents had been confiscated by the employer in 85% of cases, with two thirds indicating they were prevented and/or restricted from leaving their place of work/residence.

Conclusions

Our study demonstrates that female domestic maid abuse manifests through multiple pathways. Violence against such workers span the full spectrum of physical, financial, verbal, emotional abuse and neglect, as defined by the World Health Organization. Findings from this exploratory study cannot be generalized to the large volume of migrant worker outflows. Further research is needed to determine incidence and define patterns in other migrant worker categories such as low-skilled male workers.

Keywords

maid abuse, migrant worker abuse, international migrants, violence and health, migration health, Sri Lanka

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Introduction

Globally an estimated 52-100 million people work as domestic migrant workers abroad, 75% of them women, with many having little or no access to legal, social and health protection schemes (1). Many have limited or no access to legal, social and health protection schemes. Despite being recognised as a critical issue at the nexus of development and human rights, migrant worker abuse is poorly documented in the scientific literature (2)(3).

A 2009 article by Murty in the journal *Forensic and Legal Medicine* indicated that despite migrant worker abuse being well documented in media discourses and by human rights activists, it has received little attention from scientific researchers (6). In presenting two cases of maid abuse within Malaysia, Murty highlighted the importance of characterising injuries for physical examination and called for greater research into this domain from the medico-legal community. While the exploitation and abuse of migrant labours is well publicised (7)(8), there is a paucity of research evidence in examining cases of worker abuse. This research seeks to identify and discern the patterns of female domestic maid abuse in those returning from the Middle East region.

Materials and Methods

A cross-sectional study design was used. Sri Lankan female domestic maids returning from the Middle East region referred for medico-legal opinion were interviewed by a judicial medical officer (JMO) and a comprehensive medico-legal examination undertaken.

Study Population

The medico-legal referrals made to the Judicial Medical Office at District General Hospital Negombo (GHN) in Gampaha District, Sri Lanka's Western province were assessed. This is the largest referral hospital within close proximity to the main international airport. The Judicial Medical Office within GHN serves as a major referral point for medico-legal cases for returning migrant workers and other in-bound migrants like refugees/humanitarian entrants. Referrals are made by airport police officers, usually in coordination with Sri Lanka Foreign Employment Bureau (SLFBE) welfare officers at the airport.

Inclusion criteria utilized is as follows: any returning female Sri Lankan migrant worker, who served as a domestic maid overseas in the Middle East region that had been referred for examination at the Judicial Medical Office at GHN during the study period between 1 October 2014 to 28 February 2015.

Data instruments and analysis

Those meeting the inclusion criteria were interviewed by the JMO and medico-legal examination undertaken. Interviews were conducted in a manner to allow participants to freely share their experiences during their migration journey from pre-departure, at destination and upon return phases. The questionnaire captured socio-economic and demographic data, employment history, details of the occupation at the destination country, recruitment and pre-departure process, details of work and life at working place and details of post-arrival phase. The questionnaire was pre-tested on five medico-legal cases referred to the same hospital setting a month prior to the commencement of the study, and later revised after consultation with public health, psychiatric and forensic medicine consultants. The analysis of descriptive data from the questionnaire such as characteristics of the study population, employment and migration history were presented as frequency distributions.

Detailed medico-legal history, physical examination and mental health assessment of relevant cases was also conducted by the JMO. Nutritional status was evaluated by using internationally accepted Body Mass Index (BMI) guidelines for Asian populations (9). A BMI of $<18.5 \text{ kg/m}^2$ is indicative of undernutrition and 'trigger point' for further assessment/intervention (9). Questions relating to food consumption patterns, type and availability were also explored. Mental health status was guided by questions presented within the Patient Health Questionnaire (PHQ-9) - a widely used screening tool for common mental disorders, that has also been validated in Sri Lanka (10). The PHQ-9 was not used to diagnose mental health issues, rather act as a guide to prompt the JMO during each assessment. If one or more of the following symptoms were identified by the JMO, referral was made to the consultant psychiatrist at GHN for further evaluation: feelings of grief, helplessness/hopelessness, loss of energy, irritability, inability to concentrate for long periods, reported changes to appetite.

To assess the nature of abuse, we were guided by the World Health Organization (WHO) formulary on "violence and health" (11). The guide suggests inter-personal violence occurs when one person uses power and control over another through physical, sexual, emotional threats or actions, economic control, isolation, or other forms of coercive behaviour. The six typologies of violence are indicated: physical, sexual, psychological, verbal abuse, financial abuse, neglect and/or abuse reported as 'punishment'. We used this classification to categorize the nature of abuse as described by responders in interviews conducted by JMO. A semi-structured interview format was adopted to allow participants to freely share their

experiences and to further clarify the type of abuse through iterative questioning, For example, the question: “Did you experience any form of threat or harassment during the period of your work at the home?” was followed by probing questions that explored the specific nature/ experience of abuse. The interview responses were recorded (in Sinhalese) and subsequently translated into English. The transcripts were jointly analysed by first two authors using thematic content analysis, i.e. the responses were classified deductively into the pre-established six themes on the category of abuse.

Ethical Considerations

Ethical clearance was obtained from the Ethics Review Committee of the Sri Lanka Medical Association (reference no. ERC/14/031) on 30 September 2014. The data collection was initiated after obtaining permission from the Director of the GHN. Informed written consent was obtained from eligible subjects prior to interview process. Participants were free to withdraw and not respond to questions at any point. Appropriate referrals were made for cases requiring medical, social welfare and legal support, and was followed-up by research team.

Results

Socio-demographic characteristics

A total of 20 women were included in the study with the majority being of Sinhalese ethnicity (60%) (Table 1). The mean age of the interviewees were 35.6 years, with a range of 22 to 52 years. The majority of the participants had secondary education (75%), and had a literacy of at least one language.

Table 1: Characteristics of the study population

	<i>n</i>	(%)
Age Group		
18-24	4	20
25-29	3	15
30-34	4	20
35-39	2	10
40-44	1	5
45-50	5	25
>50	1	5
Ethnicity		
Sinhala	12	60
Tamil	5	25
Muslim	3	15

Marital status		
Married	15	75
Unmarried	4	20
Widow	1	5
Highest Level of Education		
No schooling	1	5
Grade 1-5	4	20
Grade 6-10	11	55
O/L	4	20
Previous Occupation		
Unemployed	4	20
Labourer	10	50
Garment Factory Worker	3	15
Housemaid	1	5
Other	2	10
District of origin		
NuwaraEliya	3	15
Kurunagala	5	25
Puttlam	5	25
Mathale	1	5
Matara	2	10
Gampaha	4	20

Patterns of Migration

Details of migration and employment history are presented in Table 2. The majority of participants (90%) returned prematurely, before contract period of employment. The average duration of work overseas was 14 months. Most women (95%) were formally registered with the Sri Lanka Bureau of Foreign Employment (SLBFE) and had successfully completed SLBFE’s pre-departure training prior to their departure.

Table 2: Employment and migration history

	<i>n</i>	(%)
Country of Employment		
Saudi Arabia	12	60
Kuwait	2	10
Lebanon	4	20
UAE	1	5
Jordan	1	5
Period of work		
<3 months	1	5
3–5 months	6	30
6–8 months	3	15
9–11 months	1	5
1–2 years	7	35
>2 years	2	10

	<i>n</i>	(%)
Route of entry		
Private agent	17	85
Private route	3	15
Through government	0	0
Registered migrant worker*		
Yes	19	95
No	0	0
Not aware	1	5
Undertake pre-departure training		
Yes	19	95
No	1	5
Job contract signed before departure		
Yes	18	90
No	2	10

*Formally registered by Foreign Employment Bureau of the Government of Sri Lanka.

Patterns of Abuse

The nature of abuses reported by the respondents through the interviewer-administered questionnaire is presented in Table 3. Key findings of the clinical (medico-legal) examination are summarised in Figure 1. Through thematic analysis of qualitative data from responder interviews, survey results and physical examination findings, patterns of abuse ranging from Physical violence, financial abuse, neglect, verbal abuse, psychological violence and sexual violence were identified.

Discussion

While the exploitation and abuse of female migrant workers have been well publicised¹³ there is a paucity of research evidence in examining cases of such maid abuse. The study is the first to report findings of maid abuse through cases examined through a medico-legal process in Sri Lanka.

Table 3: Nature of abuse as reported by the respondents (n = 23)

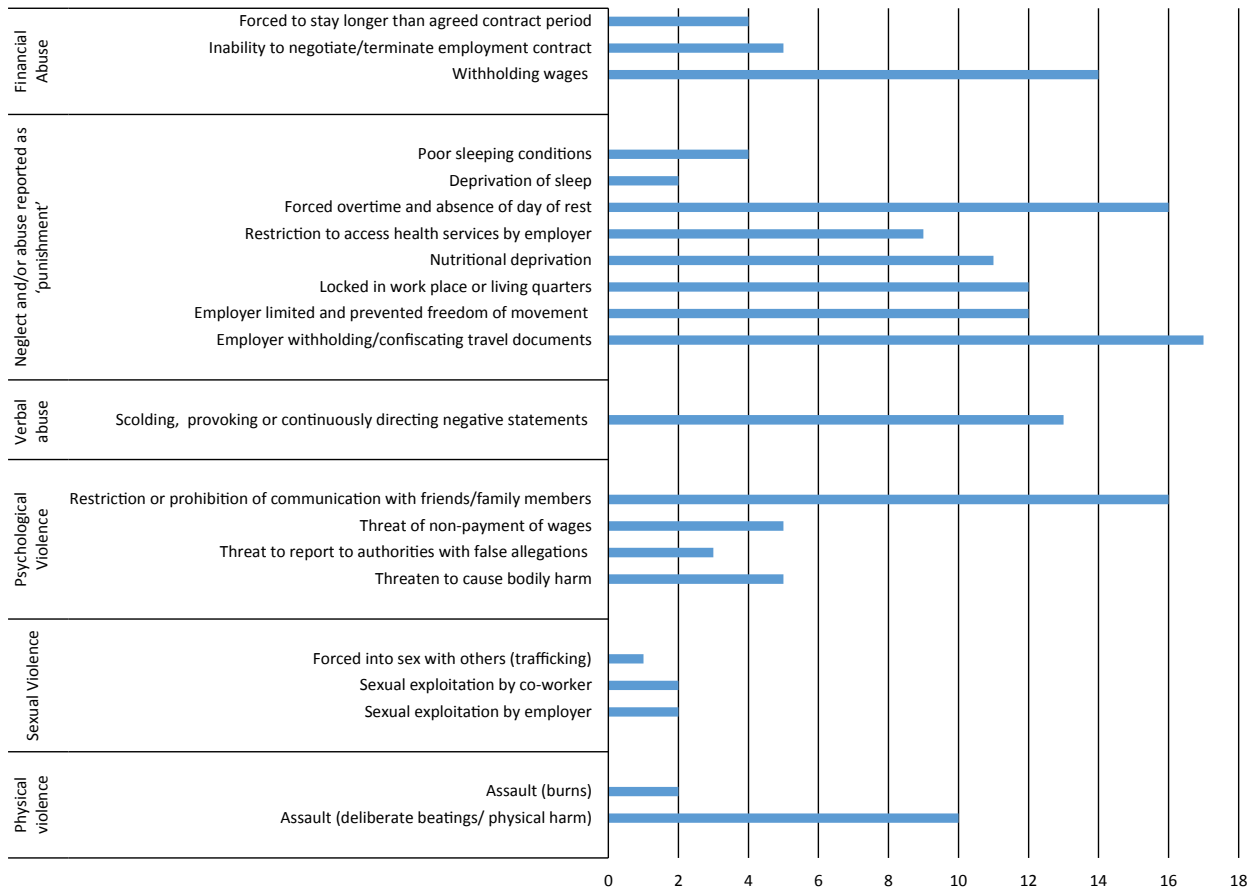
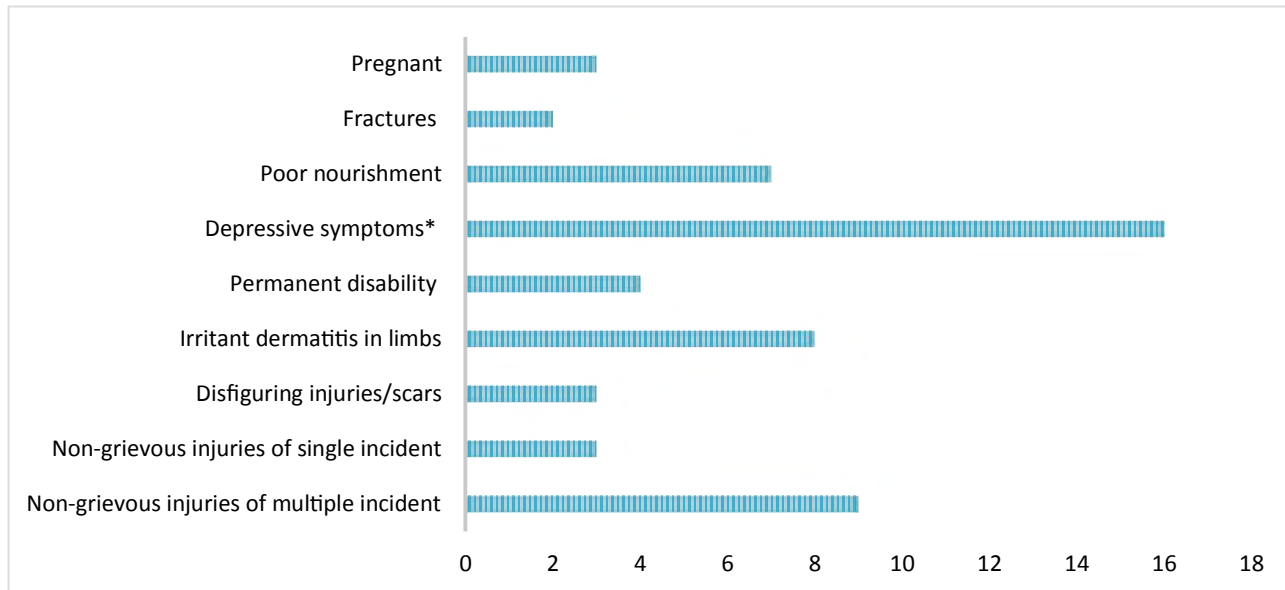


Figure 1: Key findings from medical examination (n = 23)



*One or more of these symptoms as assessed by consultant psychiatrist: feelings of grief, helplessness/hopelessness, loss of energy, irritability, inability to concentrate for long periods, reported changes to appetite.

Our study demonstrates that migrant worker abuse manifests through multiple pathways, and along the full spectrum of physical, financial, verbal, and emotional abuse as defined by the WHO (11). Key commonalities in the experience and trajectories of maid abuse were also found. Abuse occurs mainly at the hands of employers in work settings, and is often perpetrated by female heads of household.

The most common mode of abuse is assault or coercive behavior by the employer or a household member of the employer. This is consistent with the small number of reports of migrant worker abuse. In evaluating the working conditions and exposure to abuse of Filipino home care workers in Israel, Ayalon (2009) found 41% reported being verbally abused, and 40% reported not receiving adequate food (12). Shar (1997) who interviewed labour attaches (welfare officers) of embassies in Kuwait reported managing cases of physical and mental abuse of migrant workers before their repatriation (13). In the United Arab Emirates, a quarter of 239 workers living in labour camps were found to be depressed (14) and mental illness was found to be significantly correlated with physical illness and working more than 8 hours per day.

A key strength of our study was the comprehensive medical examination of each case. This assisted in the validation of some of the claims of abuse and

maltreatment. A critical finding of our study is that almost three-quarters of the returning female domestic maids who have been referred for medico-legal examination suffered some form of psychological trauma. The abusive working conditions within the work environment have also shown detrimental effects on their mental health.

Female migrant workers were also found to be vulnerable to exploitation throughout their migration journey, even at the pre-departure phase (by migration agents and money lenders), and at the arrival phase in destination country. The case of human trafficking for sexual exploitation provides clear evidence of this link. Other forms of abuse may occur throughout the recruitment process. The restrictive '*kafala*' (sponsorship) system, which ties migrant workers' employment visas to their employers, also fuels exploitation and abuse as an employer must grant explicit permission before the worker can enter, transfer employment, or leave the country (15). Unpaid/underpaid labour stemming from such a system is also a form of financial abuse (16).

Clinical examination results indicated more than half 60% of individuals had clear evidence of injuries, with over a third subjected to repetitive/systematic violence. Physical violence is inflicted in order to behave and work in the desired way of the employer or to create a sense of fear and terror on them (6,16). Physical injuries causing pain are caused mainly by beating with hands, legs, blunt

objects like wooden sticks or any other household item which is easily available at the time. The common type of injuries are abrasions and contusions, which were mainly distributed over head, upper limbs and upper trunk (6), but fractures of bones were also reported in our study. These injuries highlight a repetitive nature and some amount of permanent disfiguration and permanent disability as well.

In addition, physical exhaustion and poor state of nourishment are common complains among the abused migrant workers (13), but objective evaluation is difficult. In our study, we identified seven individuals whose Body Mass Index (BMI) was below 18kg/m². This placed them at severe risk of developing nutritional deficiency. Deprivation of food and water is a violation of basic human rights, and has also been reported in other settings (15).

Enabling legal frameworks and strategies

The International Convention on Migrant Workers protects migrants from abuse by restricting recruitment operations of workers for employment in another state, and ensuring the right to health and protection for all migrant workers. Violence against female migrant workers is especially highlighted in the Convention. Unfortunately, most ILM receiving countries have not ratified this Convention. The *World Health Assembly resolution on Health of migrants* (resolution WHA61.17) passed in 2008 prompts UN member states to develop migrant friendly health policies and ensure adequate health protection for migrant and mobile population groups.

Propelled by high profile cases of torture and abuse of ILMs, some labour-sending countries have attempted to severely restrict or prohibit female migration, to Saudi Arabia for instance. However, evidence shown such bans result in irregular forms of migration and human trafficking that lead to further health vulnerabilities (16). More robust and evidence-informed policy responses have included: toughening screening and regulation against unscrupulous migration agents and employer registries (4), enhancing pre-departure orientation programs with a holistic focus on migrant families (19)(20), utilizing pre-departure health assessments as an opportunity to not only screen by empower migrant worker on health risks and protection measures (21); advancing bilateral labour agreements between labour-sending and receiving countries; and, enabling health access and protection as a critical part of regional government dialogues within the *Colombo Process*, and the *Abu Dhabi Dialogue* (22). The key step in mitigating abuse against migrants is by

managing migration, by providing adequate protections so that domestic workers migrate on the basis of an informed choice, with guarantees for their rights (19).

Conclusion

With growing numbers of low-skilled labour migrant flows from low to middle income countries, migrant worker abuse remains a concern from a human rights groups and a medico-legal point of view (1,2). Migrant worker abuse can be defined as physical, sexual, emotional, psychological, spiritual, verbal, financial, cultural abuse and neglect, often occurring through multiple trajectories of abuse and throughout the migration cycle (pre-departure at destination or upon return). Future iterations of the WHO formulary on violence and health need to include definition of violence against migrant workers.

The findings from this exploratory study shows that violence directed at female domestic maids manifest across a wide spectrum of abusive patterns. However these findings cannot be generalized to the large volumes of migrant worker outflows, and the majority may be living comfortably or not reporting their ordeals for reasons highlighted in discussion.

Further research is needed to document the experiences of other categories of workers, especially the low-skilled male migrant workers which comprise of 53% of all registered departures (4). Investment for research to discern and compare patterns of abuse across other labour sending countries is also important. Such evidence is critical to drive policy and advocacy strategies through regional inter-governmental processors for United Nations agencies such as IOM. For instance, resolutions on ensuring health protection for migrant workers can be promoted through regional consultative process such as the *Colombo Process* and *Abu Dhabi dialogue* that aim at engaging governments on the management of overseas employment and contractual labour for countries of origin and destination (22).

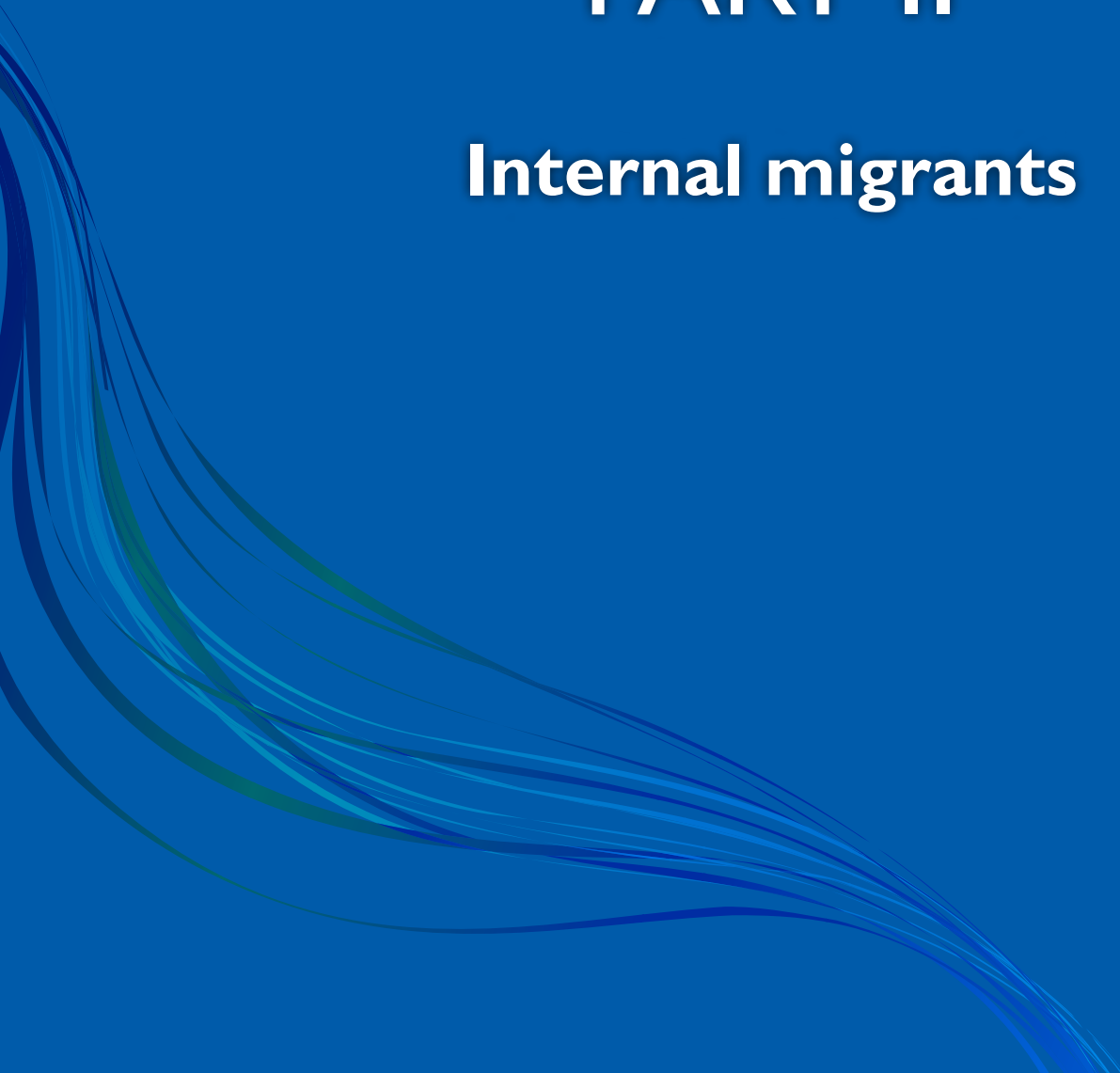
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PART II

Internal migrants



Health issues affecting female internal migrant workers: A systematic review

Upul Senarath¹

Kolitha Wickramage²

Sharika Peiris³

ABSTRACT

Background

Economic contribution by female internal migrant workers in Sri Lanka is well recognized, yet the social and health consequences are unknown. This study aims to systematically review health issues affecting female internal migrant workers in Export Processing Zones. A literature review was conducted through electronic databases (MEDLINE, HINARI, Web of Science and Google Scholar) and manual searches for grey literature published in English from 1978 to 2012. The search strategy consisted of a combination of three search strings: terms related to health status; terms for study participants; and terms for work setting. Search terms included Medical Subject Headings (MeSH) and free text in following combinations: "health", "disease", "disorder", "illness"; and "female", "internal migrant", "workers"; and "factories", "export processing", "free trade zone". Of 550 studies, eight were included for the review. The review identified high prevalence of nutritional deficiencies, risky sexual behavior and psychological disorders among female factory workers. Migrant workers had higher prevalence of anaemia and depression than non-migrants. As a positive effect, women experienced empowerment through gaining income and new knowledge. The authors conclude that female migrant workers generally tend to exhibit some disadvantage due to health risks, and are more likely to be subject to ill-health than non-migrants.

Keywords

health impact, health risks, female internal migrants, garment factory workers, Export Processing Zones

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Introduction

The United Nations defines internal migration as a permanent change in residence from one geographical unit to another within a particular country (Crowder & Hall, 2007). Internal migration has profound effects on health and well-being of an individual or a population (Chen, 2011; Hu, Cook, & Salazar, 2008; Lindstrom & Hernandez, 2006; Mberu & White, 2011; Saarela & Finnas, 2008). In Sri Lanka, several categories of internal migrants can be identified, such as labour migrants, students, seasonal workers, internally displaced persons, and armed forces personnel (International Organization for Migration (IOM) and Ministry of Health (MoH), 2011). Among the labour migrants, the internal migrant workers in Export Processing Zones (EPZ) constitute an important sub-group mainly due to their significant contribution to economic development of the country.

Sri Lanka's first EPZ was established in 1978 in Katunayake, a northern suburb of Colombo, as a part of the economic liberalization policy aiming to accelerate economic growth (Abeywardena, de Alwis, Jayasena, Jayaweera, & Sanmugan, 1994; Lakshman, 1997). The majority of the enterprises were textile and ready-made garment industries which attracted large number of young rural women from economically marginalized families to work as machine operators. Subsequently, these industries were extended to other regions of the country, and there were six EPZ and two industrial parks by year 2000, and as at present there are 12 in total (Board of Investments Sri Lanka, 2012b). Since the liberalization of economy, there was a progressive growth in per-capita gross domestic product from US\$ 281 in 1975 to US\$ 2400 by 2010 (Central Bank of Sri Lanka, 2010, 2012). The garments and textile sector forms the largest industrial employer, and remains as the second highest contributor to the nation's foreign exchange. The garments and textile exports contributed to 39.6% (US\$ 4.2 billion) of the total exports income of Sri Lanka in 2011 (Board of Investments Sri Lanka, 2012b; Central Bank of Sri Lanka, 2012). According to the Board of Investments Sri Lanka (BOI), there were 128,267 employees in the EPZ by October 2012, and the majority (59%) of them were females (Board of Investments Sri Lanka, 2012a). This population makes a major contribution to the economy since it constitutes a substantial fraction of the garment industry workforce in Sri Lanka (Board of Investments Sri Lanka, 2012b).

Health and social issues of internal migrant workers have been highlighted from different parts of the world including China, Bangladesh, Nepal, Thailand, Cambodia, and Mexico (Ahmed, Hasan, & Kabir, 1997; Chaiyanukij, 2004; Garcia et al., 2008; Islam et al., 2008; Mou et al., 2010; Puri & Cleland, 2006, 2007; Webber et al., 2010). High prevalence of nutritional deficiencies such as anemia, and Vitamin A and D deficiencies were found among female garment factory workers in Dhaka, Bangladesh (Ahmed et al., 1997; Islam et al., 2008). Risky sexual behavior, sexual harassment and violence against women were reported in Nepal and Thailand (Chaiyanukij, 2004; Puri & Cleland, 2006, 2007). Sri Lankan literature indicated that factory workers in EPZ had experienced greater health risks and many adverse health outcomes (Attanapola, 2004; Hancock, 2006; Hettiarachchy & Schensul, 2001; Jordal, 2009; Lombardo, Vijitha de Silva, Lipscomb, & Ostbye, 2012; G. Samarasinghe & Ismail, 2000). Most of the Sri Lankan studies have focused on females with the assumption by many researchers and institutions that vulnerabilities are higher in this group.

The economic contribution by internal migrant workers, in particular the workers in EPZ, is well recognized, yet the social and health consequences are unknown. There has been no attempt to identify through a detailed review process the health impacts of such workers, despite the long history and existence of these workers. High quality evidence is required to make an organized effort to ensure optimum health of this important internal migrant group. The objective of this systematic review is to examine the health issues affecting female internal migrant workers in EPZ in Sri Lanka. Further, the review attempts to investigate the hypothesis that there are differences in the health status of migrant workers compared to their non-migrant counterparts.

Methods

The review process, as illustrated in Figure 1, followed a step-wise approach in the following order: developing a search strategy; defining the selection criteria; assessment for methodological quality; and data extraction and summarization.

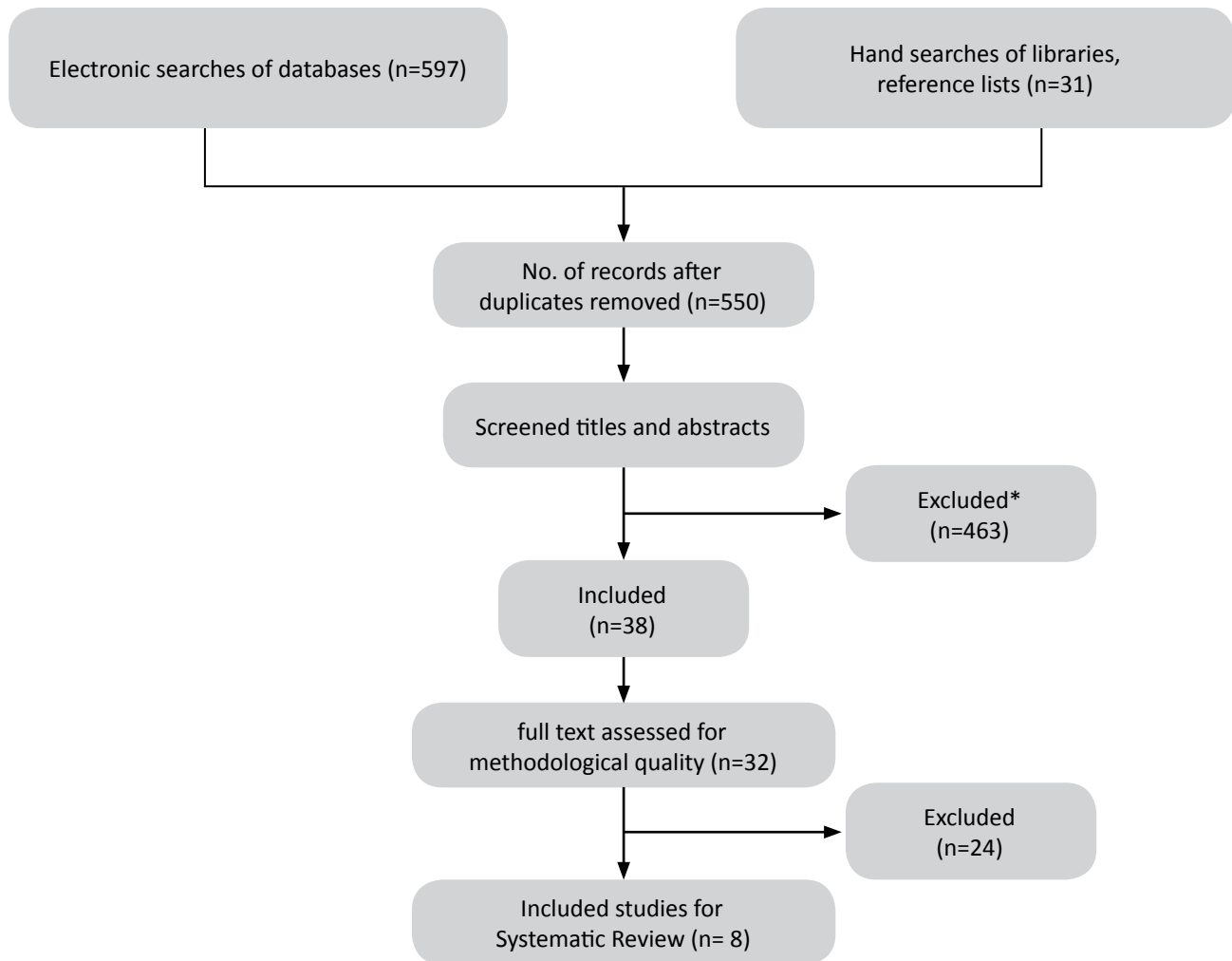
Search strategy

We undertook electronic searches of relevant databases and hand searches of grey literature from libraries of selected academic and research institutions. Electronic databases searched comprised MEDLINE through PubMed, HINARI, Web of Science and Google Scholar. The search strategy consisted of a combination of three search strings: terms related to health status; terms for study participants; and terms for work setting. Search terms included Medical Subject Headings (MeSH) and free text in following combinations: "health", "disease", "disorder", "illness" and "female", "internal migrant", "workers" and "factories", "export processing", "free trade zone". In addition, the reference lists of all retrieved publications were checked for eligible studies. Searches were restricted to papers published in English since January 1978 to November 2012.

Selection criteria

Selection of studies was based on three inclusion criteria: (i) the reported outcome was either a health issue or health-related social issue; (ii) primary study participants were females employed in an industry; (iii) study was conducted within a EPZ in Sri Lanka. We excluded articles that were based on personal opinion without any supportive data, ethnographic/qualitative studies and undergraduate level research reports, but included

Figure 1: Flow diagram of study selection



technical reports, and theses or dissertations accepted as a requirement for postgraduate qualification. Abstracts and titles were reviewed by the investigators, and then decided whether to obtain the full text for assessment of methodological quality.

Methodological quality

The methodological quality was assessed by means of a checklist, which was developed by the investigators for the purpose of the study (Appendix 1). The checklist comprised 12 items including use of clearly defined eligibility criteria for enrollment of participants, scientifically valid sampling technique, adequate number of participants, standardized procedure or tools to assess outcome variables etc. Two investigators independently rated the items in the checklist, and marked as positive, negative or uncertain. Evidence was graded into 3 levels

based on the percentage of positively rated items: poor quality (<60%); satisfactory quality (60-79%); and high quality (≥80%). Only the “satisfactory” and “high” quality studies were included in the final review.

Data extraction and summarization

As listed in Table 1, eight publications were included for the final review (Amarasinghe, 2005, 2012; Hancock, Middleton, Moore, & Edirisinghe, 2011; Hettiarachchy & Schensul, 2001; Lombardo et al., 2012; Pallewatta, 2005; S. Perera, 2004; G. Samarasinghe & Ismail, 2000). These comprise 3 journal articles (2 indexed and 1 non-indexed), 3 postgraduate research publications (2 doctoral theses and 1 master’s dissertations) and 2 research reports. All these studies were cross-sectional in nature, however 2 studies included case-control designs nested within them. We adapted a conceptual framework to extract data and identify evidence for health outcomes, predisposing

Table 1: Characteristics of the publications included in the systematic review, according to health issues

Main theme	Study (publication type)	Study Population	Sample size
Nutrition	Amarasinghe, 2004 (Master's dissertation)	Garment industry females workers in Free Trade Zone ^a Katunayake	n=652
Reproductive Health	Hettiarachchy & Schensul, 2001 (Journal article)	Young Unmarried women in Free Trade Zone Katunayake	n=775
Reproductive Health	Perera, 2004 (Journal article)	Female migrant workers in Export Processing Zone Katunayake	n=400
Mental Health	Samarasinghe & Ismail, 2000 (Research Report)	Female blue collar workers Export Processing Zones of Katunayake, Biyagama, Rathmalana, Koggala, Pallekele	n=1000
Mental Health	Pallewatta, 2005 (Doctoral thesis)	Female workers in Free Trade Zone Katunayake	n=1630
Musculo-skeletal disorder	Amarasinghe, 2012 (Doctoral thesis)	Female garment workers Export Processing Zone Biyagama	n=1083
Musculo-skeletal disorder	Lombardo et al, 2012 (Journal article)	female garment factory workers in Free Trade Zone Kogalla	n=1058
Gender issues	Hancock et al, 2011 (Research Report)	Women worked in factories in Export Processing Zones in Sri Lanka	n=2304

a. the terms 'Free Trade Zone' and 'Export Processing Zone' were interchangeably used in the studies.

factors, physical environment, migration experience, and health care in each study (Figure 2) (Wickramage, 2012). Four studies have compared health outcomes between migrant and non-migrant workers or tested an association between migration and health outcomes.

