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Full Length Research Paper

Seroprevalence of Chikungunya during outbreak in Dhaka, Bangladesh in 2017

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Chikungunya (CHIK) infection is re-emergence public health problem globally including Bangladesh. It is an arthropod-borne disease, which is transmitted by mosquitoes bite. The virus was first isolated in Newala district of Tanzania in 1953. In 2017, an outbreak of Chikungunya, has struck Bangladesh's capital, Dhaka. This study was conducted to know the seroprevalence, clinical presentations and seasonal trends of CHIK infection. This study was conducted in the Ibn Sina Diagnostic & Consultation Center, Uttara from January to November, 2017. Serum samples from about 1060 Chikungunya suspected cases were tested for immunoglobin M (IgM) and IgG antibodies by Immuno-Chromatographic test (ICT) method. Out of total tested cases, 524 (49.43%) were seropositive for Chikungunya, among the seropositive 379 (72.32%) were IgM positive, 98 (18.70%) were IgG positive and 47 (8.96%) were both IgM and IgG positive. The most affected age group was 11 to 40 years. Females were more affected than males. A high percentage of Chikungunya seropositive cases were found among suspected patients.

Key words: Chikungunya, IgM and IgG antibodies, seroprevalence, outbreak in Dhaka.

INTRODUCTION

The Chikungunya virus infection as an important mosquito-borne disease of an alpha genus belongs to the Togaviridae family (Ang et al., 2017). The virus consists of single-stranded RNA genome, a 60 to 70 nm diameter capsid and phospholipids envelop. Chikungunya fever is predominantly transmitted by bites of mosquitoes of *Aedes* genus (*Aedes aegypti* and *Aedes albopictus*). Probably, Chikungunya virus originated in East Africa (Dash et al., 2011). Chikungunya virus was first isolated from the serum of a febrile human during an epidemic outbreak by Ross in Newala district of Tanzania in 1953 (Khatun et al., 2015). Since then, Chikungunya virus has become a more global concern (Kabir et al., 2017). In Asia, *Ae. aegypti* is believed to be the principal vector for transmission during the human outbreak. Only female mosquitoes are infective and bite human in daytime

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Table 1. Distribution of suspected Chikungunya case patients.

Parameter	No. of cases	Percent
Positive	524	49.43
Negative	536	50.57
Total	1060	100

Table 2. Distribution of serologically positive Chikungunya case.

Antibody	No. of cases	Percent
Anti-Chikungunya IgM positive	379	72.32
Anti-Chikungunya IgG positive	98	18.70
Both IgM and IgG Positive	47	8.96

(especially early morning and late evening). A high vector density in the post-monsoon season accentuates virus transmission (World Health Organization, Special Programme for Research, Training in Tropical Diseases, 2009). In 2008, the first Chikungunya outbreak occurred in the northern area at Rajshahi and Chapainawabganj districts of Bangladesh. Outbreak was investigated by Institute of Epidemiology, Disease Control and Research (IEDCR) and International Centre for Diarrhoeal Disease Research Bangladesh (ICDDR, B). An outbreak of fever with prolonged joint pain was investigated at Dohar of Dhaka District in 2011; suspected cases were identified by house-to-house surveys. Approximately, 29% of the village residents have symptoms consistent with Chikungunya fever during the outbreak (Khatun et al., 2011). After that six confirmed cases of Chikungunya were reported in 2014. In 2017, Chikungunya outbreak occurred at Dhaka of Bangladesh. Clinical confirmed cases had 2,314; reported in different hospitals and clinics of Dhaka from May to September 2017 and more than 1 million people were affected in the capital city of Bangladesh (Kabir et al., 2017). Chikungunya viral fever occurs in the victim of all ages in both sexes. Acute Chikungunya virus infection usually has the onset of high fever, severe joint pain, myalgia, erythematous, and maculopapular rash, which can range in severity from a mild, localized rash to an extensive rash involving more than 90% of the skin (Miner et al., 2015). The joint pain begins to improve after the first week, although some patients have persistent joint pain, swelling and morning stiffness. These symptoms can last for up to 3 years (Burt et al., 2017). There are different ways for diagnosis of Chikungunya fever; however, blood specimen is collected from an infected patient within 7 days for the Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) to detect the viral RNA. Both anti-Chikungunya antibodies immunoglobin M (IgM) and IgG can be detected in either the acute or the convalescent-phase samples (Wahid et al., 2017). ELISA and ICT test were performed for detection of IgM and IgG (Dash et al., 2011).

