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Conclusions: The design of flexible and community friendly intervention programmes to ensure the efficacy and sustainability of controlling dengue vectors through community based integrated vector management strategies, is recommended.

Keywords: Dengue, Knowledge attitudes and practices, Socio-economic, Risk factors, Sri Lanka

Background

Dengue is a vector-borne viral infection transmitted by *Aedes aegypti* and *Ae. albopictus* mosquitoes [1]. At present, the number of countries reporting dengue epidemics on a regular basis has increased from nine in 1970 to more than 128 countries within the past four decades, making dengue fever the most rapidly spreading mosquito-borne viral disease in the world [2]. The global burden of dengue could be ascertained by the reporting of approximately 390 million infections of dengue per year [3, 4]. The situation is more severe as a major public health issue among tropical and subtropical regions in the world.

In Sri Lanka, the most severe epidemic of dengue was recorded in the 2017 with 186,101 suspected cases [5]. Every year, a considerable amount of the annual budget is allocated in the health sector for curative and preventive measures of dengue, considering it as one of the main public health concerns in the country. Similar to many Asian countries, a complex interplay of multiple factors, e.g. urbanization, sanitation, mosquito control, meteorological, environmental, biological and demographic factors, results in dengue occurrence and transmission. Studying these factors is important in recognizing significant spatial and temporal trends of dengue outbreaks in any country [4, 6–8]. However, the relative importance of each factor on epidemic incidence and geographical distribution of epidemics may vary from one country to another, depending on the specific climatic, environmental, socio-cultural and economic conditions [9].

Regardless of the promising progress of the development and clinical evaluation of a vaccine, no vaccine or specific therapeutic treatments are yet available for dengue. This leaves the option of controlling and limiting the abundance of mosquito vector populations, as the potential solution for management of dengue epidemics [10]. After realizing the limited feasibility of chemical based vector control programmes, the Vector Controlling Entities (VCE) in Sri Lanka, are now focusing on the implementation of Integrated Vector Management (IVM) approaches. Community-based vector reduction programmes are supported as a key step under IVM as recommended by the World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) [11, 12]. However, in order to design and prior implementation of such community-based vector management programmes, it is a requisite to have an in-depth understanding on risk factors such as socio-economic and demographic

factors, along with knowledge, attitudes and practices (KAP) related to dengue at local settings [13].

Studies that characterize socio-economic and demographic risk factors of populations at high and low dengue prevalence rates may enable the identification of key thematic areas to be focused in vector control, while highlighting the gaps in existing control activities [14]. However, comprehensive studies of that nature are very limited in Sri Lanka. Therefore, assessment of awareness, attitudes, practices of the local communities and associated socio-demographic risk factors of dengue, is of paramount importance for implementing community-based control programmes. Hence, the present study was designed and carried out in order to characterize socio-economic, demographic, living standards and KAP-related risk factors that affect dengue transmission in two high risk populations residing in lowland and highland areas of Sri Lanka.

Methods

Study design: selection of locations

Colombo District (6.70° to 6.98°N and 79.83° to 80.22°E), the commercial capital of Sri Lanka, accounted for approximately 18.42% ($n = 34,274$) of the dengue cases reported from Sri Lanka in 2017 and is the most high-risk area for dengue incidence in Sri Lanka [5]. Being located in the lowland of the country, Colombo is the most urbanized metropolitan area of the country, which hosts a highly variable multi-culture and multi-ethnic population of 2,309,809 within an area of 699 km² [15]. In contrast, Kandy District (6.93° to 7.50°N and 80.43° to 81.04°E), located in the central highlands (Fig. 1), extends over an area of 1940 km², covering a wide array of natural environmental features in contrast to Colombo. It is of major tourist interest due to its natural location, and places of historical and religious importance. At present, Kandy District is the third highest risk area for dengue transmission in the country, contributing to 7.73% ($n = 14,378$) of the total dengue cases reported in 2017 in Sri Lanka [5].

In this context, the study focused on socio-economic risk characterization of highland and lowland populations of the country with notable variations in land use, demography, living standards and KAPs. The lowland areas included in this study were predominantly urban areas compared to the semi-urban and rural highland areas (except for the Kandy Municipal Council area) in