Results

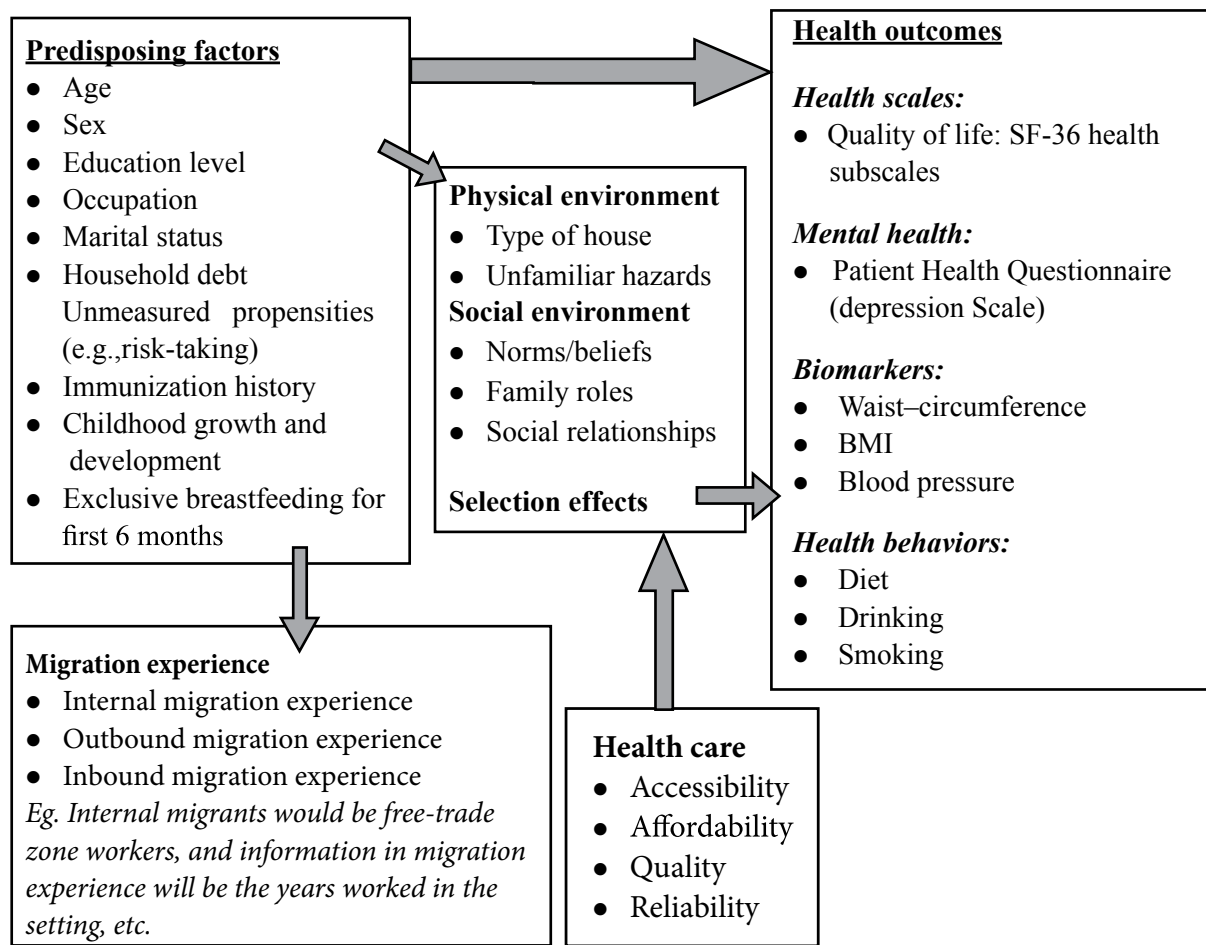
The study participants were females and the majority, i.e., more than two-thirds, aged below 30 years. The mean age varied between 23.0 to 30.7 years in the studies which reported mean age (Amarasinghe, 2012; Hancock et al., 2011; Lombardo et al., 2012; Pallewatta, 2005; S. Perera, 2004; G. Samarasinghe & Ismail, 2000). The percentage unmarried ranged from 63% to 88% (Amarasinghe, 2005, 2012; Hancock et al., 2011; Pallewatta, 2005; S. Perera, 2004; G. Samarasinghe & Ismail, 2000). Overall, the majority has passed GCE ordinary level, and in three studies this percentage was more than 84% (Hancock et al., 2011; Lombardo et al., 2012; S. Perera, 2004). In five studies, the majority of participants ranging from 59% to 100% were migrant workers (Amarasinghe, 2005, 2012; Hancock et al., 2011; Pallewatta, 2005; S. Perera, 2004; G. Samarasinghe & Ismail, 2000). In contrast, one study conducted in Koggala EPZ reported a lower percentage of migrant workers, amounting to 14.6% (Lombardo et al., 2012). Two studies did not present the migration status in measureable terms (Hancock et al., 2011; Hettiarachchy & Schensul, 2001).

Findings related to health and social issues were grouped according to 5 broad themes: (i) Nutrition; (ii) Reproductive health; (iii) Mental health; (iv) Musculo-skeletal disorders; and (v) Gender issues. The overall findings are summarized in Table 2. The differences in selected health and social outcomes between migrant and non-migrant female factory workers are highlighted in Table 3.

Nutrition

Body Mass Index (BMI) of female factory workers were examined in two studies (Amarasinghe, 2005; Lombardo et al., 2012). In 2004, a study by Amarasinghe among 640 female workers in a Garment sector at Katunayake EPZ estimated the prevalence of underweight (BMI <18.5 Kg/m²) at 34.2% (Amarasinghe, 2005). The number of underweight subjects was further disaggregated according to the international classification by World Health Organization (World Health Organization, 2012), and the prevalence of mild, moderate and severe thinness was found to be 16.9%, 12.5% and 4.8% respectively. According to a more recent study in Koggala EPZ the prevalence of underweight in female garment factory workers was 28.1% (Lombardo et al., 2012). Amarasinghe also investigated haemoglobin and serum ferritin and found that 45% of female workers were anaemic (haemoglobin <12 g/dl) (Amarasinghe, 2005). Almost two-thirds (67%) found to have low serum ferritin levels (serum ferritin <12 µg/l) indicating iron store depletion.

Figure 2: Conceptual framework for the types evidence on health status that could be gathered from studies that assesses health status of migrants and mobile populations (*developed by K.Wickramage*)



As shown in Table 3, the prevalence of anaemia was significantly higher among those who migrated from rural areas (50.7%) than those staying their own homes (34.9%).

Reproductive health

In this systematic review, we found two studies investigating issues pertaining to reproductive health (Hettiarachchy & Schensul, 2001; S. Perera, 2004). A study conducted in Katunayake EPZ in 2001 highlighted that young, unmarried women migrating from poor rural villages to EPZs, were at a higher risk for unprotected pre-marital sex and unwanted pregnancy. Of the 775 women, 29.5% disclosed that their female friends in the zone were often involved in risky sexual behavior. Of the respondents, 16% stated that they themselves were involved in the following risky sexual behavior: sexual relationship (12.8%); oral sex (0.9%); relationship with a married man (2.6%); penetrative sex (2.6%); getting

pregnant (2.7%); and having an abortion (1.4%). Another study, reported that the majority of female migrant workers in Katunayake EPZ had knowledge to protect unwanted pregnancy (74.5%), and awareness about HIV/AIDS (90.0%) (S. Perera, 2004). However, only 20% could correctly recognize the fertile period in the menstrual cycle, and less than 20% were aware of the other sexually transmitted diseases.

Mental health

In the present review, there were 2 studies which focused on mental health status of female factory workers (Pallewatta, 2005; G. Samarasinghe & Ismail, 2000). Using a validated General Health Questionnaire (GHQ-28), Samarasinghe and Ismail assessed psychological distress among 1000 female blue collar workers in 5 EPZs in 2001 (G. Samarasinghe & Ismail, 2000). The scores for the four sub-scales of psychological distress were as follows: “Somatic scale” relating to people’s feelings of health

Table 2: Key findings of studies included in the systematic review

Study	Problem Category	Indicator	Value
Amarasinghe (2004)	Under nutrition	Underweight (BMI <18.5) Normal (BMI 18.5-24.9) Overweight (BMI 25.0-29.9) Obesity (BMI ≥25)	34.2% 52.0% 11.9% 1.9%
	Anaemia	Anaemia (Hb, 12 g/dl) Hemoglobin (g/dl) 9.13 (5.15) Iron store depletion (Serum Ferritin <12 µg/l)	44.7% 11.4 (±1.6) 66.6%
Perera (2004)	Knowledge on reproductive health	Knowledge to protect unwanted pregnancy Correctly recognized fertile period in menstrual cycle Awareness about HIV/AIDS Awareness of other Sexually Transmitted Diseases	74.5% 20.0% 90.0% <20.0%
	Attitudes on reproductive health	What do peers normally do if they get pregnant through pre-marital sex? Induced abortion Commit suicide Return home and bring up child Abandon baby	72.3% 24.4% 14.2% 12.7%
Hettiarachchy & Schensul (2001)	Risky sexual behaviour	Having a friend with Risky sexual behavior Having any risky sexual behavior Sexual relationship Getting pregnancy Having an abortion Having penetrative sex oral sex having relationship with a married man	29.5% 16% 12.8% 2.7% 1.4% 2.6% 0.9% 2.6%
Pallewatta (2005)	Psycho-somatic problems	Prevalence of chronic fatigue Prevalence of common mental disorders	23.5% 23.2%
Samarasinghe & Ismail (2000)	Psychological distress	mean score (±SD) Somatic scale Anxiety Scale Social dysfunction scale Depression scale	9.13 (±5.15) 7.13 (±5.31) 6.49 (±3.33) 3.90 (4.32) 3.90 (±4.32)
Amarasinghe (2012)	Musculo-skeletal disorders	Prevalence of work-related neck and upper limb Musculo-skeletal disorder	54.9%
		Site of pain Neck Shoulder Elbow Wrist Specific work-related syndrommes	29.3% 38.5% 22.1% 4.1% 0.7% to 24%
Lombardo (2012)	Musculo-skeletal disorders	Prevalence of musculoskeletal symptoms (occurring more than 3 times or lasting a week or more during the previous 12-month period).	15.5%
		The most common site of pain Back Knee	57.3% 31.7%
	Under nutrition	Underweight (BMI <18.5)	28.1%
Hancock (2011)	Empowerment	participated more in home decision making	55.8%

and fatigue and providing a measure of bodily sensations (mean=9.13, SD=5.15); “Anxiety scale” includes items relating to anxiety and sleeplessness (mean=7.13, SD=5.31); “Social Dysfunction scale” includes items relating to the extent to which a respondent is able to

cope with the demands of work and the usual challenges of life (mean=6.49, SD=3.33); “Depression scale” includes items relating to depression and suicide (mean=3.90, SD=4.32). Table 3 shows that the mean depression score was significantly higher in migrant females (mean=4.01)

SECTION III

Health Status of Migrants and their Families

PART II: INTERNAL MIGRANTS

Table 3: Differences in the health status between female migrant workers and female non-migrant workers in Export Processing Zones in Sri Lanka

Study	Study population	Indicator/s	Migrant workers	Non-migrant workers	Significance in difference/ Association
Amarasinghe (2004)	Garment industry females workers in Free Trade Zone Katunayake	Prevalence of Anaemia (% with Haemoglobin <12 g/dl)	50.7%	34.9%	P<0.05
Samarasinghe & Ismail (2000)	Female blue collar workers Export Processing Zones of Katunayake, Biyagama, Rathmalana, Koggala, Pallekele	Mean Score: Somatic Scale	9.19	8.34	NS
		Anxiety Scale	7.18	6.45	NS
		Social Dysfunction Scale	6.43	6.93	NS
		Depression scale	4.01	2.41	P<0.01
Pallewatta (2005)	Female workers in Free Trade Zone Katunayake	Odds ratio of having chronic fatigue in a migrant worker in contrast to non-migrant worker	OR (95%CI) = 0.51 (0.18, 1.52)	Contrast group	NS
Amarasinghe (2012)	Female garment workers Export Processing Zone Biyagama	Odds ratio of having neck and upper limb musculoskeletal disorder in a migrant worker in contrast to a non-migrant worker	OR =1.0	Contrast group	NS

NS=Not significant; OR (95%CI)=Odds Ratio (95% Confidence Interval).

than those who lived own home (mean=2.41). However, there were no significant differences in mean scores in the somatic, anxiety and social dysfunction scales between migrant and non-migrant groups.

The prevalence of chronic fatigue was estimated at 23.5% in a study conducted by Pallewatta in Katunayake EPZ in 2005 (Pallewatta, 2005). The results were based on a validated “Checklist of Individual Strength” questionnaire among 1630 female workers. The common mental disorders were found in 23.2% of female workers according to the General Health Questionnaire-30 (GHQ-30), a 30-item tool validated previously in Sri Lanka (Pallewatta, 2005; D. Samarasinghe & De Silva, 1990). A case-control design nested within this study investigated the predictors of chronic fatigue including the migrant status. The risk for chronic fatigue was significantly higher in women who were working overtime for 3 hours or more (OR=29.9), supporting family from their monthly earnings (OR=27.7); and not engaged in leisure time activities (OR=10.2). As shown in Table 3, there was no significant association between migration status and chronic fatigue (OR=0.51, 95%CI 0.18-1.52), though the percentage of migrant workers was lower in cases (86.9%) than controls (92.9%).

Musculo-skeletal disorders

Two cross-sectional studies, with sample size exceeding 1000 in each, described musculoskeletal disorders in female garment factory workers (Amarasinghe, 2012; Lombardo et al., 2012). One study conducted in Biyagama EPZ revealed that prevalence of work-related neck and upper limb musculo-skeletal disorders was 54.9% (Amarasinghe, 2012). Percentage of migrant workers was almost equal in cases (55.7%) and controls (55.7%) with an Odds Ratio of 1.0, indicating no association between migrant status and musculo-skeletal disorders in this population. In contrast, the study from Koggala EPZ, a rural area in Southern Province showed a lower prevalence of musculoskeletal disorders (Lombardo et al., 2012). For example, symptoms occurring more than 3 times or lasting a week or more during the previous 12-month period was 15.5%. The most common sites of pain were back and knee in contrast to neck and shoulder in the former study.

Gender issues

A survey on gender empowerment sampled 2304 women between 2008-2011 who worked in factories in Sri Lanka’s EPZ (Hancock et al., 2011). The survey found that either explicitly or implicitly the women experienced empowerment in many ways for example, through gaining new knowledge, earning income, financial

contributions to their family, increased decision making etc. The common dis-empowering factors included public humiliation and harassment associated with the EPZs, and sexual harassment in public and the workplace. Main strength of this study was the combination of quantitative and qualitative data that provided empirical and 'generalisable' results that are valid and rigorous. According to the study from Koggala EPZ only 0.5% reported having been subjected to emotional abuse, and none of the workers reported any sexual or physical abuse at work during last 12 months (Lombardo et al., 2012).

Discussion

According to the selected studies, the respondents were relatively young and well-educated females, and the large majority have migrated from rural areas to work predominantly in garment factories. The review identified high prevalence of underweight and anaemia, risky sexual behavior, psychological disorders and musculoskeletal disorders, and as a positive effect, empowerment through gaining income and new knowledge.

Despite many potential nutritional challenges in young females in Sri Lanka, only few dimensions of nutritional status have been described in studies selected for this review (Department of Census and Statistics (DCS) & Ministry of Healthcare and Nutrition (MOH), 2009; Jayatissa & Hossain, 2010). Iron deficiency anemia, known as one of the strongest predictors for low productivity and adverse reproductive outcomes, was prevalent among women in the EPZs. The strength of this study lies with the comparison of anaemia between migrant and non-migrant populations highlighting that migrant workers were more affected than non-migrants. It is also noteworthy to observe that the prevalence of anaemia was higher in EPZ (44.7%) than the national estimate for women in the reproductive age group (31.6%) (Piyasena & Mahamithawa, 2003).

Reproductive health issues among female factory workers in Katunayake EPZ have been reported since early 80's, however these early studies did not fulfill the quality assessment criteria to be included in this review (Jordal, 2009; Voice_of_women, 1983; Wellawatta, 1999). One of the earliest surveys in 1983 indicated that there were higher number of unwanted pregnancies, life-threatening illegal abortions and sexually transmitted infections within the zone (Voice_of_women, 1983). The 2 studies on reproductive health in our review supported the fact that the young female factory workers experience risky sexual behaviours, though the rate was not so high. Authors speculated that the actual figures would

be somewhat higher than the reported proportions due to the fact that young unmarried women under-report sexual activity. Findings were well supported with evidence of ethnographic studies too (Attanapola, 2004; Hewamanna, 2003).

Our review identified some negative effects of migration on mental health status, in particularly on depression. These findings support speculations of a previous report that females in ready-made garment industries were under tremendous mental stress working in environs quite different to what they are used to, in more urban surroundings away from their villages (Wellawatta, 1999). Despite a number of studies on musculoskeletal disorders in different EPZs since 1980s, only 2 studies were eligible for this review due to methodological limitations (Amarasinghe, 2012; Hanifa, 2003; Lombardo et al., 2012; S. R. Perera, 1993; Voice_of_women, 1983). These 2 studies showed conflicting evidence probably due to contextual differences in the female workforce, ergonomics, and access to occupational health services. The prevalence of musculoskeletal disorders was higher (54% vs. 15.5%) in the setting which had higher proportion of migrant workers (72.7% vs. 14.6%) (Amarasinghe, 2012; Lombardo et al., 2012). These differences mandate the need for further investigation for the effects of migration on musculo-skeletal disorders.

The phenomenon of young women migrating from their patriarchal home environment to EPZs has evoked a new sub-culture which is distinct from both their own village setting and modernized urban society (Hewamanna, 2003; Hewamanne, 2003). Early studies reported that young women who came from outstations, and were out of parental control, would be easy victims of sexual exploitation (Voice_of_women, 1983). An ethnographic study discussed that young female factory workers experienced verbal and physical harassment at workplace and local society due to changing gender roles (Attanapola, 2004). In contrast, this systematic review highlighted some positive effects related to gender issues, that women experienced empowerment through gaining new knowledge, earning income, financial contributions to their family, and increased decision making. We also identified a number of health services within some EPZ under the purview of the BOI that ensured a safe and dignified workplace (International Organization for Migration (IOM) and Ministry of Health (MoH), 2011). Further, results from the study of Koggala EPZ also showed a very low incidence of gender-based violence. There could be many possible reasons for this situation: Zone located in a more rural setting; most (85.3%) workers living in their family homes; workers were more mature (mean age 27.8 years), and educated

(most had education beyond grade 10); and action taken to prevent abuse and uplift status of women (Lombardo et al., 2012).

Despite long existence of migrant workers in EPZs in Sri Lanka, and a number of research conducted, only 8 studies with sufficient quality were identified for this review. Of them, only 4 studies analysed the effects of migration through comparisons, and some of these comparisons did not use multivariate analyses to account for confounding effects. None of the studies included in this review has investigated environmental health issues pertaining to migrant workers in EPZ. It has been reported that overcrowding, poor ventilation and inadequate sanitation in boarding houses are common health problems (Wellawatta, 1999). There is scarcity of publications on outbreaks of communicable diseases though these have been frequently reported in mass-media.

Despite these limitations, this systematic review provides useful evidence on key health issues affecting female migrant workers who constitute the largest proportion of the workforce in the garment and apparel sector, the nation's largest industrial employer. The information from this review may be useful for development of the internal migrant component of the 'National Migration Health Policy' which is currently being developed by the Government of Sri Lanka in partnership with the International Organization for Migration through an evidence-based policy making process (Ministry of Health (MOH) and International Organization for Migration (IOM), 2012). The review may also provide insights into strategic planning through a rights-based approach to create an enabling environment to ensure the health protection of workers, especially those that are female internal migrants.

In conclusion, we found evidence that female migrant workers generally tend to exhibit some disadvantage due to health risks, and are more likely to be subject to ill-health than their non-migrant counterparts. Whist more rigorous research is needed to empirically determine the true health impacts within this internal migrant population, the nation's efforts to enable health protection for internal migrant workers is paramount.

Key Points:

- This systematic review identified high prevalence of nutritional deficiencies such as underweight and anaemia, risky sexual behavior, psychological disorders and musculo-skeletal disorders, among

female factory workers, and as a positive effect, empowerment through gaining income and new knowledge.

- Female migrant workers are more likely to be subject to ill-health than their nonmigrant counterparts, for example, higher prevalence of anaemia and psychological depression was found in migrant workers than their non-migrant counterparts.
- Internal migrant workers are mainly concentrated in the garment and apparel sector, which also forms the largest journal of the college of community physicians of Sri Lanka 15 industrial employer in Sri Lanka, and remains as the second highest contributor to the nation's foreign exchange Sri Lanka. More rigorous research is needed to empirically determine the true health impacts within this internal migrant population.

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Analysis of the domestic legal framework in relation to the right to health for internally displaced persons in Sri Lanka

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ABSTRACT

Background

We critically examine Sri Lanka's current legal framework to examine the extent to which the 'right to health' is stipulated specifically for those conflict affected internally displaced persons (IDPs) living within IDP camp settings. Understanding the domestic legal frameworks pertaining to the right to health may be useful for those professionals working at the nexus of legal medicine and human rights in Sri Lanka and advancing gaps in knowledge in this area.

Keywords

health, human rights, internal displacement, Sri Lanka

Introduction

Human Rights as they relate to the Right to Health

A "human rights-based approach" recognizes that every human being, by virtue of his or her birth as a human being, is a holder of rights. Human rights are therefore an obligation on the part of the Government to respect, protect and fulfill these rights. The United Nations supports its Member States in *progressively realizing* the right to health for all is thus a legal and moral obligation incumbent on all members of the international community. Today, the right to the enjoyment of the highest attainable standard of physical and mental health is at the centre of the achievement of the Millennium Development Goals (MDGs) - a major effort by global community to eradicate extreme poverty. Goals 4, 5 and 6 specifically relate to health. The human right to health is firmly recognized in numerous international instruments under the Normative Framework. For instance, Article 25(1) of the Universal declaration of human rights (UDHR) while non-binding affirms, "everyone has a right to a standard of living adequate for the health of himself and his family, including food, clothing, housing, and medical care and necessary social services."

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The ICESCR provides the most comprehensive article on the right to health in international human rights law. According to article 12(1) of the Covenant, States Parties recognize "the right of everyone to the enjoyment of the highest attainable standard of physical and mental health", while article 12(2) enumerates, by way of illustration, a number of "steps to be taken by the States Parties to achieve the full realization of this right". ICESCR has been ratified by 145 countries, including Sri Lanka (as of May 2002). In May 2000, the Committee on Economic, Social and Cultural Rights, which monitors the Covenant, adopted a General Comment on the right to health. General Comments serve to clarify the nature and content

SECTION III

Health Status of Migrants and their Families

PART II: INTERNAL MIGRANTS

of individual rights and States Parties' (those states that have ratified) obligations. The General Comment recognized that the right to health is closely related to and dependent upon the realization of other human rights, including the right to food, housing, work, education, participation, the enjoyment of the benefits of scientific progress and its applications, life, non-discrimination, equality, the prohibition against torture, privacy, access to information and the freedoms of association, assembly and movement. Further, the Committee interpreted the right to health as an inclusive right extending not only to timely and appropriate health care but also to the underlying determinants of health, such as access to safe and potable water and adequate sanitation, an adequate supply of safe food, nutrition and housing, healthy occupational and environmental conditions and access to health-related education and information, including on sexual and reproductive health.

General Comment 14 acknowledges the importance of the underlying determinants of health by stating that the right to health is dependent on, and contributes to, the realization of many other human rights, such as the rights an adequate standard of living, privacy and access to information. General Comment 14, contains both *freedoms and entitlements*. Freedoms include the right to be free from non-consensual medical treatment (this has especially been invoked on interventional studies and psychiatric treatments), torture and other cruel, inhuman or degrading treatment or punishment, and the right to control one's body, including sexual and reproductive freedom.

Entitlements include the right to a system of health protection; the right to prevention, treatment and control of diseases; the right to healthy natural and workplace environments; and the right to health facilities, goods and services. Participation of the population in health-related decision-making at the national and community levels is another important entitlement. Non-discrimination and equality are critical components of the right to health. States have an obligation to prohibit discrimination and ensure equality to all in relation to access to health care and the underlying determinants of health. States must recognize and provide for the differences and specific needs of population groups, such as women, children, or persons with disabilities, which generally face particular health challenges, such as higher mortality rates or vulnerability to specific diseases. General Comment 14 sets out four criteria by which to evaluate the right to health: a) *Availability* to allow Functioning public health and health facilities, goods and services, as well as programmes, have to be available in sufficient quantity; b) *Accessibility* of Health facilities, goods and services

have to be accessible to everyone without discrimination, within the jurisdiction of the State party; c) *Acceptability* of all health facilities, goods and services must be respectful of medical ethics and culturally appropriate, sensitive to gender and life-cycle requirements, as well as being designed to respect confidentiality and improve the health status of those concerned; and, d) *Quality* of Health facilities, goods and services must be scientifically and medically appropriate and of good quality.

The right to health is a fundamental human right, yet there is opportunity for States to limit their responsibilities to exercise public health protection. The Covenant's limitation clause, article 4, is primarily intended to protect the rights of individuals rather than to permit the imposition of limitations by States. A State party for example can "*restrict the movement of, or incarcerates, persons with transmissible diseases such as HIV/AIDS, refuses to allow doctors to treat persons believed to be opposed to a government, or fails to provide immunization against the community's major infectious diseases, on grounds such as national security or the preservation of public order*", has the burden of justifying such serious measures in relation to each of the elements identified in article 4. As elaborated in article 5.1, such limitations by a State must be proportional. Proportionality means that measures must be least restrictive with alternatives adopted, they should be of limited duration and subject to review by UN Human Rights Council.

Additionally, the right to health is recognized, inter alia, in the CERD of 1963, the CEDAW of 1979 and in the CRC of 1989. Several regional human rights instruments also recognize the right to health, such as the European Social Charter of 1961 as revised, the African Charter on Human and Peoples' Rights of 1981 and the Additional Protocol to the American Convention on Human Rights in the Area of Economic, Social and Cultural Rights of 1988 (the Protocol entered into force in 1999). Similarly, the right to health has been proclaimed by the Commission on Human Rights and further elaborated in the Vienna Declaration and Programme of Action of 1993 and other international instruments.

New trends and developments in international legal framework pertaining to health and human rights

In recent years, there have been considerable developments in international law with respect to the normative definition of the right to health, which

includes both health care and healthy conditions (Yamin, 2005). These norms offer a framework that shifts the analysis of issues such as disparities in treatment from questions of quality of care to matters of social justice. When assessing the new additions to the international legal framework, there appears to be a trend towards a more inclusive definition of the right to health for specific segments of the population, most notably children and disabled persons, and within specific contexts.

For instance, The Convention on the Rights of the Child was adopted and opened for signature, ratification and accession by General Assembly resolution 44/25 of 20 November 1989. It entered into force 2 September 1990, in accordance with article 49. The Children's Convention have some powerful provisions regarding child health, yet to help stem the growing abuse and exploitation of children worldwide, in 2000 the United Nations General Assembly adopted two Optional Protocols to the Convention to increase the protection of children from involvement in armed conflicts and from sexual exploitation. First was the Optional Protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography, adopted and opened for signature, ratification and accession by General Assembly resolution A/RES/54/263 of 25 May 2000, entry into force on 18 January 2002. Second was the Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict, adopted and opened for signature, ratification and accession by General Assembly resolution A/RES/54/263 of 25 May 2000, entry into force 12 February 2002. The fact that special emphasis was provided to child well-being in conflict settings is indicative of a trend towards context specific and focus on specific vulnerable groups in the population.

More recently, the United Nations passed a resolution protecting the rights of disabled persons that is also indicative of the trend in focusing on specific vulnerable groups and recognizing the unique health, developmental and economic challenges these groups face in society. The Convention on the Rights of Persons with Disabilities is an international human rights treaty of the United Nations intended to protect the rights and dignity of persons with disabilities. The Convention which opened for signature on 30 March 2007 became one of the most quickly supported human rights instrument in history, with strong support from all regional groups. 155 States signed the Convention upon its opening in 2007 and 126 States ratified the Convention within its first five years (UN, 2012). Article 25 provides explicit protection on health grounds specifying that "persons with disabilities have the right to the enjoyment of the highest attainable standard of health without discrimination on the basis of

disability", with "States Parties shall take all appropriate measures to ensure access for persons with disabilities to health services that are gender-sensitive, including health-related rehabilitation. Highly relevant to the research question posed in this thesis, was the emphasis the 2007 Convention placed on rights of disabled persons in situations of humanitarian emergencies. Article 11 of the convention on 'Situations of risk and humanitarian emergencies' stipulates that States Parties shall take, in accordance with their obligations under international law, including international humanitarian law and international human rights law, all necessary measures to "ensure the protection and safety of persons with disabilities in situations of risk, including situations of armed conflict, humanitarian emergencies and the occurrence of natural disasters".

The review of international frameworks in this chapter have also revealed potential weaknesses in enabling health protection of civilians affected by conflict – that of the role of health professionals. In times of armed conflict and in post-conflict situations, civilian hospitals, medical facilities and health and medical staff may themselves become targets of war. Ensuring health protection requires steps not only to safeguard the lives of health workers involved in responding to humanitarian crises, but also ensuring the enabling environment is created for them to practice effectively. Essential to the human rights perspective of health are the obligations of the State and non-state actors in protecting the health care workers/health system in order to ensure the fulfillment of the individual's right to health. Health protection can also be enabled if the professionals responsible for the health care system are well trained, capacitated and committed to universal ethical principles and professional standards. The state is therefore responsible to establish and secure an enabling environment for health professionals to undertake interventions.

Indeed in 2002 the UN Member States at the 55th World Health Assembly in Geneva adopted a resolution WHA55 entitled "Health and medical services in times of armed conflict" (WHA, 2002), to protect medical missions and to enforce the protection of healthcare during conflict settings. Whilst the resolution was recognized as supportive of the Geneva Conventions to enforce the protection of healthcare during armed conflict, many human rights organizations and advocates called for the leadership by WHO to develop practical methods and mechanisms for the documentation of all violations of international humanitarian law against patients, health workers, facilities, and transports and to provide guidance to member States in how to increase protection of health functions in zones of armed conflict. Indeed a coalition

called “Safeguarding Health in Conflict Coalition” formed by aid organizations such as Doctors for Human Rights, International Council of Nurses and Physicians for Human Rights and other, advocated to WHO to urge passage of a new resolution—requiring the WHO to lead international data-collection of attacks on health workers, facilities, transports, and patients (Intrahealth, 2012). At the 65th World Health Assembly in Geneva in May 2012, WHO member states adopted a resolution requiring the WHO to lead international data collection on attacks involving health workers, facilities, transportation and patients during armed conflicts (WHA, 2012). The Safeguarding Health in Conflict coalition also appealed to WHO to ensure there is domestic and international prosecution of those responsible for intentional attacks on healthcare facilities, health workers, patients and the transport systems for providing drugs and medical supplies, which constitute war crimes under the laws of war (IHPI, 2012). This latter proposal however has yet to be adopted, with robust systems of accountability, with consequences for non-compliance of the resolutions still not enshrined by member states (Rubenstein, 2012).

The emergence of global epidemics such as SARS in 2003 and the implications of multinational corporations in influencing the health of populations such as the Tobacco and Pharmaceutical industries, have highlighted the urgent need to reform national public health laws and international obligations relating to public health in order to meet the new realities of a globalized world (Sohn, 2012). For instance, the WHO Framework Convention on Tobacco Control (2003) was a direct response to the need to ensure the right to health of all populations at risk of cancer and other morbidities due to cigarette smoke, and the revision of the WHO International Health Regulations in 2005 which provides a legal basis for the control and prevention of communicable diseases. Although discussions on such developments go beyond the scope of this thesis focused on a post-war health sector humanitarian response, such trends are expected to lead to enhancements within the existing international human rights instruments/ policy landscape.

In this analysis of normative frameworks, it also becomes apparent that there are complex linkages between health and human rights (WHO, 2002). The right to health is inter-related with, and expressed implicitly and explicitly in numerous articles. To speak of health in isolation of other rights then becomes futile. These inter-relationships, graphically presented in Figure 1, show the protection of specific rights of IDPs during disasters and their connection with the normative frameworks. Therefore the right to health operates directly or indirectly as a prerequisite to all other human

rights recognized in treaties. To deny someone health care is to deny or damage all that individual’s rights. Without health, individuals are denied their right to be contributing members of the community and to provide for their families. Individuals who lack adequate health care can thus lose some or all ability to exercise fully the civil, political, economic, social, and cultural rights they possess. As Perrin in his analysis of *The Right to Health in Armed Conflict* articulates, the protection of the right to health requires the complement of the entire legal framework; “While IHL integrates specific considerations, striking a balance between humanitarian considerations and military necessity, human rights law remains relevant to complement IHL in order to fill the potential gaps” (Perrin, 2009).

Finally, the SPHERE Standards were presented as an important and practical resource/tool to guide Governments and humanitarian actors to ensure the Right to Health is realized for disaster affected populations. However, it is important to point out that the SPHERE standards reflect the minimum standards and package of essential live saving care. What should aimed for is not the minimum, rather to achieve the realization of the entire complement of care afforded to other non-displaced members of the society.

The rights of internally displaced persons

All persons are entitled to enjoy, equally and without discrimination, the same rights and freedoms under international and national law. There are various bodies of International law that provide a comprehensive International legal framework for protection in all situations, including those during armed conflict. However, there are three bodies of law that provide a legal framework for protection in all situations of internal displacement: International human rights law (IHR), International humanitarian law (IHL), and finally International criminal law (ICL). A fourth element is also considered: “The Guiding Principles on Internal Displacement” (GPID). While the GPID is not a law, it sets out the rights of IDPs and the responsibilities of States and other authorities towards them. Other internationally developed instruments, guides and standard operational principals and articulate the right to health for displaced populations. These include the SPHERE Project which sets a Humanitarian Charter and Minimum Standards in humanitarian intervention, and Codes of Conduct enshrined in individual agencies such as those International Red Cross & Red Crescent Movement.

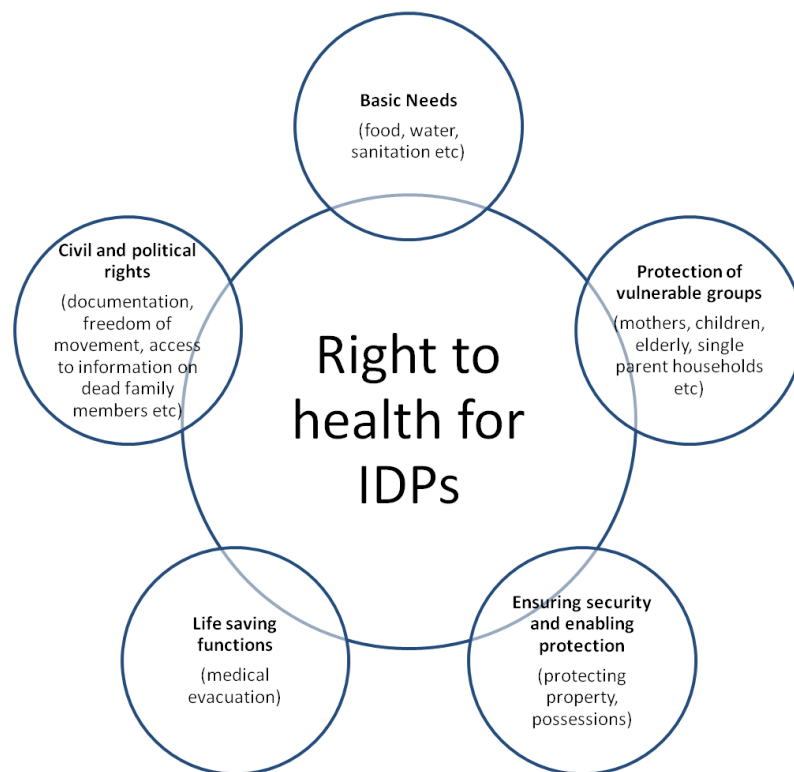
Duty to Protect in reference to Internally Displaced Persons (IDPs)

Internally Displaced Persons (IDP) are defined as persons who are uprooted for reasons of war, disaster or persecution, and move within the borders of their own nations [1]. During the three decades of armed conflict between the Sri Lankan armed forces and the Liberation Tigers of Tamil Eelam (LTTE), it is estimated that over a million people were displaced. As of the end of September 2012, more than 115,000 internally displaced people (IDPs) were still living in camps, with host communities or in transit sites, or had been relocated to areas other than their places of origin in Sri Lanka [2].

