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Technical Report 17

COVID-19 outbreak in Sri Lanka: an epidemiological response

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Highlights

- The well-coordinated teamwork led by the Epidemiology Unit, partnering with the all relevant heath and non-health stakeholders as well as health authorities at sub-national level can be regarded as the cornerstone of the success story of Covid-19 outbreak control in Sri Lanka.
- The effective contact tracing system, disease surveillance strategy and well-planned isolation and quarantine mechanism were the major strengths behind the success of prevention and control of Covid-19 in Sri Lanka.
- Diagnosing testing for Covid-19 with rRT-PCR was strategically intensified in keeping with the evolving outbreak kinetics.

Background

On 31 December 2019, Chinese health authorities reported to the World Health Organisation (WHO) a cluster of pneumonia cases of unknown aetiology from Wuhan in the province of Hubei, China that could cause severe acute respiratory illness. This disease subsequently started spreading to other countries. Whenever a new virus is reported to spread across international borders in any part of the world, it activates the pandemic response plan in Sri Lanka in an appropriate and proportionate manner, signifying the beginning of a possible cascade of activities to follow. A pandemic of this nature, if not handled promptly and appropriately, could cause a total calamity in a country. It can soon disrupt the day to day life of people, adversely affect the economy, and above all overwhelm the health sector, thus leaves no room for delay in its response.

In Sri Lanka, the pandemic response is mainly executed by the Epidemiology Unit - the national centre for communicable disease control, Medical Research Institute (MRI) - the national laboratory, Health Promotion Bureau (HPB) - the national risk communication hub related to health and the Quarantine Unit -the national institution in-charge of

border health at the points of entry who guide and coordinate the health teams at sub-national level (1). These lead agencies were called to play a central role in fighting the current outbreak, which included providing leadership, technical guidance, advocacy, intra- and inter-sectoral coordination, risk communication, monitoring and evaluation, while the Disaster Preparedness and Response Division provided coordination and support for all units involved in the outbreak response. However, the aggressive nature of the current outbreak also called for extensive involvement of the Sri Lanka Armed Forces and Police at a very early stage. The additional capacity of the military in areas such as contact tracing, 'lockdown' activities and managing quarantine centres had to be harnessed while being cautious of the danger in exposing them to this highly infectious disease by utilizing them for certain high-risk activities. The country, through its pandemic preparedness plan was well-positioned at all levels and multiple sectors to control the outbreak. However, many new challenges were posed due to the unprecedented nature of this outbreak as well as the response exerted. The overall goal was to control the outbreak in a way that it would have a minimal impact on the health of people, the economy and societal structures. This could be best achieved by keeping the epidemic curve as flat as possible by maintaining the caseload well within the health system capacity.

The main objectives of the outbreak response were to: 1. reduce importation of the pandemic virus into the country 2. strengthen surveillance for early and coordinated response 3. delay spread of virus or contain at the source 4. reduce the impact of the virus on morbidity and-mortality by early detection and treatment and, 5. protect the vulnerable groups and 6. monitor and evaluate the evolving response to the outbreak (1).

• Strategizing the outbreak response

Although little was known about this new virus and its impact, much could be learnt by closely following its behaviour in other countries where in-country propagation had preceded that of Sri Lanka and later that in Sri Lanka. During the initial stages of the pandemic, its global spread was tracked closely and the risk to Sri Lanka was assessed regularly. Appropriate strategies based on evidence and public health and epidemiological principles were applied to prevent and detect imported cases and to control local transmission. The kinetics of the outbreak and its response to control measures were monitored carefully, and control strategies were changed, or new strategies adopted, as and when necessary. Some of the control measures were backed by the Quarantine & Prevention of Diseases Ordinance No. 3 of 1897 and its amendments. As a signatory to the International Health Regulations (IHR) 2005, Sri Lanka complied with all IHR requirements in all aspects of outbreak control. Guidance provided by the WHO was closely followed with adaptation to the local context where necessary.

