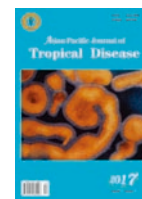


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Incidence of dengue virus eruption in Swat, Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

Objective: To classify and confirm the identified dengue fever (DF) cases in Swat in order to provide epidemiological facts as fundamental for health care units to establish curative and preventive procedures for oncoming DF outbreaks.

Methods: Blood samples were collected from non-registered and registered patients in Saidu Sharif Teaching Hospital, Swat to test dengue virus via advance dengue NS1 Ag card assay. Then positive dengue patients' blood was further analyzed through hematology analyzer (Mindray BC-3000 plus) machine.

Results: The most affected area by dengue virus is Mingora in Swat District. The total number of patients examined were 5592 including 3822 (68.34%) males and 1579 (31.65%) females. The male population was (68.34%) more than female (31.65%), although the infection rate was less in age group > 60 (2.02%) in both populations. The highest infection rate was found in 16–40 years of age (55.70%) with minimum death rate (0.78%). The characteristic signs were detected, which were high temperature with fever (100.00%), nausea (70.18%), belly pain (50.16%) and splenomegaly (34.16%). The majority of patients showed blood platelet counts between 7000 and 100000/cm², and fever duration was 7–14 days.

Conclusions: In this study, males were more affected than the females and high prevalence rate of DF was found in teenager.

1. Introduction

Dengue infection is mostly found in tropical and subtropical mosquito which is a native and virally transmitted disease, and risk of its infection is increased due to globalization and urbanization[1]. *Aedes* mosquitoes, namely, *Aedes aegypti* and *Aedes albopictus* are the principal carriers of dengue fever (DF) worldwide[2]. DF is a virally transmitted disease caused by *Aedes* mosquitoes in human[3]. Dengue virus (DENV) recurred in 2010, mainly in Sindh,

Punjab and certain cities in Khyber Pakhtunkhwa Province. After 2010, natural calamities like floods continued throughout the year, and DENV-2 and DENV-3 were reported and it was claimed that the prevailing serotype is a lower occurrence of DENV-4[4]. Modern suggestions predicted that the fifth DENV type is supposed to be as infectious as the other four types and will follow the same pattern of geographical and environmental region[5]. It was claimed that in the past 50 years, its existence was 30 times greater than its early arrival as compared to the growing population in different countries[6]. The first DF was noticed and reported in India (Madras) in 1780. The first virology has been verified in Eastern Coast of India and Calcutta in 1963–1964[7]. The presence of various diseases is widely ranging from minor infection, through vascular outflow which is the characteristic of dengue hemorrhagic fever that causes a severe shock disease and multi-organ disaster[8].

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The study protocol was performed according to the Helsinki declaration and approved by Medical Superintendent of Saidu Sharif Hospital, Swat District. Informed written consent was obtained from patients.

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A study conducted in India reported that the infection of dengue is a risk for preterm delivery and low birth weight may increase as recommended by previous studies[9]. From Odisha, five deaths and 25 cases were reported in 2010[10].

The main aims of this study are to create awareness among the people of Swat about the consequences of DF, to estimate and categorize the toll of people affected by DF throughout the current period and to produce the environmental effects.

2. Materials and methods

2.1. Study area

The lush green and historic Swat valley lies between 34°40'–35° N latitude and 72° to 74°6' E longitudes. The total area of Swat is 5337 square kilometers with a total population of round about 1257602. Nineteen regions of Swat District were brought under considerations which were adversely affected by DENV including Mingora, Saidu Sharif, Spal Bandai, Khwazakhela, Madyan, Kalam, Bahrain, Mian Dam, Barikot, Odigram, Balogram, Qambar, Rahim Abad, Manglor, Banjot, Kabal, Matta, Charbagh and Manglor. The research was carried out with the collaboration of Saidu Group of Teaching Hospital in four months period of August–November 2013–2014. During the visits of different hospitals, 5–6 mL of blood was collected from all patients. Besides, a proforma comprised the complete information of particular patients. Sample of blood was directly transported to the Department of Zoology Government Post Graduate Jahanzeb College Swat, Khyber Pukhtunkhwa, Pakistan. The serum was isolated from the blood in micro centrifuge tube through centrifuge machine and preserved at –80 °C.

2.2. Collection of clinical data

Data were collected both from outside the hospital and from the admitted patients in the hospital with the warning sign and symptoms of existing dengue infection indications and satisfying the analytic criteria of dengue infection, *i.e.*, having positive immunoglobulin G, immunoglobulin M, NS1 anti-dengue antibodies.

2.3. Blood tests and procedures

Blood samples were collected from all members and complete blood count was conducted for all patients. Total patients were studied carefully for intestinal pain, inflamed liver, gum draining, hematemeses, nausea and stomach ache. Various analyses were performed like platelets count, liver function, and anti-dengue antibodies NS1, immunoglobulin M, immunoglobulin G with the help of different diagnostic tools.

