

Regional report

Chikungunya-type fever outbreak: some aspects related to this new epidemic in Jaffna district, northern Sri Lanka

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Chikungunya, a disease caused by alpha virus and transmitted by *Aedes* mosquitoes, had seldom been heard by the people of Jaffna until early November 2006, although a chikungunya-type fever epidemic was reported in western Sri Lanka in 1965 [1-3]. While few samples have been confirmed for the presence of CHIK virus, widespread of chikungunya-type fever outbreaks have been reported from many parts of the country since September 2006. Similar outbreaks of CHIK virus have also been reported from many states of India including Tamil Nadu since December 2005 [4-6]. In Sri Lanka, Mannar district, which lies very close (32km) to Rameshwaram island of Tamil Nadu, was the area to first experience the fever outbreak. It has been estimated that the ongoing fever epidemic in Jaffna district has affected thousands of people between November and mid December 2006 (personal communication-DPDHS Office, Jaffna).

It is difficult to establish the origin and mode of spread of CHIK fever to Jaffna because this epidemic occurred when the main land route (A-9) between Jaffna and the rest of the country remained closed since August 2006 owing to renewed armed conflict. Only sea and air transport facilities are available to facilitate public movement between Jaffna and the rest of the country. The closure of the main highway has hindered the availability of food and drugs in the market. Even the available items are sold for higher prices, creating an additional burden for ordinary people to meet daily requirements and raising concerns about nutrition and health. Although the disease has affected a large number of people, there are no facilities in Jaffna Teaching Hospital to diagnose CHIK fever. According to the health authorities in Jaffna, a few samples sent by air to the Medical Research Institute were confirmed for CHIK virus. A study was carried out under these circumstances in a highly affected village in Jaffna district to assess the severity of the fever as well as public attitudes and responses toward the epidemic.

A structured questionnaire-based study was carried out in mid December 2006. Entire households in Inuvil-West (09° 43'N:80° 01'E), a residential rural area located 7km away from Jaffna city, were visited during this study. The suspected chikungunya-type fever cases were initially reported from this locality and almost the entire village was affected by the disease. There is a single Government Central Dispensary in addition to a privately owned hospital and a few small medical centers.

The questionnaire was composed of multiple choice questions and an interview. There are four major parts: a) demographic information, b) symptoms and manner of treatment for chikungunya fever, c) knowledge about chikungunya, mosquitoes and mosquito-borne diseases, and d) attitude and practice to prevent mosquito bites. Basically the structured questionnaire was formulated to elucidate information on: monthly income, educational background, number of family members affected by fever, symptoms, manner of treatment (from government hospitals or private medical centers), recovery, how much was known about chikungunya, mosquitoes and their role in disease transmission, severity of the mosquito menace, mosquito biting time, and type of personal protective measures taken against mosquito bites. The questionnaires were written in Tamil (native language) and administered to heads of households from 0900 h to 1300 h. If no male head of household was available, a female head of household was interviewed.

Larval surveys were also carried out in houses of all the respondents to obtain the following *Aedes* larval indices - a) House Index (HI) - the percentage of houses or premises with one or more habitats positive for *Aedes* larvae, b) Container Index (CI) - the percentage of water holding containers positive for *Aedes* larvae, and c) Breteau Index (BI) - the number of positive containers per 100 houses [7].

One hundred sixty two heads of households (67 males and 95 females), consisting 653 individuals, were inter-

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viewed in the study area.

Education and monthly income

Twenty-six percent of the interviewees had received education up to Grade 5 (primary level education), 50% up to Grade 11 (secondary level education), and the rest up to Grade 12 or above (tertiary level education). Forty-eight percent earned a monthly income of less than LKR 10,000 (\$ 97.00).

Infection, symptoms and treatment received

All the respondents stated that their family members had been affected by the fever. Among 653 members in all households 645 had contracted the disease irrespective of age and sex. None of the affected individuals were hospitalized for treatment. All the affected respondents stated that they had suffered high fever and arthralgia in addition to one or more symptoms associated with CHIK infection. The respondents reported no deaths or haemorrhagic features. Ninety-six percent of interviewees stated that the affected family members sought treatment from a private medical center and the rest from the Government Central Dispensary. Sixty-six percent said that the fever abated within 3 days, 26% within 5 days, 6% within a week and 2% more than a week.

Mosquito menace and awareness

All the respondents were aware of the menace posed by mosquitoes. Twenty-nine percent assessed the mosquito problem as severe and 71% as moderate. Eighty-six percent and 14% responded that the mosquito biting activity was severe in the evening and the night respectively. Ninety-one percent of the respondents were unaware of the causative agent of chikungunya, but the rest cited the virus. However when asked about the mode of transmission only 82% mentioned the involvement of mosquitoes. Fifteen percent of the households consider the fever to be fatal. Nearly 96% of the respondents revealed that they had not attended any awareness programme on the prevention and treatment of CHIK fever conducted by the authorities. Seventy percent of the respondents were able to name one or more mosquito-borne diseases. Malaria (62%) was the best known mosquito-borne disease followed by chikungunya (7%) and dengue (1%).

Practices for personal protection

Almost all of the households used personal protective

measures to avoid mosquito bites. Among these 11% employed protective measures daily and 89% seasonally (during the rainy season). Although smoke was the most widely practiced personal protective method most of the respondents used more than one measure such as an electric fan, mosquito coils, and bed nets in combination. Nearly 86% of the respondents stated that they were attempting to maintain a clean living environment by employing one or more of the following: eliminating stagnant water bodies and removing water holding containers, bushes and grasses.

