



## RESEARCH PAPER

## OPEN ACCESS

## Epidemics of dengue virus in the recent outbreak in 2017, in District Mardan, Khyber-Pakhtunkhwa province of Pakistan

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**Key words:** Dengue virus, Epidemics, Outbreak, Seroprevalence, KPK.

<http://dx.doi.org/10.12692/ijb/12.3.280-284>

Article published on March 30, 2018

### Abstract

This study aimed to find out the recent burden of dengue virus infection during the recent epidemic in district Mardan in 2017. The suspected patients of Dengue Virus infection from different areas of district Mardan were hospitalized at Mardan Medical Complex (MMC). The admitted patients were treated in an isolated ward specified for Dengue cases. We came across 2421 suspected cases of Dengue fever during 11 months period (January to November, 2017). The suspected individuals have been screened for dengue infection through Immunochromatographic technique (ICT), having recombinant NS1 antigen and both antibodies IgM and IgG coated. About 313 cases were found positive for dengue IgG, IgM, or both IgG and IgM, NS1, NS1+IgM, NS1+IgG, NS1+IgM+IgG. The dengue infection rate in males (214) was higher as compared to females (99). The rate of infection was found more in the age range of 15-35 years of age (44.08%). All the patients were suffering from severe fever (97.5%), Skin rash (20%), Abdominal pain (40%), Vomiting (50%), Nose bleeding (Epistaxis 55%), Gum bleeding (33%), Haematemesis (30%) headache and Fatigue. Although Dengue virus infections has greater epidemic in some of the regions of KPK province in 2017 but in Mardan district least number of individuals have been affected. Our findings show male subjects' seroprevalence is more as compared to female in the recent outbreak.

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## Introduction

All over the world, about 2.5 billion people are living in tropical and subtropical regions are at danger of epidemic of dengue virus transmission (Murray *et al.*, 2013). Morbidity of Dengue virus infection has been increased thirty times in the last five decades. Because of its spread from country to country and from urban to rural areas, it infects more than 400 million people every year. In dengue virus endemic areas, about half of the world population is at risk (Bhatt *et al.*, 2013). Being a member of flaviviruses, dengue virus have four different serotypes (from DENV1-4), transmitted by two vectors *Aedes aegypti* (primary vector) and *Aedes albopictus* (secondary vector). The primary vector, *Aedes aegyptia* is a highly urbanized, domestic mosquito that propagates in stored water and preferably feeds on humans (Khan J and Khan A, 2015). Since 1992, Pakistan has gone through a number of dengue fever epidemics.

In 1994, the first epidemic happened in Karachi which is southern city of Pakistan (Chan *et al.*, 1995). During this outbreak the two serotypes, DENV-1 and DENV-2, were reported (Akram *et al.*, 1998), while in epidemic of 2005–2006 in Karachi, DENV-3 was identified for the first time (Jamil *et al.*, 2007). Later on, in 2007-2009, outbreaks occurred in Lahore which was due to DENV-2 and DENV-3 serotypes respectively (Fatima *et al.*, 2011).

Later on, the two destructive dengue outbreaks were documented in the country, first in Lahore in 2011 and in 2013 in KPK Province in Swat that has affected more than twenty thousand individuals with around four thousand deaths (Ali *et al.*, 2013).

The current study has focused on district Mardan (KPK), to whom least consideration has been given during the outbreaks. The aim of the study was to find out documented cases of dengue infection in the current outbreak in the year 2017 in district Mardan that has done major breakthrough in Peshawar city of KPK.

## Materials and method

### Study Site

The study was performed in District Mardan, 60 km North of Peshawar (Fig. 1), where the total population is 2.373 million according to 2017 census. The prevalence of dengue virus transmission, through reported DHF cases, has been permanent for the last five years. The study area is a flat agricultural zone; the climate is tropical with average temperatures ranging from 20°C to 30°C and relative humidity is quite high throughout the year while maximum humidity has been recorded in December i.e. 73.33 per cent. The rainfall here averages 559mm.



### Approval from ethical committee

The study was approved by the Ethical Committee of the Department of Biotechnology, Abdul Wali Khan, University, Mardan.

### Data collection

The concern study was done in Mardan Medical Complex (MMC) with the prior approval of Medical superintendent (MS) and in collaboration of medical physicians and laboratory technical staff.

The admitted patients with dengue infection symptoms and dengue hemorrhagic having positive IgG, IgM and NS1 anti-dengue antibodies were directly observed and interviewed.

### Analysis

The suspected individuals have been screened for dengue infection through Immunochromatographic technique (ICT), having recombinant NS1 antigen and both antibodies IgM and IgG coated. All these cases were enrolled and record was observed since January 2017 to November 2017. The patients were examined for Gum bleeding, Petechiae, Severe Headache, Enlarged liver (splenomegaly), Epistaxis, Abdominal pain, Haematemesis, Loose motion, and vomiting. The analysis was performed for anti-dengue antibodies NS1, IgM, IgG with the help of different diagnostic tools.

### Results

A total of 2421 dengue suspected subjects were examined, out of which 313 (12.92%) patients were infected with dengue virus from January to November. In total positive subjects, 214 (8.83%) patients were male and 99 (4.08%) were females. Most of the patients belonged to urban areas of Mardan.

