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Original Research Article

Epidemiological Study of Dengue Fever in Lahore

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Abstract

Background: Dengue is a tropical disease caused by dengue virus (DENV). It is one of the most significant arthropod-borne viral infections. ***Objectives:*** The aim of the current study was to characterize epidemiological, laboratory markers of dengue infection during the recent epidemic in Lahore. ***Methods:*** During the prospective laboratory based observational study, 1,082dengue suspected cases were haematological examined. CBC tests were conducted for the confirmation of dengue infection due to decrease rate of platelets count. Data regarding the laboratory features, platelet count tests were also recorded for the dengue positive patients. ***Results:*** Out of total samples 300 cases including were223 (74.3%) were male and 77 (25.6%) were female detected positive for the dengue infection. In the dengue positive patients, the highest prevalence was observed in the age group41-50 years, 76(25.3%) followed age group11-20years, 28(9.3%), 31-40 years, 37 (12.3%), 51-60 years 34(11.3%), 61-70 years, 29(9.6%), 71-80 years, 25 (8.3%), 0-10 years are 9(3%). The highly affected area in District Lahore was Johar Town block B 61(20.3%) followed by Multan chungi (17%), Ewan town and Johar town block A are 34 (11.3%), Mustafa Town 29(9.6%), Gulberg 27 (9%), Shadman 24(8%), Johar Town block D 21(7%) and Iqbal town 19(6.3%). ***Conclusion:*** The highly affected area in district Lahore was found Johar town block B. Therefore, the health department should take actions by educating the public about basic cleanliness of the environment. The community should be encouraged to participate in the control of such vector based diseases/infections.

Keyworlds: Dengue, Epidemics, vaccination.

INTRODUCTION

Dengue is a tropical infection which is caused by the dengue virus. DENV is a positive single-stranded RNA virus which belongs to the family Flaviviridae and genus Flavivirus [1]. Dengue virus is transmitted by female mosquitoes mainly of the species *Aedes aegypti* and, to a lesser extent, *Ae. albopictus*. These mosquitoes are also vectors of chikungunya, yellow fever and Zika viruses [3]. Dengue is widespread throughout the tropics, with local variations in risk influenced by rainfall, temperature, relative humidity and unplanned rapid urbanization. According to the report of the World Health Organization (WHO), there is a tremendous increase in the incidence rate of the dengue infection and pose a global health catastrophe [2]. The infection can be the outcome of the transmission of any of the 4 dengue serotypesof the virus that cause dengue (DENV-1, DENV-2, DENV-3 and DENV-4). Recovery from infection is believed to provide lifelong immunity against that serotype. However, cross-immunity to the other serotypes after recovery is only partial, and temporary. Subsequent infections (secondary infection) by other serotypes increase the risk of developing severe dengue [3].

The infection can be asymptomatic or can also give rise to an indistinguishable fever which can be associated with other health abnormalities including Dengue hemorrhagic fever (DHF), Dengue fever (DF) or Dengue shock syndrome (DSS) [1]. The incidence of dengue has grown dramatically around the world in recent decades. A vast majority of cases are asymptomatic or mild and self-managed, and hence the actual numbers of dengue cases are under-reported. Many cases are also misdiagnosed as other febrile illnesses [2].

Global burden of dengue

One modeling estimate indicates 390 million dengue virus infections per year (95% credible interval 284–528 million), of which 96 million (67–136 million) manifest clinically (with any severity of disease) [2]. Another study on the prevalence of dengue estimates that 3.9 billion people are at risk of infection with dengue viruses. Despite a risk of infection existing in 129 countries [3], 70% of the actual burden is in Asia [2]. The number of dengue cases reported to WHO increased over 8 fold over the last two decades, from 505,430 cases in 2000, to over 2.4 million in 2010, and 5.2 million in 2019. Reported deaths between the year 2000 and 2015 increased from 960 to 4032.

Now in 2021 month of October 1,082 cases are reported in punjab. 400 recoveries and 682 can be treated [4]. This alarming increase in case numbers is partly explained by a change in national practices to record and report dengue to the Ministries of Health, and to the WHO. But it also represents government recognition of the burden, and therefore the pertinence to report dengue disease burden. Therefore, although the full global burden of the disease is uncertain, this observed growth only brings us closer to a more accurate estimate of the full extent of the burden [4].

