

## ORIGINAL ARTICLE

## Frequency of Chikungunya Virus Infection in the Tertiary Care Hospital of Karachi

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### ABSTRACT

**Objective:** To determine the frequency of Chikungunya virus (CHIKV) infection in the tertiary care hospital of Karachi during the time from 1<sup>st</sup> January 2017 till 31<sup>st</sup> December 2018.

**Study Design:** This was a retrospective cross-sectional study.

**Place and Duration of Study:** The study was conducted in the Department of Microbiology, Dow Diagnostic Reference and Research Laboratory, Karachi, Pakistan from 1<sup>st</sup> January 2017 till 31<sup>st</sup> December 2018.

**Materials and Methods:** Serum of suspected patients of Chikungunya virus infection was separated from venous blood samples and checked for immunoglobulin M (IgM) antibodies against Chikungunya virus infections by applying a micro titer plate enzyme-linked immunosorbent assay (ELISA). Data was collected after the approval of ethical committee of Dow University of Health Sciences by Pacslink software and analysis was accomplished by using Statistical Package for Social Science SPSS version 17.0 for frequencies of age group, gender, and IgM positive Chikungunya virus infection.

**Results:** Out of 4329 venous blood samples collected from suspected patients of Chikungunya virus infection. 1181(27%) showed the presence of IgM of Chikungunya virus (CHKV) infection. Majority of the patients were in the third decade of their lives with median age of 38.74 years. The proportion of males was slightly more 605 (51%) than females 575 (48%) (Table I). Age group 16-44 years showed high prevalence 627 (53%) as compared to other age groups (2017-2018) (Figure: 1). Incidence of CHIKV was higher in October and November 2017(37.8%), than 2018 (Figure: 2).

**Conclusion:** This study concluded that the frequency of Chikungunya virus Infection was higher during the period from 1<sup>st</sup> October till 31<sup>st</sup> November 2017.

**Key Words:** *Chikungunya Virus, Infection Control, Serology Markers, Tertiary Care Hospital, Viral Diseases.*

### Introduction

The name Chikungunya derives from Makonde, which means to become contorted. Chikungunya virus (CHIKV) is an enveloped, single-stranded, positive sense flavivirus that is sustained in nature between humans and *Aedes* mosquito.<sup>1</sup> These vectors are found all over the globe and are responsible for many outbreaks. Female mosquitoes are responsible for the transfer of virus because blood meal is special ingredient for the development of egg. The virus used to divide in the salivary gland of mosquitoes.<sup>2</sup> The CHIKV symptoms can be

observed 4-7 days after the bite of a mosquito. Arthralgia is the main symptom involving the ankle joint, knee joint, lower back, wrist, and phalanges. Fever comes with rigors and chills and has a distinctive biphasic trend. Other symptoms including nausea, fatigue, headaches, muscle pains and rashes.<sup>3</sup> The disease is self-limiting, but it may take a prolonged course before it abates.<sup>4</sup> High-risk population includes newborns infected around the time of birth, older adults (>65 years), patients with medical condition such as increased blood pressure, diabetes, or heart disease.<sup>5</sup> *Aedes albopictus* and *Aedes aegypti* are responsible for the spread of the virus. These mosquitoes are mostly found in tropical and subtropical locations and frequently bite during daylight. The proximity of mosquito breeding to human habitation is a significant risk factor for Chikungunya. Complications include the involvement of urinary, cardiovascular, cerebral, and digestive systems. If the virus is transferred via the vertical route of transmission, it may lead to neuro-

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disability due to severe encephalopathy. Currently, CHIKV fever has affected more than 50 countries. The global distribution of *A. aegypti* is expanding due to global travel and trade, including the virus. It has become a public health problem in Asia, Africa, Europe, and America. In late 2004, there was a massive outbreak in Eastern Africa that extended to India and East Asia in a span of 2 years, which affected approximately 2 million people.<sup>6</sup> A study conducted by Muhammad et al proposed detection of CHIKV during Dengue outbreak in 2011 in Lahore.<sup>7</sup> In September 2016, National Institute of Health (NIH) had issued a warning concerning the risk factors involved in Chikungunya disease after its outbreak in India. So, after the NIH warning due to lack of appropriate measures Pakistan had its first Chikungunya outbreak in the populated area of Karachi, including Malir, Shah Faisal, Saudabad and neighborhoods, where over 3000 people have been infected in Nov 2016. In addition, Pakistan had a burden of other viral infections including Crimean-Congo hemorrhagic fever, dengue in 2016. World Health Organization and health authorities had a serious concern about these viral emergencies.<sup>8</sup> CHIKV infection suspicion is based on clinical and epidemiological criterion, but disease confirmation required laboratory testing. Laboratory diagnosis involves detection of viral RNA and serological testing. Serological tests are the most used for the diagnosis of CHIKV. A combination of molecular and IgM antibody detection assays is suggested for diagnosis of CHIKV infection. Chikungunya IgM antibodies are appeared and detectable after 3-5 days of Chikungunya viral infection and elevated for 3-6 months. In addition, CHIKV IgG antibodies appear after two weeks of infection and remain elevated for years.<sup>9</sup> After CHIKV emerged in Karachi during 2016, and an outbreak eventually was declared when evidence of local transmission was confirmed.<sup>10</sup> Babar et al reported higher rate of CHIKV infection in the duration of December 2016 till May, 2017.<sup>11</sup> The current outbreak of 2016-17 in Pakistan was termed as a mysterious disease related to warm climate and substandard sanitary state of the town.<sup>12</sup> Due to the higher number of cases observed in the duration of 2016-2017, we planned this study with the objective to assess the incidence of CHIKV Infection in our setup during the period of 1<sup>st</sup> January 2017 till 31<sup>st</sup>