2.4. Ethical considerations

Approval was taken from the Medical Superintendent of Saidu Sharif Hospital, Swat District to carry out the study. Permission was obtained for each patient after discussing with each of them. All the patients were informed that the obtained data were personal and only for investigational drives.

3. Results

We studied 5592 cases of DF and dengue hemorrhagic fever patients in which 3822 were positive DENV NS1 with weightage (68.34%) males and 1770 were females with weightage (31.65%). Majority of the patients belonged to urban areas, *i.e.* Mingora, Saidu Sharif, Rahim abad, Barikot and Matta while some patients belonged to rural areas, *i.e.* Charbagh, Manglawar and Qambar of Swat District. Maximum affected patients were in age group of 16–40 years. The weightage of individual age group-wise was shown in Table 1. High prevalence rate was (55.70%) recorded in the people having the age of (16–40) for DENV NS1.

Table 1
Age wise distribution of infected population.

Age group (years)	Patients No.	Percentage (%)
1–15	495	8.85
16–40	3115	55.70
41–60	1869	33.42
> 60	113	2.02
1–60	5592	100.00

3.1. Gender wise distribution of infected population

The high prevalence of DF was found in males (68.34%) as compared to females (31.65%) among our study population as shown in (Table 2). Mingora and surrounding area were more affected from DENV.

Table 2
Gender wise distribution of infected population.

Sex	Infected population No.	Percentage (%)
Male	3822	68.34
Female	1770	31.66
Total	5592	100.00

3.2. Area wise distribution of infected population

Data presented in Table 3 showed the prevalence of DF in different areas of Swat District. The maximum number of patients belonged to Mingora (3406) out of 5592, and the least number of patients was observed from Malamjaba and Madyan (14 and 15), respectively, out of 5592. From the data, it was clear that the proportion of DF was far greater in city area than in the villages. A total of 297 cases were reported out of the district. The prevalence of DF in other areas of Swat District was shown in Table 3.

Table 3

Area wise distribution of infected population.

Area	Infected person
Out of the district	297
Mingora and surrounding area	3406
Saidu Sharif	611
Marghozar	23
Charbagh	276
Barikot	126
Odigram	33
Balogram	37
Qambar	121
Rahimabad	168
Manglor	89
Banjot	32
Kabal	156
Matta	38
Khwazakhela	47
Madyan	15
Kalam	59
Bahrain	16
Malumjaba	14
Total cases	5592

3.3. Platelets rank of infected population

The maximum number of patients have platelets ranking from 100 000 to 800 000, while the minimum number of patients have platelets (29 000–150 000) (Table 4).

Table 4

Platelets count of dengue patients (No.).

Cases	Platelets normal count	Platelets observed status
2596	150 000–450 000	100 000–180 000
2023	150 000–450 000	80 000–100 000
746	150 000–450 000	50 000–79 000
184	150 000–450 000	30 000–49 000
43	150 000–450 000	15 000–29 000

4. Discussion

The total confirmed cases in Swat District were 5592. These patients were admitted and treated properly for the DF. The first case was testified at 12 August 2013 and last confirmed case was at 22 November 2013, which took approximately 104 days. The maximum reported confirmed cases had happened in September, 2013. A study in Lahore regarding to DF 281 which confirmed DF cases have been reported[11]. In our study population, the greater proportion of DF was found in the age group 16–40 (55.70%) closely followed by (33.42%) for the age group of 41–60. The least number of DF was found in the age group > 60 that constituted (2.02%) of the sample size. Data presented in Table 2 showed that the male population was more affected (68.34%) than the female population (31.65%). It is because the females of this area are almost covered in their clothes which protects them from the attack of the dengue mosquitos as compared to the males. Data presented in Table 3 showed that the maximum affected region in Swat District was Mingora and its outskirts (3406) out of 5592 participants were from Mingora and surrounding area, while the minimum patients were reported from Madyan and Banjot. The leading outbreak of dengue happened in Swat District of Khyber Pakhtunkhwa in which 37 patients died of having platelets less than 15 000 out of 167 patients.

From the recent study, it has been concluded that the females were less affected with DF as compared to males and maximum reported confirmed cases had happened in September, 2013 and also confirmed that the people of age group of 16–40 years were infected more than half of the total infected population.

According to the previous dengue occurrences in the country and from our study, we realized that Pakistan is now endemic in dengue. For the avoidance of such types of occurrences, public awareness campaigns are necessary through which we can alert the people to practise mosquito repulsive mesh, mosquito repellents in order to decrease the accidents of infection by eradicating the vectors. In Government sectors, there should be a strong monitoring team, and new staff should be appointed especially in teaching hospital, and separate funds should be given to the dengue unit and researchers.

Conflict of interest statement

We declare that we have no conflict of interest.

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