Outbreaks of dengue

The symptoms of dengue fever first time seen in 1994 in Karachi, while in Khyber Pakhtunkhwa the dengue fever case was initially registered in swat in August 2013, Dengue infection spread from one place to another through travelers. According to 2013 data, Khyber Pakhtunkhwa was on the top of dengue infected people, 3177 cases were registered [5]. In Swat from August 2013 to November 2016, and 5569 patients were affected from dengue fever in which 37 patients were died. Dengue viral disease has caused many outbreaks in Pakistan in 1994 to 2011.In Pakistan Dengue fever first time reported in 1982 in which out of 174 patients, 12 were the affected patients [6].

The infection rate in males was double as compared to female, with a male to female ratio of 2:1, an observation that corresponds with previous results [7]. Dengue fever cases are continuously increasing in the province but the virus is wreaking havoc in Lahore as most number of cases is being reported from the city. Ninety confirmed cases of dengue fever have been reported across the province, including 81 in Lahore, during the last 24 hours.

The total number of dengue cases in the province has reached 1,082. Lahore is the most-hit city as it has so far reported 905 confirm dengue cases, out of total 1,082 cases reported across Punjab. Meanwhile, the health department has sped up its campaign to destroy dengue larva as it inspected 336,902 indoor and 89,921 outdoor places. Dengue larvae were destroyed from 158 places, including 73 places in Lahore. Punjab Primary and Secondary Healthcare Department secretary Imran Sikandar Baloch stresses that the people should take protective measures to avoid dengue fever besides observing standard operating procedures (SOPs) to ensure protection from the coronavirus [8].

Transmission

Mosquito-to-human transmission

The virus is transmitted to humans through the bites of infected female mosquitoes, primarily the *Aedes aegypti* mosquito. Other species within the Aedes genus can also act as vectors, but their contribution is secondary to *Aedes aegypti*. After feeding on a DENV-infected person, the virus replicates in the mosquito midgut, before it disseminates to secondary tissues, including the salivary glands. The time it takes from ingesting the virus to actual transmission to a new host is termed the extrinsic incubation period (EIP). The EIP takes about 8-12 days when the ambient temperature is between 25-28°C [4-6]. Variations in the extrinsic incubation period are not only influenced by ambient temperature; a number of factors such as the magnitude of daily temperature fluctuations [9, 10], virus genotype, and initial viral concentration can also alter the time it takes for a mosquito to transmit virus [11]. Once infectious, the mosquito is capable of transmitting virus for the rest of its life [12].

METHODS AND MATERIALS

This study is based on the dengue outbreaks of Lahore in 2021. Lahore is a district of Pakistan's Punjab province. Study design Proper consent was taken before conducting this study from authorities and patients enrolled for this study, data from patients were collected through lab reports. A total of 300 blood samples were collected from suspected dengue fever patients from October 2021 to check the prevalence of dengue fever in Lahore on the basis of hematological test.

Identification of dengue (signs / symptoms):

Dengue is a severe, flu-like illness that affects infants, young children and adults, but seldom causes death. Symptoms usually last for 2–7 days, after an incubation period of 4–10 days after the bite from an infected mosquito [13]. The World Health Organization classifies dengue into 2 major categories: dengue (with / without warning signs) and severe dengue. Dengue should be suspected when a high fever (40°C/104°F) is accompanied by 2 of the following symptoms during the febrile phase [21].

Severe dengue

A patient enters what is called the critical phase normally about 3-7 days after illness onset. It is at

this time, when the fever is dropping (below 38°C/100°F) in the patient, that warning signs associated with severe dengue can manifest. Severe dengue is a potentially fatal complication, due to plasma leaking, fluid accumulation, respiratory distress, severe bleeding, or organ impairment [12].