December 2018.

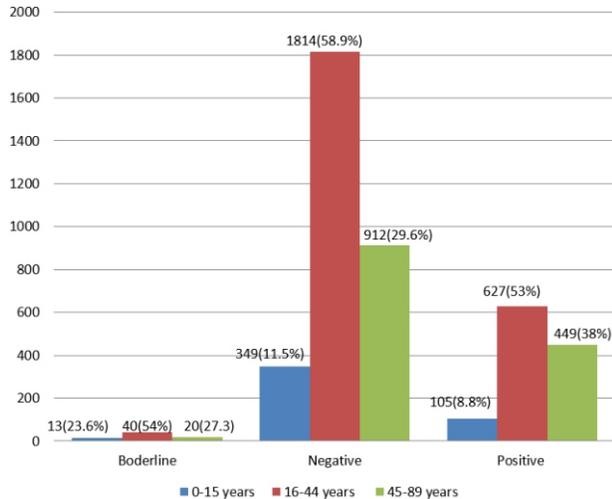
## Materials and Methods

It was a retrospective cross-sectional study, conducted with convenience sampling technique in the Department of Microbiology, Dow Diagnostic Reference and Research Laboratory, Karachi, Pakistan, during the time from 1<sup>st</sup> January 2017 till 31<sup>st</sup> December 2018. The patients were suspected cases of Chikungunya virus infection. They were advised for the detection of IgM antibody of Chikungunya virus by their physician. The permission for conducting this study was taken from the Institutional Review Board of Dow University of Health Sciences. The retrospective, non-parametric data was retrieved from Pacslink (laboratory data software) then it was shifted to SPSS software for final evaluation. Venous blood samples were collected from suspected patients of Chikungunya virus infection. 5 ml venous blood received in yellow cap gel tubes, after centrifugation for 10 minutes, serum was separated for further testing. 10 microliter serum was checked for Immunoglobulin M (IgM) antibodies against CHIKV infections by applying a micro titer plate ELISA assay. The test was done according to the kit manufacturer's protocol (EUROIMMUN, ELISA reader Statfax) and inferred either positive or negative based on absorbance with respect to cutoff values. Data analysis was accomplished by using Statistical Package for Social Science (SPSS version 17.0) for frequencies of age group, gender, and IgM positive Chikungunya virus infection. We included only those blood samples of patients who were registered for detection of IgM of Chikungunya virus infection irrespective of age and gender. Exclusion criteria included clinical samples of patients registered for detection of IgM of Chikungunya virus with inadequate serum volume, improper labeling, and absence of demographic information.

## Results

A total of 4329 blood samples of suspected patients were registered for the testing of the occurrence of IgM of CHIKV Infection during the period from 1<sup>st</sup> January 2017 till 31<sup>st</sup> December 2018. Out of total (4329) blood sample 1181 (27%) were showed the presence of IgM antibodies of CHIKV. Majority of them were in the third decade of their lives with median age of 38.74 years. Males were slightly more

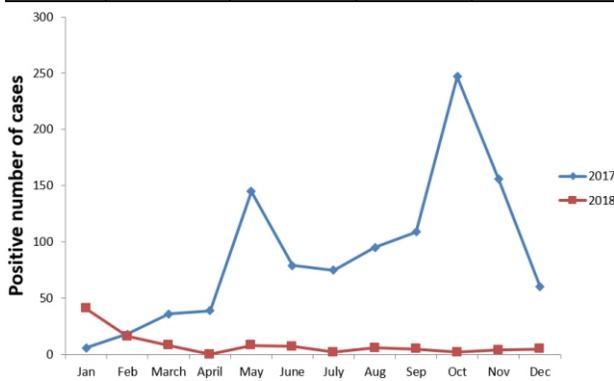
605(51%) than female 575(48%) (Table:1). Age group 16-44 showed high prevalence of IgM 627(53%) as compared with other age groups (Figure: 1). Incidence of CHKV was higher in October and November 2017(37.8%), than 2018 (Figure: 2).