METHODOLOGY

The study was conducted in Ibn Sina Diagnostic & Consultation Center Uttara from January to November 2017. Inclusion criteria include the patient who reported to the clinic with high fever, joint pain, headache, skin rash, and received a doctor's referral to the diagnostic centre for Chikungunya test. Exclusion criteria include patients who were unwilling to participate. Respondents were selected and inform consent taken at the time of blood collection and also written permission was taken from branch Manager. About 2 to 3 ml of whole blood samples were collected from each patient using sterile aseptic precautions, and serum was separated by standard methods. Collected serum samples were tested for IgM and IgG anti-Chikungunya antibodies by immune chromatographic method (ICT) according to the SD STANDARD DIAGNOSTICS, PHA instruction. In this method, IgM and IgG were detected by using an antibody capture method and gold-labeled anti-Chikungunya virus monoclonal SD Chikungunya antibody. The patient serum (10 µl) and 3 drops (90 µl) of buffer solution are added for dilution of serum. The result was taken within 15 to 20 min after the appearance of the color of control line and test line. Results of all tests were written in the laboratory resister and data collection sheet. Data obtained were statistically analyzed by SPSS software version 23. P-value <0.05 was considered as statistically significant.

RESULTS

A total of 1060 Chikungunya suspected cases were studied to detect anti-Chikungunya IgG and IgM antibodies in serum samples. Out of these, 524 (49.43%) samples were positive for Chikungunya infection and 536 (50.57%) were negative (Table 1).

Out of total 524 Chikungunya positive cases, IgM anti-Chikungunya antibody was found positive in 524 (72.32%) samples, IgG anti-Chikungunya antibody was positive in 153 (18.70%) and both IgM and IgG were positive in 47 (8.96%) cases (Table 2).

Table 3 shows that respondents in the age group 31 to 40 years were more infected than other age groups. There was no statistical significance (P>0.05) between age and anti-Chikungunya antibody. Female respondents were more infected than male and statistical (P<0.05) differences were found between sex and anti-Chikungunya antibody.

Figure 2 shows the clinical symptom of the respondents which includes high fever and joint pain was the most common symptom of most cases, joint swelling (48.03%), rash (69.33%), headache (73.59%), and body pain (83.09%) of seropositive cases.

DISCUSSION

Chikungunya virus is an important re-emerging disease of the tropical and sub-tropical regions in last decade.

Table 3. Age-sex distribution of Chikungunya suspected cases.

Variable	CHI-IgM (ICT)	
	Negative	Positive
Age of the respondents		
0-10 years	21	36
11-20 years	146	98
21-30 years	129	87
31-40 years	121	123
41-50 years	71	77
51-60 years	34	71
Above 60 years	14	32
Total	536	524
Significance	χ^2=7.45, df=6, p=0.281	
Sex of the respondents		
Female	359	331
Male	177	193
Total	536	524
Significance	χ^2=19.27, df=1, p=0.01	

Chikungunya has been occurring regularly with periodic surges in a number of cases (Singh, 2007). The differential diagnosis associated with Chikungunya fever includes a wide variety of viral which includes Dengue, bacterial and parasitic infections that produce a similar syndrome. A definitive diagnosis is confirmed by virus isolation and/or serological test. This study describes the seroprevalence of Chikungunya virus in Dhaka resident population. A total of 1060 serum samples from suspected cases of Chikungunya infection were received during the study period, out of which 524 (49.43%) samples were positive for Chikungunya infection. It was found that 379 (72.32%) anti-Chikungunya IgM positive. Khatun et al. (2015) reported 29% Chikungunya infection in Dhaka Dohar, Chopra et al. (2014) reported 49.0%, Divya and Krishna (2016) reported 21.8% and Wadekar et al. (2017) reported 8.17% and Cunha et al. (2017) reported 35%. The study also showed that most (58.77%) affected age group was 11 to 40 years; these results are comparable with Wadekar et al. (2017) and Cunha et al. (2017). Less than 10 years age group was 4.2% least affected. According to gender distribution, female were more infected than male. These findings are comparable with the study done by Kawle et al. (2017), Divya and Krishna (2016) and Mohanty et al. (2013). The highest percentage of morbidity was found in female and females were more frequently affected than males (Ang et al., 2017). Clinical presentation of Chikungunya seropositive cases showed that fever, joint pain, joint swelling, headache, and the rash were the most common symptom in all the cases. Headache was seen in 73.59% and body pain in 83.09% of seropositive cases. Joint swelling and rashes were observed in 48.03 and 69.33% seropositive cases, respectively. Similar findings correlated with other studies conducted by Mohanty et al. (2013) and Balasubramaniam et al. (2011) showed that fever and joint pain were the most common symptom (Figure 1).

