View Point

Toward the Development of an Integrated Climate-Sensitive Disease Surveillance in Southeast Asian Countries: A Situational Analysis

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Abstract

Changes in climatic conditions influence the transmission of water and/or vector-borne diseases. It is one of the reasons for the emergence and re-emergence of various infectious diseases. This case study documents the learnings from selected Southeast Asian countries that can be useful for developing integrated disease surveillance and early warning system for selected climate-sensitive diseases. Through informal key-informant interviews and site-visits to Sri Lanka, Bhutan, and Thailand, we studied the disease surveillance, meteorological surveillance and early warning systems. These leanings suggest that an integrated data sharing mechanism is essential for real-time disease prediction. Further, there is immense scope for developing mechanisms on the uniform in data collection, data processing and analysis. There is an urgent need for developing a multi-sectoral collaborative plan for the integration of surveillance for real-time prediction of climate-sensitive diseases.

Keywords: Climate-sensitive diseases, disease surveillance, early warning, Southeast Asia

Introduction

Globally, 250,000 additional deaths per year would be attributable to climate change between 2030 and 2050.[1] As per the WHO, there are five major impacts of climate change i.e., malnutrition, mortality, and injuries caused by flood and storm, heat waves, vector-borne diseases such as malaria, dengue, and water scarcity and contamination. Recent studies from the South-East Asia (SEA) region provide some evidence of the impact of climate change on health at the local level. A study from India found that heatwaves had increased in frequency, as had their average and maximum duration all over India.[2] A study from Nepal showed that a 1°C increase in mean temperature increased the incidence of malaria by 25%.[3] A study from Bangladesh revealed the disproportionate health risks of vulnerable population groups from climate change, mainly malaria, dengue, childhood diarrhea, and pneumonia.[4] A sentinel surveillance conducted as part of a pilot project on health adaptation in Bhutan found the presence of *Culex* and *Anopheles* vectors at very high altitudes (>2100 m) for the first time. There are global evidence that changes in climatic conditions can extremely influence the transmission of water-borne and vector-borne diseases.[5-8]

Access this article online

Quick Response Code:

Website: www.ijcm.org.in

DOI: 10.4103/ijcm.IJCM_285_19

Although countries of the SEA region are vulnerable to many climatic hazards, there is a paucity of documentation of their response to such threats. This study documents the mechanisms of disease surveillance and early warning systems for priority climate-sensitive diseases. The aim is to study strategies for effectual integration of disease surveillance and early warning systems in selected Southeast Asian countries.

Methods

About 21 informal key-informant interviews and three focus group discussions were conducted to develop this case study (August to October 2018) in Sri Lanka, Bhutan, and Thailand. Key-informants were the officials from departments of health, environment and climate change,

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How to cite this article: Yasobant S, Saha S, Puwar T, Saxena D. Toward the development of an integrated climate-sensitive disease surveillance in southeast asian countries: A situational analysis. Indian J Community Med 2020;45:270-3.

Received: 11-07-19, **Accepted:** 21-01-20, **Published:** 01-09-20.

academia. Interviews were conducted at the date, time, and place convenience of participants. Interviews conducted at the participants' workplaces after obtaining permission and consent to participate. A pilot-validated interview guide with broad open-ended questions documenting the current disease surveillance mechanism, health system structure, data management and organizational structure for climate change, and policies was used to document the information. Audio recordings (after consent) and verbatim notes were taken during the interview. The summary of the interviews was read back to the participants to ensure participant validation. Transcripts were made on the same day based on the verbatim notes and the recordings. Manual descriptive content analysis was used to analyze the transcripts.[9,10] The decision on coding rules and theme generation was done by using the standard procedures and in consensus.[11] Both inductive and deductive codes were generated. To ensure that the results are a reflection of the data, the codes/themes were related back to the original data.[12] The themes were described in the form of Strengths, Weaknesses, Opportunities, Threats (SWOT) matrix. The findings were reported by using Consolidated Criteria for Reporting Qualitative Research.[13] This study was approved by the Technical Advisory Group of Indian Institute of Public Health Gandhinagar, India.

Observations

The observations are presented country-specific with two major focus, i.e., disease surveillance system and the meteorological surveillance system. The key observations are summarized in Table 1.

Bhutan

The Ministry of Health (MOH), whose major focus is on preventive and health-care services, provides free services for all.[14-16] The private health system is not so prominent for delivery care; however, few private diagnostic centers are observed.[17] Three main surveillance systems documented in Bhutan, i.e., National Early Warning Alert and Response Surveillance (NEWARS), constituting both indicator-based surveillance (IBS) and event-based surveillance, disease-specific supplementary surveillance systems such as influenza-like illness (ILI) and severe acute respiratory infections, Water Quality Monitoring Information System.

The Royal Center for Disease Control is the key agency under the Department of Public Health, MOH, Royal Government of Bhutan, controls the surveillance system. NEWARS is the prime surveillance system of the country. Under the IBS component of NEWARS, 21 identifiable diseases are reported from all health facilities. The National Environment Commission is the key agency that tackles and implements climate change actions in the country. However, the National Center for Hydrology and Metrology is an independent body that looks after meteorological surveillance across the country, through 92 meteorological stations across Bhutan. These stations measure local weather conditions (temperature, humidity, and rainfall) daily. Although these two institutes work independently, they share some information.