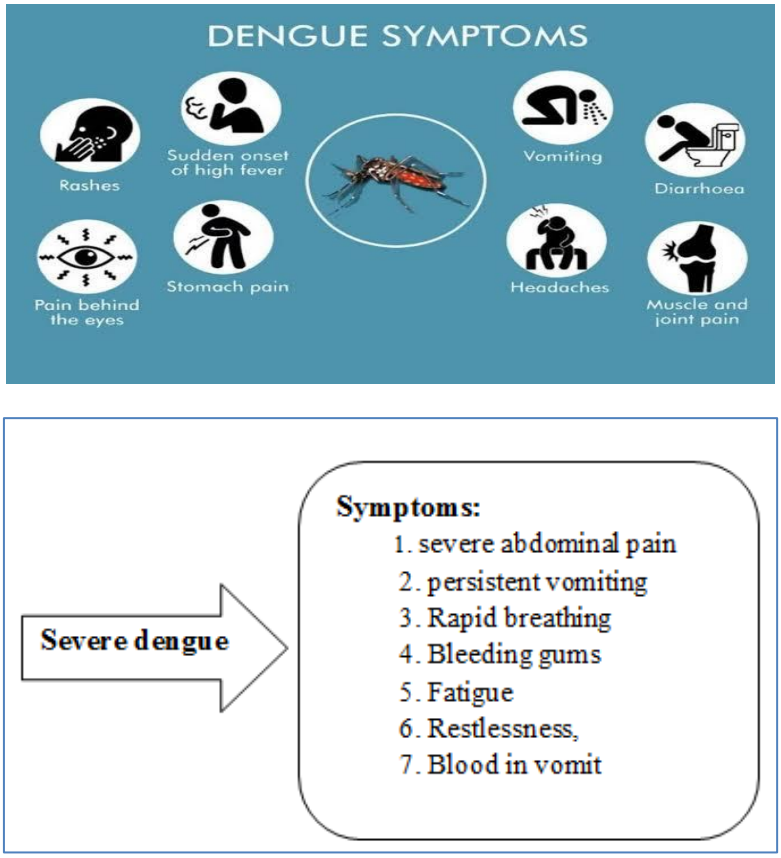

Fig-01: The symptoms of dengue fever start occurring between 4 to 7 days after the bite. Following are the symptoms which begin 4 to 7 days after infection and last for up to 10 days [17].

If patients manifest these symptoms during the critical phase, close observation for the next 24–48 hours is essential so that proper medical care can be provided, to avoid complications and risk of death.

Fig-02: *Aedes aegypti* mosquitoes spread dengue to people through bites [16]

Diagnostics

Several methods can be used for diagnosis of DENV infection. These include virological tests (that directly detect elements of the virus) and serological tests, haematological tests, which detect human-derived immune components that are produced in response to the virus). Depending on the time of patient presentation, the application of different diagnostic methods may be more or less appropriate [20].

Treatment

There is no specific treatment for dengue fever. Fever reducers and pain killers can be taken to control the symptoms of muscle aches and pains, and fever. The best options to treat these symptoms are acetaminophen or paracetamol. NSAIDs (non-steroidal anti-inflammatory drugs), such as ibuprofen and aspirin should be avoided. These anti-inflammatory drugs act by thinning the blood, and in a disease with risk of hemorrhage, blood thinners may exacerbate the prognosis [13].

For severe dengue, medical care by physicians and nurses experienced with the effects and progression of the disease can save lives – decreasing mortality rates from more than 20% to less than 1%. Maintenance of the patient's body fluid volume is critical to severe dengue care. Patients with dengue should seek medical advice upon the appearance of warning signs [13].

Dengue vaccination

The first dengue vaccine, Dengvaxia (CYD-TDV) developed by Sanofi Pasteur was licensed in December 2015 and has now been approved by regulatory authorities in 20 countries. In November 2017, the results of an additional analysis to retrospectively determine serostatus at the time of vaccination were released. The analysis showed that the subset of trial participants who were inferred to be seronegative at time of first vaccination had a higher risk of more severe dengue and hospitalizations from dengue compared to unvaccinated participants. As such, use of the vaccine is targeted for persons living in endemic areas, ranging from 9-45 years of age, who have had at least 1 documented dengue virus infection previously [14].

Fig-03: The World Health Organization says use of the worlds only licensed dengue vaccine should be restricted because of concerns it increases the risk of severe disease in people who have never previously had dengue [14].