Refugees, by definition, are outside of their country of nationality or habitual residence.¹ Both categories of displaced persons often face similar risks and deprivations. Unlike IDPs however, refugees have a legal status under international law. IDPs are primarily the responsibility of the state and come under the purview of state law.

This has resulted in many debates being raised as to the level of international community's involvement in IDP crisis. IDPs depend on the state for protection and assistance. IDPs' fundamental rights and freedoms and economic and political freedoms are often compromised. Therefore the protection needs and risks of this sector are generally higher than those of the general population. Involuntary departure and the fact that the individual remains within his/her country are the two defining elements of an internally displaced person (IDP). Figure 1 adapted from the WHO, shows the required multi-sectoral approach for protecting the health rights of IDPs (Bile et al., 2011). As summarized in Figure 1, the right to health for IDPs, lie at the fulcrum of the right to life, economic, social and cultural rights and civil and political rights. It therefore highlights internal displacement as a core human rights problem, and not merely a humanitarian issue that requires humanitarian response. Internal displacement violates civil and political as well as economic, social and cultural rights.

Figure 1: Protection of specific human right during disasters and their connection with health rights



¹ A refugee is defined as a person who owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his/her nationality or habitual residence, and is unable, or owing to such fear, is unwilling to avail himself/herself of the protection of that country. See Art. 1 of the 1951 Convention Relating to the Status of Refugees.

Each State bears the primary responsibility for protecting internally displaced persons, and all persons within their own country. National responsibility is a core concept of any response to internal displacement. The role of the international community cannot directly affect the protection of IDPs since IDPs are a function of state sovereignty. Even as governments themselves may act as perpetrators of violence, and human rights violations against their own citizens, the role of international actors is to reinforce, not replace, national responsibility.² The State must not only ensure the protection of rights in accordance with international law, but responsibly enable indigenous strategies and domestic legal protections in situations of internal displacement. The international strategic framework entitled *Addressing Internal Displacement - Framework for National Responsibility* sets 12 key actions for states to implement in relation to IDP protection [3]. Today it forms a sort of ‘checklist’ for protection of IDPs and gauge responses by the State. In addition to entailed is contained in the 12 elements. This framework will be applied in later chapters as an attempt to determine the extent to which the Sri Lanka authorities ensure the right to health for those Internally Displaced in the aftermath of the most recent civil conflict.

Domestic Legal Framework in Sri Lanka

The Government of Sri Lanka (GoSL), with its dualist system of law making has a responsibility to ensure that their national laws and policies respect and reflect their obligations under international law, including those contained in international human rights and humanitarian law. More specifically, national legislative and policy frameworks should respect the rights and guarantees to which IDPs are entitled under international law, and be consistent with Sri Lanka’s international legal obligations. IDP Protection strategies and activities should also take into account relevant domestic traditional, customary, or religious dispute resolution mechanisms.

While the local laws are applicable to IDPs, the analysis below provides evidence that there is no policy coherence, and in some cases, ‘non-progressives’ in legislation to address the right to health of the displaced. Further, there is no overarching national legal framework that specifically and holistically refers to right to health for those internally displaced. The result of this is that IDPs may be deprived of their rights and marginalized of their agency and aspiration. Thus, in Sri Lanka, existing health provisions applicable to IDPs are scattered in an unsystematic manner, with little cohesion. Nonetheless, the rights of IDPs are partially secured by approximately 11 existing national laws/acts described in detail below. Of these, the vast majority were created between 2002 and 2007.

Though the *Right to Health* it is not directly stipulated as a Constitutional right, there are instruments in Sri Lankan fundamental rights field that may be evoked. According to the *Article 12 (1)* of Constitution, “all persons are equal before the law and are entitled to the equal protection of the law. Therefore, special mechanisms, if the situation requires should be provided to uplift their rights because different qualities of health standards for persons residing in different geographic locations may constitute discrimination under the Article 12 of Sri Lankan Constitution. Common laws that apply to all states citizens are also invoked in protecting IDP rights. Statutes like Penal Code, Food Act, Health Service Act and provincial statues on health service have specifically laid down provisions to maintain and preserve public health. IDPs too, are entitled to these constitutional and statutory rights, with no distinctions to their status as IDPs. The discussion below analyses the domestic legal framework in ensuring the right to health of internally displaced persons in Sri Lanka.

The Sri Lankan Constitution

The Fundamental Rights Chapter 3 of the Sri Lankan Constitution³ does not explicitly express and recognize the right to health. As described earlier, the only reference given to health is as a suspension or derogation where Article 7 of the Fundamental Rights of the constitution states, “*in the interests of national security, public order and the protection of public health...*” the state may

² In situations of armed conflict, both State and non-State actors, have a responsibility to respect and ensure respect for international humanitarian law, including by providing protection and assistance to the civilian population.

³ A constitutional right is a legal right granted by a sovereignty's constitution to its citizens and possibly others within its jurisdiction.

withhold rights. The Sri Lankan Constitution guarantees that “(1) All persons are equal before the law and are entitled to the equal protection of the law”, and, (2) “No citizen shall be discriminated against on the grounds of race, religion, language, caste, sex, political opinion, place of birth or any such grounds”.

Even though there is no explicit statement in the Constitution of Sri Lanka on the *right to health*, the constitution does clearly articulate the right to life in Articles 11 and 13.4 of the constitution. This inalienable right of life is indeed a pragmatic link to the right to health since there is no life without health. Therefore it may also be argued that the right to health is protected under the Sri Lankan Constitution because the right to life would be meaningless without it.

A prime example where the *right to life* clause has enabled the right to health is seen by the landmark decision of Justice Mark Fernando made in the Supreme Court in the case of Sanjeewa, AAL (on behalf of G.M.Perera) V Suraweera, OIC, Wattala and others, where he cited the Article 12 of the ICESCR⁴. The bench ruled in this case that “citizens have the right to choose between state and private medical care to save one torture victim's life”. Justice Mark Fernando submitted that the infringement of a right to health can be justifiable under the Sri Lankan Constitution because the right to life would be meaningless without providing essential health care¹⁷.

An interesting comparison can be made with the constitution of Mozambique, another country, like Sri Lanka, that was subjected to a protracted civil crisis which led to millions of internally displaced persons. In Mozambique's Constitution, the articulation and enshrinement of the *right to health* within the Fundamental Rights, Duties And Freedoms of the Constitution, provides that “all citizens shall have the right to medical and health care, within the terms of the law, and shall have the duty to promote and preserve health” [4]. The Constitution clearly states that “medical and health care for citizens shall be organized through a national health service which shall benefit all Mozambicans”. Thus the right to health is explicitly expressed within its constitution for citizens.

The *Right to health* is given a statutory recognition in numerous Statutory Rights⁵ in Sri Lanka. The 13th Amendment of Sri Lanka's Constitution (Certified on 14th November, 1987) devolves major elements of health care to Provincial and District level Government authorities, to especially promote more efficient administration by the local Authorities in relation to public health. As per the List I (Provincial Council List of 9th Schedule) referred in Article 154A of 13th Amendment to the Constitution, “the establishment and maintenance of public hospitals, rural hospitals, maternity homes, dispensaries (other than teaching hospitals and hospitals established for special purposes); “Public health services, health education, nutrition, family health, maternity and child care, food and food sanitation, environmental health and Formulation and implementation of Health Development Plan and of the Annual Health Plan for the Province come under the purview of relevant Provincial councils. According to the Concurrent List (List III referred 13th Amendment of the Constitution), schools for training of Auxiliary Medical Personnel; the supervision of private medical care, control of nursing homes and of diagnostic facilities within a Province; Population control and family planning and Constitution of Provincial Medical Boards are to be done by both parties”. Other Subjects and Functions not Specified in List I or List III are reserved by the Central Government. These include such components as financial allocation of health budgets.

The Sri Lankan Penal code

Sri Lanka's criminal code is a document which compiles all, or a significant amount of, a particular jurisdiction's criminal law [5]. Typically a criminal code will contain offences which are recognized in the jurisdiction, penalties which might be imposed for these offences and some general provisions (such as definitions and prohibitions on retroactive prosecution. In Sri Lanka's Penal code 3 sections cite offences affecting the public health: *Section 271. Making atmosphere noxious to health, Section 262. Negligent act likely to spread injection of any disease dangerous to life and Section 263. Malicious act likely to spread infection of any disease dangerous to life.*

⁴ Silva v Iddamalgoda 2003 2 SLR 63, Rani Fernando v OIC Seeduwa Police, SC/FR/700/2000, SCMinutes 26.07.2004 and described in paper by Dissanayake, S (2009) “Right to Health” of Internally Displaced Persons, Human Rights Commission of Sri Lanka.

⁵ Statutory rights are an individual's legal rights, given to him or her by the local and national ruling government.

These sections make it punishable “to do a negligent or malicious act likely to spread infection of any disease dangerous to life”. In addition, adulteration of foods, making atmosphere noxious to health, fouling the water of a public spring or reservoir, inter alia are made as offences under the Penal Code and also under the Food Act. Commentators have concluded that according to these provisions, “no doubt exists” as to the recognition of the statutory right regarding right to health [6].

Sri Lanka's Emergency Laws and implications for public health protection

The Sri Lanka Penal Code does contain many provisions where the state can charge and prosecute individuals who are considered “enemies of the state and terrorists”. Two additional sets of laws—the *Public Security Ordinance 1947 (PSO)*, dating back to British colonial rule [7], and the *Prevention of Terrorism (Temporary Provisions) Act of 1979 (PTA)*— provides the state broad powers to hold individuals without charge or trial in violation of their basic due process rights [8]. The Prevention of Terrorism Act, enacted in 1979, allows arrests without warrant and permits detention without the suspect being produced before a court for up to 18 months.

The government formulated more than 20 new emergency regulations in 2005, following the assassination of the then Foreign Minister, Lakshman Kadirgamar. Two important emergency laws formulated in 2005 were: *The Emergency (Miscellaneous Provisions and Powers) Regulation No. 1 of 2005* and the *Emergency (Prevention and Prohibition of Terrorism and Specified Terrorist Activities) Regulation No. 7 of 2006*, provide military personnel with sweeping powers of arrest and detention without regard to the fundamental rights protections provided by international law. The key features/powers to state activated by these two emergency laws may also allow for the detention of any person “acting in any manner prejudicial to the national security or to the maintenance of public order, or to the maintenance of essential services”. The State may: a) Allow for detention of persons without charge for up to one year. This can be extended for an additional six months, or 18 months altogether. The Emergency Regulations provide for a detainee to be physically produced before a magistrate within 30 days (instead of within one day (24 hours) under the criminal procedure code); or b), Authorities need **not** submit a written record

of arrest and detention to the court, or ensure the rights of detainees to be notified of the reasons for arrest or for detainees to have access to legal counsel.⁶

It is important to highlight in this discourse on health and human rights that the IDP camps were not managed under civilian administration (through the Government agent), rather by the Ministry of Defense (under the purview of a military officer titled “Competent Authority of IDP care”). Health care services within the IDP camps were however managed by the Ministry of Health under the guidance of the Minister of Health, Secretary of Health and under field operational leadership of Directorate of IDP Health Care. The competent authority for IDPs restricted movement of displaced persons out of Menic Farm IDP camp during the first 6 months, permitting only those deemed severely ill requiring referral to specialized medical facilities, or those who had obtained special consent from authority to depart camp. Both international and local humanitarian agencies were also initially subjected to restricted movement/access into the IDP settings, although access to undertake interventions were granted to UN agencies and increased within 2 to 3 months of camp establishment. The rationale provided for such measures were that tight enforcement of camp movements were needed until LTTE cadres from within the displaced civilian population were identified and referred for Government rehabilitation and reintegration programs [9]. Emergency laws of Sri Lanka were invoked via parliamentary process, and other anti-terrorism legislation as ground for the state to undertake measures to isolate those ‘enemies of the state’. The restrictions on civilian movements in and out of Menic Farm were lifted after this phase. Some advocacy groups termed such restrictions, to both humanitarian access and movement of IDPs’ as ‘unlawful’ [10].

The Sri Lanka Penal Code contains many provisions where the state may indeed charge and prosecute individuals who are considered “enemies of the state and terrorists”. The Prevention of Terrorism Act (PTA), enacted in 1979, allows arrests without warrant and permits detention without the suspect being produced before a court for up to 18 months. The government may hold a person under the PTA on suspicion and need not charge the person with an offense. The government formulated more than

⁶ Showing that important requirements of Sri Lankan law are not applicable under the emergency regulations.

20 new emergency regulations in 2005, following the assignation of Foreign Minister Lakshman Kadirgamar. Two important emergency laws formulated in 2005 were: The Emergency (Miscellaneous Provisions and Powers) Regulation No. 1 of 2005 and the Emergency (Prevention and Prohibition of Terrorism and Specified Terrorist Activities) Regulation No. 7 of 2006, provide military personnel with sweeping powers of search, arrest, and detention without regard to the fundamental rights protections provided by international law. Authorities need not submit a written record of arrest and detention to the court, or ensure the rights of detainees to be notified of the reasons for arrest or for detainees to have access to legal counsel. According to Human Rights Watch Report (HRW) of Sri Lanka in 2010 [10], the emergency regulations of Sri Lanka are “vaguely worded” and claim to facilitate arbitrary arrest of suspects. Habeas corpus is a writ requiring a person under arrest to be brought before a judge or into court, especially to secure the person’s release unless lawful grounds are shown for their detention [11]. Habeas corpus is an important aspect of human rights, and article 141 of the Sri Lankan constitution, provides for the right of habeas corpus [12]. The HRW alleges that Sri Lanka Emergency Regulations violates article 141 of constitutional rights by allowing authorities to hold detainees in irregular places of detention, move a detainee from place to place for interrogation, and do not require the publication of a list of authorized places of detention [13]. The HRW report argues that the term “prejudicial to the national security” is not further defined and “could be interpreted to include peaceful or nonviolent acts protected under the rights to free expression or association”.

In discussing the *Right to Health* as a Universal Human Right Norm, it becomes important to expand on the key international instruments and how they enshrine the right to health. International human rights law provides protections to individuals in custody during an internal armed conflict unless they are superseded by more specific provisions of humanitarian law. International humanitarian law (*the laws of war*) exists as international humanitarian law and human rights law, and are applicable during internal armed conflicts such as the conflict in Sri Lanka. Importantly, *international human rights laws* includes the International Covenant on Civil and Political Rights (ICCPR)[14], which Sri Lanka ratified in 1980, and the Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment[15], the Convention on the Rights of the Child[16], and other sources of human rights law. Human rights can only be suspended in certain circumstances, such as during a declared state of emergency, where the State may temporarily derogate from (suspend) certain

rights. Such suspension is subject to strict requirements outlined in the *Siracusa Principals*. The ICCPR also permits states to suspend or restrict (derogation) certain rights during a state of emergency. There are however, a number of human rights that cannot be restricted in any circumstance including *the right to life, as freedom from torture and slavery and freedom of thought, conscience and religion*.

A UN report alleged serious human rights violations against the Government of Sri Lanka (labeled in media as the *Darusman Report*) and also in recent UNHRC debates on Sri Lanka, that the Sri Lankan government violated the fundamental human rights, including the right to be informed of specific reasons for arrest, the right to challenge the lawfulness of the detention before an independent judicial authority (habeas corpus), and the right of access to family members while the displaced population lived in Vavuniya IDP camps [17]. The Government of Sri Lanka maintained that the final assault on the LTTE in the Wanni region from early 2009 was based on ‘humanitarian grounds’. The Government military spokespersons and the political leadership labeled the final conflict as a ‘*rescue mission*’ to ensure the *protection of rights* of those innocent civilians incarcerated by the LTTE”. The State embraced the view that the assault was part of an *obligation to protect civilian life and respect and fulfill the right to health*, within their jurisdictions.

Acts, policies and legislation relevant to upholding the right to health of IDPs in Sri Lanka

a) Rehabilitation of Persons, Properties and Industries Authority Act, No. 29 of 1987- was drafted “to assist the owner of any affected property to repair and restore such property. Under the Act, the Government of Sri Lanka (GoSL) upholds the responsibility of creating an authority to assist in the repair, restoration, or rehabilitation of persons, properties industries. This act derives some elements from the Principles on Housing and Property Restitution for Refugees and Displaced Persons (*Pinheiro Principles*).

b) Welfare Benefits Act, No. 24 of 2002 - provides the necessary legal framework for the payment of welfare relief benefits and formulates the guidelines for a transparent selection process for welfare recipients.

c) Mediation (Special Categories of Disputes) Act, No. 21 of 2003 - this Act dictates the creation of arbitration

boards for special categories of disputes, including those that relate to resettlement. Although most special categories are not clearly defined in the act, the authority created in the process upholds the responsibility of identifying and defining these special circumstances.

d) Sri Lanka Disaster Management Act, No. 13 of 2005 - called for the establishment of the National Council for Disaster Management, the Disaster Management Centre, and technical advisory committees, amongst other entities. These entities are responsible for the preparation, coordination, and management of disaster-related plans and programs.

e) The Tsunami (Special Provision) Act, No. 16 of 2005 and Registration of Deaths (Temporary Provision) Act, No. 17 of 2005 served in the pressing aftermath of the 2004 tsunami to address temporary and immediate coordination and distribution channels for humanitarian aid and relief.

f) The Geneva Conventions Act, No. 04 of 2006 gives “effect to the first, second, third, and fourth Geneva Conventions on Armed Conflict and Humanitarian Law [19]. Adherence to the obligations under the Geneva Conventions has a bearing on the status of Sri Lanka’s IDPs, and the government is obligated under International Humanitarian Law in protecting the rights of civilians during times of war.

g) National Child Protection Authority Act, No 50 of 1998. Recommends measures to address the humanitarian concerns relating to children affected by armed conflict and the protection of such children, including measures for their mental and physical well-being and their reintegration into society. A related, yet thematically different act is the Children and Young Persons Ordinance Act, which describes the age of legally entering workforce and conditions for child labour. It derives its formulate from the ILO convention with reference to child labour etc. ILO convention talks about the age of 14 years as the child labour age, and 14 to 18 is allowed but for ‘non harmful jobs’ which do not significantly impact on physical and mental development.

h) Mental Health Policy of Sri Lanka (2005), and the Mental Health Act of Sri Lanka, 2010 (currently submitted for Cabinet approval). The National Mental Health policy applies latest advances in mental health care and treatment, and reshaping more power to patients and for community based rather than institutional care. Whilst it does not explicitly mention IDPs, it acknowledges the fact that after protracted civil conflict, the need for community mental health services are even more pronounced. The

policy principles articulate, the protection of ‘the human rights and dignity of people with mental illness’ and for ensuring ‘mental health services will be culturally appropriate and evidence based’.

i) Resettlement Authority Act, No. 09 of 2007 - decrees the “Establishment of an authority to be called the Resettlement Authority; to vest the Authority with the power to formulate a national policy and to plan, implement, monitor, and co-ordinate the resettlement of the internally displaced persons and refugees [19]. The Resettlement Authority Act has functions to ensure that resettlement or relocation of IDPs in a safe and dignified; and that IDPs are engaged in the development process of the country. The Act is limited in its protection of more recent IDP case loads, since it articulates the protection of those protracted IDPs (from 1983 to the 2006), and not the ones most recently displaced. The Act is also not intended to provide provisions for resettlement, rather ‘to coordinate activities’ of IDPs.

j) International Covenant on Civil and Political Rights Act of Sri Lanka No. 56 OF 2007. Is perhaps the most powerful Act in term of guaranteeing rights of IDPs, although it does not explicitly mention IDPs. Its power lies in the fact that it allows for the High Court to exercise jurisdiction over the enforcement of the human rights recognized under this Act. There is no such clause even in the Fundamental Rights chapter in the Sri Lankan Constitution. Technically, this Act provides leverage for securing rights for IDPs who are after all citizens of the State.

k) National Migration Health Policy of 2013. Provides emphasis on all forms of migrant and mobile populations, including those ‘forced migrants’ (as refugees and IDPs). The policy articulates an inter-ministry approach in ensuring the public health safety of the migrants, irrespective of irregular (undocumented) and regular status, and also ensure the public health of host population. The policy articulates a *rights-based* approach to health, and emphasizes State functions to ensure the right to health is fulfilled via health assessment, border health interventions and reintegration of returnee migrants by health system, to name a few dimensions.

l) National Action Plan for the Protection and Promotion of Human Rights (2011 to 2016). Internal displacement violates civil and political as well as economic, social and cultural rights. There is a need to highlight internal displacement as a core human rights problem. It is not only a humanitarian issue that requires humanitarian response. Indeed a positive development the Government of Sri Lanka has taken, which some critiques may say symbolically, has been the launch of a *National*

Action Plan for the Protection and Promotion of Human Rights (2011 to 2016). The plan was developed by a range of civil society, academic and government agencies between 2010 to 2011. The government strategy to improve the rights of IDPs has been further strengthened by the activities contained in the priority areas on IDPs articulated in a National Action Plan. The Ministry of Resettlement and the Ministry of Disaster Management are the main 'focal' departments responsible for the implementation of the majority of recommendations for IDP rights, with support of the relevant line-ministries. While the Government of Sri Lanka has not chosen to adopt the GPID as a Government Policy for assisting IDPs affected by the conflict, it may be argued that the National Action Plan for the Protection and Promotion of Human Rights and other domestic policy instruments provide sufficient protections for IDPs by way of a nationally accepted action plan, where if implemented, may contribute in realization of the right to health.

Other relevant instruments, protocols and groups:

A positive step taken by the Ministry of Health within one year of displaced persons entering Menic farm was the establishment of *National Standard Operating Procedures and National Guidelines in Health Sector Disaster response*. The guidelines were developed by the DPRU, the same unit that coordinated the health sector efforts, after extensive consultation from medical colleges, academia, UN agencies and NGOs. The detailed guidance notes encompass all aspects of disaster response and is now delivered as a modular course to help capacitate medical officers as humanitarian health sector focal points throughout the country. However as indicated by the 55th and 65th World Health Assembly Resolutions in encouraging health care workers and health system to systematically measure violence related incidents through its various typologies (explained in previous chapter) is still not mandated in the Ministry of Health plans. Better training of public health workers in undertaking conflict sensitive and culturally appropriate strategies for violence prevention and mitigation may serve to boost the existing *National Standard Operating Procedures and National Guidelines in Health Sector Disaster response*.

Sri Lanka IDP Protection Working Group (IPWH). In Sri Lanka, an IDP Protection Working Group (IPWH) was established by UNHCR in 2006 to serve as an Inter-Agency forum to bring actors together to discuss protection issues related to the conflict, IDPs and returnees at a national level. The Working Group aims to strengthen collaboration between agencies, identify needs and gaps, and advise the Government of Sri Lanka) and UN Country Team on protection issues. The IDP Protection Working

Group has strong links with IDP protection fora in the districts and reports on a regular basis. The IDP Protection Working Group's membership consists of both UN and non-UN actors [20]. The IDP Protection Working Group is chaired by UNHCR and reports periodically to the Inter Agency Standing Committee ('IASC') and Consortium of Humanitarian Agencies on protection issues. Despite the broad mandate of the IPWG, it is unclear how the group contributed to the humanitarian response that emerged following the resolution of military conflict in 2009. There is little documented evidence and references to the activities of the IPWH during this period.

Summary

This paper aimed to provide a brief overview of the principles in relation to Right to Health for IDPs in Sri Lanka and how these are enshrined within domestic legal frameworks. To summarize, the right to health is enshrined under multiple policies and legal provisions. While the language varies across such documents, it is noted that three key concepts emerge across all international instruments: First, it is the State that has the responsibility to guarantee their citizens the right to adequate health. Secondly, the State has the responsibility to ensure that none of their citizens are deprived of this right by state action. Finally, these rights are guaranteed to all citizens, regardless of displacement status, race, religion, gender, age, or social standing in the community, or other status. In this analysis of normative frameworks, it also becomes apparent that there are complex linkages between health and human rights (WHO, 2002). The right to health is inter-related with, and expressed implicitly and explicitly in numerous articles. To speak of health in isolation of other rights then becomes futile. These inter-relationships, as graphically presented in Figure 1, show the protection of specific rights of IDPs during disasters and their connection with the normative frameworks. Therefore the right to health operates directly or indirectly as a prerequisite to all other human rights recognized in treaties. To deny someone health care is to deny or damage all that individual's rights. Without health, individuals are denied their right to be contributing members of the community and to provide for their families. Individuals who lack adequate health care can thus lose some or all ability to exercise fully the civil, political, economic, social, and cultural rights they possess. As Perrin in his analysis of *The Right to Health in Armed Conflict* articulates, the protection of the right to health requires the complement of the entire legal framework; "While IHL integrates specific considerations, striking a balance between humanitarian considerations and military necessity, human rights law remains relevant to complement IHL in order to fill the potential gaps" (Perrin, 2009).

Ensuring IDP health protection beyond acute phases

Many studies have shown that long after the ‘last bullet is fired’ from the barrel of a gun, the health consequences of war linger on. They linger not only in the buried landmines that result in blast injuries even decades after the peace-agreements are signed, but as traumatic events buried within scarred minds, and at the most fundamental level of our genes. Solana (2006) argues that, ‘when crises are being resolved long term health issues are addressed last. Public health policy is thus seldom thought of in human security terms’. Well into periods of lasting peace, the contaminants of war such as landmines and UXOs continue to kill and maim civilian populations. The constant displacement, both as internally displaced persons or as refugees fleeing the state boundaries, leads to disruptions in vaccination campaigns, micronutrient supplementation programs, and other public health efforts. The ‘downstream’ impact of such chronic nutritional deficiencies may also lead to abnormal child growth outcomes (Gluckman, 2007). Generational impacts can also be seen in children born to underweight mothers, where stunting (height-for-age) and poor cognitive function development may also occur. The “fetal programming hypothesis,” also known as the “developmental origins of health and disease” suggests that conditions very early in human development, even *in utero*, can leave lasting imprints of an organism’s physiology, imprints that may ‘affect susceptibility to diseases’ with onsets that may occur many decades later (Gluckman, 2007).

A seminal study by Susser and colleagues (1998) on the follow-up of children conceived during the Nazi occupation of Holland at the end of World War II implicated fetal stress to poor psychiatric outcomes later in adult life. Also called the “Dutch Hunger children study”, the research provided a natural experiment in which pregnant women, along with the rest of the civilian population, were subjected to extreme food deprivation during a relatively discrete period of conflict (Terry, 2001). There was clearly a statistically significant elevation of risk of schizophrenia and related disorders among those whose mothers went through the peak of the famine during their second trimester of pregnancy (Brown, 2000). These findings have also been validated in other studies of individuals born during times of hunger and famines in China (St Clair, 2005). The affect chronic stress has on reshaping the human genome has also been revealed in Nobel Prize winning research (Epel, 2004). Evidence suggests that prolonged psychological stress not only influences disease processes and cellular immunity but also affect molecules that play a key role

in aging. The implications of these research findings to those war affected populations that have experienced significant chronic stress through protracted conflicts and multiple displacements are yet to be explored.

These findings bring new insights and challenges into the ‘ripple effect’ on human health, development and well-being long after the resolution of conflict. Therefore, even though the ‘right to health’ may be realized for those displaced during the period of their stay in IDP camps, the fact that there are longitudinal consequences pertaining to health protection is of significant value, and a one often overlooked by health authorities, aid health agencies and human rights activists. It is argued that health systems need to account for and addressing such effects in health policy and planning following a humanitarian crisis.

From this analysis of the domestic legal framework that Sri Lanka has a somewhat robust and well articulated means of ensuring protection of those displaced. There appears to be sufficient provision for the fulfillment for the rights to health for IDPs despite the fact that the right to health is not enshrined as a Fundamental Right Sri Lanka’s Constitution. The perpetual challenge then remains in the implementation of such Acts, Regulations and Policies; and also in the attitudes and determination of the state which views and values sovereignty over domestic affairs over international law. Concepts of sovereignty tend to be socially and politically conditioned and is therefore not static. Some states clinic to the notion of absolute power at domestic level.

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Prevalence of depression and its associated factors among patients attending primary care settings in the post-conflict Northern Province in Sri Lanka: A cross-sectional study

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ABSTRACT

Background

In Sri Lanka, civilians in the Northern Province were affected by a long-term armed conflict that ended in 2009. This study aims to describe the prevalence of depression and its associated factors among adult patients attending primary care settings in the Northern Province in Sri Lanka.

Methods

We report data from a cross-sectional patient morbidity registry established in 16 primary care facilities (12 Divisional Hospitals and 4 Primary Medical Care Units) in four districts of the Northern Province. The Patient Health Questionnaire-9 (PHQ-9) was used to assess depression among all patients aged ≥ 18 years, between March and May 2013. A sample of 12,841 patient records was included in the analysis. A total score of ≥ 10 in the PHQ-9 was considered as major depression. Factors associated with major depression were tested using multivariable logistic regression analysis.

Results

The prevalence of major depression was 4.5% (95% CI: 4.1–4.9) and mild depression was 13.3% (95% CI: 12.7–13.9). The major depression was significantly higher in females than males (5.1% vs. 3.6%) and among unpaid family workers (6.0%) than any other category who earned an income (varied between 1.2% and 3.2%). The prevalence was rising significantly with advancing age, and ranged from 0.3% in the youngest to 11.6% in the elderly.

Multivariable regression analysis revealed that the females have a higher risk for major depression than males (OR = 1.4; 95% CI: 1.1–1.7). Older patients were more likely to be depressed than younger patients, OR (95% CI) were 4.9 (1.9–12.5), 5.6 (2.2–14.0), 5.7 (2.3–14.2) and 4.7 (1.8–11.9) for the age groups 25–34, 35–49, 50–64, and ≥ 65 years respectively, in contrast to 18–24 year group. Disability in walking (OR = 7.5; 95% CI: 5.8–9.8), cognition (OR = 4.5; 95% CI: 3.6–5.6), self-care (OR = 2.6; 95% CI: 1.7–4.0), seeing (OR = 2.3; 95% CI: 1.8–3.0), and hearing (OR = 2.0; 95% CI: 1.5–2.5) showed significant associations with depression.

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Conclusions

Depression is a common issue at primary care settings in a post-conflict population, and the elders, women and persons with disability are at a greater risk. Strengthening capacity of primary care facilities and community mental health services is necessary for early detection and management.

Keywords

depression, mental health, primary care, post-conflict, Patient Health Questionnaire, PHQ-9

Introduction

Depression is a major public health problem that affects patients and society [1,2]. The clinical condition named as unipolar depression, is characterized by depressed mood, hopelessness, helplessness, intense feelings of guilt, sadness, low self-esteem, thoughts of self-harm and suicide [3]. The estimates of global disease burden ranked depression as the fourth leading cause of disease burden in the year 2000, accounting for 4.4% of total Disability Adjusted Life Years (DALYs) [4]. Depression is known as one of the most prevalent yet treatable mental disorders presenting in general medical as well as specialty settings [5,6]. About one in ten patients seen in the primary care settings suffers from some form of depression [7,8]. According to a systematic review, depression substantially increases the risk of death, and gives rise to other chronic disease conditions such as cardiovascular disease [9].

The World Mental Health Survey reported that 15% of the population from high-income countries compared to 11% from low and middle-income countries were likely to get depression over their lifetime [10]. Globally, 5.5% reported having an episode of depression in the previous year. Studies from the South Asian region show varying prevalence of depression possibly due to differences in the study settings and instruments used to measure it. For example, the age-adjusted prevalence of depression in an urban South Indian population was 15.9% according to *Patient Health Questionnaire-12* (PHQ-12) [11], in contrast to 45.9% in urban Pakistan according to *depressive symptom questionnaire* [12]. It was found to be 29% in rural Bangladesh using the *Montgomery and Aasberg Depression Rating Scale (MADRS)* [13]. In Sri Lanka, there is a scarcity in mental health research, and only few studies have reported depression and its correlates [14]. According to the national mental health survey of Sri Lanka conducted in 2007, depression was assessed using the *Patient Health Questionnaire-9* (PHQ-9), and the prevalence of major depression was 2.6% [15]. The effects of war on mental health have been documented in previous literature, and the common

war-related mental health conditions included post-traumatic stress disorder (PTSD), anxiety and depression [16-18]. Studies in the post-conflict populations showed a definite increase in the incidence and prevalence of mental disorders, with women being more affected than men. Prevalence rates were associated with the degree of trauma, and the availability of physical and emotional support [19]. A study in Sudan after 20 years of war reported a high prevalence of mental disorders, for example, over one third of respondents met symptom criteria for PTSD, and half of respondents met symptom criteria for depression [20].

In Sri Lanka, civilians in the Northern Province were affected by 30-year long armed conflict that ended in May 2009. A household survey in 2009 among residents of Jaffna district in the Northern Province revealed a substantially high prevalence of symptoms of war-related mental health conditions, which were significantly associated with displacement status and underlying trauma exposure. In this survey, the overall prevalence of PTSD, anxiety, and depression were 7.0%, 32.6% and 22.2% respectively [21]. A high prevalence of common mental disorders (18.8%) was reported among internally displaced persons, particularly where displacement was prolonged, with major depression at 5.1% and other depressive syndromes at 7.3% [22]. A study in school children in areas affected by the armed conflict reported that the great majority of children experienced severely traumatizing events such as combat, bombing, shelling, or witnessing the death of a loved one, and their performance and functioning were related to the total load of traumatic events experienced [23]. According to a recent qualitative study in Northern Sri Lanka, complex mental health and psychosocial problems at the individual, family and community levels in a post-war context were found to impair recovery [24]. These studies indicate that more efforts related to psychological health are needed to re-establish the normalcy in the region despite the re-settlement of the internally displaced persons in the Northern province, together with infrastructure and livelihood development programmes by the state and non-state sectors.

Improving services of primary health care facilities would provide easy access to a wider population for their basic health needs, and reduce overcrowding of larger hospitals. The Primary Medical Care Units and Divisional Hospitals (PMCU/DH) in the Northern Province have been strengthened after the conflict, with the aim of providing first contact care to treat minor illnesses and screen and refer patients for health care institutions at higher level. We assume that the prevalence of depression and other psychosocial issues would be higher in a post-conflict population that seeks care from these facilities in the Northern Province than in the rest of the country. The aim of this paper is to report on the burden of depression and describe the factors associated with depression in a post-conflict population, using a large sample of adult patients accessing primary medical care settings in the Northern Province in Sri Lanka.