Sri Lanka

Sri Lanka has a robust disease surveillance system, which is evident in the successful elimination of malaria from the country.[18] The MOH, Nutrition, and Indigenous Medicine is the leading agency providing stewardship to health service development and delivery. The public health-care system is divided into the Community Health Care System (preventive and promotive health) and the Curative Health Care System.[19]

The private sector contributes more than 48% of outpatient care in the country.[20] The epidemiology unit at the ministry level technically supervises the entire system of surveillance in Sri Lanka. The medical officer at MOH and the public health inspector of the area play crucial roles at the peripheral level. The disease surveillance program involves disease-specific notifications, special surveillance on selected diseases such as vaccine-preventable diseases, leptospirosis, human rabies, and dengue fever. In addition, sentinel site surveillance is being carried out for ILI and severe acute respiratory illness.[21,22]

The Ministry of Mahaweli Development and Environment is the nodal ministry for monitoring climate change. However, there is no formal mechanism to share climate data from the meteorology department with the health ministry. The health department does not utilize climate data for disease prediction. In one instance, the Colombo municipal corporation reported purchasing seasonal data from the meteorology department. Overall the country needs a convergence plan for all departments, training on modeling, prediction, and development of a replicable model.

Table 1: Summarized overview on health system and disease surveillance system of selected Southeast Asian countries

Country	Population	Governance system	Health system structure	Disease surveillance system
Bhutan	750,125	Constitutional monarchy	Three-tier integrated system with no/minimal private sector contribution	NEWARS and disease-specific supplementary surveillance system
Sri Lanka	20,227,597	Unitary semi-presidential constitutional republic	Three-tier integrated system with moderate private sector contribution	National disease surveillance system and disease-specific supplementary surveillance system
Thailand	64,785,909	Unitary parliamentary constitutional monarchy under a military junta	Three-tier integrated system with moderate (1/3rd) private sector contribution	The national disease surveillance system

NEWARS: National Early Warning Alert and Response Surveillance

Table 2: SWOT analysis from the selected three SEA countries

Items	Bhutan	Sri Lanka	Thailand
Strength	Well-functional event-based and indicator-based surveillance system, publicly available meteorological information, pilot integration for climate-sensitive diseases	Robust disease surveillance system with the help of epidemiology units across the nation. Public health inspector at the ground level	SRRT for both indicator-based and event-based surveillance system, good network of public health volunteers at ground level, and community radio stations for health promotion
Weakness	Although human resource at the field level is engaged in these activities, skilled HR like epidemiologists are lacking. lack of measures for the detection of duplicate cases	Nonutilization of climate data in disease prediction	Inter-departmental collaboration rarely happens
Opportunity	Techno-enabled surveillance system	Engaging private providers in the disease surveillance system Availability of climate data for use in disease prediction	Active tropical medicine departments of medical colleges and network of radio stations at the village-level
Threat	Integrating NEWARS with other disease-specific and/or laboratory-based surveillance systems	Repeated natural calamities	Repeated natural calamities

NEWARS: National Early Warning Alert and Response Surveillance, SRRT: Surveillance Rapid Response Teams, SWOT: Strengths, Weaknesses, Opportunities, Threats , HR: Human Resource, SEA: Southeast Asia

Thailand

The Ministry of Public Health (MOPH), along with several autonomous agencies like Health Systems Research Institute, Thai Health Promotion Foundation, National Health Security Office, National Health Commission Office and Healthcare Accreditation Institute, formulates, implements, monitors, and evaluates the health policies of the nation. The government runs three-fourths of the hospitals in Thailand. Most of the private health-care set-ups are small and <100 bedded, while large private hospitals cater to mostly international patients.[23] The Epidemiology Bureau, Disease Control Department, MOPH collects disease information from the community. As per observations, a combination of indicator-based and event-based surveillance is achieved with the help of Surveillance Rapid Response Teams and network.

The agency responsible for weather forecasting and monitoring in Thailand is the Thai Meteorological Department under the agency of the Ministry of Digital Economy and Society. A total of 122 weather stations are employed throughout Thailand that record mostly surfaces weather. Data are recorded manually at the station in a logbook and is then entered into a personal computer, to be sent as the World Meteorological Organization-coded messages to the headquarters. However, the data are not analyzed adequately for disease forecasting.

SWOT analysis of each country with respect to the current surveillance systems and meteorological data integration is shown in Table 2.

Need for Developing an Integrated Surveillance System

There are some country-specific initiatives such as Integrated Surveillance and Climate Informed Health Early Warning System that have been implemented on a pilot basis across these three countries. However, the convergence, information sharing, and data integration to predict the outbreaks of climate-sensitive diseases are largely missing. While these initiatives merit a robust evaluation to understand their capability to predict diseases, it is essential to have intersectoral collaboration. There is an urgent need for convergence of departments responsible for the integrated surveillance system, as documented in this case study.

While these countries are making efforts to mitigate the impact of climate change, there is scope for better uniformity in data collection, processing, and analysis. The need of the hour is an integrated training program with the involvement of both meteorology and public health departments to strengthen the quality, data integration, and sharing for real-time prediction of climate-sensitive diseases.

Acknowledgments

We would like to thank the team from WHO and ministries of respective countries who supported our visits. We are also thankful to WHO-SEARO for their support in facilitating the visits to these countries. We would like to thank Dr. Anurag Saxena, Dr. Mahaveer Golechha from IIPHG for assisting in country-specific visits during data collection and Dr. Komal Shah, Dr. Vebhav Patwardhan from IIPHG for assisting in the initial literature review process.

Financial support and sponsorship

This activity was funded by WHO-SEARO. Funders have no role in the design of the study and interpretation of findings of the study.

Conflicts of interest

There are no conflicts of interest.

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