Control / preventions

1) Use mosquito repellents, even indoors.
2) When outdoors, wear long-sleeved shirts and long pants tucked into socks.
3) When indoors, use air conditioning if available.
4) Make sure window and door screens are secure and free of holes. If sleeping areas are not screened or air conditioned, use mosquito nets.
5) Wear natural colored clothing (beige, light grey)
6) Get rid of water containers around dwellings and ensure that doors and window screens work properly.
7) Disposing of solid waste properly and removing artificial man-made habitats that can hold water;
8) Covering, emptying and cleaning of domestic water storage containers on a weekly basis
9) Using of personal household protection measures, such as window screens, repellents, insecticide treated materials, coils and vaporizers. These measures must be observed during the day both inside and outside of the home (e.g.: at work/school) because the primary mosquito vectors bites throughout the day.
10) Engaging with the community to improve participation and mobilization for sustained vector control.
11) Emergency vector control measures such as applying insecticides as space spraying during outbreaks may be used by health authorities;
12) Active monitoring and surveillance of vector abundance and species composition should be carried out to determine effectiveness of control interventions;
13) Prospectively monitor prevalence of virus in the mosquito population, with active screening of sentinel mosquito collections [20].

RESULTS

Out of confirmed 300 dengue cases, 223 (74.3%) were male and 77 (25.6%) were female. The highly affected age group was 41-50 years, 76(25.3%) followed age group11-20years, 28(9.3%), 31-40 years, 37 (12.3%), 51-60 years 34(11.3%), 61-70 years, 29(9.6%), 71-80 years, 25 (8.3%), 0-10 years are 9(3%). The highly affected area in District Lahore was Johar Town block B 61(20.3%) followed by Multan chungi (17%), Ewan town and Johar town block A are 34 (11.3%), Mustafa Town 29(9.6%), Gulberg 27 (9%), Shadman 24(8%), Johar Town block D 21(7%) and Iqbal town 19(6.3%) as shown in (Table 1,2)

Table-01

Variables	Total	Percentage %	Average	p-value

	N=300			
Males	223	74.3%	Males	0.000
Females	77	25.6%		

Age groups	Total (n=300)	Percentage
0-10	9	3%
11-20	28	9.3%
21-30	62	20.6%
31-40	37	12.3%
41-50	76	25.3%
51-60	34	11.3%
61-70	29	9.6%
71-80	25	8.3%

Table-02: **Dengue cases in Lahore according to area**

Areas	Total (n=300)	Percentage
Multan chungi	51	17%
Iqbal town	19	6.3%
Mustafa Town	29	9.6%
Ewan Town	34	11.3
Gulberg	27	9%
Johar Town block A	34	11.3%
Johar Town block B	61	20.3%
Johar Town block D	21	7%
Shadman	24	8%

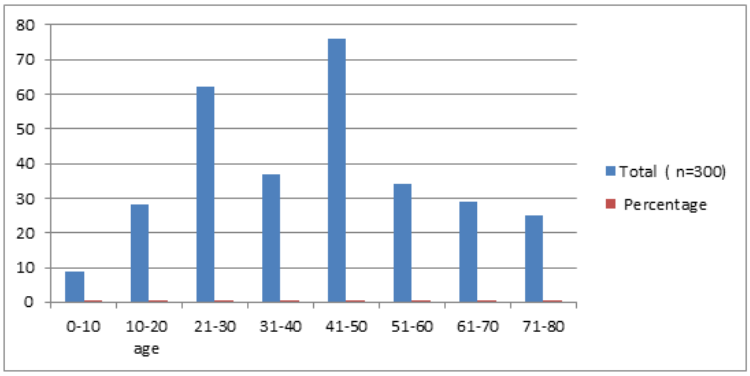

Fig-04: Graphical representation total number of patients according to age group and percentage