Methods

Design, setting and participants

A cross-sectional descriptive study was conducted in selected primary health care facilities in the districts of Jaffna, Mannar, Kilinochchi and Mullaitivu. There are 61 Divisional Hospitals (DH) and 35 Primary Medical Care Units (PMCU) in the Northern Province [25], and a rapid rise in the patient influx has been observed in these centres over the recent past possibly due to improvement of health facilities. The study was carried out in 16 purposively-selected primary care centres comprised of 12 DH and 4 PMCU, which collectively provide outpatient care for approximately 2000 patients per week. These sites were purposively selected to capture the health institutions accessed by both recently resettled conflict-affected population and the host population. These 16 health facilities are geographically scattered across the four districts, and serve to the re-settled communities as well as the host populations. A patient morbidity registry was established for the purpose of the study in these centres. Eligible participants included adult men and women aged 18 years or more, who were seeking care at the Out Patient Departments of these study centres. Pregnant women and patients who were severely ill or required emergency hospital admission were excluded. The individuals who had been interviewed once were not included again at their subsequent visits. The data were collected between March and May 2013, and can be considered as a reflection of patients seeking primary care services in the Northern Province due to representation of both resettled and host populations, geographical distribution, and duration of data capture. The sample size was calculated to estimate prevalence of depression at 26% (the highest reported figure in Sri

Lanka using the same instrument), with 95% confidence intervals within $\pm 1\%$ precision. The sample size was doubled to account for variation between centres (design effect of 2), and further expanded by 5% to adjust for invalid and incomplete records. The expected sample size was 15,500, and the anticipated time period to cover this sample was 8 weeks according to the average patient load. All eligible participants were recruited consecutively to obtain the required sample size.

Data collection instrument and methods

We used the Patient Health Questionnaire-9 (PHQ-9) to assess depression. The PHQ-9 is a widely used instrument in primary health care settings, and has the advantage of its exclusive focus on the 9 diagnostic criteria for DSM-IV depressive disorders [26,27]. The PHQ-9 has 9 questions with a score ranging from 0 to 3 for each question. It has been validated and used for screening and diagnostic purposes in different settings both developed and developing countries including Sri Lanka [10,28-30]. Shortness coupled with its construct and criterion validity makes the PHQ-9 an attractive, dual purpose instrument for making diagnoses and assessing severity of depressive disorders, particularly in the busy setting of clinical practice [26]. The PHQ-9 has been previously translated into Sinhalese and Tamil languages and used in the National Mental Health Survey of Sri Lanka conducted in 2007 [29]. The present study used the Tamil version with minor modification to improve its cultural validity.

In addition, a series of six questions was adopted from the questionnaire of Sri Lanka census of population and housing to assess level of disability, which was originally developed by United Nations Washington Group on Disability Statistics [31,32]. The 6-item disability scale used in the present study has been previously validated [31]. These 6 questions on disability can provide a reasonable estimate on people with disabilities, and have been frequently used in population census and surveys for measuring disability prevalence worldwide. The levels of difficulties on seeing, hearing, walking, cognition, self-care and communication were marked on a 3-point rating scale. Data on basic socio demographic data such as age, gender, and nature of occupation of the participants were also included in the morbidity register. All interviews were conducted in Tamil language which is the native language of all participants as well as the interviewers.

The medical officers attached to the selected DH and PMCU were trained adequately to interview participants and record data in the Patient Morbidity Registers. Reliability of data was ensured through several practice interviews during the training. A field coordinator

monitored the process of data collection and received the registers through health authority fortnightly for data entry. Validity of the data was also verified at the time of data entry by the field officers.

Data analysis

The PHQ-9 scores each of the 9 DSM-IV criteria as “0” (not at all) to “3” (nearly every day), with a maximum score of 27. A previous study has reported that PHQ-9 score of 10 and above had a sensitivity of 88% and a specificity of 88% for major depression. PHQ-9 scores of 5, 10, 15, and 20 represented mild, moderate, moderately severe, and severe depression, respectively [33].

In our study, the prevalence major depression was defined as the proportion of individuals with a total score of 10 or more in the PHQ-9. The cutoffs of 5, 10, 15, and 20 represented the thresholds for mild, moderate, moderately severe, and severe depression, respectively. Data on disability were dichotomized as ‘no disability’ vs. ‘any disability’ by combining ‘some difficulty’ and ‘not possible’ categories together. The cross tabulations were generated between prevalence vs. age category, sex, occupation, district and different disabilities. Univariable regression analyses were performed to calculate the odds ratios (OR) and 95% confidence intervals (95% CI) to indicate the magnitude of risk of each independent variable for major depression. In the multivariable analysis, logistic regression models were used in a stepwise back-ward manner, to calculate adjusted Odds Ratios. All independent variables were entered at the beginning step, while those non-significant were removed in a step-wise manner. The variables retained in the final step were the age, sex, district, and disabilities in seeing, hearing, walking, cognition and self-care. Data were analyzed using SPSS 16.0 evaluation version.

Ethical considerations

Ethics clearance was granted by the Ethics Review Committee of the Faculty of Medicine, University of Colombo (Reference No. EC-13-066). Informed verbal consent for participation in the study was obtained from participants and the study did not include any person less than 18 years of age. Strict confidentiality and privacy were maintained during interviews and on all personal records. Patients who were found to have any depression were given appropriate medical advice by the medical officers, and those with major depression were referred for necessary action using a referral pathway. This referral mechanism has been already in-place in the mental health programme of the existing health system in the Northern Province.

Results

Sample characteristics

Of the total 12,973 participants recruited over a period of 8 weeks, 132 (1.2%) were excluded due to missing data in their records. As shown in Table 1, the analytic sample consisted of 12,841 individuals, with the majority being between the ages 25 and 64 years (77.3%), and women (56.5%). The mean age was 43.2 years with a standard deviation of 15.6. Relatively a small percentage (13%) was formally employed either in government or private sector, almost one-fourth (24.9%) was working on their own account, while the majority (55.5%) was unemployed thus categorized as unpaid workers contributing to family enterprise. The rates of disability, as defined by the proportion having difficulty or inability in performing a particular function, were relatively high for seeing (18.4%), and walking (17.2%) and low for self-care (1.1%) and communication (1.2%).

Table 1: Summary of the sample characteristics of respondents (n = 12,841)

Variable	Number	(%)
Age group (years)		
18-24	1,475	11.5
25-34	3,025	23.6
35-49	3,888	30.3
50-64	3,019	23.5
65 and above	1,434	11.2
Sex		
Male	5,578	43.4
Female	7,263	56.6
Nature of employment		
Govt./Semi govt. paid employee	1,071	8.3
Private sector paid employee	595	4.6
Employer	857	6.7
Own account worker	3,197	24.9
Contributing to family enterprise	7,121	55.5
District		
Jaffna	4,930	38.4
Kilinochchi	3,392	26.4
Mannar	509	4.0
Mullaitivu	4,010	31.2
Disabilities^a		
Seeing		
No difficulty	10,478	81.6
Difficult or not possible	2,363	18.4

Variable	Number	(%)
Hearing		
No difficulty	11,840	92.2
Difficult or not possible	1,001	7.8
Walking		
No difficulty	10,636	82.8
Difficult or not possible	2,205	17.2
Cognition		
No difficulty	11,758	91.6
Difficult or not possible	1,083	8.4
Self-care		
No difficulty	12,697	98.9
Difficult or not possible	144	1.1
Communication		
No difficulty	12,687	98.8
Difficult or not possible	154	1.2
Total	12,841	100

Govt. government; DH divisional hospital; PMCU primary medical care unit.

a. Those responded difficult or not possible at all are considered as having disability.

Prevalence of depression

The PHQ-9 in the present sample was found to have a high internal consistency as indicated by Cronbach's alpha of 0.79. As displayed in Table 2, 13.3% of the respondents had mild depression (PHQ score 5 to 9) and 3.3% moderate depression (PHQ score 10 to 14). Less than 1% were found to have moderately severe (PHQ score 15 to 19) and severe (PHQ score ≥ 20) depression. Overall, the proportion of patients with any depression was 17.8%.

Table 2: Prevalence depression as measured by PHQ-9 among patients attending primary health care facilities in the Northern Province (n = 12,841)

Level of depression	%	95% CI	n
No depression	82.2	81.5 - 82.9	10,559
Mild depression	13.3	12.7 - 13.9	1,706
Moderate depression	3.6	3.3 - 3.9	468
Moderately severe depression	0.8	0.6 - 1.0	101
Severe depression	0.1	0.0 - 0.2	7
Total	100.0		12,841

The prevalence of major depression as indicated by the total PHQ score of 10 and above was 4.5% (95% CI: 4.1–4.9) (Table 3). The prevalence of major depression was significantly higher in females than males (5.1% (95% CI: 4.1–5.5) vs. 3.6% (95% CI: 3.3–3.9)) and unpaid family workers (6.0% (95% CI: 5.6–6.4)) than any other category who earned an income (varied between 1.2% (95% CI: 1.0–1.4) and 3.2% (95% CI: 2.9–3.5)). As illustrated in Figure 1, the prevalence was rising significantly with advancing age, which ranged from 0.3% (95% CI: 0.2–0.4) in the youngest to 11.6% (95% CI: 11.0–12.2) in the elderly (χ^2 (df = 1) for linear trend = 303; $p < 0.0001$). Significantly higher rates of major of depression were reported in all 6 categories of disability, ranging from 16.5% to 43.1%.

Figure 1: Trend of major depression according to age category of patients attending primary health care facilities in the Northern Province (n=12,841). χ^2 (df=1) for linear trend = 303; $p < 0.0001$. Error bars indicate 95% confidence intervals.

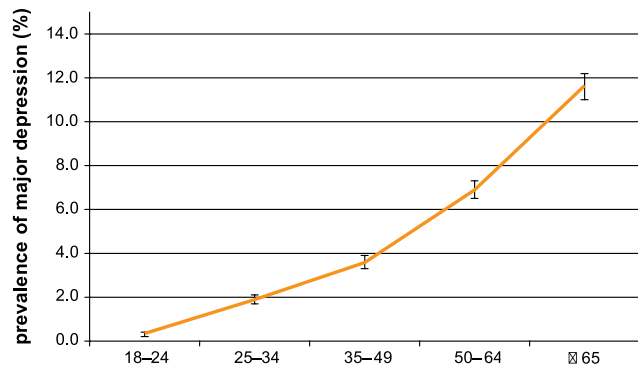


Table 3: Prevalence depression as measured by PHQ-9 among patients attending primary health care facilities in the Northern Province, according to selected socio demographic characteristics (n = 12,841)

Variable	Major depression %	95% CI	Total
PHQ Score	≥ 10		
Age group (years)^a			
18-24	0.3	0.2 - 0.4	1,475
25-34	1.9	1.7 - 2.1	3,025
35-49	3.6	3.3 - 3.9	3,888
50-64	6.9	6.5 - 7.3	3,019
65 and above	11.6	11.0 - 12.2	1,434

Variable	Major depression %	95%	CI	Total
Sex				
Male	3.6	3.3	3.9	5,578
Female	5.1	4.7	5.5	7,263
Nature of employment				
Govt./Semi govt. paid employee	1.4	1.2	1.6	1,071
Private sector paid employee	3.2	2.9	3.5	595
Employer	1.2	1.0	1.4	857
Own account worker	3.2	2.9	3.5	3,197
Contributing to family enterprise	6.0	5.6	6.4	7,121
District				
Jaffna	6.5	6.1	6.9	4,930
Kilinochchi	2.4	2.1	2.7	3,392
Mannar	5.1	4.7	5.5	509
Mullaitivu	3.7	3.4	4.0	4,010
Seeing				
No difficulty	1.8	1.6	2.0	10,478
Difficult/not possible	16.5	15.9	17.1	2,363
Hearing				
No difficulty	3.1	2.8	3.4	11,840
Difficult/not possible	20.5	19.8	21.2	1,001
Walking				
No difficulty	1.3	1.1	1.5	10,636
Difficult/not possible	20.1	19.4	20.8	2,205
Cognition				
No difficulty	2.2	1.9	2.5	11,758
Difficult/not possible	29.5	28.7	30.3	1,083
Self-care				
No difficulty	4.0	3.7	4.3	12,697
Difficult/not possible	43.1	42.2	44.0	144
Communication				
No difficulty	4.2	3.9	4.5	12,687
Difficult/not possible	27.3	26.5	28.1	154
Total	4.5	4.1	4.9	12,841

a. Chi-square for linear trend of major depression across age groups = 302; $p < 0.0001$.

Factors associated with depression

Univariable and multivariable analyses revealed some significant predictors of major depression (Table 4). Females reported a higher risk of having major depression than males (adjusted OR = 1.4 (95% CI: 1.1–1.7)). Older patients were more likely to have depression than younger patients, the adjusted odds ratios were 4.9 (95% CI: 1.9–12.5), 5.6 (95% CI: 2.2–14.0), 5.7 (95% CI: 2.3–14.2) and 4.7 (95% CI: 1.8–11.9) for the age groups 25–34, 35–49, 50–64, and ≥ 65 years respectively, in contrast to 18–24 year group. Although unemployed persons had a higher risk for major depression in the univariable analysis, this factor was non-significant when adjusted for confounding effects in the multivariable analysis. Effect of disability was highly significant in our analysis, except for those with disability in communication. Patients with disability in walking (adjusted OR = 7.5 (95% CI: 5.8–9.8)), cognition (adjusted OR = 4.5 (95% CI: 3.6–5.6)), self-care (adjusted OR = 2.6 (95% CI: 1.7–4.0)), seeing (adjusted OR = 2.3 (95% CI: 1.8–3.0)), and hearing (adjusted OR = 2.0 (95% CI: 1.5–5.8)) showed significant effects on depression. Significant differences in major depression were evident across districts. In the multivariable analyses, Kilinochchi and Mannar districts had a 1.5 (95% CI: 1.1–2.1) and 4.6 (95% CI: 2.8–7.4) increase in odds respectively, relative to the referent district of Mullaitivu.

Discussion

Using a large sample of 12,841 individuals, we report that the prevalence of major depression is 4.5% in adult patients attending primary care settings in the Northern Province, four years after the end of a protracted 30-year armed conflict. Prevalence of mild depression is almost 3-fold higher in the study population (13.3%). Furthermore, the study reveals that older individuals, women and persons with disability are at a greater risk for depression.

To our knowledge, this is the first study that assessed depression within a population accessing primary care settings in Sri Lanka. The study design therefore yielded towards a public health approach to understand depression [34,35]. From the health services point-of-view, knowledge on burden of depression in a population that seeks care from primary care settings than in the general population would be more beneficial to provide targeted services. Further, the post-conflict nature of the study population provides a unique situation and critical evidence for policy and action.

It is noteworthy that the study finds higher prevalence of major depression (4.5%) in primary health care settings in the Northern province than the national estimate of 2.6% of major depression reported in 2007 [15]. This may be due to the fact that the national survey excluded conflict affected districts in the Northern province (due to inability of research teams to access those areas due to ongoing conflict), and that it was a community-based survey rather than a study among those seeking health care. Our estimate of major depression is somewhat closer to findings of a recent study which found major depression at 5.1% (95% CI: 3.2–7.7) in an internally displaced community due to war in the Northern province [22]. However, contextual difference and lower precision of the estimate in the latter study may limit the comparability of findings.

Depression can aggravate existing illnesses, signs and symptoms and vice-versa. Therefore, it is important to identify patients at high risk for depression so that these patients could be targeted for depression screening and treatment. Knowledge about risk factors or predictors of depression can ease identification of these patients. Regarding factors associated with depression, advancing age represents the strongest factor in our analysis, showing a linear trend with age. Although, an incremental increase of odds for depression with increasing age is observed in the univariable analysis, this stepwise pattern is not reflected in the multivariable analysis. Instead, the multivariable analysis revealed a greater but approximately equal odds (each age group showed an OR of around 5), for depression relative to the youngest age group of 18–24 years. This could be interpreted as younger age group being relatively at less risk to all other age groups in the context of other risk factors such as sex, and disabilities. Previous findings support the evidence that age contributes significantly to the prediction of depression [10,36,37]. While older adults may face widowhood, loss of function, or loss of independence, depression is not a 'normal' symptom of aging [38]. Studies show that depression that initially appears later in life is linked to a more chronic course of illness [39,40]. Living with untreated depression presents a serious public health problem since it may complicate chronic conditions such as heart disease, diabetes, and stroke; often accompanies functional impairment and disability and leads to increased health care costs [41,42]. Depression among older adults can be addressed through better community-based approaches for identifying and treating depression, and through more public awareness programmes [40,43,44].

Females are at a higher risk for depression than males; however the odds are marginal in our results. Many previous studies found a similar pattern [10,30], while some studies could not reveal significant sex differences [22,37]. The district differences of depression could be attributed to many external factors that were not included in the present study. There are differences across districts in the extent of re-settled population, livelihood development programmes, employment opportunities and access to health and other social services, that would affect the risk of depression [32]. Our study found a strong positive association between major depression and disabilities, however the cross-sectional nature of the study design limits conclusion whether disability led to depression or vice-versa. A cohort study of 6247 subjects 65 years and older in USA, who were initially free of disability has revealed that depression in elder patients caused limitation in activities of daily living and mobility after 6 years of follow-up [45]. This excess risk is partly explained by depressed persons' decreased physical activity and social interaction. Further, there is evidence that improved depression by treatment reduces disability days and disability scores in depression persons [46]. Since depression and disabilities go hand-in-hand, further evidence through randomized trials would be needed to see effects of reduction of one on another.

Trauma and potential exposure to traumatic events due to protracted civil conflict appear to be associated with adverse mental health symptoms [47]. A study conducted among residents in Jaffna district in Sri Lanka in the aftermath of war revealed that the prevalence of symptoms of war-related mental health conditions was substantial and significantly associated with displacement status and underlying trauma exposure [21]. The same study found that approximately 68% of Jaffna residents experienced at least 1 trauma event and most individuals experienced multiple traumas. Furthermore, a dose-response relationship between the number of trauma events and psychiatric morbidity was evident, and chronic exposures to trauma events corresponded with higher levels of PTSD, anxiety, and depression symptoms. A qualitative inquiry into the psychosocial situation among internally displaced persons concluded that the collective trauma, i.e., traumatic psychological effect shared by community, can be profound [48]. However, the present study failed to collect data on the previous trauma exposure among individual participants. Despite, we can confirm that all communities which were serviced by the selected primary care facilities were affected by collective trauma.

The major implication of our findings on the health system is the importance of ensuring support to primary health care services for early detection and referral of common mental health conditions. Thus, training and sensitization of primary health care personnel at PMCU and DH can indeed make a difference for early detection of common mental health disorders, especially major depression. Capacity of the health personnel at primary care level should be enhanced in the area of mental health. These personnel should be trained to diagnose depression at primary health care level and to conduct initial basic management including counselling. It is also necessary to explore the referral system and continuity of care which were not addressed by the present study. Previous literature highlights that treatment gap and stigma are major barriers for communities to seek care at the primary health care settings for mental and psychological illnesses [49,50]. Therefore, further research is needed to address these issues such as treatment gap and stigma on mental illnesses. Since the prevalence of any form of depression including the mild forms, is high, we recommend that community-based mental health programmes be strengthened to increase knowledge and skills of community level workers to deal with common mental health and psychosocial issues and psychosocial problem solving. Our findings support the recommendations of a recent qualitative study aiming to rebuild family and community agency and resilience [24].

A number of limitations of our study has to be noted. First, though many studies demonstrate that the PHQ-9 has proven to be a sensitive and specific measure, the final diagnosis needs to be confirmed by a clinical assessment. Our study adopted a health systems perspective where the assessments occurred in routine primary care settings. Obtaining a definitive diagnosis for all those entering primary health care centres for treatment would be highly resource intensive, and warrant dedicated health programs from health system. Second, we did not cover all potential predictor variables due to the fact that the data collection was done during the history taking time of each patient at the out-patient department, consecutively on all patients. Our aim was to reveal the best determinants out of few easily obtainable parameters such as age, sex, occupation and disability etc. A major limitation of our study was the exclusion of the trauma scales. Due to the sensitive nature of the questions, administration of the trauma exposure scale was considered as ethically unsound and not approved by the health and administrative authorities of the Northern Province. Finally, this may not be representative of the population of the Northern Province, since the sample was obtained from primary health care facilities. Despite the mentioned weaknesses, hitherto this study

is the largest study that has assessed depression among those seeking primary health care in Sri Lanka covering a large segment of the population. The quality of data was maintained at a high degree, especially with the PHQ-9 as described by Kroenke and Spitzer [26].

Conclusion

In conclusion, this study reports that the prevalence of major depression is 4.5% (95% CI: 4.1-4.9) in adult patients attending primary care settings in the Northern Province, and that the older individuals, women and persons with disability are at a greater risk for depression. Prevalence of mild depression is almost 3-fold higher in the study population. The results indicate that the services at primary health care settings should be strengthened to screen patients for depression and advise accordingly. Strengthening community mental health services is necessary to detect psychological issues early and manage such issues promptly.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

US participated in the design of the study, trained data collectors, performed the statistical analysis and drafted the manuscript. KW conceived of the study, and participated in its design, coordinated data collection and helped to draft the manuscript. SLP participated in the design of the study, coordination and supervision of data collection and helped to draft the manuscript. All authors read and approved the final manuscript.

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Conflict, forced displacement and health in Sri Lanka: A review of the research landscape

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ABSTRACT

Background

Sri Lanka has recently emerged from nearly three decades of protracted conflict, which came to an end five years ago in 2009. A number of researchers have explored the devastating effect the conflict has had on public health, and its impact on Sri Lanka's health system - hailed as a success story in the South Asian region. Remarkably, no attempt has been made to synthesize the findings of such studies in order to build an evidence-informed research platform. This review aims to map the 'research landscape' on the impact of conflict on health in Sri Lanka. Findings highlight health status in select groups within affected communities and unmet needs of health systems in post-conflict regions. We contend that Sri Lanka's post-conflict research landscape requires exploration of individual, community and health system resilience, to provide better evidence for health programs and interventions after 26 years of conflict.

Keywords

Sri Lanka, civil conflict, health, health research, health systems, post-conflict, mental health, internal displacement

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Introduction

Country facts

Sri Lanka is categorized as a lower middle-income country (LMIC) [1] with a population of 21 million [2]. The country has a multi-ethnic society where the majority (74%) are Sinhalese, 18% are Tamil and 7% Moor. The remaining 1% consists of Burgher, Malay and Veddas. Current literacy rates are 92.5% in males and 87.9% in females with an average life expectancy of 76.3 years [2].

Health systems and services in Sri Lanka

The public health achievements of Sri Lanka have been hailed as a success story by the World Health Organization (WHO) and it currently has the best health indicators in the South Asian region [3]. The crude death rate is 6.0 per 1,000 population and maternal mortality is 22.3 per 100,000 live births [4]. Over 90% of current live births occur in a government hospital settings in the country, and the immunization coverage is around 99% [5]. Sri Lanka has a free-of-charge health care system, heavily subsidised by the government. However, private health care is also readily available. The country's health expenditure is 4.1% of the total government expenditure with per capita health expenditure around 400 USD [4]. Sri Lanka has

0.680 general physicians per 1,000 residents compared to 2.790 physician density of the United Kingdom [6]. Mental health has been recognized as a key component of primary health care in Sri Lanka but mental health services are mostly based around institutional care, lacking a public health approach [3]. According to current figures, the country has a total of 2,031 psychiatric hospital beds and only around 48 specialist psychiatrists for over a 20 million population [7].

Conflict and displacement in Sri Lanka

Since achieving independence from Britain in 1948, Sri Lanka experienced two major armed conflicts that effectively impacted on the whole country. The Janatha Vimukthi Peramuna (JVP), a leftist organization involving mainly Sinhalese youth, led two insurgencies in the southern part of the country, first in 1971 and later between 1987–1990 [8]. Around 60,000 people were killed during these episodes, and included JVP cadres, members of the armed forces and civilians [8]. While major population movements were not triggered by these events, a considerable number of individuals and families were displaced from their homes, mainly due to prosecution by various factions involved.

The other major armed conflict to impact the Sri Lankan population was the protracted war between the Sri Lankan government and the Liberation Tigers of Tamil Eelam (LTTE), a militant organization aiming to create an autonomous Tamil state in the Eastern and Northern provinces of the country. The armed conflict which started in 1983 came to an end in May 2009, with the military defeat of the LTTE by Sri Lankan armed forces [9,10]. During the 26 years of prolonged conflict, more than 100,000 people of all ethnicities are estimated to have died, while hundreds of thousands have been injured [9,10]. The three-decades of conflict was also the key driver of internal and external displacement in Sri Lanka, displacing approximately 800,000 people at its peak in 2001, mainly from the Northern and Eastern provinces [11]. Current estimates indicate that approximately 90,000 (0.4% of the total population) people are internally displaced in Sri Lanka [11]. There are also an estimated 73,000 Sri Lankan refugees living in 112 camps in the southern Indian state of Tamil Nadu with a further 34,000 outside the camps [12]. However, these numbers can vary as refugee population tend to grow in size and has a high level of undocumented migration. Throughout the period of conflict, the numbers of Sri Lankan asylum seekers to countries such as UK, Canada and Australia has been increasing, with their irregular

migration contributing especially to mental health problems [13,14].

Internal displacement in Sri Lanka has shown a highly fluid character, ebbing and flowing with the nature of the conflict and its severity [9]. Populations experiencing conflict-driven internal displacement had to undergo highly traumatic migration episodes, and some populations has had endure displacement periods lasting several decades. These experiences stand to strongly affect the long-term health of displaced populations, and especially present a high risk of developing mental disorders. Whilst recognizing the multiple research efforts that have been undertaken through three decades of conflict, there has been little attempt to synthesize research findings on the health impact of conflict affected populations. We aim to investigate the ‘research landscape’ and take stock of the emergent findings that supports establishing an evidence-informed research platform. This paper therefore will explore the health impact of conflict among Sri Lankan population through an examination of the currently available research evidence, with an emphasis on conflict-driven internal displacement and mental health.

Review methodology

For this purpose, a literature search was carried out using Pub Med, BIOMED CENTRAL, Cochrane Library, OVID, Psych Info, Google Scholar, Embase, Sri Lanka Journals Online and other main data sources for English language articles originating from Sri Lanka, using the key words; Sri Lanka; conflict; health; physical health; mental health; internal displacement. These key words were used in different combinations to maximise the results. Studies using quantitative, qualitative or mixed-methods were included. Although the focus was to find empirical evidence, relevant reviews were considered.

No limits were imposed on publication dates. Studies on refugee populations with a Sri Lankan origin were excluded to keep the review focus on affected populations within the country. Articles without a direct link to conflict or conflict-affected populations were also excluded. Although this is not a systematic review, the search strategy followed similar established procedures in selecting relevant studies. A narrative synthesis was then conducted.

Physical health impact

Conflict-driven forced displacement precipitates physical ill health among affected populations [15], during pre-

flight, flight and post-flight periods [16]. In addition, conflict situations increase public health problems, compounded by existing health disparities [15,16]. In the Sri Lankan conflict setting, published studies provide evidence of health system disruption, public health issues affecting displaced populations, increased mortality, morbidity and disease burden (quantified by quality adjusted life years - QALYs or disability adjusted life years - DALYs), disruptions of service provision in affected regions and problems with post-conflict health needs [17,18].

In the Northern province, higher than national average maternal and neonatal mortality rates were reported, with high levels of low birth weight babies being born and increased number of stillbirths [17–19]. A study conducted during the conflict (2004–2005) on reproductive health of women in six conflict areas of Sri Lanka showed higher levels of marriage at an early age, pregnancy at an early age, increased home births, low contraception and increased maternal mortality rates [20]. This study also highlighted that women in conflict areas faced a higher risk of sexual and physical abuse, and faced various barriers in receiving adequate health care and services [20]. Furthermore, antenatal care utilization was shown to be significantly poor for women whose families were affected by conflict in Northern Sri Lanka or living in an active conflict zone in a study conducted in 2009 [21].

Another critical area of public health importance in conflict situations is the risk of infectious disease spread. Several studies done in conflict areas and among displaced populations in Sri Lanka showed a marked increase of infectious disease [17]. Acute disease outbreaks are often common within displaced camp settings due to inadequate water and sanitation facilities coupled with large populations living in close proximity within temporary accommodation/tent facilities. A large scale Hepatitis A outbreak was reported in internally displaced camps (IDP) camp settings in Vavuniya district in the aftermath of the 2009 conflict [22].

Protracted conflict also results in disrupted or fractured disease control programs. While malaria has been effectively controlled in most areas of Sri Lanka (incidence declined by 99% and only 124 indigenous cases reported in 2011), malaria incidence was reported to be much higher in the conflict regions [23]. However, even during the conflict and especially in the post-conflict period, the incidence rate has been rapidly decreasing, due to the strong epidemiological surveillance, preventive and treatment systems activated in these regions [24]. Sri Lankan asylum-seekers from Northern Province

continue to pose a new and emerging threat of malaria reintroduction as they return from failed asylum bids, usually as a result of irregular migration through endemic areas in West Africa [25]. Sri Lanka's National Programme for Tuberculosis Control and Chest Diseases (NPTCCD) also reports the prevalence of TB to be high among returning Sri Lankan refugees who were living in refugee camps in India. TB detection rate among such groups being resettled in mostly Northern districts is at 936 per 100,000 population, a higher rate than the national figure of 46 cases per 100,000 [26]. Since the end of conflict, there has been a sustained effort made by the NPTCCD in scaling up TB control activities in resettlement areas of the Northern and Eastern provinces [26]. Other infectious diseases such as leishmaniasis have also affected populations in such regions [27].

In conflict-driven displacement situations, there is an increased risk of physical trauma to civilian populations. In the Sri Lankan context, physical trauma resulted due to direct attacks from warring parties, getting caught in artillery or shelling and being injured by bombs, land mines, improvised explosive devices (IED), anti-personal mines and other forms of exploding munitions [28, 29]. Physical injuries included shrapnel wounds, limb amputations, visceral wounds and other forms of damage [28–30]. Armstrong et al. [31] describe high volumes of orthopaedic trauma seen among the IDP population at the end of the Sri Lankan conflict in 2009. A team affiliated with Medecins Sans Frontieres (MSF) conducted a rehabilitation programme for IDPs with spinal cord injury in the Northern province, working together with staff from the Ministry of Health, Sri Lanka. They provided nursing, physiotherapy, mental health care and vocation rehabilitation through the programme, and highlight the lack of adequacy in services for IDPs disabled with such high-intensity physical trauma [31]. The high rates of physical trauma in these regions has seen a dramatic drop, mainly due to the clearance of landmines after the end of conflict [32]. However, personnel involved in landmine clearing operations have been reportedly injured due to accidents when handling explosives [32].

In addition, high levels of malnutrition and disability has been reported among displaced populations [33–35]. However, accurate figures on the levels of malnutrition or disability are not available on populations displaced at the end of conflict. Nagai et al., [18] explored the 20-year trends in health service provision and health status in the conflict-affected Northern province and concluded that those outside the conflict region had a very little understanding about the actual health needs in affected areas. They further stated that strategic development and allocation of human resources for

health is required to rebuild the health service systems in the Northern province. Empowering local communities and a systematic mental health strategy is also advocated [18]. Although more access has been gained by the Sri Lankan Ministry of Health into these areas since the end of conflict, a concerted effort at conducting an accurate census is yet to materialise. A study exploring immunization status among IDP children in post-conflict areas during resettlement found that while the infant vaccination coverage in the war-torn Kilinochchi district was not different to other Sri Lankan districts, there was a marked disparity in age-appropriateness of the vaccination coverage in Kilinochchi [36]. Although the coverage levels were similar to other post-conflict settings, authors point out that Sri Lanka needs to focus on ensuring the continuation of full vaccination in the post-conflict region, which may get disrupted due to resource availability and service priority changes that can happen in the post-conflict period [36].

The above evidence shows various facets of the impact created by the Sri Lankan conflict on the physical health of affected populations, especially IDP. The evidence highlights the lack of up-to-date epidemiological data, inadequacies in service provision and lack of access to care for affected populations. However, during the last five years since conflict cessation, a large amount of programmes including immunization surveys, psychosocial assistance and other health system rebuilding work has been carried out by the Sri Lankan Ministry of Health and other agencies [37,4]. This work is especially relevant in the current post-conflict era, when a comprehensive restructuring of the health system is required to address burgeoning health needs of the returning IDP populations [33].

Mental health impact

The Sri Lankan civil conflict has had an enormous impact on the mental health of the country's population, especially in the areas of Northern and Eastern provinces. This impact has been compounded by the 2004 tsunami striking many conflict areas and causing death and destruction among communities already burdened by many years of war-related trauma [9,38]. Children and adults from every ethnicity, religion and socioeconomic background have faced conflict-related mental health issues in the country as individuals, families and communities.

Collective trauma

Somasundaram [9] terms the disruption of family and community structure and destruction of the social fabric,

networks, cohesion, and social capital as 'collective trauma'. Somasundaram and colleagues have conducted several studies mainly among Tamil populations living in and/or displaced from affected areas in the Northern province during the conflict and describe how the impact of war is hugely detrimental to the collective mental health of affected communities [39–41]. These studies are mostly qualitative in nature and used a mix of anthropological, ethnographic and health research methodology.

A study conducted in 2007 among Tamil communities in the Northern province concludes that conflict had created fundamental changes in family and community dynamics, leading to increased psychosocial problems in a collective sense [39]. Another more recent study explored psychosocial status among displaced populations in the Vanni area of Northern Sri Lanka. These populations were displaced at the end of the conflict in 2009, and had endured extreme hardship during the closing stages of the war. The findings show collective symptoms of decreased psychosocial health and the author recommends interventions that target memory healing and psychosocial regeneration of families and communities in the post-conflict rebuilding and rehabilitation phase [40]. Another study conducted by Somasundaram & Sivayokan in 2012 among conflict-affected, former displaced communities in the Northern province showed that war-related complex psychosocial issues are preventing recovery [41]. They identified a range of issues linked to poor psychosocial health including unresolved grief, self-harm, suicidal ideations, insecurity, poverty, teenage pregnancies, gender based and domestic violence, neglect of the elderly and many others [41].

Combatant mental health

Another area that has received some research attention, albeit limited, is the mental health of combatants involved in the Sri Lankan conflict. A study conducted in 2004 explored psychological status prevalence and the link with physical disability among a group of permanently disabled government soldiers, indicating that almost half of the sample had psychological distress (as measured by the General Health Questionnaire - GHQ) and one-third presented psychosomatic symptoms [42]. Hanwella & De Silva conducted a study among Special Forces and regular regular force members of the Sri Lanka Navy in the close aftermath of the conflict (3 months after end of combat in May 2009) aiming to compare mental health problems between the two groups [43]. They found that while overall exposure to potentially traumatic experiences was high in both groups, and while Special Forces experienced a higher number of traumatic events,

this group nevertheless had significantly less common mental disorder prevalence and less PTSD, compared to regular naval forces, and was attributed to the more close-knit, cohesive unit structures in Special Forces [43]. de Silva, Jayasekera and Hanwella [44] found a prevalence of 10.4% for multiple physical symptoms among the same cohort, and observed higher rates of symptom reporting among those with PTSD and common mental disorders. Another study has shown that heavy alcohol use was associated with poorer psychological health and functional impairment among military personnel in Sri Lanka [45]. A study looking at current smoking among military personnel showed a lesser prevalence than that of the general population and that smoking was significantly associated with combat experiences [46]. Two studies exploring mental health of soldiers with lower limb amputations and spinal injuries sustained during combat showed higher level of PTSD (41.7%) and other poorer mental health outcomes related to the injuries [47,48].

Epidemiological or other evidence on mental health of rebel forces (LTTE members) are not available. However, child combatants and suicide bombers used by the LTTE in the civil conflict are thought to suffer from numerous combat related psychological issues such as somatisation, PTSD, depression, anxiety, behavioural and conduct disorders [49,50]. Apart from combatants, humanitarian agency workers involved in providing relief services to conflict areas also experience conflict-related trauma. Lopes Cardoso et al. [51] explored factors affecting mental health of Sri Lankan nationals working for humanitarian organizations during the conflict and the post-conflict period, concluding that 19.0% of the 398 staff from 9 organizations reported symptoms of PTSD, 58.0% reported depressive symptoms and 53.0% with anxiety symptoms. Another study indicated higher levels of psychological distress among nurses caring for war victims in Sri Lanka [52]. While the level of stress was higher compared to civilian populations, the study found female nurses at a higher risk and being married or having children to be protective.

