



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

From Dec 5, 2015 to Oct 13, 2016, 4306 suspected cases of yellow fever were reported in Angola, with 369 deaths and an alarming case fatality ratio of 8.8%.¹ Three countries: the Democratic Republic of the Congo, Kenya, and China, have reported imported cases from Angola. This is the first time yellow fever has been reported in Asia. Of the ten laboratory-confirmed yellow fever cases reported in China, six people reside in Fujian Province, an area where dengue transmission has occurred, raising concerns of autochthonous transmission.² In response to global concerns about the spread of yellow fever and the first cases reported in Asia,³ we analysed the border health procedures pertaining to yellow fever vaccination and epidemiological surveillance, regulation, and control in Sri Lanka as a case study for other non-endemic countries, particularly those in Asia with an abundance of the vector *Aedes aegypti*.

We captured yellow fever vaccination data from the traveller vaccination unit of the Medical Research Institute, the only certified centre where outbound travellers can receive the pre-departure yellow fever vaccine; and the Port Medical Office located at Colombo seaport, which provides yellow fever vaccines to maritime travellers. To determine the volume and dynamics of inbound migrants and travellers from yellow fever-endemic countries, data from the Sri Lanka Tourism Development authority and the Department of Immigration and Emigration databases were analysed. We examined information from the International Organization for Migration database, specifically information about assisted voluntary returnees to Sri Lanka from yellow fever-endemic countries. We conducted interviews with medical

staff from the vaccination centre at the Medical Research Institute, the Ministry of Health's Directorate of Quarantine, and border control authorities to determine routine practice, record-keeping, and standard operational procedures pertaining to yellow fever vaccination at points of entry.

28 684 yellow fever vaccinations were administered to travellers from Sri Lanka during a 13-year period (1998–2011). The destinations of Sri Lankan travellers who obtained yellow fever vaccines were primarily in Africa (97%). The number of tourists to Sri Lanka from yellow fever-endemic countries increased from 911 in 2009 to 1380 in 2011, with Kenya, Nigeria, and Zambia contributing most. No disaggregated data on place of destination and duration of visit was available for both inbound and outbound travellers, and no records on the international certificate of vaccination or prophylaxis against yellow fever were available for inbound travellers. The International Organization for Migration database showed the return of 534 Sri Lankans from eight west African nations of Togo, Benin, Guinea, Sierra Leone, Mali, Ghana, Senegal, and Mauritania, during this period. All were so-called irregular migrants, part of a human smuggling operation. The average duration of stay in West Africa was 20.5 weeks. On arrival in Sri Lanka, 98% of these returnees had the yellow fever vaccination. Interviews revealed that potentially three of every five people seeking yellow fever vaccination would depart within a week of receiving the inoculation, contrary to national vaccination guidelines. There were no standard operational procedures, or monitoring or regulatory mechanisms that enabled Sri Lankan immigration authorities or port health officers to check yellow fever certification. Traveller declaration forms for both arrival and disembarkation make no reference to vaccination requirements for yellow fever or other infectious diseases.

These deficiencies might be common to most countries in Asia, making them vulnerable to the ongoing yellow fever epidemic. The data show that tourists entering Sri Lanka from selected west African and South American countries, especially via irregular routes, pose the highest risk of infection. However, the cases of yellow fever in China were mainly from returning Chinese migrant workers from Angola. Information on the yellow fever vaccination status of these populations might not be available in many countries because of gaps in registration and surveillance systems. Without these data, risk assessment would be partial and inaccurate.

With the emerging threat of yellow fever and increasing global migration trends, non-endemic countries with high densities of *A. aegypti* might be better prepared for possible yellow fever outbreaks through the establishment or enhancement of border health information systems, surveillance, and regulatory capacities. State parties to the International Health Regulations⁴ are required to develop and maintain capacities to respond to public health events at points of entry. Assessing the vaccination status of travellers when they arrive from, or depart to, yellow fever-endemic countries remains crucial. 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 establishing such measures.

We declare no competing interests.

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- 1 WHO. Yellow fever situation report. Oct 21, 2016. <http://www.who.int/emergencies/yellow-fever/situation-reports/21-october-2016/en/> (accessed Oct 25, 2016).
- 2 Wasserman S, Tambyah PA, Lim PL. Yellow fever cases in Asia: primed for an epidemic. *Int J Infect Dis* 2016; **48**: 98–103.
- 3 Chan M. Yellow fever: the resurgence of a forgotten disease. *Lancet* 2016; **387**: 2165–66.
- 4 WHO. International health regulations (2005), 2nd edn. Geneva: World Health Organization, 2005.