• Prevention of importation of cases

Given the nature of the disease contagion and the complexity and extent of global travel of the present day, prevention of imported cases in the absence of travel restrictions was extremely challenging. Sri Lanka being a popular tourist destination and having a sizable migrant Chinese workforce, was at a particularly high risk of acquiring the infection. However, all possible measures were taken to tighten border health security at all points of entry through a collaborative effort by the Epidemiology Unit, Quarantine Unit and the Health Promotion Bureau, with the support of the Airport and Aviation Services Limited, Civil Aviation Authority, Sri Lankan Airlines, Airport Health Office, Department of Immigration & Emigration, Sri Lanka Customs, Ports Authority and Sri Lanka Air Force. IHR core capacities at ports of entry were assessed and strengthened. Guidelines were issued on repatriation and quarantine of travellers, follow-up of Sri Lankan and other foreign nationals returning from high risk areas of COVID-19 transmission. Advices for returnees from high risk countries and instructions to flights from China were issued. Multi-lingual health messages and travel notices were disseminated among inbound passengers. Disease control measures including house- or institutionalized-quarantine were applied for inbound passengers depending on the risk level of their country of origin.

The list of high-risk countries was regularly revised following close monitoring of the global outbreak situation. Entry screening was performed for inbound passengers at the points of entry using thermal scanners and health declaration form (HDF). Data obtained through HDFs were shared with relevant medical officer of health (MOH) offices for follow-up and monitoring of home-quarantine activities. A follow-up sheet was issued to all regional epidemiologists (RE) to follow-up on Sri Lankan and other foreign nationals returning from high risk areas. Health personnel at the points of entry were trained on screening, evaluation and identifying suspected cases. Fast track pathways and safe transport were arranged for rapid transferring of suspected cases to designated isolation hospitals. Screening was performed for all local and foreign outbound passengers. Finally, all inbound passenger flights and cruise ships were banned in order to minimize the number of imported cases.

• Diagnostic testing and surveillance strategy

Diagnostic testing and surveillance are critical components of the outbreak response. The testing and surveillance strategy was based on the principle that early case detection and diagnosis by laboratory confirmation is crucial for the prevention of disease transmission in the community. Guidelines on eligibility for diagnostic testing were set in accordance with the WHO recommendations, evidence available from other countries, local outbreak related factors and other strategic considerations including system capacity to trace and quarantine contacts, which could have a sparing effect on testing. The testing criteria and strategy were revised, from time to time, following careful consideration of factors such as outbreak dynamics, distribution of contacts and clinical presentation of cases at the time of diagnosis, allowing for more proactive case detection through enhanced strategic testing. The more stringent eligibility criteria for testing applied initially were liberalized during subsequent revisions to include healthcare staff members under self- quarantined following high moderate risk exposure, all Severe Acute Respiratory Infection (SARI) patients admitted to any of the hospitals irrespective of age, community samples as decided by the public health staff in high risk areas, any other patient treating physician decides to exclude COVID-19 and death suspected due to pneumonia. A PCR testing algorithm was developed to include community sentinel surveillance where at least 10 samples were collected per day from the patients presenting to the OPDs of the designated COVID-19 isolation and treatment hospitals with COVID-19 like symptoms, random sampling from hotspots and vulnerable communities. This sentinel and hotspot surveillance along with the hospital-based SARI surveillance, community samples, testing of suspected pneumonia deaths and tests by clinicians to exclude COVID 19, would detect any community transmission early. Guidelines were issued on sample collection, packaging, storage, transport and coordination of surveillance activities and on performance of COVID-19 PCR testing at private sector medical laboratories [2]. PCR testing remains the gold standard test for diagnosis of SARS-CoV-2. However, this test is logistically demanding, and its case detection rate ranges from 63% to 72% and varies with the quality of the sample [3]. Therefore, other cheaper and more convenient tests including point of care tests for antigens, which would be crucial for ongoing diagnosis and surveillance were evaluated for their suitability for use. The capacity of the National laboratory - MRI and other COVID-19 testing laboratories were enhanced, and the supply chain of consumables and laboratory hardware were maintained uninterrupted.

