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Original Paper

An Epidemiological Study of Dengue Outbreak in Pakistan

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Conflict of interest

There is none conflict of interest among authors.

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Abstract

In 2016, Hazara Division reported his major outbreak of Dengue fever. In this context, current epidemiological and serological survey conducted to highlight the actual burden of Dengue fever in cities of Hazara Division. Blood samples were taken from the total of 1462 suspected people for detection of Dengue antibodies. Among these patients, 1359 (93%) were found to be positive for Dengue, including 965 (71%) males and 394 (29%) females. Distribution in keeping the presence of antibodies shows 897 (66%) IgM positive people. Second most frequently seen antibodies were both IgG and IgM in 435 (32%) people. Presence of IgG antibodies was detected in 27 (2%) individuals. 1142 (84%) of Dengue positive people were not found to be symptomatic while rest of 217 (16%) observed with various symptoms. In this outbreak peak incidence of Dengue fever was observed in Manshera city. Although minimum was seen in Abbottabad city. To conclude, this might be the largest outbreak in the history of Hazara Division and second in Khyber Pakhtunkhwa. We recommend that policymakers and the government of Khyber Pakhtunkhwa desperately need to make efforts to prevent this mounting ratio of Dengue fever and implement the vector management policies by environmental measures and promote awareness in this area.

Keywords

dengue, Hazara Division, antibodies, outbreak

1. Introduction

Dengue is a mosquito-borne viral disease caused by antigenic ally variant serotypes (DENV1-DENV4) and first isolated in Japan in 1942 (Simmons et al., 2012). Primary infection results in acute febrile illness known as Dengue Fever (DF) which is clear by a complex immune response in approximately 7 days. Secondary infection is more severe and results in hemorrhagic fever (DHF) or Dengue Shock Syndrome (DSS), both DHF and DSS can be life-threatening and may lead to death (Guzman & Kouri, 2002). The fatality rate is 1-5% (Ranjit & Kissoon, 2011).

Dengue Fever (DF) emerging as the major public health issue in tropical and subtropical areas worldwide with an incidence of 390 million infections, 0.05 million Dengue Hemorrhagic Fever (DHF) and 0.02 million deaths yearly (Gairea, 2014). An annual high incidence rate of 50-100 million occurs in more than hundred endemic countries. According to an estimate, about 2.5 billion people are at risk whom living in certain areas (Cecilia, 2014). Comparatively, to other continents Asia experience the high burden of DF. Globally two-third population of suspected patients belongs to Asia (Bhatt et al., 2013). Among South Asian, India bears the highest frequency 32 million of DF annually. According to global estimate, the annual burden of DF in India would be 0.7 million (Amarasinghe et al., 2014). Whereas, annual burden estimate for other south Asian countries was about 0.6 million for Sri Lanka, 0.5 million for Nepal and lowermost reported in Bangladesh with 0.4 million (Tissera et al., 2014) and (Murray et al., 2013). However, estimated Dengue cases reported from Pakistan are about 3.4 million at the total population of 182 million (Bhatt et al., 2013).

In Pakistan, the first dengue outbreak was reported in the city Karachi in 1994 (Jahan, 2011). The severity of DF is increased every year, the number of cases increased from 4,500 to 21,204 from the year 2005 to 2010. Lahore alone reported 14,000 cases along with 300 deaths from DF in the year 2011 (Khan & Hassan, 2011). According to country surveillance report, Pakistan has 5000 cases of DF yearly. In 2010-2011 there was the largest country outbreak of 0.25 million suspected people among them 17,000 were confirmed by laboratory assays (Ahmed et al., 2013). In Khyber Pakhtunkhwa, a huge Dengue outbreak was reported in District Swat in 2013. About 6,376 Dengue cases along with 23 deaths have been reported from Swat (Khan & Khan, 2015). Hazara is surrounded from north and east by the Northern Areas and Azad Kashmir. There is no previous study exist who figure out the exact number of Dengue cases. The current study is designed to enlighten the exact burden of Dengue fever in different cities of Hazara Division.

