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Original Research Article

Epidemiology of Dengue in Ajmer District Rajasthan In 2016

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Abstract:

The dengue virus (DENV), which is conveyed by Aedes mosquitoes, is the cause of dengue, an infectious disease that is carried by arthropods. This study aimed to understand the epidemiological pattern of dengue infection and investigate the clinical symptoms of different serotypes. A systematic study was conducted to gather information on the epidemiology, clinical characteristics, serotype distribution, and risk factors for dengue globally. This study set out to ascertain the prevalence of dengue virus infection in Ajmer. Dengue, which has spread throughout the urban and semi-urban areas of Ajmer, mainly affects men. Virus activity is highest during the monsoon and post-monsoon seasons, when vector breeding is most common. Thus, the importance of continuous seroepidemiological monitoring for the timely creation and implementation of a successful dengue control program is underscored by our work. In this paper, we will discuss it. Ajmer District dengue epidemiology: a thorough examination of serotype trends.

Keywords: Epidemiology, Dengue, Serotype, Arthropod-Borne, Aedes Mosquitoes, Virus, Flaviviridae, Flavivirus, Hyperendemicity, Vector-Borne, Hemorrhagic Fever, Myalgia, Arthralgia, Shock Syndrome.

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Introduction

The world's tropical and subtropical regions are recognised to have the highest prevalence of dengue fever (DF). This virus has been a serious health concern in India for a long time. Due to the hyperendemicity of the dengue virus (DENV), many cases of DF have been reported from Northern India during the monsoon and post-monsoon season, especially from Delhi. [1]

Dengue, an acute virus spread by mosquitoes, is a major health and socioeconomic burden in many tropical and subtropical regions of the world. Dengue is currently acknowledged as the most important arboviral illness in the world as over 50% of people live in areas where they are vulnerable to getting it, and over 50% live in countries where it is endemic.

Dengue virus: The four distinct dengue virus serotypes are descended from the genus Flavivirus and family Flaviviridae. DENV-1, DENV-2, DENV-3, and DENV-4 are the names of the four viruses. A person acquires lifetime immunity to that specific serotype after catching any of the four. Each of the four serotypes has been found to contribute to dengue epidemics and is associated with more severe occurrences of the illness. Four DENV serotypes have been discovered based on their distinct antigenic characteristics [1–4]. The serotypes are not cross-protective because to their distinct antigens. DENV is hyperendemic due to the spread of these antigenically distinct serotypes, which makes the illness unavoidable and fuels dengue outbreaks. Vector-borne infections are one of the biggest public health problems in the world and have a significant financial impact on the countries that are affected. The most prevalent virus carried by mosquitoes, dengue, is found in tropical and subtropical areas of the world. The four serotypes of the Dengue virus (DENV), a member of the Flavivirus genus and transmitted by Aedes mosquito bites, are DEN-1, DEN-2, DEN-3, and DEN-4. [2]

Human dengue infections can cause a range of symptoms, from the relatively mild, nonspecific viral disease known as dengue fever (DF) to severe hemorrhagic sickness and death. Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS), two severe hemorrhagic variants of the disease, are among the leading causes of hospitalisation and mortality among children in Asia. The dengue virus mainly infects people. Classic dengue fever symptoms include a high fever, headache, retro-orbital discomfort, headache, weakness, nausea, vomiting, stomach pain, sore

maculopapular rash. The pain was so severe that dengue was called "break bone fever." DHF is also known as dengue vasculopathy. Vascular leakage may result in serous effusions, hemoconcentration, and circulatory collapse in these patients.

Dengue shock syndrome, which has a higher risk of death than bleeding alone, can occur when severe hemorrhagic effects are coupled. Unusual manifestations are rare and include encephalitis, seizures, hepatic damage, cholecystitis, myocarditis, pericardial effusion, renal failure, severe gastrointestinal haemorrhage, Guillain-Barre syndrome, and rhabdo-amylolysis. [3]

Epidemiology: Infected mosquitoes, which are often found in tropical and sub-tropical regions of the world, mostly in urban and semi-urban settings, bite humans to spread the dengue virus (DENV). The disease is mostly spread by Aedes aegypti and, to a lesser degree, Aedes albopictus mosquitoes, the latter of which is more prevalent in some regions, such as North America and Europe.