• Isolation, treatment, contact investigation and quarantine

Diagnosis, isolation, treatment, contact investigation and quarantine make the core of an outbreak response. Case definitions were established for clinically suspected, confirmed and probable COVID-19 patients and their contacts (2). Twenty-eight designated isolation hospitals and six treatment centres including the National Institute of Infectious Diseases (NIID) which is the main treatment centre were identified throughout the country. A comprehensive clinical practice guideline for COVID-19 was developed in collaboration with the

Ceylon College of Physicians, covering topics such as clinical case definition; disposition of cases; assessing severity; preparing doctors for assessment of patients; diagnosing COVID-19; infection prevention and control measures; clinical management; discharge criteria; management of critically ill patients; criteria for intensive care unit (ICU) admissions; ICU surge capacity; acute respiratory distress syndrome (ARDS) associated with COVID-19; managing sepsis and septic shock and renal replacement therapy; staff wellbeing; managing high-risk patients; COVID-19 in pregnancy; care for older patients; autopsy practice and disposal of dead body; and outbreak response plan for hospitals. Circulars were issued on screening and management of healthcare workers following exposure to a confirmed/suspected case and maintenance of a register for workers exposed to COVID-19 (2). Details of all the diagnosed patients were obtained through a case investigation form to be filled by the hospital staff. Criteria for assessment of the level of risk associated with exposure to a confirmed / probable COVID-19 patient were established.

Identification of all contacts of a diagnosed COVID-19 patient through vigorous contact investigation is extremely important in preventing the outbreak evolving into a community transmission stage. Sri Lanka's control strategy was also largely dependent on its ability to trace contacts promptly and completely, success of which is reflected in the fact that almost all new cases are being reported among already identified contacts. Contact investigation was coordinated by the Epidemiology Unit with the support of the public health field staff, military forces, police and the civil administration staff. A register of contacts was maintained at the Epidemiology Unit and information on the contacts was shared with the relevant MOH staff for initiation and supervision of quarantine activities. Guidelines were issued to the MOHs on supervision of the Sri Lankan and other foreign nationals returning from high risk areas and contacts of diagnosed cases. Guidelines for those on home quarantine and quarantine in non-health care settings were also issued (2). Contacts and travellers were quarantined as per guidelines. Institutional quarantine capacity was vastly enhanced by establishing new quarantine facilities in many parts of the country, which were mainly managed by the military forces under the technical guidance and supervision of health authorities. 'Quarantine' was also applied for geographical areas, with strict lockdown of localities where clustering of cases had been reported or expected. Restrictions for travel across district boundaries and curfew were enforced to limit movement of the people in a bid to prevent disease transmission. A mechanism was established through the 1990 Suwasariya Ambulance Service to transport people developing symptoms while on home quarantine to the nearest government hospital or designated COVID-19 hospital.

- **Technical guidance and advocacy**

The Deputy Director Generals of Public Health Services (DDG-PHS) provided leadership in advocacy and technical guidance in the outbreak response which were extended in a timely manner to the political leadership, Ministry of Health hierarchy, Presidential Task Force on COVID-19, National Operation Centre for Prevention of COVID-19 Outbreak, COVID-19 Technical Committee and Advisory Committee on Communicable Diseases along with all key players of the outbreak response, namely the Epidemiology Unit, Health Promotion Bureau, Quarantine Unit and MRI, on all areas within their technical preview, including those on imposing travel restrictions and curfew, restriction of mass gathering, functioning of workplaces, restrictions on air travel, closure of schools and other educational institutes, testing strategies, quarantine processes and risk communication. Many circulars and guidelines related to outbreak control in addition to the ones initially developed were issued, including guidelines on rational use of personal protective equipment (PPE), workplace preparedness, environmental cleaning and resumption of immunization services during COVID-19 outbreak (2). Guidelines on ethics in communication were issued targeting all staff categories involved in patient care and outbreak control. Guidance and advice to districts were mainly coordinated through the provincial and regional

directors of health services, district and provincial consultant community physicians and the network of regional epidemiologists who in turn supported, guided and supervised the outbreak response activities at MOH level. Professional bodies such as the College of Community Physicians of Sri Lanka, Sri Lanka College of Microbiologists, Ceylon College of Physicians, Government Medical Officers Association and the Sri Lanka Medical Association also played an important role in advocacy and developing guidelines. All frontline healthcare staff in hospitals as well as at field level were trained on COVID-19 related activities.