Child and adolescent mental health

Research into the impact of Sri Lanka's protracted conflict on child and adolescent mental health has been somewhat sparse in [53,54]. A study on the effect of war related violence and violence inflicted on children and their families by Catani et al. showed that a relationship between war violence, family violence and PTSD in children [55]. In another study, more than half (58.0%) of the children reported exposure to armed conflict in various forms including experiencing direct violence, loss of family and displacement [46]. Fernando et al. [56]

conducted a study to measure the impact of conflict (and tsunami) related stressors on the psychological and psychosocial functioning of adolescents in eastern Sri Lanka. The study examined relations between direct exposure to conflict stressors as well as to daily stressors which may be unrelated to emergency settings. The study concluded that daily stressors partially mediate the relation between exposure to conflict (and tsunami) and psychological outcomes among the studied group of adolescents. Abuse and material deprivation were relatively stronger predictors of PTSD than conflict (or tsunami) [56].

A national sample of children aged between 12–17 showed associations with exposure to conflict with poorer psychological outcomes and school absenteeism [53]. Another survey looking into trauma-related impairment in children from Northern and Eastern provinces of Sri Lanka showed a relationship between the total load of trauma experienced and performance or functioning [57]. As mentioned before, child combatants have shown increased war-related stress and other symptoms of psychological trauma [49]. However, specific epidemiological evidence relating to mental health of conflict displaced children and adolescents remains an unexplored research area.

Forced internal displacement

Epidemiological studies exploring prevalence of mental disorders linked to conflict in Sri Lanka have been limited. Some studies have assessed trauma-related psychosocial status, anxiety or depression, albeit using small samples, and have focussed on developing culturally specific measures for Sri Lankan use [58,38]. In addition, epidemiological evidence on mental health of conflict-driven IDP in Sri Lanka is sparse.

Somasundaram & Sivayokan reported an epidemiological survey on war trauma and its consequences on civilians, which was conducted in 1994 in a suburban area of Jaffna district in Northern Sri Lanka [59]. They reported high levels of war-related stress, PTSD (27.0%), somatization (41.0%) and major depression (25.0%). However, this study is limited by its sample size (101 in total) and findings cannot be generalized to other populations due to small cohort, sampling method and for being a highly localised study [59].

More recently, a larger and more representative cross-sectional household survey was carried out in Jaffna district of Sri Lanka, which aimed to understand the associations between mental health and displacement [10]. It was carried out between July and September 2009, few months after the cessation of conflict in the

region. This study included around 1517 households in Jaffna along with 2 IDP camps. Out of a total of 1,448 participants, 2.0% were current IDP, 29.5% were recently resettled IDP and the rest were non-IDP residents in the area. The study reported an overall prevalence of 7.0% PTSD, 32.6% of anxiety and of 22.2% depression among the population. In addition, findings showed that current IDP were more likely to have symptoms of PTSD, anxiety or depression compare to non-IDP residents. While the prevalence of mental disorder was associated with displacement status, it was also dependent on trauma exposure in this population [10].

Data from a cross-sectional patient morbidity register from primary care facilities in 4 district in the Northern province showed a major depression prevalence of 4.5% and a prevalence of 13.3% for mild depression among adult post-conflict population [60]. In comparison, the national prevalence of major and mild depression is 2.4% and 6.7% respectively [61]. The patient population numbering around 12,000 in this study included both resettled IDP and non-displaced groups and it was conducted between March-May 2013, approximately 4 years after the end of conflict. Findings also showed that females and older age groups have stronger associations with depression along with physical or cognitive impairments [60].

Another study explored common mental disorder (CMD) prevalence among a population of ethnic Muslims displaced over 20 years ago from the Northern province of Sri Lanka, who have been living in prolonged displacement

in camps and resettlements in the Northwestern province [62]. It provides the only current evidence about the impact of prolonged displacement on mental health of conflict-affected populations in the country. The findings show that the CMD prevalence is higher (18.8%) than the national average (11.7%) [61]. The study also reports significant associations between unemployment, widowhood, food insecurity and mental health among the IDP [62]. However, it must be noted that associations reported in these studies must be treated with caution, as they may not be solely conflict-related or IDP-status related. Other region- or culture-specific factors may have played a role in higher levels of depression and other mental disorders in these populations, aggravated by the protracted conflict.

Conclusions and future research directions

The small body of published literature about the impact of Sri Lankan civil conflict on various aspects of health show a clear paucity of epidemiological evidence. Studies on physical health, child and adolescent health and mental health are characteristically cross-sectional by nature, and are limited by their design, small sample sizes or highly localised populations of interest. In addition, very few studies have explored internally displaced populations. Only one study explored populations affected by prolonged internal displacement during the three decade Sri Lankan conflict [62]. Key focus areas of the studies included in the review are summarised in Table 1.

Table 1: Key focus areas of the studies included in the review

Key focus area		Studies
Physical health	Maternal and child health	Reilley et al. [17]; Simetka et al. [19]; Kottegoda et al. [20]; Sivaganesh & Senarath [21];
	Infectious disease	Reilley et al. [17]; Abeyasinghe et al. [24]; Dahanayaka et al. [22]; Wickramage et al. [25]; Semage et al. [27]
	Physical trauma	Goonetilleke [29]; Collie [28]; Covey [30], Armstrong et al. [31]
	Nutrition and vaccination	Rajapaksa et al, [35]; Jayatissa et al. [34]; Parameswaran & Wijesinghe [36]
Mental Health	Collective trauma	Somasundaram [39]; Somasundaram [40]; Somasundarama & Sivayokan, [41]
	Combatants	Somasundaram [49]; Kasturiarachchi & Jayawardana [42]; Gunawardena et al. [47]; Somasundaram [50]; Hanwella & de Silva [43]; de Silva et al. [46]; Hanwella et al. [43]; Abeyasinghe et al. [24]; de Silva et al. [44]
	Children and adolescents	Chase et al. [54]; Catani et al. [55]; Elbert et al. [57]; Fernando et al. [56]; Siriwardhana et al. [62]
	IDPs	Husain et al. [10]; Siriwardhana et al. [53], Senarath et al. [60]
	Other populations	Somasundaram & Sivayokan [59]; IRD [61]; Fernando et al. [38]; Jayawickreme et al. [58]; Lopes Cardozo et al. [51]; Jayawardene et al. [52]; Knipe et al. [63]
Health systems/ policy	Tribe [71]; Nagai et al. [18]; Siriwardhana et al. [53]	

While the available evidence shows a high prevalence of mental health problems among conflict-affected populations in the North and East of Sri Lanka compared to other non-conflict areas [60-62], gaps of evidence are observed, especially regarding long-term mental health effects of forced internal displacement. Gaps also exist in understanding how health systems in conflict areas are recovering, and about the health of non-civilian populations, such as ex-combatants (both LTTE and the armed forces). Little is known or researched about their health status, modes of recovery, rehabilitation and/or reintegration to civilian life. However, prevalence of CMD such as depression and PTSD observed in conflict-affected populations in Sri Lanka is generally lower than that found in populations from other countries in Asia and Africa [62]. It must be noted that designs and measurements along with a host of cultural and social factors may account for the differences in prevalence of depression, PTSD or other CMD between Sri Lankan and other global populations. Studies included in our review also show variations in their design and mental health measurements, making accurate comparisons difficult in the absence of an existing baseline (except limited comparisons with the national mental health survey) [61].

Sri Lanka has been known for high suicide rates, and a recent historical cohort analysis highlighted the trends in suicide rates in the country [63]. However, data from conflict-affected regions were not captured and therefore not available due to non-systematic record keeping within disrupted health information systems. The population fraction (1.5% of the total country populations) of the conflict-affected areas were not considered to be sufficient to affect the overall analysis of suicide trends and the authors concluded that the civil conflict may have had a minimal impact on suicide trends [63]. However, further research is required to explore suicide trends in the post-conflict regions and associations with rapidly changing political, economic and social factors.

Protracted civil conflict erodes the fabric of social cohesion, dividing societies at the fault lines of prejudice [64]. The generational impacts war has on conflict affected societies, especially on children, can also extend well into periods of lasting peace [65]. The “fetal programming hypothesis” for instance suggests that conditions very early in human development, even in utero, can leave lasting imprints on a person's physiology and mental health - these imprints may ‘affect susceptibility to diseases’ with onsets potentially occurring many decades later [66–68]. An important factor neglected in assessing public health impact of the Sri Lankan conflict is the critical role of resilience in the recovery of individuals,

communities, and disrupted health systems. Protracted conflicts systematically erode such inherent community capacities and challenges meaningful recovery. The small but growing body of research evidence on mental health and psychosocial interventions that promote individual and community resilience appear to hold considerable promise for promoting connectedness in the aftermath of conflict and disasters. Assessing interventional landscapes in Sri Lanka thus forms an important research priority [38,69].

Post-disaster mental health interventions that extend beyond the provision of treatments for psychiatric morbidities and seek to strengthen social support have especially proven to be appropriate for many ethnic minority groups [32,70]. Tribe [71], suggests that Sri Lanka would benefit from adapting a model of health pluralism as a more culturally appropriate alternative to western models of therapy for conflict and disaster related psychosocial issues in the population. Despite the long history of violent conflicts, the UN member states recognized the need for strengthening national health emergency and disaster management capacities and ensuring ‘resilience of health systems’ only at the 128th Session of the World Health Assembly in January 2011. By ensuring the resilience of the health systems (critical for minimizing health hazards and vulnerabilities), delivering effective response and managing recovery in emergencies stand to become successful.

Number of studies cited in this review suggest the need to strengthen various aspects of the existing health system in the country, especially regarding the post-conflict regions and populations [10,18,20,61]. The clear deficiencies and unmet needs in the health systems of post-conflict regions such as increased mortality and morbidity, lack of health workers, low access to services, low levels of knowledge in health issues, low levels of health promotion and awareness programmes require a sustained effort from responsible stakeholders including the government, regional governments, international organizations and academics [18,72]. It must be noted however, that such deficits are in common to many post-conflict health systems across countries in Africa, Asia and Eastern Europe [73–75,15]. A recent study examining Sri Lanka's domestic legal framework in protecting the right to health of conflict displaced communities concluded that domestic laws provide sufficient provisions to enable health protection for IDPs [76]. Such provisions in the legal system can be utilised by the government to enforce a sustained drive to address gaps in health care provision to conflict-affected populations, and strengthen the health systems in post-conflict regions. Health services and health systems research can be used in the Sri

Lankan context to identify areas that require immediate or long-term solutions, such as human resources, disease burden and improving primary care. However, capacity building initiatives must be embedded within such research programmes to enable the development of the health workforce in post-conflict regions of Sri Lanka. It is critically important to establish collaborations between universities and academics from post-conflict areas and those from other parts of the country, as well as with international research community. Funding for research programmes that focus on post-conflict themes must be increased.

The research gaps highlighted in this review presents some key areas in Sri Lanka's post-conflict research landscape that requires exploration of individual, community and health system resilience and recovery. Research identifying those factors and features of resiliency in Sri Lanka's health system that enabled continued service coverage and function within resource limited conflict-affected areas during the protracted war should be conducted and may also be useful for other post-conflict countries.

Competing interests

The authors declare that they have no competing interests.

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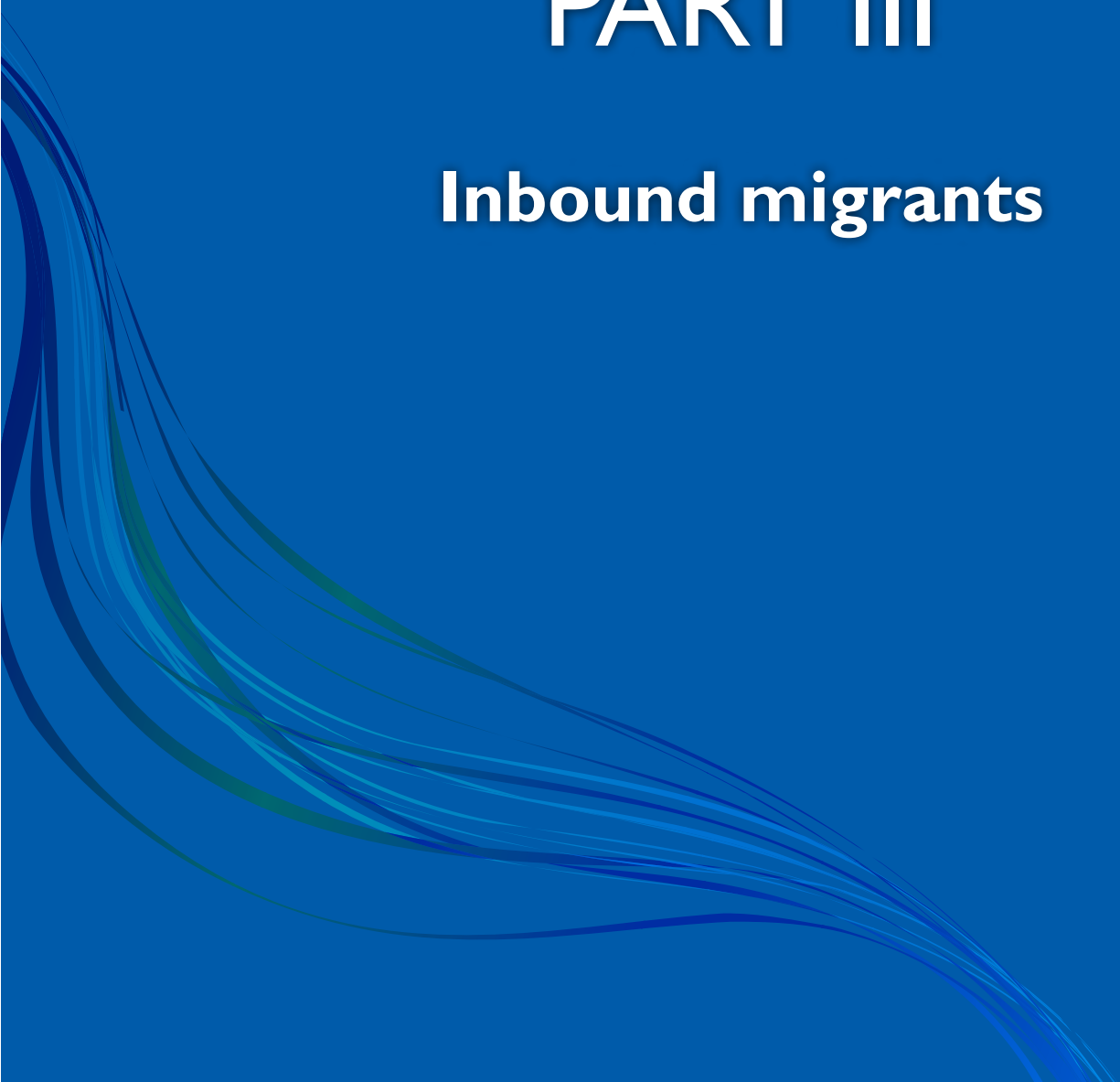
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PART III

Inbound migrants



Perceptions and experiences of health care access amongst foreign migrant workers in Sri Lanka: A scoping study

Kolitha Wickramage¹

Background

Sri Lanka's National Migration Health Policy describe inbound migrants to include, but not be limited to, overseas (or foreign) migrant workers (professional, skilled, semi-skilled and low -skilled workers), students and tourists. These migrants will be identified as valid visa holders (visit/entry visa or resident visas as defined by the laws applicable to immigration and emigration in Sri Lanka). The Policy also recognizes returning Sri Lankan refugees and failed asylum seekers of Sri Lankan origin.

With the end of a protracted civil conflict in 2009, Sri Lanka has embraced new frontiers of growth and new economic development programs throughout the nation across five broad hubs for development from 'Aviation', 'Naval', 'Energy', 'Knowledge' and 'Commerce & trade'. To realize this vision and ensure rapid development progress, there is a reliance on increasing levels of foreign investment, skills and labour. The dependence on foreign workers are more acute for sectors involving mega-infrastructure development projects such as construction of ports, railways and highways. Migrant workers will play a vital role in Sri Lanka's vision in becoming the global and regional economic hub. Sri Lanka is thus increasingly becoming a labour receiving country with growing number of foreign workers entering its shores.

Health is a major determinant and a critical enabling factor of migration. Providing health services for the inbound migrants as well as to protect the public health system of the country in terms of the health care cost and the possibilities of emerging and re-emerging public health challenges will be an enormous challenge in achieving sustainable development in the country. Indeed, Sri Lanka's National Migration Health Policy emphasizes that the State will, through multi-sectoral engagement, ensure health care access to in bound migrant populations including non-citizens employed in Sri Lanka without burdening the State sector health system and through public and private partnership; put in place mechanisms to provide access to primary health care services; and; strengthen and implement a systems for monitoring, assessment and surveillance of all in bound migrants prior to arrival or soon after arrival in the country to address diseases of public health concern to Sri Lanka. The Government recognizes that Sri Lanka enjoys some of the best health standards in the region, and will continue to promote any measure taken to minimize the impacts of ill health jeopardizing the positive outcomes of the development.

Methodology

A mixed method approach was undertaken to describe health care access, self-reported health status and health issues among foreign migrant workers in Sri Lanka. First, content analysis of existing registries of foreign migrant workers in

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Sri Lanka and domestic legal frameworks and policy analysis on documents pertaining to foreign labour were undertaken. Data sources for years (up to and including December 2011) included: The Board of Investment (BOI) registry data, disease burden data from the Ministry of Health and human mobility data from the Department of Immigration and Emigration.

Second, a qualitative research study was designed to describe health care access, self-reported health status and health issues among foreign migrant workers in Sri Lanka. Issues explored included health seeking behaviors, perceptions on health insurance and access to health services. A purposive study sample of foreign migrant workers across four construction sites, representing the three major nationalities of in-bound worker flow (Chinese, Korean and Indian) were selected. Relevant stakeholders involved in recruitment and management of the workers (e.g. management of the BOI companies, Department of Immigration and Emigration officials), and health care providers (e.g. Government and Private Hospital directors, Public health staff) were also interviewed. The purposive study sites selected were also based on geographical spread to ensure adequate variability across district sites (Hambantota District, Galle District and Gampaha District, Colombo District). An interview guide was used to conduct the focus group discussions with migrant workers. Interpreters were recruited and trained as part of the research development process in order to construct the interview guide. The same interpreters were used to translate participant responses which were recorded into English transcripts for thematic analysis.

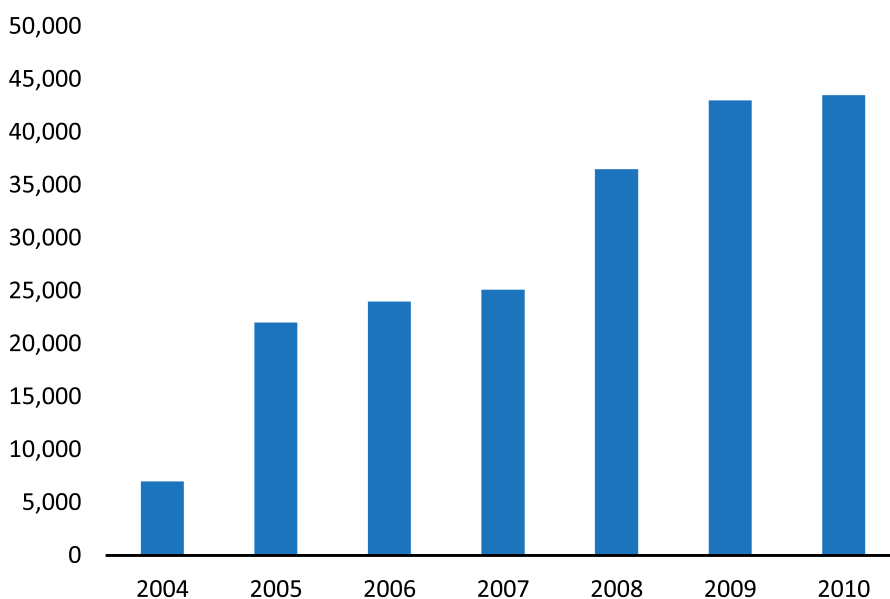
Results & Discussion

A residence visa is a permit for a non-Sri Lankan to obtain residence facilities for special purposes. There are 10 categories of residence visas ranging from employment, investment to diplomatic. Foreign labour migrants include foreigners admitted by Sri Lanka for specific purpose of exercising an economic activity remunerated from within the receiving country. Their length of stay is restricted as per type of employment. The number of in-bound migrants under the “resident visa” category, for which ‘foreign migrant workers’ are the highest proportion, have increased over the past few years (Figure 1).

The total number of resident visas issued in Sri Lanka for the year 2011 was 44,901. Of these, the majority arrive for the state sector and BOI development projects. It is predicted that there will be a remarkable increase in these numbers considering the expanded economic development in the country.

Of all resident visas issued in 2010, the highest number (53%) were for foreign migrant workers. The second highest category after migrant workers are “spouses of Sri Lankans” (16%) followed by international students/scholarship holders (11%). The highest proportion of foreign migrant workers worked in the “State-sector” (i.e. Government managed large infrastructure projects) at 52%, followed closely by those working in Board of Investment” projects (private funded/foreign direct investment projects) at 35%. The remaining 14% were sourced within the Private sector projects.

Figure 1: Total number of residence visas issued to foreign nationals (2004 to 2010)



India and China were the main source countries of migrant workers to Sri Lanka. They represented 22% and 15% respectively out of the total active resident visa holders (as of May 2011). In disaggregating the type of resident

visa categories, in 2009 Chinese nationals dominated the State sector development projects and Indian nationals were the top source country for those from Board of Investment (BOI) project sites (Table 1).

Table 1: Resident visa categories by nationality (2009)

Visa Category	Total	Country with the highest contribution		
		Country	Number	Percentage of total (%)
Students	3,913	Maldives	2,589	66.2
State sector	6,382	Chinese	4,090	64.1
Spouse Citizen	5,301	Indian	2,194	41.4
Private sector	2,228	Indian	1,154	51.8
BOI	5,832	Indian	2,660	45.6

Sri Lanka has 1,841 companies registered under BOI act (as of October 2011). There were 3,375 foreign migrant workers of different skill categories in BOI projects working in Sri Lanka by December 2011. Some of the companies have life and health insurances for their workers and some do not provide the coverage for outpatient services. Often employers cover the health expenses of the employees while in some companies the health care cost is born by the worker.

Focus group discussions with migrant workers across the four construction sites revealed that the most commonly reported health conditions were minor injuries related to workplace accidents, followed by cough and cold, allergic skin conditions, stomachaches and toothaches. Some workers, in particular from the Chinese work sites stated to have their carried their own from their home countries (which were mainly indigenous herbs/ointments). Sri Lanka does not require foreign workers to undertaken any compulsory health assessment as per the case in other countries such as Singapore, USA, Australia and the Gulf Cooperation Council countries. Managers of companies within three of the four work sites stated that workers do undergo a 'fitness to travel' examination before departure although no information was provided on the type of medical examination or conditions they were screened for.

Most foreign migrant workers worked in remote work sites where there were a limited number of private health service providers. However access to primary health care and specialized care was available to all and there were little or no cost to the workers. Most workers stated that the public health services were offered to them free of charge at point of entry. According to the general Circular No. 1226, issued by the Ministry of Health in Sri Lanka on 29th April, 1982, it is mentioned that; "All non-nationals other than Indian Estate Laborer seeking indoor treatment in paying wards in government Medical Institutions, should be required to pay enhanced charges, and those seeking in-door treatment in non-paying wards should be required to pay 50% of the relevant rates."¹ Despite this instruction, foreign workers freely accessed the government health system.

¹ Government of Sri Lanka. General Circular No. 1226, issued by the Ministry of Health in Sri Lanka on 29th April, 1982.

Workers stated that they were not discriminated based on migrant status nor denied treatment. They had high regard and “confidence in government medical services”. They accessed government hospitals at close proximity to their work sites for emergency care and minor ailments. Some of the projects/ companies have their own doctor/ nurse available. Workers did access private hospitals. Cost of treatment incurred by foreign workers at private hospitals for an outpatient visit ranged from Rs. 5,000 – Rs. 20,000.

Interviews with managers welcomed any pre-departure or post-arrival health examination if they were mandated by the Government of Sri Lanka, as long as they did not unnecessarily delay project processors. Foreign workers interviewed did not object on introducing a health checkup prior to departure or an on arrival follow-up examination for conditions such as Tuberculosis.

Study Limitations

This study was carried out as a rapid appraisal, and was limited only to workers within 4 construction sites. Therefore, the results of this study cannot be generalized to all categories of inbound migrant workers, since this was a purposive, non-representative sample. The type of work settings selected in study were linked to large scale State Sector operations, thus smaller scale operations and in-formal foreign migrant worker sector was not captured. The health and social issues pertaining to foreign migrant workers within such ‘in-formal’ sectors may have different health profile and health vulnerabilities. Furthermore, it has been reported by the Sri Lankan Immigration Controller General that increasing numbers of Indian nationals arriving to the country on tourist visa have overstayed, and engaged in both business and agricultural activities (mainly in the Eastern and Northern provinces.² Since there is a dearth in local labour to engage in agriculture and also due to labour from migrants being cheaper, there is a call for legalizing short-term migration from South India. Research on such temporary labour groups though difficult are critical.

Reflections and Recommendations

There is an increasing trend in the number of foreign nationals considering the rapid economic development in the country, and a large volume of foreign migrant workers (mainly from China and India) have been absorbed into large scale development projects.

Current discussions on the development of a national migration health policy have placed greater emphasis on increased human mobility and the ability to facilitate the spread of diseases. Re-emergence of eliminated diseases or introduction of a new diseases/strains via migration flows forms a critical component of national health security.

In using the 2010 World Health Organization country specific Tuberculosis (TB) prevalence data as a reference guide³, it can be seen that 65% resident visa applicants to Sri Lanka in 2010 were from the countries with a Tuberculosis prevalence higher than that of Sri Lanka (Table 1). Countries such as India and Bangladesh are also endemic to Malaria, to which Sri Lanka reached elimination status in 2016.

At present there is no health assessment requirement or agreement during worker recruitment or visa process in Sri Lanka. As described in study results, foreign workers and their employers interviewed welcomed the introduction of a health checkup as a pre-condition for entry and also for follow up. At the time of writing, a cabinet paper for a health assessment for inbound resident visa holders is being formulated by the Ministry of Health that seeks an evidence informed, humane, rights based and cost-effective approach to assessing health status of foreign migrant workers. With a growing trend in inbound migration, establishing a migrant sensitive health assessment model for long-stay resident visa applicants may be an effective strategy to reduce burden of Tuberculosis for instance.

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² Sunday Times. Immigration department seeks public assistance to nab foreign nationals overstaying-visas. 2013; Available from: www.sundaytimes.lk/131110/news/immigration-dept-seeks-public-assistance-to-nab-foreign-nationals-overstaying-visas-68752.html

³ WHO (2011) Tuberculosis country profiles. Link: www.who.int/tb/country/data/profiles/en/

Table 1: Total number of resident visa applicants to Sri Lanka by country of origin and status as high TB burden country (Reference: WHO TB Report 2015)

Country	Total visa applications	Extensions	High Burden TB country*
China	9,815	2,982	YES
India	9,702	4,281	YES
Republic of Korea	1,333	744	NO
Bangladesh	1,121	820	YES
Phillipines	806	466	YES
Pakistan	741	429	YES
Myanmar	497	319	YES
Thailand	411	220	YES
Indonesia	370	127	YES
Russian Federation	126	57	NO
Cambodia	124	77	YES
Kenya	76	47	YES
South africa	74	35	YES
Sudan	51	39	NO
Viet Nam	33	13	YES
Brazil	23	13	YES
Madagascar	18	13	NO
Nigeria	18	14	YES
Uganda	17	10	NO
Afghanistan	3	2	NO
Total	25,359	10,708	

*Defined by WHO as "High Burden" Countries in 2015 (Ref: World TB Report, WHO, 2015).

Survey on assisted voluntary returnees to Sri Lanka: Analysis of survey data on assisted voluntary returnees from Canada

Kolitha Wickramage¹

Rajendra Surenthirakumaran²

Introduction

Canadian authorities have indicated that Canada ‘has become a target for human smuggling operations’ with ‘growing numbers’ of irregular migrants to Canada (1,2). There is a need to harness more comprehensive information on the push and pull factors enabling such movements. Koser and McAuliffe (2013) identifies four main areas that require greater attention if an adequate evidence base on the drivers and possible deterrents of irregular migration is to be established: a) decision making on leaving origin countries; b) whether and how irregular migrants select their destination; and c) the transit phase of irregular migration and sustainable returns. This research report aims to address the first two research questions by conducting a survey of returning Sri Lankan irregular migrants (3).

Key terms and concepts

An irregular migrant is defined as a migrant whose current residence status is characterized by non-conformity with the immigration laws of the receiving country, regardless of their mode of entry. Nomenclature for irregular migrants most frequently adopted in mainstream media and political commentaries and non-UN publications include "illegal (im)migrant", "illegal", "illegal alien", "clandestines", "irregular alien" and "undocumented immigrant" and "those without papers" (4). Irregular migration has several forms, and the distinctions between them, as well as the overlaps, are important for policy makers and practitioners.

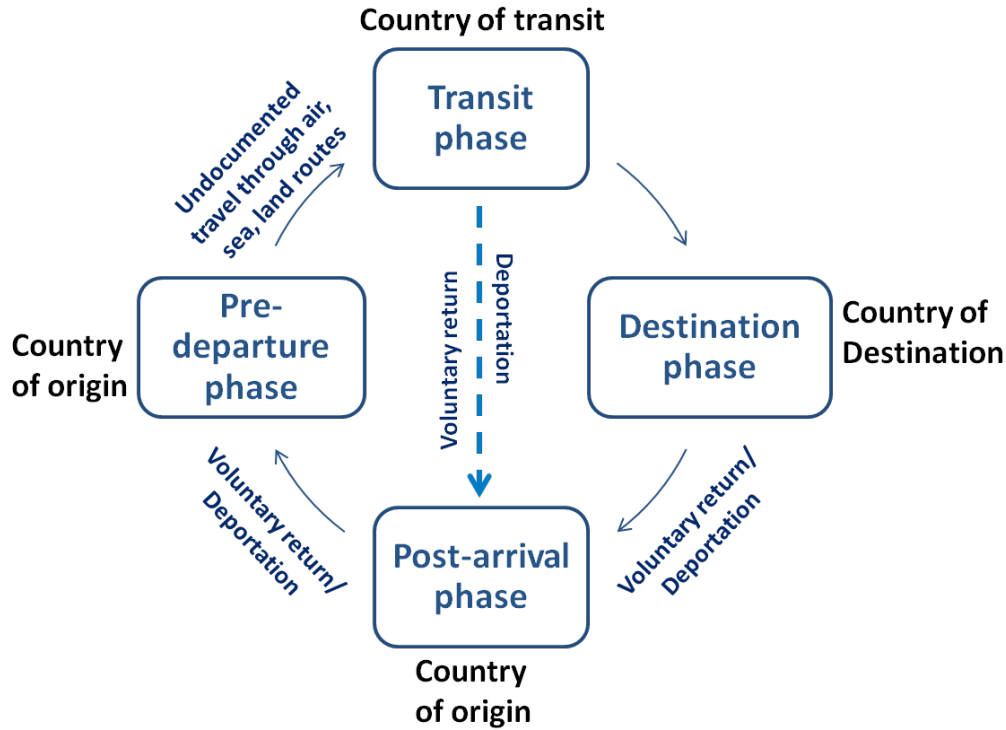
Irregular migrants maybe asylum seekers, those looking for employment or for family reunion or victims of human trafficking (4). When the procurement or retention of this illegal employment is an organized act by a group, it may be considered an “act of smuggling” under the Smuggling protocol. The distinction between "smuggling" and "trafficking" is best captured in the definitions used by the *Protocols supplementing the UN Convention against Transnational Organized Crime*, which are legally binding instruments entered into force in September 2003. The Protocol dealing with human trafficking ('The Trafficking protocol') entered into force in December 2003, and the Protocol against the smuggling of migrants by land, sea and air ('The Smuggling protocol') came into force in January 2004.

Irregular migration most often leads to adverse consequences, with many unaware about such risks and exploitative practices (see Figure 1). Irregular migrants constitute a vulnerable subgroup, particularly due to their limited access to healthcare and/or other public services available (4).

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Figure 1: The conceptual stages of irregular migrant journey (during the pre-journey, migratory, and arrival phases). Note that interceptions occur at transit countries where deportation and voluntary return occurs from these settings (image by K.Wickramage)

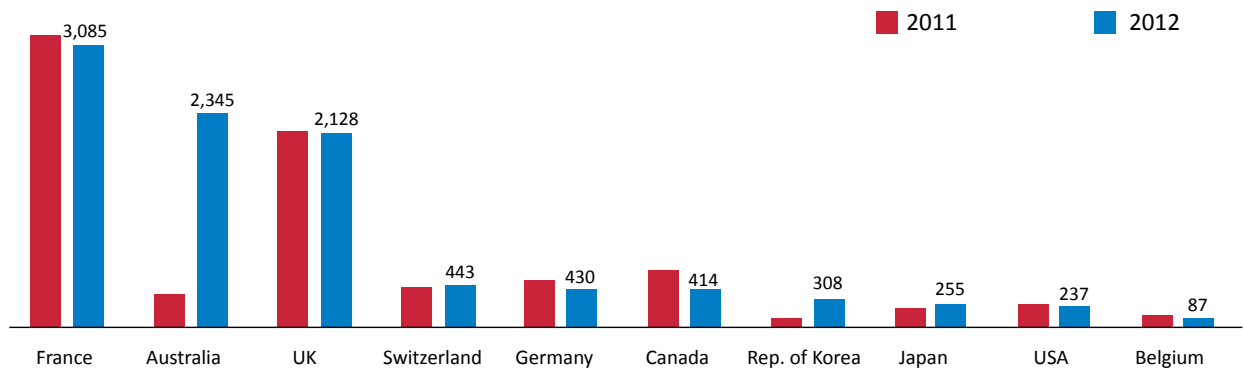


Dynamics of Sri Lankan asylum seekers and irregular maritime arrivals to Canada

Canada was the seventh largest recipient of new asylum-seekers in 2012, with 20,500 claims, a decrease of 19 per cent compared to 2011 (5). Rising numbers of Irregular Maritime Arrivals (IMAs) bear significant human, political, economic, and social costs (6). It is also clear that the economic costs associated with IMAs, as well as counter-

people smuggling efforts, are significant, and have increased considerably in recent years (7, 8). In October 2009, 76 irregular maritime arrivals from Sri Lanka were recorded on Vancouver island, and in August 2010, 492 Sri Lankan nationals arrived to same location. Data from the United Nations High Commissioner for Refugees (UNHCR) indicated that the number of people arriving in Canada to claiming asylum decreased from 629 in 2011 to reach 414 in 2012 (5). France still remained the country which most Sri Lankan asylum seekers submitted claims for the 2011–2012 period (Figure 2).

Figure 2: The data for the top 10 countries for which Sri Lankan’s sought asylum for the 2011-2012 period (generated by analysis of UNHCR database)



The United Nations Office on Drugs and Crime (UNDOC) estimated that the predominant nationality of maritime arrivals on the western coast of Canada, after having crossed the North Pacific Ocean from South East Asia, is Sri Lankan. A common practice is for these IMAs to use Bangkok, Thailand as a transit point, oftentimes temporarily residing in safe houses until they make their journey to the southern part of the country where they board fishing vessels ready to take them across the Pacific Ocean. A UNHCR report published in December 2014 reported more people are risking their lives on smugglers' boats in South-East Asia despite having knowledge of the prospect of horrific violence/abuse en route (9). UNHCR estimates that 54,000 people have undertaken irregular maritime journeys in the region in 2014, based on reports by local sources, media and people who survived the journey. This includes some 53,000 people leaving from the Bay of Bengal towards Thailand and Malaysia, and hundreds of others moving further south in the Indian Ocean.

In many cases, migrants who make the payment prior to being smuggled by sea have done so by selling property and other assets, or borrowing extensively from family members and friends. These lenders may have given up a substantial portion of their savings to finance the migrant's journey. By doing so, communities may lose valuable financial assets and economic empowerment to a cause which may ultimately not be successful, given that the migrant's journey is fraught with danger and a high degree of risk.