2. Methodology

This study designed in Department of Medical Lab Technology in University of Haripur and conducted in autumn 2016 in various public and private hospitals of Hazara Division. Approval of the hospital administration was taken before approaching the patients. Patients were carefully chosen through convenience sampling, admitted in medical wards and outdoor patients with suspected dengue fever. Data were collected from the patients after obtaining verbal consent. Criteria for inclusion was

non-stop fever from ≥ 4 days, platelets count ≤ 150 x10^9/L, severe headache, pain behind the eyes, muscle and joint pains, nausea, vomiting, swollen glands or rash were taken under consideration. All the infected patients were examined thoroughly for petechiae, abdominal pain, splenomegaly, epistaxis, gum bleeding for determination of DF or DHF.

In this study, a commercially available rapid dengue diagnostic kit, the SD BIOLINE Dengue device (Standard Diagnostic Inc., Korea) used for detection of IgM/IgG antibodies. About 3ml blood taken from suspected patients aseptically by venipuncture technique in Gel tubes. Serum was extracted by centrifugation at 3500 rpm for 5mins. Add 10 µl serum into the sample well and then add 3-4 drops of diluent. Interpretation of test results done after 15-20mins. Colour band against IgM region shows presence of IgM antibodies and band against IgG region indicates presence of IgG antibodies. Both IgG and IgM consider positive if both colour lines appear against both IgG and IgM. Date collected from above-mentioned assay analyzed in graphically and tabular form by using Microsoft Excel 2013.

3. Results

This epidemiological survey conducted over major cities of Hazara Division. This survey expresses the extent of outbreak happens in this region. A total of 1462 suspected populace who fulfill our inclusion criteria were taken into consideration. Among these suspected people, 1359 (93%) people were found to be positive for anti-Dengue antibodies. Gender wise distribution shows male were more frequently affected 965 (71%) comparatively to females 394 (29%). We further categorized these positive people into three groups according to presence of corresponding antibodies. A total of 897 (66%) people were detected positive for IgM antibodies. After ward group of both IgM and IgG antibodies showed peak value with 435 (32%) people. Only 27 (2%) individuals were observed positive for IgG antibodies against Dengue NS1 antigen, as shown in Figure 1.

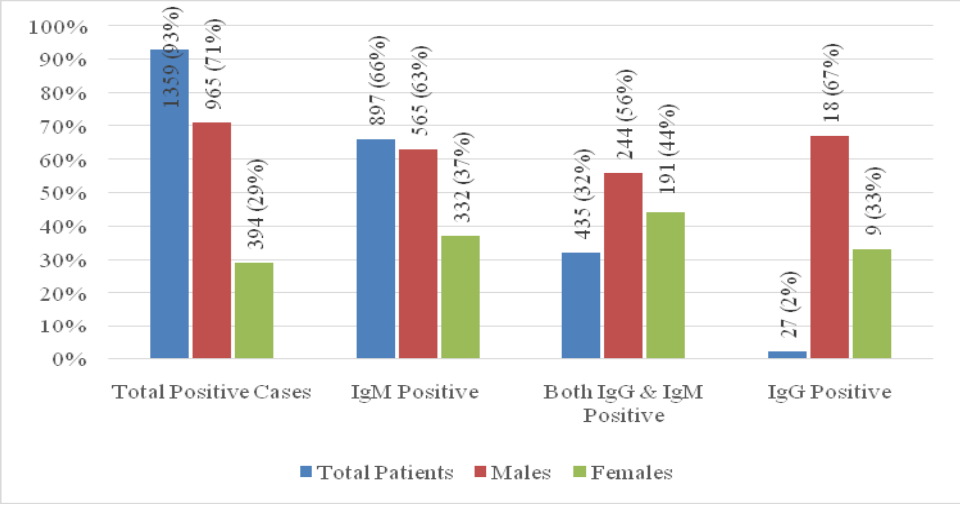

Figure 1. Gender Wise Distribution according to Antibodies Level

Table 1. Distribution of Population with Dengue Fever

	IgM Positive	IgG Positive	Both IgG and IgM Positive
Male	565 (63%)	18 (67%)	244 (56%)
Female	332 (37%)	9 (33%)	191 (44%)
Total	897 (66%)	27 (2%)	435 (32%)

Most of citizens found positive for anti-Dengue antibodies 1142 (84%) but still seem asymptomatic. While 217 (16%) population seemed to be symptomatic for various bleeding disorders like: petechiae, abdominal pain, splenomegaly, epistaxis, gum bleeding and hematemesis, etc.

