



ISSN: 2348-5906
CODEN: IJMRK2
IJMR 2020; 7(4): 16-20
www.dipterajournal.com
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Received: 10-05-2019
Accepted: 12-06-2019

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Epidemiological and clinical manifestation of dengue virus infection in 2019 outbreak of district Swat KPK, Pakistan: A report-based data

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Abstract

Dengue virus infection is a vector-borne disease spread in all regions of the world associated with humans. Dengue virus belongs to family Flaviviridae contain single-stranded positive-sense RNA. It has specific vectors for transmission of disease (*Aedes aegypti* and *Aedes albopictus*). The retrospective study was conducted in 2019 (August-November) the main aims and objectives of the study were to evaluate problems associated with dengue virus infection in study district Swat. The dengue patients visited the DHQ hospital of district Swat from various regions of the district. The patients were kept in separate ward specified dengue patients full attention is given to them by the staff of the hospital. All patients were screened for DENV NS1 ICT (immune chromatographic technique) and confirmed the ELISA method. A total of 586 patients have infected dengue virus infection with the highest ratio of 69.11% males were infected as compared to females (30.88%). The incidences of DENV were in the age group 16 to 30 (48.46%) years. In the current study, dengue infection was in peak (63.31% September) in the post-monsoon season. Most patients 47% had platelets countless 100000 cmm which may be life-threatening. So the current study evaluated that dengue infection was in high numbers in males as compared to females and most affected patients were adults. We recommend on the behalf of this study that the proper administration and monitoring is required in the Government sector and raise sufficient funds and implantation of well-equipped laboratories with properly trained technician should be hired.

Keywords: Flaviviridae, Aedes, platelets, dengue virus

Introduction

Dengue is an emerging class of mosquito-borne infectious diseases. Caused by a virus known as dengue virus (DENV) with single-stranded positive-sense RNA that belongs to the genus Flavivirus and family Flaviviridae^[1, 2]. Its genome is approximately 11000 bases coding three structural proteins (capsid protein C, Membrane protein M, envelop protein E) and seven nonstructural proteins (NS1, NS2a, NS2b, NS3, NS4b, NS5) it also includes short non-coding regions on both the 5 and 3 ends^[3]. Four Antigenically associated serotypes (DENV-1 to DENV-4) have been identified for this viral infection, and hence it is possible to get dengue infection more than once^[4]. About 40% of the world's population (~3.9 billion) is at risk for infection dengue^[5,6]. Annually More than 97 million infections are symptomatic while the rest are asymptomatic^[5]. In 125 tropical and subtropical countries, this infection is endemic due to its two unique vectors, (*Aedes aegypti* and *Aedes albopictus*)^[7, 8]. *Aedes aegyptia*, the primary vector, is a highly urbanized, domestic mosquito that Spreads in stored water and preferably feeds on humans^[9]. Approximately, the annual morbidity rate of dengue infections is 2.5%^[10]. The Asian continent has a high rate of 70% burden of dengue globally^[11]. In 1994 southern Pakistani city Karachi faced the first outbreak of dengue virus infection cases^[12]. After the first incidence in 1994, Pakistan declared dengue hemorrhagic fever as a major public health problem when the first major outbreak caused 800 positive cases and 50 death tolls 2 years later another outbreak hit the entire country^[13]. In 2010, after immense floods happened in various regions of the country like Punjab, Sindh, and in some areas, Khyber Pakhtunkhwa dengue cases were increased^[14]. In the Khyber Pakhtunkhwa (KP) province of Pakistan, the disease has been there since 2006 with low magnitude^[15] However, in 2013 an estimated 9024 positive dengue cases with 70 deaths were reported in Swat^[16].

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Afterward in 2017, a huge outbreak was reported according to IDSRs (An Integrated Disease Surveillance and Response System) 24 938, were recorded of DENV which spread in 15 different districts of Khyber Pakhtunkhwa (KPK) with the highest frequency of (23541) with 65 deaths in Peshawar [17]. The current study is aimed to evaluate the epidemiological and clinical manifestation of dengue virus infection in the 2019 outbreak of District Swat KPK, Pakistan.