The smuggling of migrants from South Asia have complex dynamics. People smugglers use a combination of regular and irregular strategies to transport migrants to intended destinations. With a large and politically active Sri Lankan diaspora in both Australia and Canada, these countries are highly sought as destinations for asylum seekers (10). Most are smuggled by air from their home countries to transit countries from which they continue onward via sea route (11). Most smuggled migrants reach Canada by air, but boat arrivals have increased in recent years, including notable cases in 2009–2011 [UNDOC].

IOM Assisted Voluntary Returnees Survey

Methodology

Specific research objectives:

- To gather in-depth information on socio-demographic profile of irregular migrant returnees
- To investigate the social, health and economic status of the returned irregular migrants/failed asylum seekers
- To identify the stakeholders involved in the irregular migration trajectories (as outlined in Figure 1), methods of smuggling, routes taken, transit and destination countries.
- To identify actual and potential health risks associated with irregular migration and according to stage of journey
- Identify health risks associated with irregular migration based on study data
- Compare findings with data from published literature and assumptions from relevant government authorities

Study setting, design and participants

A descriptive cross-sectional study methodology was employed that involved interviews with five-hundred irregular migrants. The participants were selected systematically from IOM database and an interviewer administered questionnaire was utilized to capture data on a range of socio-demographic profile, rationale and expectation for seeking irregular migration, dynamics of financing the irregular route, stakeholders and sources of information on irregular route, health risks and associated experiences during their irregular journey.

Sampling and data collection

International Organization for Migration (IOM) Assisted Voluntary Return and Reintegration (AVRR) Unit supports and facilitates the voluntary return home of Sri Lankans, including failed asylum seekers, irregular and stranded migrants.¹ IOM is mandated by its Constitution to ensure

¹ Sri Lanka became the member of International Organization for Migration (IOM) in 1990. Since then, IOM has closely worked with the state and non-state institution to ensure safe migration practices. IOM implements numerous programs encompassing human trafficking, irregular migration, migration health, labour migration, and force migrants (IDPs and returning refugees).

orderly migration, inter alia, through voluntary return and reintegration assistance. In particular, IOM emphasizes that voluntariness remains a precondition for all its AVRR activities. IOM maintains a database registry of all returnees supported through the AVRR program.

The study population was comprised of irregular migrants that were available in the registry which is maintained by the IOM Sri Lanka from 1st of April 2011 to 31st of March 2013. The inclusion criteria for the study were that all returnees had to be older than eighteen years of age, were non-institutionalized (excludes any returnee within prison or hospital system) and provided consent.

Sample size was determined according to the standard method. Equation for sample size calculation: $n = z^2 * P(100-P) / d^2$ (n – Sample size, p – anticipated proportion, d – margin of error assuming 5% error), where $n = (1.962 * 50(100-50) / 5^2) = 384$. To account for non-responders rate (20%) the sample size was calculated at 490, and then rounded up to 500. Stratified proportionate random sampling was used to identify the sample from the population. First the sample was stratified according to the district where they are living presently. Analysis of IOM's AVRR registry showed the highest proportion of returnees originating from Districts in the Northern Province, followed by Western Province. Second, the level of stratification was performed based on ethnic composition within each district. This step ensured elimination of any confounding bias associated with the inclusion of only one ethnic group.

A structured survey instrument was administered by trained interviewers. Questionnaires were initially prepared in English and then it was translated to Tamil and Sinhala. Subsequently, it was re-translated to English by university lecturer in order to maintain accuracy of the translation. Necessary modifications were done in the questionnaire in Tamil and Sinhala wherever translations did not conform to the original meaning of questionnaire in English. The questionnaire consists of the following five subsections: socio-demographic profile; rationale and expectation for seeking irregular migration; dynamics of financing the irregular route; stakeholders and sources of information on irregular route; health risks and associated experiences during their irregular journey.

A research team comprised of public health experts, medical and social science graduates. Training research staff in data collection were undertaken one month prior to the commencement of field work. The training session involved procedures for data collection, protocol for obtaining ethical consent, assessing eligibility, ensuring confidentiality and minimizing non response error. Role

plays were also conducted with research team who either played the role of an interviewer or interviewee. Each interviewer conducted two interviews that were supervised by the principal interviewer. A pilot study was carried with a sample of irregular migrants who returned after 31st March 2013. A list of reasons for irregular migration were derived after conducting focus group discussions with returnees during this pilot phase to formulate survey questions.

Survey administration

Telephone interviews with the identified participants were first facilitated by IOM's AVRR staff to verify identity, eligibility of the participants and to confirm addresses. AVRR team members explained the detail of the research and its purpose and consent forms were sent through the AVRR field team members. Subsequently telephone contact was developed with the selected participants by the research team member and standardized explanation using a script guide was given about the purpose of the study, confidentiality and voluntary participation. If a subject did not give consent she/ he were discarded as a 'non-respondent'. If a subject was unavailable at home on the first contact, several attempts were made (essentially during the weekend) before it was discarded as 'non-response'.

Data analysis and Research ethics

Statistical analysis was performed by using statistical package for social sciences (SPSS) version 16.0. Descriptive statistical analysis was performed to describe the sample characteristics and bivariate analysis was done by using Chi-square statistical tests. Ethical clearance was obtained from the Ethical Review Board of the Faculty of Medicine, Jaffna. Permission was obtained from the Director of the unit to use their database and client for the research. The participants were given the freedom to leave the study at any given moment. Informed written consent was obtained from each participant.

Results

More than half (53.2%) of the 500 returnees interviewed were returnees from Canada. Majority were young males (mean age of 33 years) and 97.4% of them were of Tamil ethnicity (Table 1). The responder group had a relatively low formal educational attainment status with only 24% graduating from high school (Table 2). The vast majority were from rural areas (73.7%). Most participants stated that they were in full time employment prior to seeking their irregular route (91.7%), with a large number (96.6%) reported having significant family debt.

The majority of returnees stated ‘escaping poverty’ as the main reason for undertaking risk of undocumented route of migration (90%), while the ‘fear of persecution’ (23.7%) and lack of employment opportunity (18.5%) were reported as the major push factors. Over half (50.8%) of returnees felt that prior to departure, they felt the asylum application process were more ‘favorable in Canada’, with 13.5% suggesting that their selection of Canada was based also on the fact that they had relatives and family living there.

Responders cited “recruiters” and “middlemen” as the major source of information about travelling through irregular means. When asked “who organized your trip?”, over three quarters of responders (77.8%) cited a “recruiter of middle-man”, and a small proportion (8.3%) by ‘friends or relatives abroad at destination country’ (Table 4). The route taken to travel to destination country was through airplane (97%) indicating that most irregular migrants were those ‘overstayers’ who violated visa regulations (Table 5).

Table 1: Socio-demographic profile

Category	Canada	%
Gender		
Male	247	92.9
Female	19	7.1
Ethnicity		
Sinhala	0	0.0
Sri Lankan Tamil	259	97.4
Indian Tamil	2	0.8
Muslim	4	1.5
Burger	1	0.4
Religion		
Buddhist	1	4.0
Hindu	204	76.7
Islam	5	1.9
Roman Catholic	40	15.0
Other Christian	16	6.0
Age		
<20	13	4.9
20-30	142	53.4
31-40	85	32.0
41-50	24	9.0
51-60	2	0.8
>60	0	0.0
Marital status (time of departure)		
Married	135	50.8
Divorced	4	1.5
Never married	127	47.7

Table 2: Economic status and educational profile

Category	Canada	%
Education		
No school education	3	1.1
From grade 1 up to grade 5	7	2.6
From grade 6 up to O/Ls	139	52.5
Passed O/Ls	51	19.2
From grade 12 up to grade 13	39	14.7
Passed A/Ls	21	7.9
University or higher	5	1.9
Employment		
Full time employee	244	91.7
Part time employee	22	8.3
Others		
Family indebt		
Yes	257	96.6
No	9	3.4
Home Setting		
Village / Rural Area	196	73.7
Urban	70	26.3

Table 3: Reason for irregular migration

Reason for migration	Yes (N)	%
A better standard of living in country of destination	8	3.0
To escape from poverty	241	90.6
Family unification in country of destination	1	0.4
Little or no job/employment opportunities in Sri Lanka	50	18.8
Little or no education opportunities in Sri Lanka	2	0.8
Fear of persecution by authorities	63	23.7
Other reasons	4	1.5

Table 4: Rationale for selecting destination country

Choose this country of destination		N.	%
Family/friends already there	Yes	36	13.5
Convinced that the Asylum application process more favorable prior to departure	Yes	135	50.8

Table 5: Information on those who organized irregular journey

Responses to question: Who organized your journey?	N.	%
I organized it myself	8	3.0
A "recruiter" / "Middleman"	235	88.3
Through friends/relatives abroad [at destination country]	18	6.8
Through friends/relatives at home country	4	1.5
Other	1	0.4
Route of travel		
Air	260	97.7
Sea	6	2.3
Knowledge on previous failed attempt on planned irregular route		
Yes	66	24.8
No	200	75.2

Summary of Findings

The most important push factor for irregular migration ranked according to order of total responses was to escape from poverty. Despite this articulation, a large proportion of participants stated that they were in full time employment prior to seeking their irregular route to Canada (91.7%). However almost all responders (96.6%) reported having significant family debt prior to departure. Interviews during formative research phase with a returnee group and with IOM project staff indicated that most returnees had mortgaged properties, assets and taken loans to finance their irregular journeys, adding to their economic vulnerability and family debt. Thus, migration for economic purposes appears to be the main driver. Other push factors included persecution, and human security, unemployment and for purposes of family reunification. Further qualitative exploration of these factors are needed to unpack the determinants of each push factor. The irregular journeys to Canada were organized mainly by 'middle-men' operating at village level. Though challenging, further research is needed on profiling such operators and how they function at community level. Findings may provide insights into determining whether such middle level operators, act alone or as part of syndicate and offer important points for intervention.

These findings from returnees, are consistent with community surveys undertaken in high IMA source areas of Sri Lanka during January and May of 2013 (12) that revealed that the reasons people intended to travel by boat to Australia involved multiple, inter-related factors, including factors related to protection, visa access, employment, people smuggling, geography and family/community links. The most prominent factors as indicated in this study, related primarily to economic prosperity.

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SECTION IV

Health system strengthening
and Migration management

PART I

Migration health assessments

The challenge of establishing a migrant sensitive, rights-based approach to tuberculosis screening in Sri Lanka

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Kolitha Wickramage²

ABSTRACT

Background

Limited attention has been made by countries of 'new immigration' to define an immigration medical examination requirement of inbound migrant flows. Importation of TB through inbound migration routes have been a largely neglected strategy in TB control in Sri Lanka despite increasing migrant flows from endemic regions. We contend that establishing a health assessment for those long stay resident visa applicants to Sri Lanka may be useful in mitigating the spread of TB. However the approach should harness a 'rights based' approach to health assessment, and also be linked to the national health system. In this way the assessment becomes a vital mechanism for global public health good rather than be perceived as a tool for discrimination or immigration control. Migrants need to be included in national and global TB control strategies, especially since mobility is a key feature of the post-2015 Millennium Development Goals agenda.

Keywords

migrants, tuberculosis screening, health policy

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Tuberculosis control among migrants – current practices and debates

The International Organization for Migration (IOM) estimates that one out of every 33 persons in the world today is a migrant.¹ The total number of international migrants has been progressively increasing, reaching 232 million in 2013.¹ The rapid movement of people due to liberalization of economies, permeability of border crossings and introduction of faster and larger aircrafts has opened avenues for rapid introduction of communicable diseases.² The risk of disease transmission may be rapid, as the case of a SARS outbreak, or prolonged, as in tuberculosis (TB). The spread of pathogens within the global village have also exposed obsolete systems of border health management and heralded advances in global disease containment.

Travel restrictions on the basis of active TB status have been imposed on immigrants and those seeking temporary residency by a number of countries with a low incidence of TB in the host population, usually comprising of high-income nations.³ Not surprisingly, the health screening of migrants is contested within political, public health, migration and development domains.^{4,5} The rationale for

non-admissibility is based on one which ensures public health protection to the host community, and for health conditions that may result in significant health care costs to the host country, especially in those operating within a socialized health care system.⁶ People migrating to these countries are required to undergo a compulsory health assessment determined by the migrant 'receiving country'. The health assessment protocols are decided based on the categories of migrants, epidemiological profile of the country they come from and their duration of stay. The timing and location of the health assessment may vary where it can be undertaken at the pre-departure migration phase (warranting an 'off-shore' examination), or an 'on-shore' examination conducted upon arrival at destination country.⁷ The screening for active TB is a universal requirement of all migration health assessments.⁸

Despite the risk of transmission, there is limited evidence that imported tuberculosis actually leads to an increase in disease incidence of host countries.⁹ Imported tuberculosis is mainly transmitted within population subgroups, often within the immigrant community in the destination country.¹⁰⁻¹³ Tuberculosis cases within foreign-born population subgroups have also been shown to be increasing in some settings. In the United Kingdom, foreign-born individuals account for 74% of all TB notifications and have a 20 fold higher TB incidence than UK-born individuals.¹⁴ In the United States of America, 62% of TB cases were among foreign-born individuals and this percentage is increasing steadily since 1993.¹⁴ In Denmark, 6.6% of all TB cases from 1992 through 2004 were migrants.¹⁵ In Singapore, 49% of new TB cases diagnosed in 2011 were among non-residents and comprised of work permit applicants, work permit holders and short-term social visitors.¹⁶ A systematic review and meta-analysis to determine the yield for pulmonary tuberculosis among new immigrants at the point of entry was established at 3.5 cases per 1,000 screened (95% CI 2.9–4.1).³ Migrants from countries with a high prevalence of tuberculosis may therefore have the potential to influence the epidemiology of TB in host countries with a low-incidence of tuberculosis.^{17,18}

Considerable variability exists between nations in the model used for immigration TB screening.⁷ Some countries in the Middle-Eastern region such as Saudi Arabia, Kuwait, Bahrain and Jordan impose both pre-departure and upon-arrival health examinations for temporary migrant workers arriving to their country.¹⁹ Differing country specific priorities on TB control, weak health systems, limited political support and technical capacity and financial constraints may be some of the reasons for non-establishment of immigrant health

assessment systems in countries experiencing high volumes of migrants from high TB incidence countries, especially in the developing world.

In this paper we analyse the dynamics of increasing inbound migrant flows and implications for the transmission, control and prevention of TB in Sri Lanka. We discuss the rationale, progress and challenges for the establishment of a health assessment requirement for inbound migrants to Sri Lanka. In providing a critical review of the existing models of migrant TB screening from selected countries, we emphasise the need for a rights based and evidence informed approach.

Tuberculosis burden in Sri Lanka and growing importance of inbound migrant flows

Sri Lanka is a middle income country considered as having a 'moderate burden' of TB with an estimated prevalence of 101 per 100,000 population, and the estimated incidence at 66 per 100,000 population.²⁰ The incidence of TB-HIV co-infection is very low (0.7 per 100,000 population). Multi-drug resistant (MDR) TB is also a rare occurrence, with only five MDR-TB cases detected in 2012. A case of MDR-TB from a foreign migrant worker from India was confirmed in 2011.²¹ The population group with the highest incidence of TB (936 per 100,000 population) were observed among returning expatriate refugees from India, following the cessation of conflict in 2009.²² Prisoners formed the second highest incident group (771 per 100,000 population), followed by the urban population in the capital city of the Colombo Metropolitan area (129 per 100,000 population).²²

A major trend has been the importance of inbound migration on TB epidemiology in Sri Lanka. Inbound migration is defined as the population flow of people into a country.²³ The pattern of inbound migration dynamics shows an increasing trend of migrants from high TB burden countries.²¹ With the dawn of peace, dynamics of inbound population movements to Sri Lanka have significantly increased across multiple categories. An estimated population of 90,000 Sri Lankan refugees living in refugee camps in Southern India are now returning home to districts mainly in Northern Sri Lanka for permanent settlement.^{24,25} Sri Lanka is also regaining its popularity as a tourist destination with the influx of tourists growing annually. The nation is also heavily dependent upon labour migration, with nearly 2 million Sri Lankans working in regions such as the Middle East, and in emerging labour markets in South Korea. Sri Lankan workers are joined by workers from other labour

sending countries in the region such as India, Philippines, Bangladesh and Pakistan at these work sites, where conditions often exacerbate health vulnerabilities.^{26,27} All registered outbound workers to these Gulf states undertake a compulsory health screening for active TB, HIV and other conditions (as defined by the receiving country), within private clinics accredited by the same country. For instance, the Gulf Cooperation Council Approved Medical Centres' Association (GAMCA) is the accreditation and monitoring body for panel physicians and clinics operating within labour sending countries for migrant workers travelling to Gulf States.

However, a previously unrealised migration trend emerges from Sri Lanka's transformation from a labour sending country to a labour receiving one to fuel the economic development boom. A large volume of foreign migrant workers (mainly from China and India) have been absorbed into large scale development projects to rapidly develop the country infrastructure over the past 5 years. Furthermore, it has been reported by the Sri Lankan Immigration Controller General that increasing numbers of Indian nationals arriving to the country on tourist visa have overstayed, and engaged in both business and agricultural activities (mainly in the Eastern and Northern provinces).²⁸ Since there is a dearth in local labour to engage in agriculture and also due to labour from migrants being cheaper, there is a call for legalizing short-term migration from South India.

There were 35,826 resident visas issued by the Sri Lankan Department of Immigration and Emigration in 2011.²⁹ Of these, the majority (42%) were for persons involved in development projects in the state sector, private sector and in the Board of Investment (BOI) projects. Our analysis shows that 54% of resident visa applicants arrive from high TB prevalent countries, out Invited paper 70 SLJID <http://sljol.info/index.php/SLJID> Vol. 4, No. 2, August 2014 of which 70% are from India and China. The WHO lists India and China among the 22 high burden countries for tuberculosis, which also have a high MDR-TB burden and incidence of TB/HIV co-infection.²⁰ A qualitative study³⁰ conducted by IOM and the Ministry of Health in 2012 revealed that the majority of foreign migrant workers working in large construction sites from China and India belonged to low socio economic strata where the risk of TB and MDR-TB were generally higher.³¹ There is currently no requirement for a person entering Sri Lanka for purposes of long stay/residency to undertake a health examination, and certainly no testing of these persons TB status.

Models for TB Screening criteria for migrants

In the development of a framework for migration health assessment for in-bound migrants, one of the main challenges would be to identify the best suitable model for Sri Lanka. The existing TB screening models in other countries among migrants vary widely.⁷ In the Netherlands, migrants from countries with high prevalence of TB who intend to stay longer than 3 months undergo obligatory screening by chest X-ray at entry. This is followed by a half yearly voluntary screening for 2 years.³² Under the United Kingdom Tuberculosis Detection Programme, long-term visa applicants for duration of six months or longer from a list of 67 countries with a high incidence of TB undergo pre-departure screening for TB.³³ All applicants undergo a chest X-ray examination followed by sputum smear examination if the chest X-ray shows signs of active TB. The recent introduction of sputum culture examination into the UK TB Detection Programme has led to a three-fold increase of case detection.³⁴

In contrast to UK, the health screening of non citizen entrants to Australia is regulated less by public health law than by migration law.³⁵ Currently, health screening is managed through a complex visa system. Except for a few categories (for example, diplomatic visas and certain emergency humanitarian visas), the nature of the diagnostic tests to be undertaken vary according to the length of stay in Australia, the category of visa sought, and the risk status of the country from which the visa is applied. Applicants from countries deemed to be "very high risk", and who intend to stay over three months must fulfil the health criteria. Any applicant who wishes to stay over 12 months, and those seeking long term residency must likewise undertake a compulsory health screening process prior to departing their country of origin.

As a labour receiving country, Taiwan Province of the People's Republic of China commenced health screening of blue collar foreign labourers where applicants are required to submit a certification of health to apply for an entrance visa. Those workers entering the country then undergo a health examination within three days of entry to country, and at regular intervals (at 6, 18 and 30 months) to ensure eligibility for work.³⁶ Applicants who fail the repeat assessment would be revoked of their employment permission. The health assessment (HA) model adopted for foreign labour migrants to many Gulf States such as Saudi Arabia, Kuwait and Bahrain share similar pre-departure and post-arrival assessment models, with some upholding a policy of deportation of workers based on TB and HIV status.³⁷

TB screening for inbound migrants may take place in one of three locations: at pre-departure phase, on arrival or at a defined period during the post-arrival phase.⁷ Pre-departure screening that occurs at the country of origin has several advantages. Since the immigrant receives screening before departure, if detected positive for TB, he/she will receive treatment in a familiar environment. The advantage to the receiving country is that pre-departure screening prevents the travel and arrival of individuals with active or infectious disease. The lack of quality-assured medical examination, laboratory tests, fraudulent documents or substitution are major challenges in establishing pre-departure screening programmes. Countries such as USA, Canada, New Zealand and Australia obtain support of IOM for undertaking health assessment processors, as well as utilise a network of trained “panel physicians” for pre-departure medical screening.¹³ Beyond the requirement of high quality TB diagnostic facilities and time-efficient processors, predeparture medical screening also requires investment in fraud prevention in the HA process.

Screening of migrants immediately on-arrival at points of entry (such as airports) from high burden TB countries provides a second option. However, the experience from UK has shown that TB assessment of migrants at point of entry using radiological assessment proved challenging to implement and resulted in a very small detection threshold of active TB cases.¹³ The third option is post-arrival screening where the screening occurs within a few weeks of migrant arriving in the receiving country through the maintenance of a quality TB screening service with supportive facilities for TB treatment and referral care. When the consequences of untreated TB patients (as well as MDR-TB and TB-HIV co-infection) are taken into account, the receiving countries should consider it as an investment rather than a burden.

The median interval for the presentation with TB after arrival to host country was reported to be 2 years in Spain,³⁸ with a range of 2 to 5 years in the United States.³⁹ Activation of latent TB infection has also found to be a common cause of TB among immigrants.^{6,38} The risk of TB transmission is also high during the first two post-migration years.^{40,41} Repeated visits to the country of origin by the migrant individual during his/her stay in the host country further increases the risk. Therefore, TB screening should not be limited for screening at arrival.¹⁵ Ideally, screening immediately after arrival to the host country should be followed with repeated assessments, for example, on an annual basis that links with existing resident visa renewal requirements.

Existing migrant screening programmes target detection of active TB disease but most programmes extend this to include screening for latent TB infection (LTBI). The prevalence of active TB among refugees from high-incidence countries migrating to low-incidence countries was less than 1% but latent infection with chest radiographic abnormalities is higher, ranging from 3–5%. Latent infection without chest radiographic abnormalities is even higher with prevalence estimates between 35–42%.⁴² Since latent TB infection is not an indication for treatment under the National Programme, the objective of a migrant TB screening programme in Sri Lanka can be limited to detection of only active TB disease. Despite its low sensitivity (59–82%) and specificity (52–63%) in the detection of active pulmonary TB,⁴² CXR remains the main screening tool in almost all migrant TB screening programmes. Interpretation of radiological findings is commonly subject to errors. Expertise and experience of interpreters and the number of interpreters affect interpretation. To overcome this limitation, standardization of interpretation is recommended and can be done by digital CXR facilities which allow centralized interpretation by experts with extensive TB experience.⁷ To overcome the low predictive values of CXR in diagnosing active pulmonary TB, sputum smear examination for acid fast bacilli and culture when CXR is abnormal and/or the migrant is having other signs and symptoms suggestive of TB should be undertaken. Conventional TB culture in Lowenstein Jensen (LJ) media takes two to eight weeks on average to produce results and has no value in migrant screening programmes. Liquid culture is rapid and should be the method of choice. All TB isolates should be followed up with drug sensitivity testing. Rapid methods such as line probe assays should be offered rather than conventional sensitivity testing which takes several weeks to produce results. Xpert-MTB Rif, the molecular testing method for sputum, provides results in two hours for TB as well as for rifampicin resistance which is a proxy indicator for MDR-TB.⁴³ Xpert-MTB Rif is ideal for migrant TB screening where rapid results are required and for testing individuals from high MDR-TB settings. Whilst such genomic technologies are powerful, cost implications may prohibit its use in district health systems. It is therefore recommended that interventional research, feasibility and costing studies be undertaken to evaluate its use, if indeed Xpert-MTB Rif is to be utilized for routine screening purposes in Sri Lanka.

Ensuring a rights based and public health approach to TB screening

Poverty and low socioeconomic status as well as legal, structural and social barriers prevent universal access to quality TB prevention, diagnosis, treatment and care.³ Diminishing peoples' vulnerability to TB is integral for the promotion of their "right to health".⁴ In order to reduce the global TB burden, the importance of continuous free access to screening, diagnostics and treatment for TB has been emphasised.⁵ TB control is therefore a global responsibility, with the successful treatment of a person benefiting both host and migrant sending countries. Migrant health assessments should therefore be based on principals of a humane, rights-based approach to health. Irrespective of citizenship and place of testing, any person detected as having active TB should be provided and afforded access to effective TB treatment and care. This approach promotes TB screening for migration as a force of global public health good.⁴⁴

Despite the public health rhetoric, the question of 'who pays' for screening and subsequent treatment of positive cases of non-citizen residents at country level (especially considering high costs of treating MDR-TB), has been a limiting factor for ensuring universal access to TB treatment in many health systems. Usually, the resident visa applicant, migrant worker or the employer of the migrant pays for the costs of health screening prior to entry. If the applicant is found positive for TB and meets the non-admissibility criteria they are disallowed to travel. It is unclear if there are formal requirements/ measures taken to facilitate those that 'fail' their medical assessment within routine health systems. A number of those who have passed the medical screening develop symptomatic TB after their arrival (due to the latency feature of the disease). As described earlier, some countries that practice compulsory post-arrival screening deport such individuals. In Taiwan Province of the People's Republic of China, the Government has planned to accommodate additional TB cases diagnosed among immigrants for both ambulatory and in-ward TB care.³⁶ In Thailand, even irregular migrants are provided with a health insurance card which also gives them access to free DOTs treatment.

Linking immigrant health assessments to health systems and ensuring rights based approach

A 'missing agenda' in immigration health assessments appears to be the lack of meaningful linkages to national

health systems. There is a need to move away from the narrow approach of viewing the health assessment as an 'immigration requirement', to utilizing it as an instrument/ mechanism for global public health benefit. This necessitates a strengthening of coordination and linkages between health assessment providers (usually private sector) and national TB control programmes. Technical cooperation between labour sending and labour receiving countries on joint strategies and information sharing on TB screening and control of migrants (especially large volumes of migrant workers from Asia to Middle East) are needed. Joint research among such countries may also facilitate the development of improved screening algorithms and the evidence base for diagnostic test performance in real world settings. Enabling policy and legal framework for inbound health assessment in Sri Lanka Since 2010, the Government of Sri Lanka, with the technical support of IOM, established an inter-ministerial mechanism to address the migration health challenges faced by the changing migration flows. The World Health Assembly Resolution 61.17 on the Health of Migrants provided a platform to initiative the discourse on the health needs and vulnerabilities of migrants and mobile populations. A series of national research studies were commissioned to gain better understanding on the health risks and vulnerabilities of each migrant category, and to inform policy and practices.⁴⁵

Sri Lanka's 'National Migration Health Policy' was launched in October 2013 after a four year inter-ministerial process. The policy also recognizes the need to provide accessible, effective and affordable primary health care services in a way that will not be a burden in any manner to the country's free health services.²³ The policy ensures all inbound, outbound, internal migrants (and their families), irrespective of their legal status, are to be provided health care in a dignified and humane manner. Safeguards to public health of the host population are also articulated. Thus, the policy provides a conducive framework to pursue the above mentioned recommendations on establishing a health assessment of inbound migrants with not only rights based but a public health and evidence based approach. This conducive domestic legal framework can be harnessed in designing the inbound health assessment model.

A potential model for health assessment for long-stay resident visa applicants for Sri Lanka

Current immigration procedures and practice in Sri Lanka require a prospective resident visa applicant to arrive in Sri Lanka on an 'entry visa' and then apply for the resident

visa after obtaining necessary endorsement from the relevant line-Ministry. A health assessment model therefore needs to be performed on a post-arrival basis where screening for tuberculosis needs to be carried out within the first week of arrival. A proposed algorithm to be followed may involve undertaking chest radiography by a qualified radiologist and if TB is suspected, three consecutive sputum samples (taken over two consecutive days) can be used for microbiological testing (liquid culture) and/or Xpert analysis. In order to ensure efficient and effective Health Assessment processing for the large applicant caseload, a dedicated centre is preferred. Those confirmed with TB diagnosis may opt to undertake supervised DOTs treatment at country level, or choose to return to their country of origin. The onus on the health authority is however to ensure an effective, efficient and migrant sensitive screening process and provide information to the immigration authority for visa issuance and communication to the applicant on follow up steps. Such methods are well described and used by many labour receiving countries implementing on arrival health assessments.³The details of the model are subject to current technical development and will be published separately.

Conclusion

Drawing upon epidemiological and program data from Sri Lanka's National TB program, this paper contends that importation of TB through inbound migration routes have been a largely neglected strategy in TB control. Establishing a migrant sensitive health assessment model for long-stay resident visa applicants may be an effective strategy to mitigate such threats as MDRTB which has already occurred through such routes. With a growing trend in inbound migration, Sri Lanka can embrace the lessons outlined in this paper to formulate a health assessment model that embraces not only an evidence based public health approach but also a rights based approach to immigrant TB screening. As country that has recently launched a dedicated national level policy on protecting health of migrants, Sri Lanka has an ideal opportunity to develop a model that embraces such elements for global public health good. More generally, migrants need to be included in national and global TB prevention and control strategies. For the achievement of global health goals, it is indispensable that migrants' health is addressed in the post-2015 UN development framework.

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Can migration health assessments become a mechanism for global public health good?

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ABSTRACT

Background

Migrant health assessments (HAs) consist of a medical examination to assess a migrant's health status and to provide medical clearance for work or residency based on conditions defined by the destination country and/or employer. We argue that better linkages between health systems and migrant HA processors at the country level are needed to shift these from being limited as an instrument of determining non-admissibility for purposes of visa issuance, to a process that may enhance public health. The importance of providing appropriate care and follow-up of migrants who "fail" their HA and the need for global efforts to enable data-collection and research on HAs are also highlighted.

Keywords

migrant health, health assessment, tuberculosis screening, migrant rights

Introduction

Today, more people are "on the move" than at any other time in recorded history [1]. Although there are many categories of migrants, the scope of this paper focuses on international migrants, defined by the United Nations as "persons born in a country other than that in which they reside in" [2]. There are an estimated 232 million international migrants, which, if these were their own country, would be the sixth largest nation in the world [1]. International migration forms a key pillar in globalization. Remittances from migrant workers account for almost 90 percent of the total stock of international migrants [3], making significant contributions to economic development and foreign exchange reserves [4]. Remittances also contribute to the achievement of the Millennium Development Goals by reducing poverty through the provision of income at the household level, which is spent on food, shelter, education and health.

Migration Health Assessments (HAs)

Health assessments (HAs) form an integral part of many immigration and labour migration programs worldwide. At its core, the HA is essentially a medical examination, usually conducted by a registered medical practitioner (or "panel physician") based on a criteria set by the country or employer of their intended destination ("destination country"). They are regulated through the immigration processes and labour laws of destination countries as part of a person's visa

Journal reference

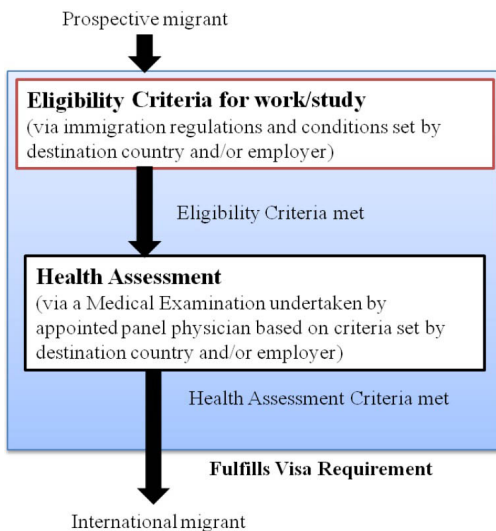
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requirement (Figure 1). The origin of pre-departure HAs may be traced to their introduction at the end of the First World War, when major immigrant-receiving nations established off-shore medical screening programs for prospective migrants [5]. Migrants intending to work, study or seek residency in a country on a permanent basis or for a temporary period of time are required to undertake the medical examination. HAs are also undertaken for refugees and humanitarian entrants as part of resettlement programs and for irregular/undocumented migrants usually at post-arrival immigration holding/detention centers [6]. The focus of this paper considers only those undertaking HA as part of formal migrant programs and, thus, excludes this latter group.

Figure 1: A basic model showing how the health assessment (HA) is a linked migration process



Challenge of Estimating the Magnitude of HAs World-Wide

There are currently no global estimates on the total number of international migrants that undertake HAs, the sites and countries performing the screening, rates of disease detected and treatment outcomes. Baseline estimates of international migrants disaggregated to categories, such as labour migrants, students and humanitarian entrants, are also difficult to obtain at the global level [1]. The lack of data and limited evidence makes it difficult to quantify the magnitude of those undertaking HAs globally.

Data from seven government registries of known international migrant worker populations from the Asian region may provide an insight into the volume and dynamics of HAs for international labour migrants (Table 1). All migrant workers intending to work in Countries of the Gulf Cooperation Council (GCC), such as Qatar and Saudi Arabia, are required to undertake an HA at designated GCC clinics/panels in their countries of origin, with most requiring a follow-up examination after arrival [7].

In 2012 alone, over five million international migrant workers had successfully “passed” the HA requirement to enable them entry for work (Table 1). Remittances from such migrant workers significantly contributed to the GDP of these nations. Despite the large volume of tests conducted, the HA case-load represented only 24% of the total estimated stock of international migrants in these seven countries. The data also underestimates the actual numbers of those undertaking the HA. For instance, migrants who are seeking to gain residency to non-GCC

Table 1: Outflow of migrant workers from selected Asian countries in 2012

Country	Population (millions) in 2013 ¹	Poverty Rate ²	Estimated stock of emigrants in 2013 ³	Registered Labour Migrants to GCC ⁴ nations in 2012 ⁵	Remittances (USD Bn) in 2012 (% of GDP) ⁶
Bangladesh	156.60	31.5	5,635,489	457,590	14.12 (12.2%)
India	1252	29.80	6,845,565	722,139	68.82 (3.7%)
Nepal	27.80	26.6	591,199	1,611,085	4.793 (24.7%)
Pakistan	182.10	22.3	3,557,855	628,452	14.01 (6.1%)
Sri Lanka	20.48	8.9	829,818	247,431	6.01 (10.1%)
Indonesia	249.90	12.5	1,336,688	603,159	7.212 (0.8%)
Philippines	98.39	26.5	2,380,669	791,765	24.64 (9.8%)
Total			21,177,283	5,061,621	139.605 Bn

Notes: ^{1,2} World Bank (2013) Country Data Base. ³ United Nations (2013) Department of Economic and Social Affairs; ⁴ Gulf Cooperation Council (GCC) includes the following countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates; ⁵ Figures are from government statistical sources from each individual country; ⁶ World Bank (2014) Annual Remittances Data (April 2014).

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countries in Europe or America and as international students are not included. More importantly, the actual number who undertook the medical examination, those made non-admissible and the results of such tests are not published. There are no requirements or indeed global efforts for those undertaking HAs to publish such data. Since the data only includes those migrants that had formally registered with foreign employment agencies, it excludes those who travel via undocumented or “irregular” migration routes [8].

Developed nations with extensive immigration recruitment programs, such as Australia, Canada and the USA, also utilize HA models that are conducted at the migrant’s country of origin [9,10]. Although data on exact numbers of HAs undertaken each year are not published, it is estimated that, collectively, five countries of the USA, Canada, Australia, U.K. and New Zealand undertake approximately two million immigration medicals annually [11]. The British Columbia Centre for Disease Control estimates that approximately 450,000 immigration medical examinations are completed annually, 350,000, which are undertaken through overseas panels and 95,000 undertaken in Canada [12].