Aedes larvae indices

Among the 162 houses inspected 82 were found to be positive for *Aedes* larvae. A total of 214 containers holding water were examined and 147 were found to be infested with *Aedes* larvae. Based on these data the following indices were obtained: HI=51%, CI=69% and BI=91.

Mosquito-borne diseases such as dengue and malaria are serious public health concerns in Jaffna district. This is mainly due to the immense socio-economic impact of two decades of civil war on the people of the district. The civil unrest has been the major barrier for health authorities to deliver prompt treatment and to implement appropriate vector control strategies [8]. The recently renewed armed conflict has resulted in the closure of the main supply route to the district. This has created an acute shortage of essential items including drugs. The chikungunya-type fever outbreak compounded the problems of people struggling to meet their daily needs.

Although several dengue cases have been reported from Jaffna District in recent times, chikungunya, with symptoms similar to dengue, is reported for the first time. According to medical sources in Jaffna more than 10,000 outpatients were treated for CHIK fever between November and mid-December 2006 in government hospitals. However, the real nature of the epidemic in the district is not known due to the self-limiting nature of the disease and the manner of treatment sought by affected individuals. Our study reveals that a vast number of affected individuals sought treatment from private medical centers. If this reflects the scenario for the whole district, a large number of affected patients could have gone uncounted, as there is no link between private clinic centers and the Government Health Department in Jaffna and no way to maintain records for treatment statistics.

All the affected individuals in the study area were treated based on clinical signs, as there are no facilities to confirm the presence of CHIK virus in Jaffna. All the respondents had fever and arthralgia (lasting for more than a month) in addition to one or more other symptoms associ-

ated with CHIK fever [9]. Similar symptoms were also reported in the 1965 epidemic [1,3] in western Sri Lanka. Females are the highly affected sex group in Sri Lanka [2] and in India [6]. However, the present study shows that the fever has affected all individuals irrespective of age, sex, educational level and socio-economic status. The high morbidity might be related to lack of immunity in the affected population because they were exposed to this viral disease for the first time. It has been reported that the recent chikungunya fever epidemic in India is more severe than the previous outbreaks with complications and death [4]. Our personal communications with medical consultants in Jaffna Teaching Hospital reveal that there were few haemorrhagic manifestations or complications like ulcers (scrotal, inguinal and oral) and viral encephalitis with cervical lymph node enlargements. The fever infection is suspected to have aggravated the existing critical illness and thus caused few deaths of itself. It is speculated that the severity could be related to changes in virus genome [4]. Although the previous epidemics in India were reported to be caused by Asian genotype CHIKV virus, the recent 2006 epidemic in India was caused by central/East African genotype CHIKV virus [10]. No reports are available on the genomic sequences of the CHIK virus that caused fever epidemics in Sri Lanka.

Ae. aegypti is the established vector of CHIK virus in India [11]. Laboratory infectivity studies show that even *Ae. albopictus* can transmit CHIK virus [12,13]. *Ae. aegypti* is mainly confined to urban areas and thus the disease is mainly transmitted through an urban cycle [2,9]. However the present outbreak in Jaffna district has affected both urban and rural areas, indicating the prevalence of *Ae. aegypti* even in the latter. A previous study carried out in a highly populated area located in close proximity (3.5km) to the study area confirmed a high prevalence of both *Ae. aegypti* and *Ae. albopictus* with indoor breeding habit from October to January. As Jaffna district receives monsoon rain from October to December, a positive association between *Aedes* density and rain-fall was reported in the study [14]. The calculated BI for *Aedes* larvae in the study area was greater than 90. According to the general guidelines, any BI value above 50 indicates a high risk of transmission [7]. The results of larval indices support the above interpretation in relation to disease transmission occurring in the locality. The reported severity of mosquito bites in the evening also indicates the prevalence of *Aedes* mosquitoes, a feature associated with their daytime feeding behavior. The timing of the disease and the occurrence of both species would have accelerated the momentum of disease transmission provided that both species are susceptible to CHIK virus in Jaffna district. Jaffna district lies in the dry zone of Sri Lanka and generally experiences warm and humid conditions except

rainy days. It was reported that an increase in temperature enhances the susceptibility of mosquitoes to CHIK virus [15]. Therefore all these factors might have collectively contributed to the rapid spread of the disease in the district. As there is no report on the susceptibility of *Aedes* mosquitoes to CHIK virus from Sri Lanka, such an investigation is warranted for further vector control measures.

Almost all of the respondents practice one or more personal protection methods. Using smoke is the most commonly used practice. However our previous study related to personal protective measures revealed that the public in Jaffna mainly use mosquito coils as their personal protective measure against mosquito bites [16]. The change in practice might have been related to an acute shortage of mosquito coils in Jaffna after the closure of the A-9 highway. The ineffectiveness of personal protective measures (preferably used at night) against fever transmission is partly attributed to the daytime feeding behaviour of vector mosquitoes. Although a considerable portion of the households are aware of mosquito-borne disease and are practicing measures to remove mosquito-breeding sources, the results of *Aedes* larval indices indicate that many people easily overlook small water containers and rarely consider them to be breeding sources of *Aedes* mosquitoes. This behavioral aspect may be associated with inadequate public awareness about mosquito-breeding sources and it suggests the need for a comprehensive public awareness programme related to mosquito-borne diseases.

The present chikungunya-type fever epidemic is considered to be the greatest public health problem encountered in Jaffna in recent times. The major failings associated with the outbreak are the lack of diagnostic facilities and the non-implementation of an organized vector control programme with active participation of the public. Therefore the health authorities should formulate an appropriate strategy to combat mosquito-borne diseases in order to prevent similar outbreaks in the future.

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