Material and methods

Description of study area

District Swat is district of Malakand Division of Khyber

Pakhtunkhwa province in Pakistan which is renowned for its outstanding beauty. It lies between (34° 36' 56" N & 71° 42' 30" E - 36° 02' 54" N & 71° 42' 30" E). It has somewhat warm and humid climate with short and moderate summers; temperature rarely rises above 37°C. The annual rainfall averages around 33 inches with about 17 inches during June-September. The human population of Swat is about 2.31 million. With high mountains, green meadows, and clear lakes, it is a place of great natural beauty and is a popular spot for tourists [Fig 1]. This district is bordered by Shangla, Buner, Dir (Malakand) and Chitral. It has numerous habitats for mosquito breeding.

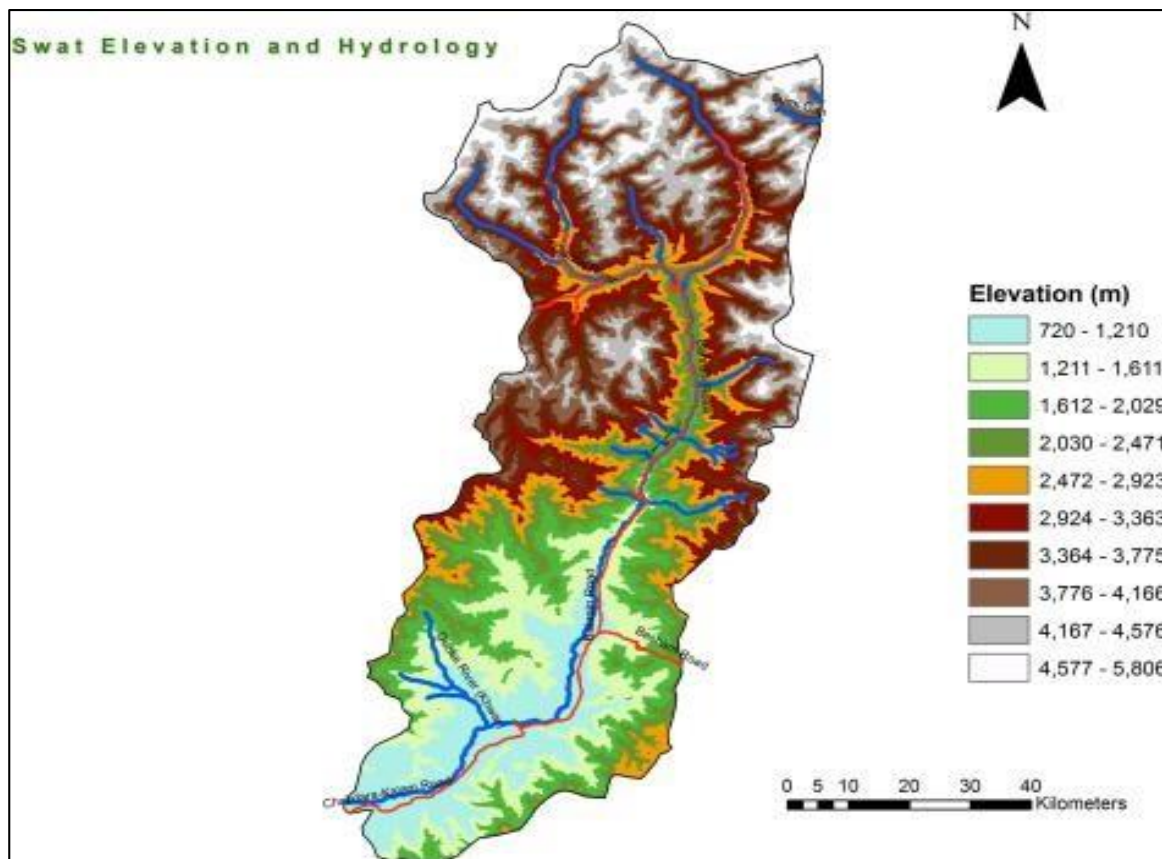


Fig 1: Map of Swat KP Pakistan

Collection of Clinical Data

The data regarding the dengue virus was collected from Saidu teaching hospital Mangora Swat with the prior approval of HOD of medicine. The patients having signs, symptoms for dengue fever were registered and admitted dengue specified ward. All the infected patients were examined thoroughly for Petechiae, Abdominal pain, Enlarged liver (splenomegaly), Epistaxis, Gum bleeding, Hematemesis, Loose motion, vomiting. The analysis performed were platelets count, liver function, and anti-dengue antibodies NS1, IgM, IgG with the help of different diagnostic tools.

Laboratory Analysis

The laboratory analysis (Screening) done over ICT (immunochromatographic technique) of suspected patients NS1 antigen and both coated IgG and IgM antibodies. All were documented from August-November having all the above-mentioned symptoms.

Ethical Approval

The current study was permitted by the Ethical Committee of the Department of Biochemistry, Abdul Wali Khan, University, Mardan KPK, Pakistan.

Results

Overall percentage of dengue virus infection in the study individuals

A total of 1100 suspected patients visited Saidu teaching hospital for DF and dengue hemorrhagic fever from various regions of districts with various symptoms from August 2019 to November 2019, a total of 586 cases of dengue positive cases were documented by pathology department of the hospital. The highest prevalence was found in male population with 397 cases (69.11%) and 181 were females (30.88%) presented in Table 1.