- **Risk communication**

Given the modes of transmission of the virus and its high infectivity, effective risk communication becomes an important component of the outbreak response playing a vital role in changing human behaviour to prevent disease transmission. Gaining trust of the public through early communications and maintaining clarity, unambiguity, consistency and transparency of appropriate information was essential for avoiding rumours, mitigating stigma and discrimination, busting myths, avoiding panic, raising public awareness and increasing the public acceptance of preventive measures, all of which would lead to effective community engagement. Providing up to date information about the outbreak situation, appointing designated spokespersons for risk communication, clearly communicating the control strategies adopted by the government with their rationale and roadmap to the end game, and delivering clear and appropriate health messages to people were among the main strategies adopted to achieve this objective. The first press release on the new epidemic was issued on 26 January 2020, even before the first case in Sri Lanka was identified. The Epidemiology Unit and the HPB functions as the official sources for COVID-19 related data. The strategies employed were based on accepted principles of risk communication. Necessary changes to the strategies were made following inputs form behaviour surveillance and constant observation of the evolving outbreak and the response exerted. The risk communication was primarily carried out by the HBP that liaised with all state and private media institutions effectively in reaching out to the public. Relatively unconventional communication platforms such as the official social media webpages and communication networks, official institutional websites and online video presentations were also used in addition to the traditional print and mainstream electronic media in order to reach all segments of the community. Printed and electronic IEC material including posters, e-posters, short films, songs, comedies, TV advertisements, animations and jingle-based audio-visual presentations were developed. Risk communication was also done through press conferences, talk shows and paper articles. Many position papers, fact sheets, information leaflets and press releases were also issued.

It can be reasonably assumed that the strategies adopted so far by the government have paid off, which is evident by the absence of widespread community transmission, relatively low caseload that is well within the health system capacity and relatively low mortality rate, all keeping with other countries acclaimed to be successful in mitigating the outbreak. The role played by all key stakeholders have contributed towards these accomplishments.

The way forward

Research is an integral component in the epidemic response that could guide future directions of the control strategies immensely. This becomes even more important in the context of the current outbreak where the contagion and the disease outcomes have already shown some inter-country variation. Some of the research priorities would be forecasting the kinetics of the outbreak for different possible scenarios through modelling, while factoring all relevant parameters including the health system capacity which would allow timely and accurate decision making; studying the symptom profile of positive cases at the time of diagnosis which would direct the testing and quarantine strategy; and studying the already cured patients to explore any protective or predisposing factors that would shed light upon any preventive and control strategies.

Studying the treatment approaches and patient outcomes would be paramount in guiding patient management.

The challenges posed by the current epidemic have strengthened and brought innovation into many epidemiological approaches for controlling the outbreak including screening and diagnosis, isolation, contact tracing and quarantine. Ways in which they could be further strengthened and refined, making the country better positioned to fight future outbreaks, need to be explored.

Having to "live with the virus" seems inevitable in the event of resuming economic activities and activities of day to day life amid disease transmission still happening, for a considerably long period of time until an endgame strategy such as an effective vaccine is available.

Adopting new practices and system changes by the people as well as organizations and institutions will be mandatory for life in the "new normal" that follows lifting of current restrictions. Developing practical guidelines and strategies for implementing these new practices, and a massive communication campaign to make aware, empower and engage communities to adopt them as well an effective advocacy campaign targeting the government and organizations to facilitate the necessary system changes are immediate needs.

Author Declaration

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