Diversity in HA Models and Diseases Screened

Countries maintain their sovereignty in deciding who to admit in their country and the rules regarding non-admissibility. The purpose and rationale for conducting HAs for migrants are usually articulated in documents describing visa rules/regulations. HAs are very common in sectors that largely recruit migrant labourers, such as domestic maids and construction workers [13]. A number of countries require migrant workers to undertake an on-arrival medical exam and follow-up exams at regular intervals as a condition for maintaining their work and residency permit [7,14,15,16].

HAs are usually conducted as a measure to limit or prevent transmission of diseases of public health importance to their host populations; and to avert potential costs and burden on local health systems, especially for the treatment of chronic disease conditions [17]. The conditions examined are stipulated within screening protocols and technical instruction notes developed by destination countries and/or employers [18]. The concept of ‘normality’ in health status determination is dictated by the admissibility criteria and where the threshold for non-admissibility is placed. A study by Alvarez (2011) highlighted the diverse range of HA models across sixteen countries that differed across diagnostic protocols used,

for example, to screen for tuberculosis (TB), the site of testing and the category of migrants to be tested [19].

The diseases detected are also difficult to generalize and compare, since they depend upon the definition of “admissibility” of the concerned immigration countries. In the case of tuberculosis (TB), for example, it depends on whether the screening is done to detect active, infectious disease, and therefore, the screening protocol is based on clinical, radiological and laboratory findings or latent TB, largely based on the tuberculin skin test.

Non-Admissibility: Those Who “Fail”

Public health consequences on those failing the HA are difficult to assess, considering most authorities seldom publish data on potential migrants who have undergone screening, the types of disease conditions and follow-up or referral outcomes. A paper by Elwood (2009) estimated that of the 450,000 immigration medical examinations that are completed annually by Citizenship and Immigration Canada (CIC), 55% arrived in Canada, of whom 6000 applicants were referred to health authorities across the country for post-landing medical surveillance [12]. The majority of referrals were due to tuberculosis and a minority related to positive syphilis or HIV serology [12]. A report by health authorities in Taiwan Province of the People's Republic of China highlighted that 101,881 foreign migrant workers or 3.7% of all examined over a seven year period had failed the mandatory HA (Table 2) [20]. Failure results in revoking of employment permission and exit from country. In Oman, expatriates developing TB during their stay in the country are deported after conversion to smear-negative, in what is referred to as “the repatriation policy” [7]. Such policies have been viewed by analysts as a possible barrier to early detection and effective treatment of expatriates insofar as it may stigmatize patients and induce them to avoid public health services [21]. HIV and TB control also becomes challenging due to individuals with active disease becoming a “hidden group”, failing to present early to healthcare providers, due to fear of deportation.

Table 2: Statistics of failure in the health examination of foreign labourers in Taiwan Province of the People's Republic of China from 2001 to 2007. Table modified from [20]

Year	HA Type ¹	Migrants Examined	Number Failed (%)	Parasite (+) ²	TB (+) ³	HIV (+) ⁴	Syphilis (+)	HBs Ag (+)	Other ⁵
Total for 2007	A	127,121	233 (18%)	88	27	12	9	60	37
	B	342,958	25,649 (7.5%)	25,220	387	13	29	NA	0
Total (2001 to 2007)	A	849,473	2152 (25%)	703	282	112	135	378	542
	B	2,730,708	101,881(3.7%)	98,275	1,893	127	284	NA	1,300

Notes: ¹HA Type A: HA undertaken within three days post-arrival to Taiwan Province of the People's Republic of China; HA Type B undertaken at 6, 18 and 30 months after entry for work. ²Parasite (+) means the number of people infected with intestinal parasites. ³TB (+) means failure in pulmonary tuberculosis screening. ⁴HIV (+) means positive antibody reaction to human immunodeficiency virus. HBs Ag (+) means positive reaction to hepatitis B surface antigen. ⁵Other (+) means failure in other items, including positive reactions in pregnancy tests, leprosy tests and urine screenings for narcotics. Urine screening for narcotics was cancelled since January 2004.

The Need to Link Health Systems with Migration HA Mechanisms at the Country Level

Global public health goods are defined as interventions and services whose benefits cross borders and benefit communities globally [22]. For example, the efforts in controlling TB and HIV provide a public health benefit across borders [23]. HAs provide an opportunity to promote the health of migrants through the initiation of health promotion, disease prevention and curative interventions for conditions that, if left untreated, could have a negative impact on the migrant's health and on the public health of the host community and communities of origin, as well.

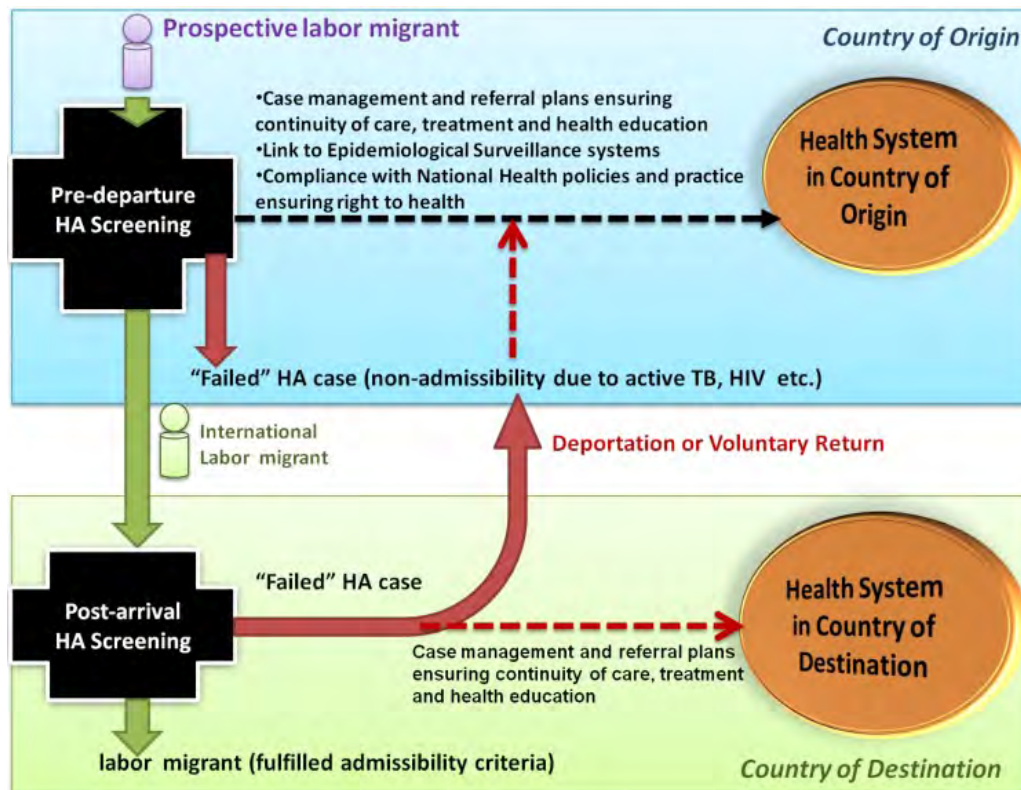
A feature of migrant HAs processors is that they often operate within a “vacuum”, with little or no formal linkage to the public health system of the country of origin. We contend that if migrant HA processors are to meaningfully contribute to public health good, then they need to overcome exclusionary approaches, be linked to the national health systems and be complemented by health promotion measures to enhance the health-seeking behavior of migrants. If a prospective migrant is made “non-admissible” at the end of an HA process and is not provided with adequate counselling, treatment and follow-up care, nor contact tracing and preventive care measures are not followed, then we argue that HAs will remain limited as an “immigration functional requirement” of the destination country/foreign employer, rather than providing a public health good. The absence of such public health measures in HA processors may also not take into account international commitments to achieve global health goals as stipulated

by the widely adopted World Health Assembly resolution on health of migrants and other such international instruments [24].

Falzon (2012) in the context of exploring the challenge of TB control posits a rhetorical challenge, “Can we turn around the perception embraced by many national public health authorities that “migration is a threat” into an opportunity?” [25]. We argue that if HAs are to adopt more collaborative and meaningful forms of partnership with national health systems, this may indeed lead to greater public health benefits. When suspected cases of HIV and hepatitis C, for instance, are identified as part of the HA process, a case-management plan for the potential migrant may be activated. This may involve the delivery of health education, referral to local health services for treatment and linkage to relevant health promotion programs (Figure 2). Patient consent and participation form a vital part of this follow-up process.

As Figure 2 indicates, ensuring migrants are linked to appropriate medical care irrespective of their HA result, active reporting to national epidemiological surveillance systems and adherence to national health guidelines are examples of adopting a ‘health systems’ approach to migrant HAs. In the case of TB, where strict adherence to strategies of directed observed treatment (DOT) of patients have been identified as critical, the return of migrants affected with TB to home countries during or before the completion of a treatment may contribute to insurgency of drug-resistance. Therefore, better linkage of HA processors with health systems may lead to other benefits, such as ensuring the continuity of the treatment of migrants and curbing the potential spread of drug-resistant TB [26,27].

Figure 2: Health assessment model for international labour migrants showing linkages needed to connect HA processors with national health systems in country of origin and country of destination



Role of Panel Physicians and Immigrant Countries

Engaging destination countries and employment agencies in linking their HA mechanisms to national health systems is also essential in “closing the circle” to enable public health gain. In this regard, the role of immigration country-appointed panel physicians/providers in embracing an enhanced public health agenda needs to be emphasized. It is important to ensure that training and technical instruction (TI) guides for panel physicians formulated by the governments of destination countries emphasize partnerships with national health authorities for disease surveillance requirements (as per the country’s public health regulations) and ensuring treatment and referral plans for those prospective migrants deemed non-admissible based on health status.

A positive development in recent years has been the formation of an Intergovernmental Immigration and Refugee Health Working Group (IIRHWG) formed in 2005 by the governments of the USA, Canada, Australia, U.K. and New Zealand to establish a global panel doctor network. Efforts are being made to strengthen TB diagnostic and screening networks through shared clinics,

quality control standards and ensuing policy and practice coherence. Such initiatives may serve to enhance health system linkages and advocacy to improve migrant health and minimize public health security threats.

This group of five countries have also encouraged the establishment in 2009 of an International Panel Physician Association (IPPA) with the mission “to create, maintain and improve a communication network that will enable all participants to establish standardized medical exams based on best practices; give panel physicians, civil surgeons and health experts the ability to share information resources; and promote research and publication on issues related to health and migration”. We underpin the critical role panel physicians can play in leading a possible transformative agenda for immigration HAs. The obligations of recruited screening providers need to be inspired by the same deontological principles of healthcare of the migrants and global health good, stipulated by the inherent relationship between physician and patient. Additionally, more advocacy and new policies are needed vis-à-vis migrant recruiters, so as to better realize these days much emphasized principles of social responsibility for health, also through the use of migrant and employee HAs.

Conclusion

With declining investments in global public health expenditures, a growing focus on universal health coverage [28], a renewed focus on finding, treating and curing those 'left behind' from vertical disease control programs [29] and for promoting active screening for at-risk groups migrants and mobile populations [30], HAs may indeed serve as a global public health good. Despite this potential, HAs remain a largely forgotten "intervention space" in global public health. We argue that the several million HAs performed every year for the scope of migration and international labour offer an important opportunity to enhance universal health coverage.

Discriminatory and excessively exclusionary practices need to be removed as an impediment to patient and global health goals. In countries where a deportation policy is enforced for migrants failing health conditions, the potential to stigmatize vulnerable migrant groups raises ethical and global health concerns. Practices of excludability and forcible return of migrants on medical grounds may contribute to fueling stigma and impeding the recourse to early diagnostics and care. Migrant-sensitive health policies are therefore needed to inform immigration and international recruitment policies [29]. For instance, establishing information systems to evaluate the effectiveness of immigrant screening to allow for evidence-based adjustments of HA policies have been highlighted in the Netherlands [30].

Rather than focusing on the excludability, the HA provides an opportunity to interact with potentially vulnerable migrant groups and to enable health promoting practices. This necessitates strengthening coordination between HA providers and national health systems and a larger partnerships between the public and private actors involved in HA, which leading international health and migration agencies can help build. The public health value of the HA may only be achieved if the HAs move beyond the modus of a mere "disease screening" tool for excludability, to one which ensures adequate quality of care and treatment follow up.

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Author Contributions

Kolitha Wickramage and Davide Mosca conceived of the conceptual ideas for the manuscript. Kolitha Wickramage wrote the first draft, and Davide Mosca contributed to the final manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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PART II

Enhancing border health capacities

A multi-sectoral approach to enhancing public health security and meeting International Health Regulations at points of entry in Sri Lanka

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Global health security in an increasingly mobile world

The International Health Regulations (IHR) are a set of legally binding regulations to prevent the spread of diseases and events across international borders, and are thus a cornerstone that ensures global health security. IHR provides a global framework agreed upon by the member states for the collective international management public health emergencies while minimizing disruption to travel, trade and economies, and at the same time respecting individual human rights [1].

The IHR (2005) identifies several hazards: biological (infectious, zoonotic, food born), chemical and radio-nuclear material which may cause a public health emergency of international concern (PHEIC) as manifested by imported or exported human cases, infected or contaminated vectors or contaminated goods [1]. Many low and middle-income countries are challenged in meeting capacities required to implement IHR. In 2014 for instance, only 34% of countries within WHO African Region had met IHR “core capacity” implementation status with respect to points of entry, and only half had established preparedness capacity [2]. Failure to contain the West African Ebola outbreak was largely attributed not only to weakened health systems but also delayed national response capacities [3]. The critical importance of strengthening IHR core capacities has emerged as a critical area of attention within a wider global health security agenda [4]. It must also be stated that a number of limitations exist within IHR that limit its realization. For instance, despite the legally binding nature of IHR (2005) it does not include any enforcement mechanism for the countries which fail to achieve core capacities.

Mapping population mobility dynamics across (and movements within) national borders; understanding health risks/resiliencies of various migrant groups; and, identifying ‘spaces of vulnerability’ along such mobility corridors are important in formulating strategies to enhance and implement IHR capacities at borders. Strengthening core capacities at designated Points of Entry (POEs) and at primary health care systems located in and around borders, strengthening Government capacities to address health vulnerabilities associated with migration is critical [5]. Also, ensuring the inclusion of migrant populations in public health emergency and response plans, regardless of their status is vital. The failure to do so not only jeopardizes the public health safety of this particular group, but also that of entire communities where they reside [6].

Current public health threats in Sri Lanka

Sri Lanka is an island nation whose geographical location in the Indian Ocean continues to be of strategic importance for travel, trade, commerce and cultural exchange within the South Asian region. Sri Lanka’s points of entry comprise of two international airports (Katunayake and Mattala) and four sea-ports (Colombo,

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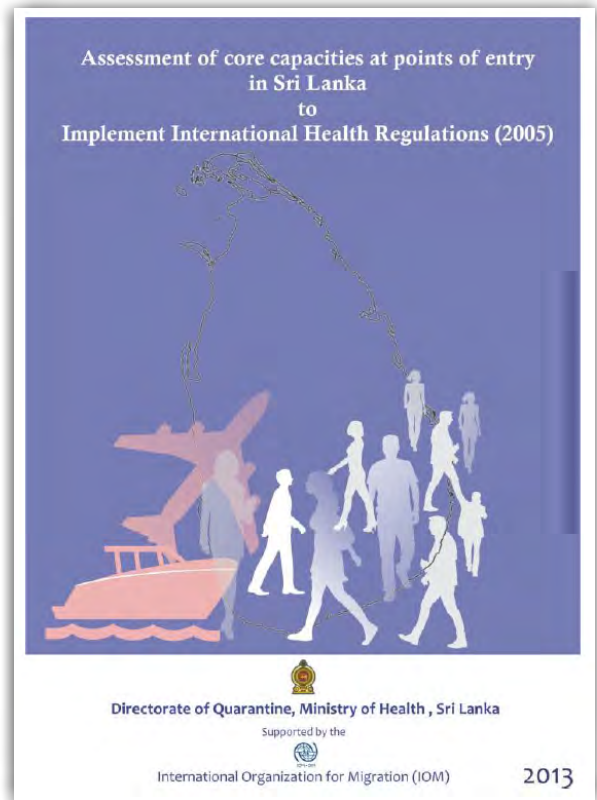
Galle, Hambantota, Trincomalee). Since the end of the protracted conflict, Sri Lanka has undertaken a rapid development trajectory with the building of new international air ports and sea ports, building major highways interconnecting the country, increasing global business investments that bring foreign migrant workers and a rapidly growing tourist industry. Such trends are associated with an increase in inbound, outbound and internal migration flows, as described in *Sri Lanka's National Migration Health Policy (2012)*.

The policy also recognises the importance of communicable disease control in the dynamic of migration. For instance, Sri Lanka has no indigenous malaria falciparum cases reported since 2013, and the country reached “malaria elimination” status in 2016. The continued presence of Anopheles vectors in some parts of the country make Sri Lanka vulnerable to re-introduction of malaria. Inbound labour migrants flows from countries endemic to the disease pose a threat via re-introduction. For instance, in early 2012, thirty-two cases of malaria were reported in returning Sri Lankan irregular migrants from West Africa [7]. Cluster of malaria infections have also been reported amongst Pakistani asylum seekers living in open communities in Sri Lanka [8]. Health security threats at the nexus of outbound migration also exist. A tenth of Sri Lanka's population work as international labour migrants, with the majority (93%) residing in the Middle East region [9]. The risk of MERS-CoV being introduced to Sri Lanka given the large number of Sri Lankan migrant workers in the Middle East and South Korea including those returning Hajj pilgrims have been reported [10].

Capacities to implement IHR (2005) in Sri Lanka

The Directorate of Quarantine was established by the Ministry of Health (MOH) in 2008 to ensure the implementation of IHR (2005) in Sri Lanka. Sri Lanka has two national IHR focal points (NFP): the Director Quarantine (DQ) and the Chief Epidemiologist (CE). Under the stewardship of the DQ are Port Health Medical Officers and Public Health Inspectors that operate at airports and seaports, and form the dedicated ‘front-line’ staff undertaking border health practices.

Article 5 and Annex 1a of the IHR (2005) requires member states to identify service and system gaps, especially regarding POE. The eight core capacities at the POE needed to detect, assess, notify and respond to a PHEIC were evaluated in 2013 by the Ministry of Health with



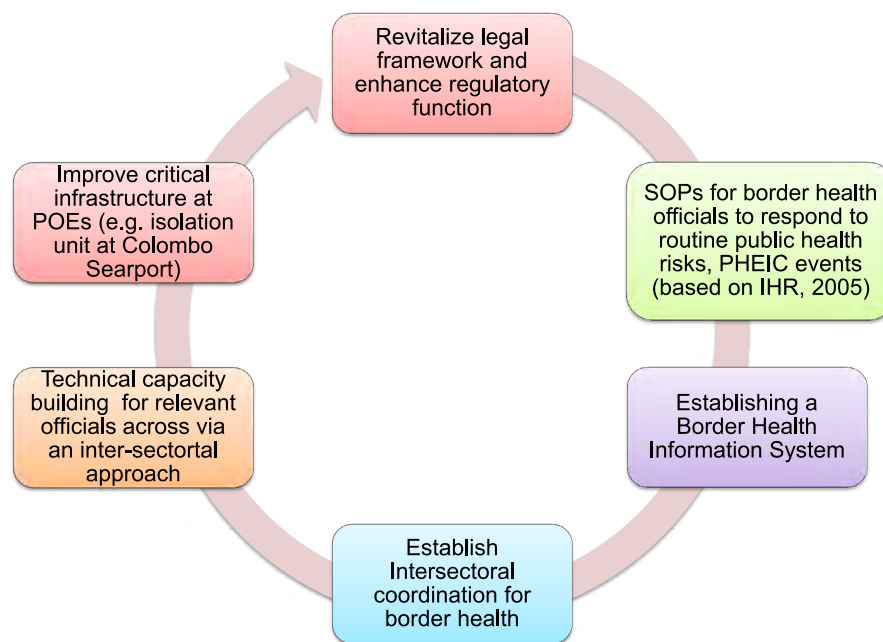
technical support from the International Organization for Migration (IOM) - the UN Migration Agency, using a multi-method approach. First a desk review of domestic legal framework and regulations were undertaken. Secondly, ‘IHR core capacity monitoring framework’ developed by the WHO [11] was used in developing the IHR evaluation check list which is divided into two components. Assessed in component I are services related to IHR (2005) core capacities: human resources, infrastructure, financial, networking with other agencies (mechanism), and training related to IHR. The eight core capacity requirements in component II assessed were: national legislation and policy, coordination and NFP communications, surveillance, response, preparedness, risk communication, human resource, laboratory capacity. Assessment was undertaken by a multidisciplinary team (comprised of medical administrators, public health and legal specialists) through field visits, observations and key informant interviews with relevant stakeholders from health and non-health sectors that were related to border health (period from June 2013 to August 2013). The health system and service gaps identified under each core capacity are presented in Tables 1–3. In addition, all available data routinely collected at the Port Health Offices were analysed.

Strategies for strengthening the POE to Sri Lanka

Mapping of current practices at POE, including stakeholder and resource gap analysis using IHR (2005) core capacity requirements provided evidence to need to affect a paradigm shift from an archaic disease-centred model of 'quarantine and isolation' to building an innovative strategy for 'border health' as articulated in the 'new' IHR (2005). Anchored into this approach is the inter-sectoral coordination for public health to meet the modern global health security challenges faced

by Sri Lanka in the context of a changing dynamic of international travel and disease epidemiology. A new 'national border health strategy' was formulated in 2013 by the Ministry of Health (Directorate of Quarantine) with the technical guidance and financial assistance of IOM. This new innovative approach was based on four main strategic areas; (a) changes to legislation (b) system changes through new Standard Operating Procedures (SOPs) and an Emergency Preparedness and Response Plan (c) training and simulations (d) e-based real-time surveillance system (see Figure 1).

Figure 1: Core elements of Sri Lanka's National Border Health Strategy Project supported by IOM



Outcome 1: A domestic legal framework that is revitalized and updated to address the new and emergent border health threats/issues; and which enables meaningful statutory and regulatory functions for border health officials.

Outcome 2: A Standard Operational Procedures developed for Border Health officials and key stakeholders at POE to guide the operations/practice according to IHR (2005).

Outcome 3: Development and pilot test of a National Border Health Information System (BHIS) to enable real time health surveillance.

(a) Updating domestic legal framework

Port health laws in Sri Lanka dates back to 1897 with the establishment of the 'Quarantine and Prevention of Diseases' Act, which was subsequently revised in 1952 (Act No. 12). The Act stipulates provisions for preventing the introduction of all contagious and infectious diseases into Sri Lanka [12].

Following a series of discussions with the Chief Legal Officer of the Ministry of Health and IOM, and a following multiple technical workshop with Legal Officers of other institutions such as the Department of Foreign Affairs that are critical for IHR implementation, a cabinet

memorandum was successfully passed to amend the Quarantine and Prevention of Disease ordinance in 2013. The revitalized Act now accommodates the new injunctions within IHR (2005). These include for instance: various typologies of public health 'events' or 'threats' in addition to the disease based 'contagious diseases' and 'infected persons'. The Director/Quarantine and Port Health Medical Officers were also identified as the 'Competent Authority' within the domestic legal framework. International notification, partnerships and coordination with other agencies in cases of a PHEIC were also included according to local capacities and institutional portfolios.

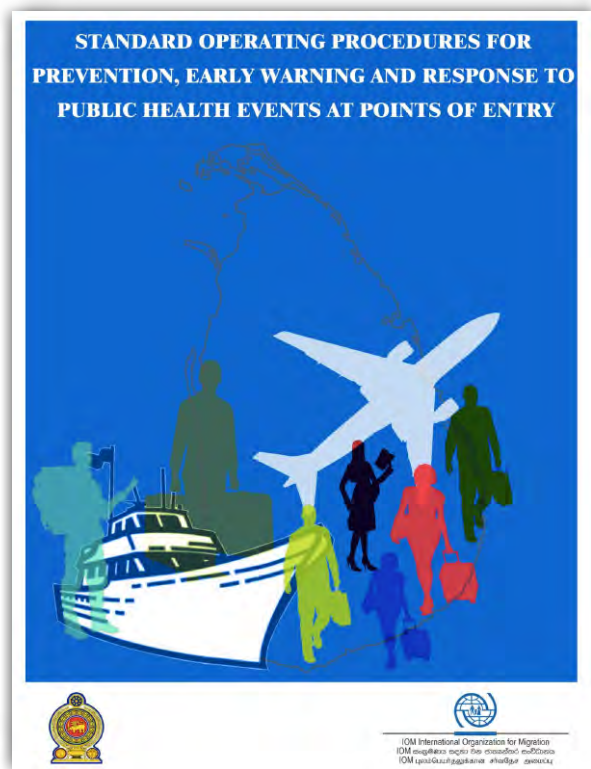
(b) System changes through new SOPs and Emergency Preparedness and Response Plan for both routine and PHEIC events

A manual of 'Standard Operating Procedures (SOP) for prevention, early warning and response to Public Health events at Points of Entry' was developed after an intensive iterative process involving relevant Government Ministries and agencies over an eight month period - a process led by the Ministry of Health and IOM (*adjacent image*).

A Technical Working Group comprised of a multi-disciplinary group of experts were formed to lead the process which included peer-reviews, site mapping, process evaluation and multi-agency desktop simulations. Innovative systems changes were suggested to the routine procedures as well as to PHEIC response mechanisms for both Sea Ports and Airports. A monitoring and evaluation framework was embedded to roles of DQ to ensure adherence to SOPs and also enshrined within the revised the 'Quarantine and Prevention of Diseases' Act.

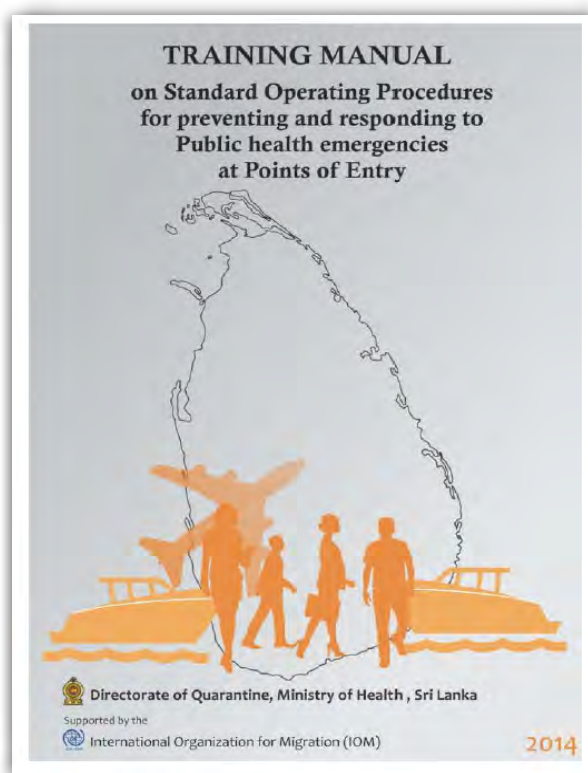
(c) A Multi-hazard Public Health Emergency Preparedness and Response Plan

A Multi-hazard Preparedness and Response Plan was developed and the roles of multi-sectoral partners were defined for the international Sea Ports (*adjacent image*). Following a planning workshop held in collaboration with in the Disaster Preparedness and Response Unit (DPRU) of the Ministry of Health, a 'hands-on' training for the staff on the emergency preparedness and response was conducted. A number of training methods, including desk simulations for all staff at POEs were conducted for various scenarios with the technical and financial support of IOM. Their knowledge and application on preparedness and response planning were also tested. Onboard Simulations in Ships and Aircrafts were planned but postponed due to the ongoing Ebola epidemic in 2015 period. Facilities at the Infectious Disease Hospital (which acts as the isolation, quarantine, treatment center for travelers with or suspected of a PHEIC due to an infectious disease) were upgraded by its administration as per the Multi-hazard plan. Guidelines on the coordination structure/dynamics of the inter-ministerial steering committee to be activated in case of a PHEIC was also formulated. Incorporating and updating IHR related hazards into existing national emergency response plans of the Ministry of Disaster Management was also recommended as a crucial 'next step' to ensure policy/implementation coherence and avoid confusion in event of a PHEIC declaration affecting Sri Lanka.



(d) Training and simulations

A training need assessment was conducted among the Medical Officer/Port Health and Public Health Inspector/Port Health at all POE's in August 2014 using a pre-tested, self-administered questionnaire covering 34 activities under 12 areas specified in the SOP [11, 13]. Each activity was assessed on four aspects: How important the activity is to the effective performance of the job? How well each activity is currently performed? And, how can the activity be improved through training processors alone and/or through system changes? A training manual was prepared based on the priority training needs identified (*adjacent image*). The training manual is designed to be user friendly and multi-sectoral in approach with flow charts and easy to follow guides covering border health risks from humans, animals, food and livestock cargo and chemical and radio-active cargo. At time of writing the MOH was planning a schedule to conduct in-service training programmes for port health staff. A new monitoring and evaluation mechanism through 'quarterly reviews' for the Port Health Medical Officer and Port Health Public Health Inspector were introduced by the Director of Quarantine to ensure the adherence to the SOPs and implementation of IHR at each POE. In addition, terms of reference/job descriptions were revitalised for border health teams at both air and seaports in concordance with updated domestic legal framework and to enable effective implementation of IHR (2005).



(e) E-based real-time border health surveillance system

Border health operations such as the daily issuances of practises generates a significant volume of informatics that require effective data input and management system. Data is vital to not only identify patterns but to take immediate action. An evaluation of the existing information management system by a joint IOM-MOH technical team using both qualitative and quantitative research methods found the current paper-based systems at the international airport and seaports to be slow, error prone, non-standardized offering no real-time data analysis or interpretation faculties. A web based Border Health Information System (BHIS) was developed by IOM and MOH in consultation with a Sri Lankan based software company to capture and aggregate data related to routine border health procedures undertaken by border health officers from international airports and seaports. The paper based record keeping at POE was converted to a real-time comprehensive e-surveillance system where data could be collected in a timely and complete manner. This data is entered using mobile tablet PC device and

minimize errors in data entry and thereby ensure the quality of data. The data are entered using a portable web-linked device by the port health medical officer visiting Ship or the Aircraft, and then fed to the BHIS immediately. The system sends alerts and notifications to the medical officer in-charge of the relevant POE and to the Directorate of Quarantine at central level. The system generates periodical reports and returns and have capability to run queries. While the system has completed a pilot phase, a number of operational challenges still exist in terms of familiarity of interface by port health staff and analytics. The system has the capacity to be integrated into early warning systems and to be linked to e-alert systems for preparedness and response. Further investment and resources are needed to expand the BHIS beyond the pilot settings (at the main international airport in Katunayake and the large Colombo and Galle seaport hubs) to other POEs across the country.

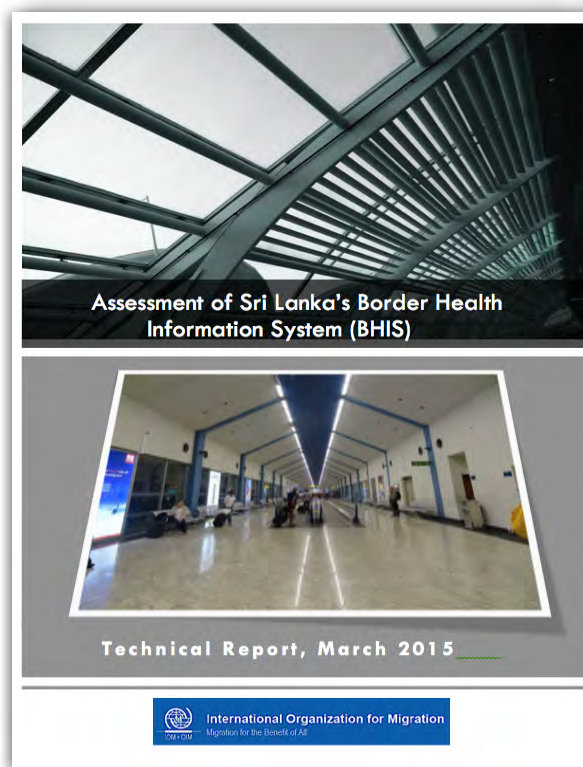
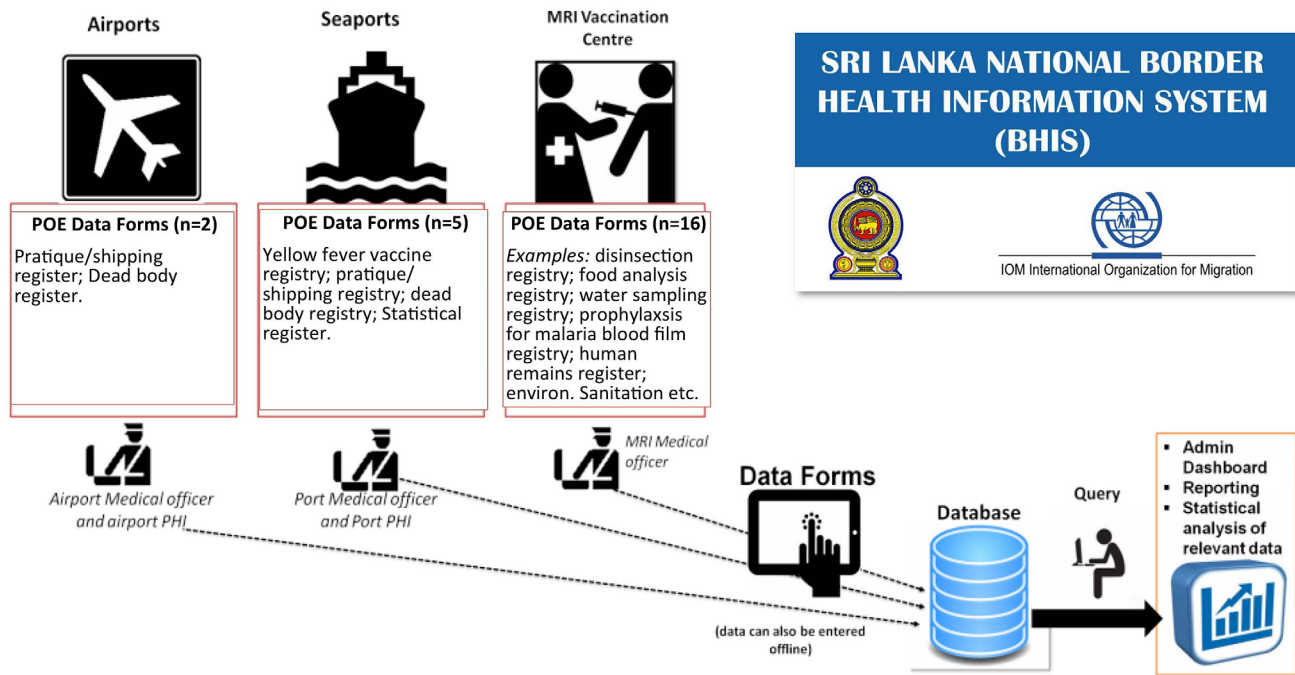


Figure 2: Sri Lanka's Border Health Information System (BHIS) - schematic diagram on data sharing and management
(Designed by K.Wickramage, 2013)



Discussion and lessons learnt

Addressing migration health and human security challenges is not a simple science. It is intricately interlaced with global health diplomacy, human rights and recognition of the shared responsibility in ensuring health protection throughout a person's migration cycle/trajectory. Beyond the biomedical and technical interventions needed, good governance, an enabling legislature, implementation of laws and regulations and multi-disciplinary action are at the heart of ensuring health security outcomes at national, sub-regional and global levels. The evidence informed assessments and interventions described in the Sri Lankan experience are aimed at institutionalizing IHR to become part of the routine fabric of health system practice, where ensuring health security is not 'just a health ministry' role but an inter-ministerial one. Such multi-sectoral coordination however requires consistent commitment and sensitization among policymakers, administrators, practitioners and also business community and civil

society. The latter two groups may demand for greater accountabilities and protections for public and industries from the potentially devastating effects of a pandemic influenza for instance. It is historically known that national preparedness planning is often not prioritized by governments and local authorities until an actual event/public health emergency occurs. Commitments to global health security need to move beyond policy rhetoric and translate into building meaningful inter-sectoral relationships, joint platforms for action and co-investment by relevant government ministries, private sector and inter-governmental organizations, in terms of resources, personnel and technical/knowledge input. In moving forward, ensuring sustained political leadership in the already formulated *Sri Lanka Migration Health Policy* and commitment implementing the national action plan on migration health is critical. The lessons learnt, experiences and practices of Sri Lanka in building the National border health strategy, which in large part was supported by technical cooperation from IOM may also serve as a reference for other countries in the region to develop similar strategies in other countries.