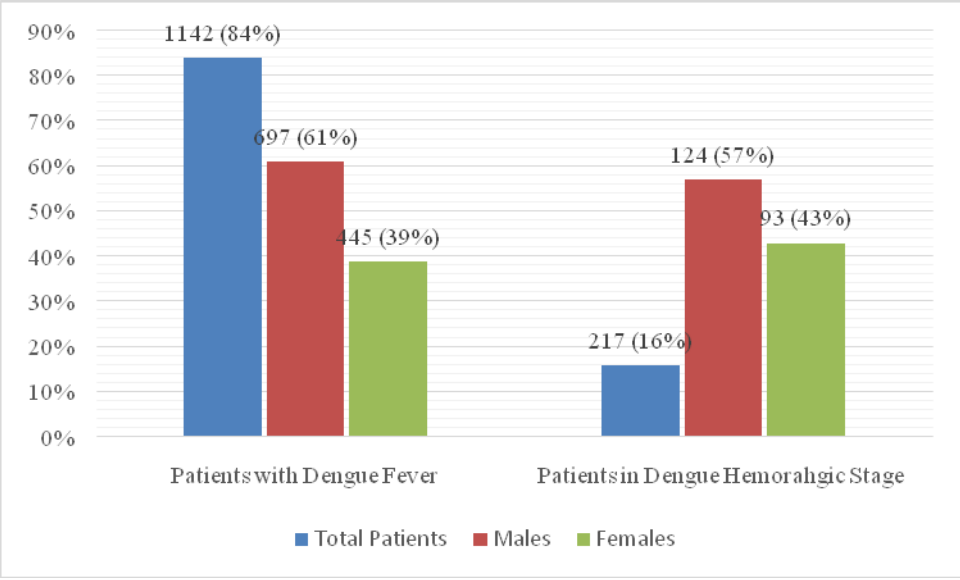

Figure 2. Symptomatic Distribution of Patients with Dengue Fever

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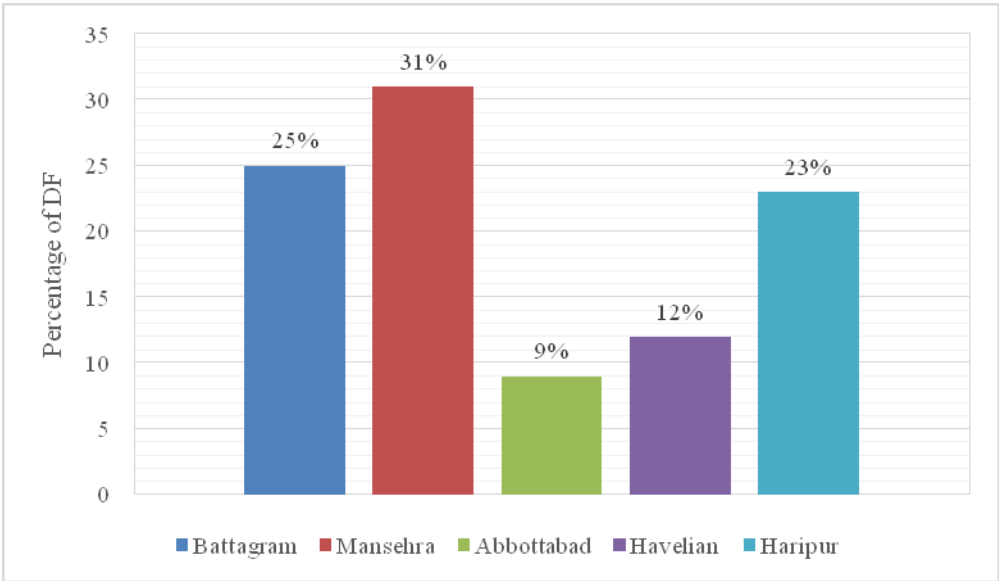