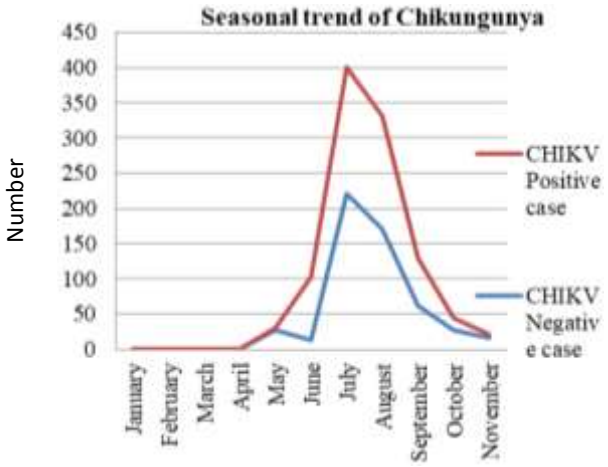

Figure 1. A seasonal peak was seen in the month of June to September.

This study shows seroprevalence of 49.43%. The geographical distribution had a significant influence on the prevalence of antibodies to the virus. The Chikungunya infected number of cases was more in the months of May to September and less during the months of January to April. Most of the studies represent seasonal variation, because of the increase in vector density during the rainy season (Dwibedi et al., 2011).

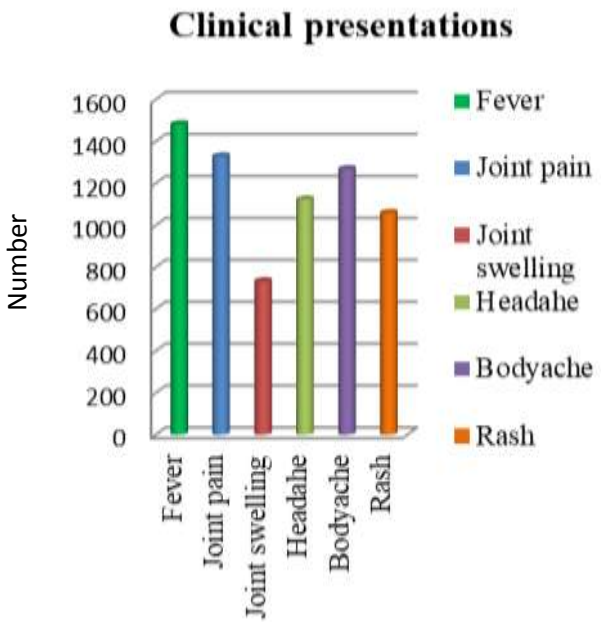

Figure 2. Clinical symptom of the respondents.

This might be explained by the possible impact of ecological characteristics of the areas on the natural cycles of the arthropod-borne viruses under consideration (Shrihari et al., 2012).

Conclusion

Chikungunya affects the humans of all age in both sex groups worldwide. In this study, there was no mortality but morbidity rate was high in affected cases, most affected age groups belonged to 11 to 40 years. The seroprevalence of Chikungunya in the study was 49.43%. The finding suggests it continuance as a major health threat in the present scenario. The *Aedes* mosquito is present in varying density in the different season. The virological surveillance of CHIKV and other vector-borne diseases should, therefore, be given utmost attention that will in turn help in the prediction, prevention, and control of impending and sporadic outbreaks in developing countries.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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