Table 1: Gaps identified in the domestic legal framework in relation to implementation of IHR (2005)

Core capacity at POE	Gaps identified
National legislation and policy	<ul style="list-style-type: none"> • Primarily addresses 'contagious diseases' and already 'infected persons'. • Non-delegation of the power of the Competent Authority to the implementers (Director/ Quarantine and Medical Officer/Port Health) of the IHR (2005). • Roles and responsibilities of the NFP, international notification, partnerships and coordination with other agencies having a stake in response in a PHEIC and preparedness not stated. • IHR implementation documents not specified: Maritime Declaration of Health, Aircraft General Declaration, Ship Sanitation Control Certificates. • Non-delegation of the power of the Competent Authority (Medical Officer/Port Health) in ensuring of food safety of travelers and in control of vectors and reservoirs in and near POE - Food Act (No. 20 of 1991) and Prevention of Mosquito Breeding Act (No.11 of 2007) respectively. • There are legal provisions related to zoonotic, chemical and radio-nuclear hazards. • The Civil Aviation Act, Port Authority Act, Disaster Management Act which are related to public health security at POE do not address the role of the Ministry of Health or the Port Health Officers.

Table 2: Gaps identified in the response, coordination, risk communication and preparedness in relation to implementation of IHR (2005)

Core capacity at POE	Gaps identified
Response	<ul style="list-style-type: none"> • Absence of adequate facilities for isolation of affected travelers within the POE, resulting in transferring them immediately to the closest hospital. • Absence of designated hospitals for managing cases or suspects for each POE. • Absence of specially designated ambulances, equipment or trained personnel at neither the POE nor they being identified from adjacent hospitals for immediate transportation of cases or suspects to an appropriate medical facility. • Absence of protocols for disposal of solid and liquid waste; decontamination of baggage, cargo, containers, conveyances, goods or postal parcels; disposal of human remains in a PHEIC of infectious origin. • Absence of Rapid Response Teams, coordination mechanisms and SOPs with regard to a PHEIC at Sea Ports. • Absence of a location, specially designated and equipped for parking an affected or suspected Ship in the event of a PHEIC at Sea Ports.
Coordination	<ul style="list-style-type: none"> • Absence of a steering committee including the Ministry of Health and other relevant Ministries for implementation of IHR. • Absence of SOP for coordination between the National Focal Points and the health and non-health stakeholders.
Risk communication	<ul style="list-style-type: none"> • Absence of a 'risk communication strategy' apart from the IEC material developed by the Epidemiology Unit during the SARS and Avian Influenza epidemic seasons or a designated 'spokesperson' in the Ministry of Health in the event of a PHEIC.
Preparedness	<ul style="list-style-type: none"> • The National Civil Aviation Public Health Emergency Preparedness Plan of Sri Lanka developed in 2013. • The pandemic preparedness plan developed by the Epidemiology Unit during the Avian Influenza pandemic. • Absence of a National Preparedness and Response Plan incorporating all-hazards approach of the IHR (2005). • Absence of a Preparedness and Response Plan for PHEIC at the sea ports. • Non-conduct of simulations to respond to a PHEIC at POE. • Well established and operationalized preparedness plans for managing disease outbreaks led by the Epidemiology Unit with coordination with other sectors. • Teams, involving multiple sectors had been identified and trained in the management of natural or man-made disasters within the country by the Ministry of Disaster Management and the MoH.

Table 3: Gaps identified in surveillance and human resources and laboratory capacity in relation to implementation of IHR (2005)

Core capacity at POE	Gaps identified
Surveillance	<ul style="list-style-type: none"> • Absence of an effective surveillance system, with timely and comprehensive reporting, consisting of: rapid detection, risk assessment and alert. • Inconsistence of notification of a case or suspect of an infectious disease due to absence of clearly laid down flow of information, resulting from operation of separate Medical Centres within the POE. • Some of the IHR notifiable conditions are not included in the latest version of the list of notifiable diseases of Sri Lanka (2005) and Director Quarantine is not identified as a designated point to be notified in such events (19). • Unavailability of adequate facilities for risk assessment of a case or suspect of infectious origin at POE. • Lack of knowledge of Medical Officer/Port Health of the focal points to be contacted at POE, in case of a chemical or radio-nuclear event at the POE. • Periodical reports based on notifications are not generated nor is the information shared with Medical Officer/Port Health.
Human resource	<ul style="list-style-type: none"> • Absence of job descriptions for the port health staff. • Absence of in-service training opportunities to Port Health Officers on IHR and no training needs assessments conducted during last 5 years. • IHR is not included in the basic training curricular of medical undergraduates or public health staff.
Laboratory capacity	<ul style="list-style-type: none"> • Laboratories not linked to the PHEIC response mechanism.

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Identifying issues and operations of medico-legal concern at Sri Lanka's international airport

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Introduction

An international airport operates within a complex and dynamic environment of human mobility that pose significant challenges in managing and mitigating public health risks. A high volume and influx of passengers as a result of increased international travel and trade, relatively low-cost air travel across and within continents and decreasing travel times have challenged public health authorities in terms of preparedness and response measures to public health emergencies.

Beyond the obvious threats of infectious disease outbreaks such as pandemic influenza and other public health threats outlined in the International Health Regulations (IHR), officials from customs, immigration, aviation, law enforcement and border health at international ports of entry face with a diverse range of cases and incidents of travelers that are of medico-legal concern. These include for instance the identification and effective management of victims of human trafficking [1], body packers carrying illegal substances often embedded/ingested/inserted within their bodies [2,3,4] and other forms of trafficking [5,6]. Most cases involve varying degrees of abuse and criminality that are also of significant medico-legal concern. Identifying incidents/events that threaten public health safety are vested by government through the various service organs that operate within the airport.

The medico-legal service in any country is an integral component of the criminal justice system as well as the civil justice system. The medico-legal system in Sri Lanka was established during the latter part of the British colonial period in the late nineteenth century, and are maintained as a State run process through the combined effort of Ministry of Justice, Ministry of Health and Higher Education Authority. In an era of ever increasing and rapid human migration, greater attention and effort have been undertaken by governments around the world to meet medico-legal demands boost [7-10]. There is a scarcity of data in the literature on research studies that have looked at assessing medico-legal capacities at airports. With a rapid rise in inbound migration flows to Sri Lanka [11], there is a need to build effective measures for such emerging border health challenges.

Objectives

This study sought to identify the potential issues of medico-legal concerns at Sri Lanka's international airport as well as to map the existing stakeholders and their functions in responding to such cases. In doing so, the study aims at contributing to a larger national border health strategy that seeks to enhance capacities of relevant stakeholders at points of entries to Sri Lanka.

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Methodology

A qualitative study was conducted which involved stakeholder mapping and interviews with officials from agencies/organization involved in airport operations with a role in management of health issues/deaths of passengers. The Bandaranayaka International Airport at Katunayaka in Western Province, is the main international airport in Sri Lanka that handles a volume of nearly 7 million passengers per year. It has work areas/zones for Immigration/Emigration control activities, custom clearance, passenger waiting areas for transit passengers, food and sanitation facilities, medical facilities, and cargo and quarantine facilities.

First a stakeholder mapping of the airport setting was conducted to define the agencies involved and the routine operations and practices of officials at the international airport. A total of 21 key informant interviews were conducted with representatives from the following agencies: the Department of Immigration and Emigration (3), Civil Aviation Authority (1), airport management (2), Department of Customs (2), port medical officers (1) and public health inspectors (2) of the Ministry of Health, medical officer of Civil Aviation Authority (1), airline ground staff (2), staff of Sri Lanka Bureau of Foreign Employment (SLBFE) (2), staff of the duty free shops at the airport (2) as well as the Airport Police unit (2). Interviews were guided by use of a semi-structured questionnaire which sought to capture details on the following areas: the organization structure of the agency/actor and its operations at the airport setting; identify medico-legal issues within their routine operations; to identify gaps in the current medico-legal system and to identify suggestions to improve the current system. Content analysis of the qualitative findings were undertaken and emergent themes formulated into categories.

Findings and Observations

The medico-legal issues identified at the Bandaranayake International Airport is categorized into three broad activity domains: 1) handling of deaths, 2) examination of suspects produced by immigration and custom officers, 3) identification and examination of victims of trafficking and abused labour migrants.

1. Handling of deaths

According to Sri Lankan law, all sudden deaths and those of unknown causes are subjected to inquests [12]. During the inquest, the person's death is established and if necessary the postmortem examination conducted to find the cause of death.

The airport health office reported an average of one death per month within the airport or onboard a flight. The authorities maintain a paper based record keeping system (these records are currently being assessed by authors). It was also reported that most onboard deaths are non-Sri Lankans. In the current system, the deaths onboard a vessel or within the airport are referred to the on-call medical officer at the civil aviation authority medical center. Once the death is confirmed by the officer, an order is given for an inquest and the body sent to the mortuary of the District General Hospital Negombo. However, in certain instances, the medical officer does not inform about the death to the port medical officer or to the quarantine officers.

According to the *Quarantine and Disease Prevention Act* of Sri Lanka (updated in 2014) rapid detection of a human case or suspect arriving at an international port of entry are based on information, received prior to arrival, in the form of 'pratique'. Pratique is the license (Health Clearance Certificate) to enter a port in Sri Lanka on assurance from the captain that it is free from contagious disease. Under the *Quarantine and Disease Prevention Act*, investigating and decision making power has been delegated to quarantine officers of the health unit (port medical officers and public health inspectors) and Director General Health Services to investigate and take decision on the matter. There are currently no technical guidelines on the management of dead bodies at the points of entry, even in the event where there is suspicion of a death of passenger travelling from a country where a Public health emergency of international concern (PHEIC) has been declared. At time of writing the Ministry of Health in partnership with the International Organization for Migration (IOM) were developing a program to enhance technical capacities of airport officials in meeting IHR core capacities at international points of entry, including a Standard Operational Procedures (SOP) manual for port health officers in managing PHEIC events.

2. Examination of suspects produced by immigration and custom officers based on health grounds

According to Sri Lanka's *Immigration and Emigration Act*, the regulatory powers bestowed within the duties of immigration officers include detention of travelers entering to Sri Lanka based on medical grounds. At present, these visitors are produced to the medical officer at the airport health office or the attending medical officer from the Aviation Authority at BIA by. The medical officer may be asked to provide a medical clearance to the traveler if these are to be detained (until deportation) or released.

Customs officers iterated that they would arrest passengers/travelers on suspicion of body packing/concealing illicit goods/drugs in body cavities, despite having no formal training. In the absence of guidelines and SOPs, they escort suspected body packers to private medical centers near the airport for medical officers to examine them. Diagnostic facilities to test for suspected hazardous substances such as androgen drugs and other prohibited drugs during the custom clearance process is not available.

Passengers displaying highly aggressive, erratic, psychotic or violent behavior may be brought to the attention of immigration officers by airline staff or airport police officials. According to Sri Lanka's *Act of offence committed under the influence of liquor* [13], intoxication is not considered as an offence. However, it is an offence to cause annoyance, harm to other individuals, create or have intent to damage public property. Customs, health and immigration officers noted that there was no clear guidance issued for airport officials on the case management/guidelines of handling violent passengers under the influence of alcohol and other drug induced states.

3. Identification and examination of suspected victims of trafficking and exploitative labour migration

Interviews with immigration officers revealed a number of trafficked victims as well as returning Sri Lankan migrant workers who were victims of abuse have been identified as they have passed through immigration counters. However despite the existence of the Bureau of Foreign Employment (SLBFE) welfare desk at the airport, there has been no formal coordination and referral between the immigration counter, police and welfare office. The SLBFE desk provides an ideal opportunity for returning migrant workers to seek support and possible medico-legal referral via airport police office to the Judicial medical office in Negombo General hospital (located near vicinity of BIA).

Conclusions

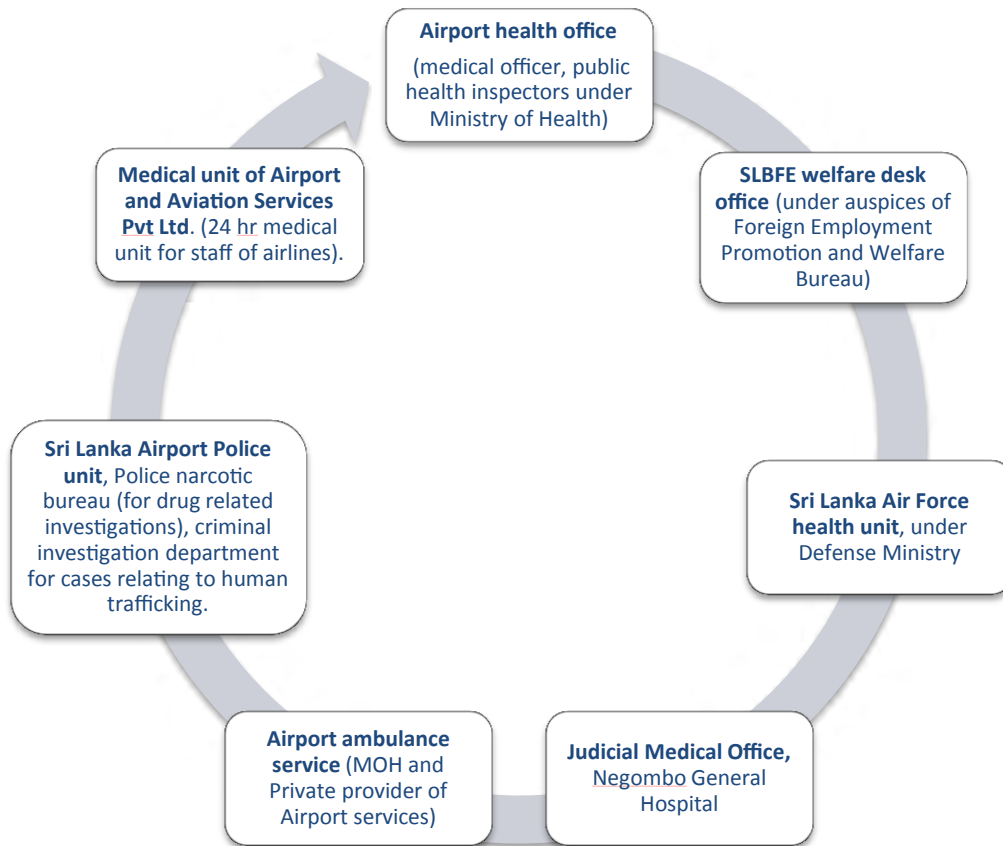
This formative study provides the first assessment of medico-legal issues and stakeholder dynamics at Sri Lanka's international airport. With rapid increases in inbound migration flows to Sri Lanka [11], there is a need to build effective capacities and measures for such emerging border health challenges. For instance the results highlighted the need for a referral system to be in place in handling of deaths onboard and within the airport. The SOPs recently developed by the Health Ministry with technical input from IOM regarding issues related to IHR core capacities, forms a sound platform to build such capacities.

Joint training and simulation exercises of officials in relevant agencies forms also forms a key component of strengthening capacities to address medico-legal issues. For instance, a training on identification and management of victims of trafficking is critical. Recommended action to be taken by border officials who suspect case of trafficking have been well defined in IOM's publication "Caring for Trafficked Persons: A Guide for Health Providers" [14].

Referral systems are the third key component to be established, for instance for the radiological examination for those suspected body packers. Building capacity of relevant health officials to respond to medical emergencies as a result of "body packer syndrome" - when packet of heroin or cocaine that has been ingested ruptures resulting in acute poisoning, tachycardia, hypertension, epilepticus, seizures, myocardial infarction and ventricular fibrillation. Investment in technologies such as rapid identification systems/diagnostic tests for identifying prohibited drugs and androgens may also need to be considered.

It must be noted that this study is only a rapid 'scoping' assessment of medico-legal functions, and a more comprehensive assessment is needed in order to formulate specific strategies, SOPs and referral pathways and screening algorithms for use by the various stakeholders at the airport setting and at referral sites such as the judicial medical office at Negombo General Hospital. An inter-agency coordination mechanism is therefore needed in order to catalyze the in-depth assessment and formulate joint strategies (see Figure 1).

Figure 1: Inter-Sectoral Coordination framework to respond to medico-legal issues at BIA



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Challenges in identification and management of body packers at Sri Lanka's international airport: A case-series

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ABSTRACT

Background

In this paper we present four different cases of body packing examined at the Judicial Medical Office of District General Hospital in Negombo. We highlight the different modes of presentation, the investigative method, and management practice. A lack of a systematic approach for management of such cases may result in avoidable morbidity/mortality and for many passengers carrying illicit substances to go undetected.

Keywords

body packers, medico-legal examination, border health, migration health

Introduction

Body packing is the voluntary or coerced swallowing of drug-filled packets to smuggle drugs across borders or other security checkpoints (1). Body packing is a recognized mean of smuggling worldwide (2). Body packers may ingest dozens of packets containing life-threatening doses of heroin, cocaine, or amphetamines (3). Routine detection of the smuggled packets with routine radiological examination is challenging (4).

Most cases are revealed because an ingested packet has ruptured, because of intestinal obstruction or because of drug-induced toxic effects or obstruction or perforation of the gastrointestinal tract. Body packers (also termed 'drug mule') may then present to physicians for evaluation while in legal custody. In general, there are three types of presentations of body packers to medical attention: a) Arrest and referral by law-enforcement officer; b) acute symptoms of drug toxicity; and c) Bowel obstruction.

The "body packer syndrome" occurs when packet rupture results in poisoning, usually after cocaine or heroin ingestion. For instance cocaine may cause agitation, tachycardia, hypertension, sweating, dilated pupils and hyperthermia. More serious effects are status epilepticus, seizures, myocardial infarction and ventricular fibrillation (5). The need for surgical intervention as a result of rupture, gastrointestinal obstruction/ulceration or respiratory arrest due to the aspiration of a package has been reported (6). In a patient with "body packer syndrome" as a result of heroin may produce a decreased level of consciousness, respiratory depression and pinpoint pupils.

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Sophistication of the packaging methods used by drug smuggling organizations has reduced the morbidity of their drug mules. The packets are made out of various materials, however the most commonly used is latex condoms. Other materials use for packing are the cut fingers of latex gloves, plastic bags, aluminum and balloon.

Methods

Four different cases of body packing examined at the JMO's office the District general hospital in Negombo, Western Province of Sri Lanka in the year 2013 are presented.

Case 1

An Indian national was arrested by law enforcement authorities at BIA and produced for medico-legal examination on suspicion of gold smuggling to the JMO office in Negombo. General and systemic examination was unremarkable. A plain abdominal radiograph showed 10 pieces of metallic foreign bodies in abdomen in hypochondriac region (see Figure 1). The patient was admitted to the casualty surgical unit for observation and he was given Lactulose and Bisacodyl (dulcolax) orally and Bisacodyl suppository. The examinee passed total of 10 capsule shape metallic foreign bodies of 2.5 cm long and 1cm diameter (Figure 2) in three consecutive days. They were covered with a blue colour carbon paper and wrapped with a latex cover.

Figure 1 (left): Ten metallic type foreign bodies in plain abdominal radiograph (on admission).

Figure 2 (right): Capsule shaped gold pieces wrapped in latex cover



Case 2

A 28-year-old female Thai national was admitted by immigration officers to the Negombo hospital emergency department with excessive vomiting. On admission she complained of right lower abdominal pain and vomiting, which she related to severe menstrual pain. Admitting officer suspected she was intoxicated and referred to on-call JMO and medical team. On examination she appeared flushed, agitated and was shouting wildly. Her pulse at this phase was at 100/min, Blood Pressure at 140/90 mmHg. She had mild tenderness in epigastric area of abdomen, hard stools in rectum, and a tampon in her vagina.

Urgent ultrasound of abdomen revealed suspected foreign bodies in both vagina and rectum. Erect abdominal radiograph showed suspected foreign bodies in the abdomen and pelvis (Figure 3).

She was admitted to casualty medical ward to manage intoxication and was given Lactulose and Bisacodyl (dulcolax) orally and Bisacodyl suppository. She passed total of 88 yellow coloured latex capsules (4 X 2cm) which was suspected to contain cocaine (Figure 4).

Figure 3 (left): Foreign bodies in erect abdominal radiograph

Figure 4 (right): Eighty eight latex capsules suspected to contain cocaine



Case 3

A 62-year-old female Sri Lankan was arrested and produced for medico-legal examination on suspicion of gold smuggling by police narcotic bureau at BIA and by custom officers. She was referred to Negombo hospital by police. General and systemic examination was unremarkable. On digital rectal examination found the anal sphincter tone to be reduced. A metallic object

was felt inside the rectum. A plain abdominal radiograph showed a piece of metallic foreign bodies in pelvic region (Figure 5). The patient denied that she had inserted anything inside the rectum. The patient was admitted to the casualty surgical unit and foreign body was manually removed from the rectum. A rectangular metallic cube (4.5 cm X 2.5 cm X 1.5 cm in dimension). It was covered with a black colour carbon paper and wrapped with a latex condom (Figure 6).

Figure 5 (left): A rectangular foreign bodies in plain abdominal radiograph

Figure 6 (right): Rectangular god cube covered with a black colour carbon paper and wrapped with a latex condom



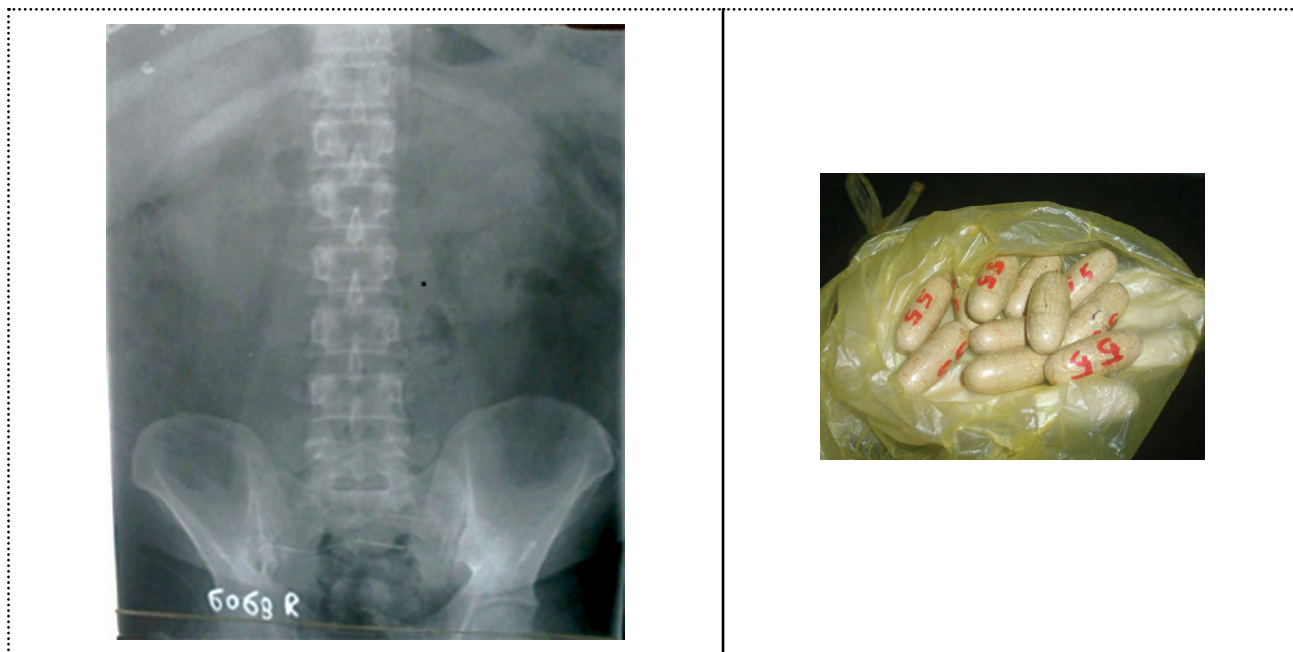
Case 4

A Pakistan national male was arrested and produced for medico-legal examination on suspicion of heroin smuggling. General and systemic examination was unremarkable except for mild lower abdominal tenderness. A plain abdominal radiograph was normal.

Abdominal ultrasound was also inconclusive. The patient was admitted to the casualty surgical unit for observation because of strong suspicion and he was given Lactulose and Bisacodyl (dulcolax) orally and Bisacodyl suppository. The examinee passed total of 70 sausage like fully sealed capsule of 2 X 4cm (Figure 8) in three consecutive days which contained heroin.

Figure 7 (left): Erect abdominal radiograph completely showing no distinct appearance of foreign bodies

Figure 8 (right): 70 latex capsules suspected to contain cocaine



Medicolegal challenges in identifying body packers

Since most of the body packers were foreign nationals, language barriers meant it was difficult to obtain proper patient history and consent for examination and investigations. Identification of complications of body packing ("body packer syndrome") is also difficult. Intoxication by leakage of package and other bowel injuries require advanced surgical referral. Modern packaging forms do not always appear in X-ray as indicated in Case 4. Management decisions on what interventions to be used are not standardized, and currently there are no defined coordination between law enforcement and health authorities at points of entry.

Conclusion and Recommendations

Case series reveal two trajectories of referral of body packers that arrive for medical attention at the judicial medical office. First is through a law-enforcement officer detaining traveler on suspicion of being a drug mule. Second referral type is from airline staff or immigration officer that alerts health/law enforcement staff at airport. Such referral is made usually as a result of an acute emergency/onset of symptoms due to drug toxicity, usually as a result of breach/leakage of the vessel holding the illicit substance. Bowel obstruction and contusions also warrants such emergency. A lack of a systematic approach and standard operational procedures for such officials in managing suspect cases may result in many passengers carrying illicit substances to go undetected.

A review of training modules of border health officers and the Directorate of Quarantine contained no specific reference/technical instruction on managing the types of medico-legal cases presented in this paper. Currently, referrals/follow-up and case management approaches vary considerably depending on the available officer and/or unit reporting incident. For instance, police officers at BIA have directed the inbound travelers suspected of carrying substances to undertake radiographs of suspected areas of the body from private radiology clinics near the vicinity of BIA. Referral to hospital is made only for acute emergencies, when there was difficulty in removal or their denial/non-admission of concealment.

Having detailed SOPs, undertaking tailored training/sensitization for case management protocols and referral for all relevant border health, immigration and law enforcement officials is need. At the 'downstream' end at the judicial medical office/hospital setting may also benefit from training in managing those passengers who are detained and those who are self-referred as potential body packer cases. It is important that doctors do not find themselves pressured to implement 'their own rules' and manage potential fears and interests through training program (6).

An Inter-sectoral coordination mechanism on border health driven by the Ministry of Health is also needed to boost such capacities at points of entry. The mechanism will need to have both technical and administrative focal points from each relevant agency involved in border protection (encompassing health, law enforcement, immigration control, aviation and private sector providers) in order to establish a multi-sectoral approach to address medico legal issues at Sri Lanka's international airport. With ever increasing numbers of travelers to Sri Lanka such efforts will be crucial.

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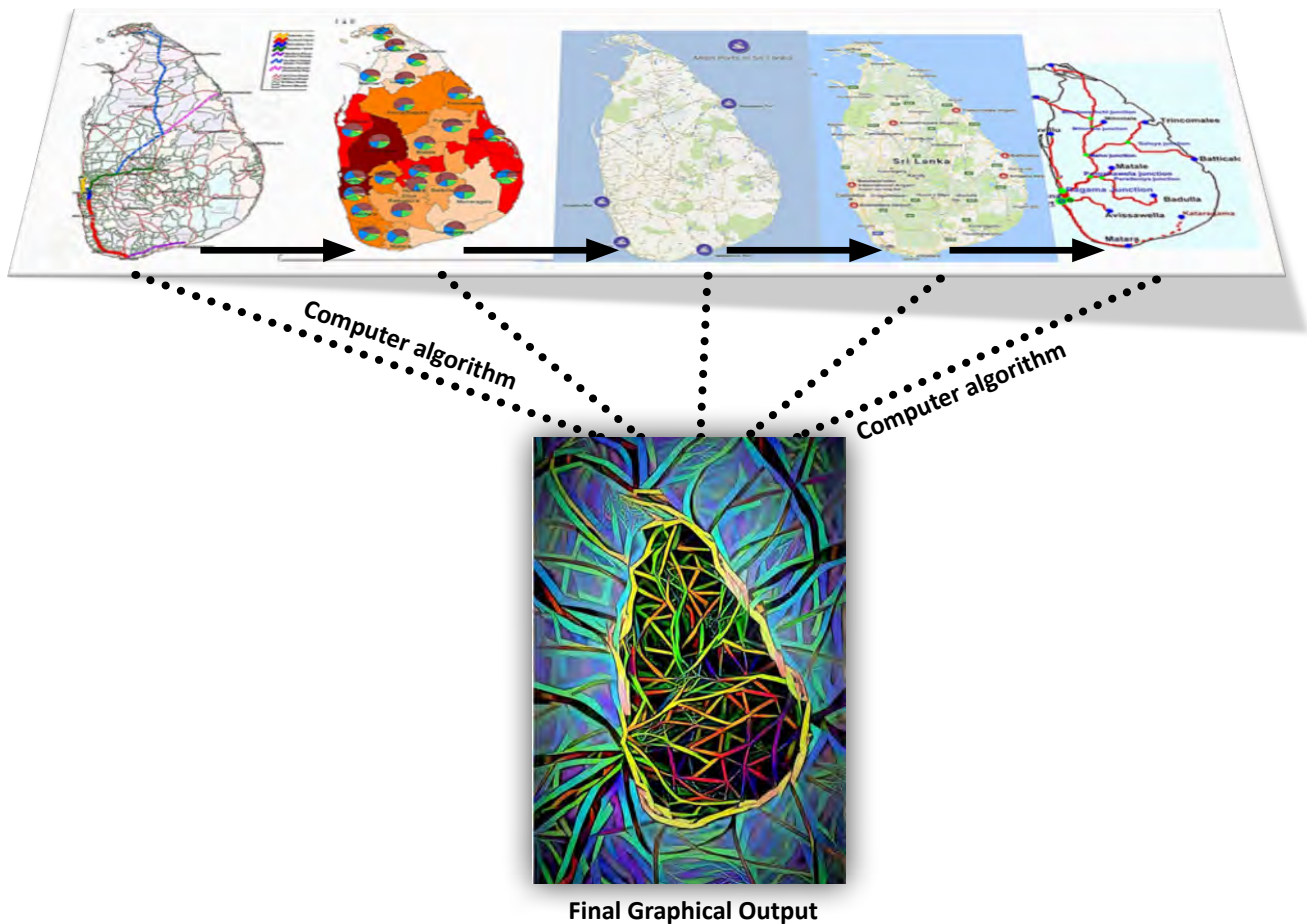
Cover art design

The cover artwork was generated by superimposing various data maps relating to migration and human mobility in Sri Lanka. These included labour migrant worker densities and departures by province, major transport routes/hubs, points of entry mapping and other available geo-spatial distributions of population movement data. The graphical file was then reconstructed using a computer algorithm to formulate the final image presented. Each line encapsulates multiple human mobility data points.

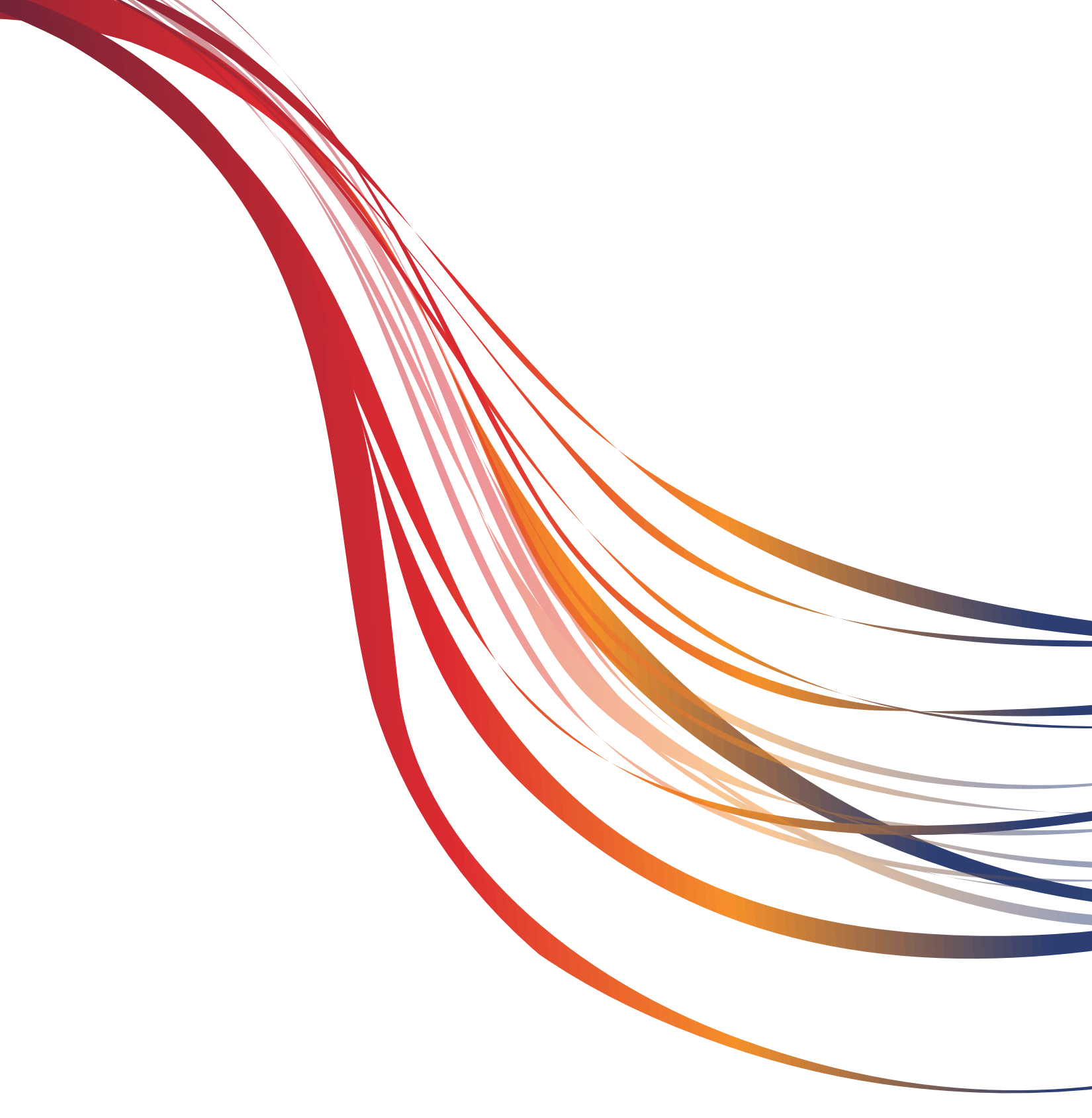
The software used to generate this effect is called Ostagram, and is based off “DeepDream”, a software pioneered by Google Inc. Ostagram finds patterns within images and attempts to bring these patterns together into a resulting image—a process referred to as ‘algorithmic pareidolia’. It is an emerging art style referred to as Inceptionism*, which uses computer generated artificial intelligence. The underlying foundation of “DeepDream” is based on deep learning algorithms and neural networks (a computer system designed to mimic the activity of a human’s brain).

The design was deliberately used to infer the interconnectedness of factors and complexity in exploring research questions within the migration health domain.

Superimposition of Data Maps (e.g. foreign employment departures by district, transport corridors)



* Mordvintsev, A., Olah, C., & Tyka, M. (2015). Inceptionism: Going deeper into neural networks. Google Research Blog.



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