**Table 2.** Anti-dengue antibodies in male and female.

Anti-dengue Antibodies	Male	Female	Total	Percentage %
NS1	20	09	29	1.19 %
IgG	54	24	78	3.22%
IgM	111	50	161	6.65%
NS1 + IgG	01	01	02	0.08 %
NS1+ IgM	03	04	07	0.28 %
IgG + IgM	22	10	32	1.32 %
NS1 + IgG +IgM	03	01	04	0.16 %
Total	214	99	313	12.92 %

**Table 3.** Age wise data of dengue infected patients.

Age of patients	No. of patients	Percentage %
1 month-15 years	78	24.92
15-35	138	44.08
35-50	62	19.80
50- Onward	35	11.18

### Discussion

The hot and humid summers of Pakistan supports the propagation of Aedes species that are vectors for carrying dengue virus. The areas where dengue

The summary of clinical features is shown in (Table 1). All the infected individuals were observed to suffering from fever, followed by the common clinical features of enlarged liver and then vomiting and Epistaxis (Nose bleeding). Less common were abdominal pain, Haematemesis, (Blood in Vomiting) Gum bleeding, skin rashes and melena. (Table1).

**Table 1.** Clinical features of dengue infected individuals.

Fever	97.5%
Abdominal pain	40%
Vomiting	50%
Enlarged liver	67%
Nose bleeding	55%
Gum bleeding	33%
Skin rashes	20%
Haematemesis (vomiting blood)	30%

All serological test/markers of all positive patients (313) including NS1, IgM and IgG, have been shown in table. 2. Additionally, the age wise dengue incidences were also determined by analyzing the data obtained from hospital. The rate of dengue infection was highest in patients with age ranging from 15 to 35 (44.08%) followed by 1 month to 15 years (24.92%) and from 35 to 50 years old patients were affected (19.80%) followed by 50 to onward age patients (11.18%) were affected (Table 3).

is epidemic lack the effective control of mosquito owing to increase in dengue incidence (Gubler and Trent, 1993).

Due to World's unparalleled growth in population and unintended and unrestrained urbanization, people of different communities migrate from one city to another, may cause the spread and propagation of vectors and corresponding infection (Gubler and Trent 1993, Gubler 1996).

It is believed that dengue virus come in to Pakistan at Karachi sea port via tires carrying eggs of infected mosquitoes (Strobel and Lamaury 2001).

In 1982, several dengue cases were identified in Punjab Province of Pakistan 174 patients were hospitalized out of which 12 patients were found positive but no effective information were available till 1994. (Chan *et al.*, 1995). In 2005, in Karachi the dengue had affected almost 4500 cases, while in overall country till 2010, 21,204 individuals had been registered (Khan and Hasan 2013). In 2011, a total of 18,000 cases were registered. Again in 2011, a major outbreak occurred in Lahore resulting in 16,000 cases and 350 deaths (Butt, 2010). In swat district of KPK, in 2013 due to an outbreak 8, 343 cases were registered with the mortality of 57 (Express Tribune: *October 22, 2013*). which were comparatively lower than Punjab. According to Ministry of health Punjab dengue has affected 174 patients in Lahore and 519 patients in Rawalpindi in 2016 while in 2017 the number of affecties is 37 patients in Lahore and 174 from Rawalpindi. This statistic in Peshawar is drastic as it has almost affected 24,807 individuals with mortality of 69, (WHO, 12 Nov, 2017).

In contrast to the above outbreak, here in Mardan district, least population has been affected. In our study the total number of suspected population was 2421 in which 313 (12.92%) was found positive [Table.2]. While male and female affected individuals were 214 (8.83%) males and 99(4.08%) respectively. This lower ratio might be due to least migration toward the affected regions as the people get aware of the spread, outbreak and the respective consequences through media.

Secondly Government of KPK might have done some better arrangement for the control of dengue infection to other cities and districts of the province. It was observed that the increase number of male patients is because of their traveling to urban areas for different business or trade purposes. In the light of current and previous investigations, we came to the point that dengue shows variation from non-epidemic to highly epidemic year.

In the current study mostly cases (44.08%) were found in the patients with the age of 15 to 35 years (Table.3). which is somehow same to other studies in KPK outbreaks in recent couple of years .In this study we came across mostly the patients were of young age it might be due to more exposure to the environment or more susceptible than of other ages. However, the rate of dengue infection was observed to increase with the passage of time. The reason may be the travel of people from rural to urban areas where the dengue is endemic. Most of the patients were suffered from fever which shows that it is the most common symptom of dengue infection [Table. 1]. The patients were observed to suffering from bleeding from various body parts including gums, nose etc, however the biochemical analysis of these patients revealed the presence of other abnormalities like leucopenia etc. The patients also presented different symptoms including fever (97.5%), Skin rash (20%), Abdominal pain (40%), Vomiting (50%), Nose bleeding (Epistaxis55%), Gum bleeding (33%), Haematemesis (30%) headache and Fatigue [Table. 1]. We observed that these symptoms were significantly linked to dengue fever. In conclusion least number of populations in district Mardan has been infected by the dengue virus as compared to other cities outbreak even in the same or earlier outbreaks.

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