**Fig 1: Frequency of Chikungunya Virus Infection in Different Age Groups from 2017-2018 (N=4329)**

**Table I: Gender Wise Distribution of Chikungunya Virus Infection from 2017-2018 N=4329**

Gender	Borderline n (%)	Negative n (%)	Positive n (%)	Total n (%)
Female	34(46%)	1311(42%)	576(48%)	1921(44.3%)
Male	39(53%)	1764(57%)	605(51%)	2408(55.6%)
Total	73	3075	1181	4329



**Fig 2: Month Wise Frequency of Chikungunya Virus Infection in Year 2017-2018**

**Discussion**

Since its identification in 1953, there have been multiple epidemics of CHIKV infections throughout Africa and Asia.<sup>2</sup> The emerging CHKV infection in Pakistan has become a serious threat with a significant effect on public health because of its epidemics and devastating symptoms which results

in economic burden on patients. Our study discovered a high incidence of CHKV during the period of October and November in 2017; however, the emergence of CHIKV was not highly reported during 2018. Naik et al also reported highest incidence in monsoon period starting from July till October.<sup>13</sup> Similarly one more study from India endorsed our finding.<sup>14</sup> Intense breeding of mosquitoes occurs from July till October, before and after monsoon rains. The stagnant water is converted into small ditches, which results in the growth of insects, thereby imposing a substantial burden on the control of mosquito-borne infections. The outbreak is linked with warm climate and inadequate sanitary conditions. The poor hygienic system of Karachi including open drains and feculent morasses are brilliant breeding habitats for mosquitoes. Vector control is the most significant strategy in controlling the transmission of CHKV infection.<sup>15</sup> Furthermore, a study found that besides abiotic factors (temperature & humidity), habitat also plays a major role in the growth of mosquitoes *A. aegypti* resides in water collected close to residential areas.<sup>16</sup> Current study reported high prevalence in age group 16-44 years with male predominance, endorsed by other studies.<sup>17-19</sup> However, Lubna et al contradicted the results of our study and showed higher prevalence in females.<sup>20</sup> Our study estimated IgM antibodies in the serum of 27% suspected cases of CHKV. Another study revealed 38.06% cases were positive by IgM antibodies.<sup>21</sup> A conclusive lab diagnosis can be made by evaluating acute-phase serum or plasma by PCR, IgM and neutralizing antibodies.<sup>22</sup> Development of IgM antibodies occurs at the end of the first week of infection. Therefore, samples should be obtained from a convalescent period of illness otherwise IgM antibodies will be replaced by IgG antibodies. Chikungunya is usually misdiagnosed as dengue that results in complications and further spread of disease.<sup>23</sup> Since three decades, statistical analysis of diagnosed and undiagnosed viral infections showed no indication of the prevalence of CHIKV in Pakistan.<sup>24</sup> However, poor diagnostic tools could be one of the reasons or unlike other viral infections, which present with the same symptomatic manifestations. The eco-tourism and global travelling have brought about outstanding changes

in the epidemiology of CKHV in Pakistan. A study found phylogenetic close strains of CHKV in India and Pakistan.<sup>25</sup> Local health authorities should take serious action against the occurrence of a regional epidemic of arbo viral diseases during the monsoon season.<sup>15</sup> NIH had alerted and advised the government to be vigilant across border travelling. There is increasing spread of infectious diseases to other parts of the country due to lack of preventive measures and screening for viral diseases at airports, railway stations and at the Pakistan–India border.<sup>26</sup>

We have no prophylaxis measures like vaccines, to fight against CHIKV. Only supportive treatments are provided to symptomatic patients. The constant reporting of clinical cases of CHIKV in Pakistan is alarming. Moreover, continuous incidence in the last two years is justified that if proper precautions will not be taken, then devastating complications of CHIKV may occur in Pakistan.<sup>27</sup> We acknowledge number limitations of our study such as lack of history from suspected cases of Chikungunya virus infection and unavailability of confirmatory test (RT-PCR) to all IgM positive. Despite all these limitations, detection of IgM antibodies is cost effective initial tool for finding of acute phase Chikungunya virus infection. Our data also helped us in detecting seasonal variations in emergence of Chikungunya virus infection.

### Conclusion

An emerging epidemic of CHKV infection in Pakistan is distressing issue. This study found that the frequency of Chikungunya virus infection was higher during the period of October and November 2017 with male predominance and age group 16-44 years. The important measures for the control of CHKV infection including surveillance programs, proper disposal of waste, vector control, and public awareness programs through available resources, efficient diagnostic tools and development of good health care system should be established on an urgent basis.

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