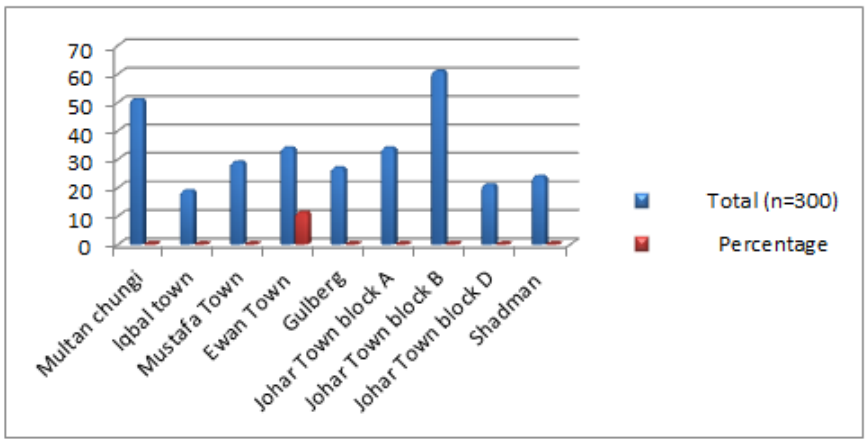

Fig-05: Graphical representation numbers of patients found in different areas

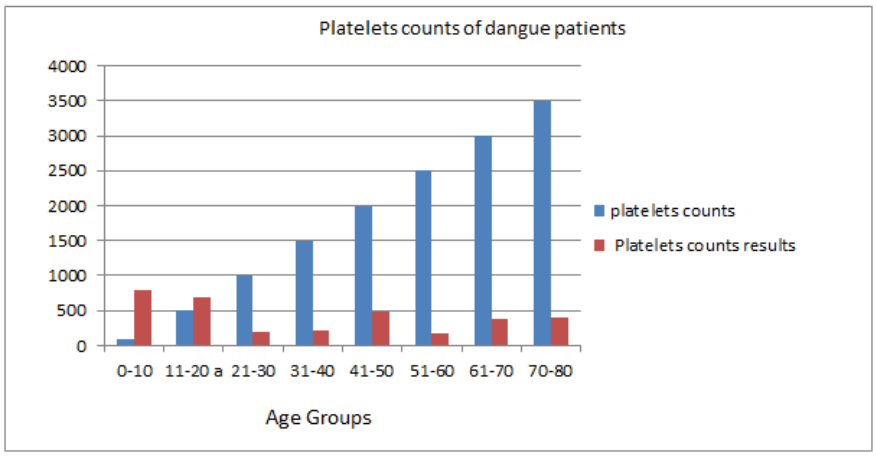

Fig-06: Graphical representation of platelets count according to age group in dengue patients

CONCLUSION

In this study the prevalence of dengue fever was found more in male than female. The most predominated age group was 41-50 years. Furthermore, the highly affected area in district Lahore was found Johar town block B. Therefore, the health department should take actions by educating the public about basic cleanliness of the environment. The community should be encouraged to participate in the control of such vector based diseases/infections.

DISCUSSION

The data obtained in this study showed that Dengue fever in 2021 was highly prevalent in district Lahore. This study showed that the arboviral pathogen is affecting both rural and urban areas in the world [7]. The current study showed that the percentage of male (74.3%) is higher than female (25.6%). Male mobility rate is higher than the female mobility rate. Dengue is widespread throughout the tropics, with local variations in risk influenced by rainfall, temperature, relative humidity and unplanned rapid urbanization. According to the report of the World Health Organization (WHO), there is a tremendous increase in the incidence rate of the dengue infection and pose a global health catastrophe [2]. The infection can be the outcome of the transmission of any of the 4 dengue serotypes of the virus that cause dengue (DENV-1, DENV-2, DENV-3 and DENV-4).

Recovery from infection is believed to provide lifelong immunity against that serotype. However, cross-immunity to the other serotypes after recovery is only partial, and temporary. Subsequent infections (secondary infection) by other serotypes increase the risk of developing severe dengue [3]. Because in the Pakistan most of the females spend their time in homes, whereas males do their jobs and travel from place to place to fulfill their needs. In the current study the highly affected age groups were 41-50 years, 76(25.3%) followed age group11-20years, 28(9.3%), 31-40 years, 37 (12.3%), 51-60 years 34(11.3%), 61-70 years, 29(9.6%), 71-80 years, 25 (8.3%), 0-10 years are9(3%).

The highly affected area in District Lahore was Johar Town block B 61(20.3%) followed by Multan chungi (17%), Ewan town and Johar town block A are 34 (11.3%), Mustafa Town 29(9.6%), Gulberg 27 (9%), Shadman 24(8%), Johar Town block D 21(7%) and Iqbal town 19(6.3%). The occurrence of dengue fever in the highly affected age group is due to the involvement of individual in activities outside their residences especially in morning and evening [14]. In the present study, the high occurrence of dengue In these areas, the poor sanitation system, poor water supply and drainage, inappropriate clean water storage system in living areas, improper collection and disposal of wastes contribution in the breeding of dengue vector mosquito [15].

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