Table 1: Sex-wise distribution of positive patients

S. No	Postive Cases	Percentage %
1	405	69.11%
2	181	30.88%

Age-wise distribution of infected Population:

The infected individuals were categorized into 5 age groups; 1-15, followed by 16-30, 31-45, 46-60 and above 60. The highest DF rate was found in age group 16-30 with 284 patients (48.46%), followed by 31-45 with 149 (25.42%), 1-16 64 (10.92%), 46-60 58 individuals (9.89%) and above 60 with 31 patients (5.29%). The weightage of group-wise is also shown in Table 2.

Table 2: Age -wise Distribution of DF patients

Age Groups	Number of patients	Percentage
1 to 15	64	10.92%
16 to 30	284	48.46%
31 to 45	149	25.42%
46-60	58	9.89%
Above 60	31	5.29%
Total	586	100%

Month wise Patients Distribution of Dengue Fever

The spreading and rigorousness dengue virus infection with perspective infected individuals were reported in September 60.31%, followed by October with a rate of 26.10% and November with 6.31%. The lowest prevalence 2.8% was observed in August. as shown in table 3.

Table 3: Months Wise Patients Distribution of Dengue Fever:

Months	Total Positive Cases	Male Positive	Female Positive	Percentage
August	25	20	05	42.6%
Sep	371	251	120	63.31%
Oct	153	104	48	26.10%
Nov	37	29	08	6.31%

Table 4: Distribution of dengue patients based on antibodies

Anti-dengue Antibodies	Male	Female	Total	Percentage %
SN1	356	156	511	87.20%
IgG	01	04	05	0.85%
IgM	19	06	25	4.26%
SN1+IgG		01	01	0.17%
SN1+IgM	04		04	0.68%
IgG+IgM	07	06	13	2.21%

Platelets count status of positive dengue patients

The platelets count in 47% (274) 43% (251) patients was in range of 100000-200000 /cmm, 7% (42) patients with 200000-300000/cmm, followed by 3% and 1% was around or more than 300000/cmm (Table 5)

Table 5: platelets count status of positive Dengue patients

No of Platelets	Total Patients	Percentage %
<100000cmm	274	47%
100000-200000/cmm	251	43%
200000-300000/cmm	42	7%
300000-400000/cmm	15	3%
>400000/cmm	04	1%