Figure 3. Different Patterns of Dengue Outbreak among Cities of Hazara Division

Comparative analysis up of different cities of Hazara Division illustrate Mansehra city shows peak ratio of (31%) cases. Second most effected city was Batagram with (25%) positive cases. Moreover, (23%) in Haripur and (12%) people give the impression in Havelian city. Lowermost cases of DF in this outbreak were (9%) found in Abbotta bad as shown in Figure 3.

4. Discussion

Incidence rate of Dengue fever is consistently rising mainly in tropical and subtropical areas. Now Dengue is considered as most rapidly transmittable disease. According to World Health Organization (WHO), Dengue fever will become major public health issue worldwide if there is lack of proper surveillance and preventive measures (World Health Organization, 2009). It is thought that Dengue virus come in Pakistan along with tires carrying eggs of infected mosquitoes. So far, this virus consistently causing many outbreak in different area of Pakistan (Strobel & Lamaury, 2001). Till 1994, there was not exact figures available for dengue cases in Pakistan (Khan & Khan, 2015).

According to current study, Manshera city showed remarkable highest load of (31%), while Abbottabad bear minimum (09%) burden of Dengue patients. A similar result has been reported by a study conducted in Manshera. Naveed et al. (2013) done a detailed survey around KPK also report the major burden of dengue in Manshera city (Ali et al., 2013). Humid climates especially rainy season and temperature >20^{o}C, increase in population growth, unplanned urbanization mainly contribute in breeding and transmission of dengue vector (Paul et al., 1998). Mansehra is one of most humid. The average annual temperature in Mansehra 18.5 °C and average rainfall is 1445 mm (Climate, 2016). This is most favorable temperature for breeding of mosquito (Alto & Bettinardi, 2013).

Total incidence ratio of Dengue cases was observed to be (93%) and distribution of antibody level was

IgM (66%) both IgM and IgG (32%) and only (2%) for IgG only. A previous study from KPK revealed the incidence rate was (94%) in 2013 and antibody distribution was reported as (52%) IgM (20%) IgG and (3.7%) showed both IgG and IgM antibodies(Ali et al., 2013). Current outbreak might be a 2nd largest outbreak ever in history of KPK and first largest in Hazara Division. This possiblydue to poor management and diagnostic facilities available here and majority of natives belongs to lower class family and cannot afford expenditure of private sector.

Another possible cause of this outbreak is tap water supply, temperature and humidity. A study conducted in Vietnam reported tap water supply was supposed to the main source for breeding of mosquitoes (Schmidt et al., 2011). Similar relationship of tap water and dengue breeding also reported by the study conducted in Lahore in 2012 (Mukhtar et al., 2012). Climate and temperature also greatly effects on transmission cycles of DF. The pattern of rainfall may also play a part in endemic of dengue (Kanchanapairoj et al., 2000). In our study males population effect more than females, similar findings reported in previous two studies conducted in KPK (Khan et al., 2015) and (Ali et al., 2013). This probably due to result of gender specified contact and limited intellectual settings and daily outdoor activities.

The main objective of this study to highlight this endemic and there is necessity to conduct more seroprevalence studies to find out most frequent serotype in this area. The timely detection, eradication plans and typical administration of this can aid to lessen the morbidity and mortality premiums to a degree. In conclusive, the policy makers and government of Khyber Pakhtunkhwa need to take bold steps in order to confines the mounting ratio of disease and setup vector management policies (Ali et al., 2017). Moreover, educational awareness campaign must be initiated meanwhile proper monitoring and concentration must give to health care services, capable of delivering prompt and adequate medical management in affected areas can lessen mortality.

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