Discussion

In 1982 Pakistan, registered the first dengue virus infection outbreak in Punjab Province which was confined to the Lahore district [18]. Thereafter, several outbreaks have been documented from Khyber Pakhtunkhwa (KPK), Baluchistan and Sindh Province, but no adequate attention has been given to establishing a comprehensive laboratory-based surveillance program to comprehend the burden of disease to circulate viral serotypes, which may be supportive for primary execution of disease monitoring and control. As a result of improper attention two major (2011 and 2013), DENV outbreaks occurred in various districts of Pakistan, like Lahore (Punjab) and KPK (Swat, Mansehra) and neighboring regions [19]. In our study higher number of incidence was found in 69.11% (405 positives) as compared to the female population with 181 (30.88%) cases (Table 1). Our study confirmed cases were categorized into 5 groups; according to the patient's age. The highest suffered age group adults one with 284 (48.46%), followed by 31-45 with 149 (25.42%) cases, 46-60 (9.89%), while the least number of cases were found in the age above 60 with 5.29%. The results are correlated with the study conducted in KPK in 2017 with 45% positive cases in the age group 16-30 [17, 21]. Furthermore, Gadhwal *et al.* investigated that most of the dengue infection was found in adults [20]. Comparatively our finding also discloses that adults of the study area are also more vulnerable to dengue virus infection. The current data also revealed that males are affected (69.11%) as compared to females (30.88%) population. These results are correlated with the study that was conducted about the dengue infection ratio in male-females Asian six countries [20, 22, 23]. The same results were found in another report of KPK in which the male population ratio of dengue virus infection was high as compared to females [24]. The reason may be the outdoor exposure of males are very much than females and other possible reason may be cultural dress wear by females protect from biting. The current study also showed the month-wise dengue incidences of DENV. The present was noticed from August-November in which the highest positive cases were reported September (63.31%), followed by 26.10% (October), November (6.31%) while in August least number of cases were reported. The same results were found in the conducted by Khan *et al.* in 2013 with peak incidences in September (45%). The same observation was also revealed in another study from past incidences [26, 27]. The reason may be the peak of due rainfall in the studied area humid environment might help in vector breeding of dengue mosquito. In the present decline in platelets count was found in 47% of patients due to this hemorrhagic and blood leakage from certain parts occur. The same findings are correlated with our results in which thrombocytopenia was observed [25]. Here in our study different serological markers (antibodies and anti-antibodies) were found like NS1, IgG, IgM. The highest ratio of NS1 (87%) in effected patients shown its acute stage (days of illness 1-4 or 5), followed by IgM 4.26% and IgG+IgM 2.21%. The same results were found in the evaluation of the dengue serological test through ELISA a Q-PCR by Ferraz *et al.* [28]. A study also reported in Khyber Pakhtunkhwa, of 612 suspected individuals had been registered. The total prevalence ratio was 52.12% of particular dengue antibodies like IgG or IgM was 52.12% and 23 (3.75%) samples presented to both the IgG+ IgM antibodies. The highest was due to the patients who traveled to the endemic area [29]

Conclusion

It is concluded in the present report and past literature that dengue virus infection is endemic viral infection in district Swat KPK Pakistan, which threaten all age group of life especially, according to current report 16- 30 age group is more exposed to this infection. We recommend on the behalf of this study that the proper administration and monitoring are required in the Government sector and raise sufficient funds and implantation of well-equipped laboratories with properly trained technicians should be hired.

Conflict of interest

The authors do not mention any financial or personal relations with other persons or organizations, which could adversely affect the contents of this publication and/or assert authorship rights of this publication.

Acknowledgment

We would like to acknowledge the supports and assistance provided by HOD of medicine and in charge of dengue ward of Saidu teaching hospital Swat and are also very grateful Dr. Muhammad Salman Department of Microbiology and Biotechnology, Abasyn University Peshawar, Pakistan for his precious recommendations.

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