DENV-1, DENV-2, DENV-3, and DENV-4 are the four serotypes of the virus. Infection with one serotype only confers transient immunity to the other serotypes, and recurrent infections with a different serotype increase the risk of severe dengue. Most dengue cases either have a low fever or no symptoms at all. However, in certain situations, major dengue will develop, which can result in severe organ malfunction, shock, or severe bleeding. This stage sometimes starts after the fever has gone down, and warning signs include severe abdominal discomfort, frequent vomiting, bleeding gums, fluid build-up, lethargy or restlessness, and liver enlargement.

Although there is no known cure for dengue, prompt detection of cases, recognition of severe dengue warning signs, and suitable clinical therapy are essential components of care to stop the disease from getting worse and killing people. [4]

Dengue disease and clinical management: Dengue is a complex sickness with a wide range of clinical signs that is often ignored or misinterpreted as other tropical diseases that produce fever. Most patients experience a sudden onset of fever after the incubation period, which typically lasts 2 to 7 days and is often accompanied by symptoms such as headaches, arthralgia, myalgia, anorexia, sore throat, and a macular skin rash. Distinguishing dengue from other feverish illnesses becomes challenging during this time. Most patients have a self-limiting clinical course that does not proceed to dengue shock syndrome (DSS), dengue hemorrhagic fever (DHF), or other severe types of dengue. Particularly virulent virus strains or secondary dengue infections are two factors believed to be linked to an increased risk of severity. In extreme situations, hemorrhagic and shock consequences may arise because to thrombocytopenia and increased vascular permeability. There isn't a specific antiviral treatment or vaccination available at the moment. However, the case fatality rate for severe dengue can be less than 1% if cases are detected quickly and treated clinically, particularly by starting intravenous rehydration. Currently, effective vector control measures are the main emphasis of dengue control due to the lack of viable treatment. [5]

Review of Literature: Dengue fever currently affects over 100 countries in tropical and subtropical climates, compared to just 9 countries that had significant dengue epidemics prior to 1970. WHO estimated that between 50 and 100 million cases of dengue are reported each year, with a 30-fold rise in incidence worldwide over the last 50 years (WHO, 2012). The dengue virus (DENV) is a serious hazard to public health worldwide today, and about two-fifths of the world's population is susceptible to contracting the virus [6]

Classical dengue fever (DF) is a mild, self-limiting febrile illness caused by infection with any of these serotypes; nevertheless, a small number of cases are progressing to potentially fatal dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). Dengue has emerged as one of the world's primary causes of illness and mortality in tropical and subtropical areas in recent years, becoming a serious public health concern (Kyle and Harris, 2008). [7]

Even when there is a host-agent interaction, the precise causes of dengue severity are still unknown in certain cases. By spreading to more recent locations, infected cases contribute significantly to the dengue virus's introduction.

There is a dearth of scientific data on circulating DENV serotypes and their molecular and epidemiological characterization due to the small number of research conducted in different parts of the Indian subcontinent (Mishra et al., 2015; Zangmo et al., 2015). In the eastern Indian state of Odisha, thorough research on the epidemiological risk factors of dengue virus infections, molecular detection of DENV, and serotype-specific circulation of DENV has not yet been undertaken [8]

Objectives:

- To understand the seasonal trend and pattern of disease; and to study disease outcome in dengue.
- To Study the Epidemiological factors correlated with dengue viral infections
- To determine age, sex, month wise serologically Positive Dengue Cases

Research Methodology

The current study was carried out retrospectively at JLN Medical College in Ajmer, Rajasthan, throughout the first year, which ran from January 1, 2016, to December 31, 2016. As part of standard laboratory procedures, 473 patients with feverish illnesses had approximately 5 ml of blood drawn, and the sera were separated. Immunochromatographic rapid strip testing of NS1 (Non-Structural protein 1), IgM, and IgG was used to establish the laboratory diagnosis of dengue. The IgM Enzyme Linked Immuno Sorbent Assay (MAC-ELISA) was used to validate the serological diagnosis. When doing the ELISA, the manufacturer's instructions were closely adhered to. According to the manufacturer's instructions, values were computed and outcomes were interpreted.

Result and Discussion

Dengue virus infections and epidemiological considerations The association between epidemiological factors, which include the host (human), agent (virus), and ecology (abiotic factors), determines the risk factors for dengue viral infections (see Fig. 1). [9]

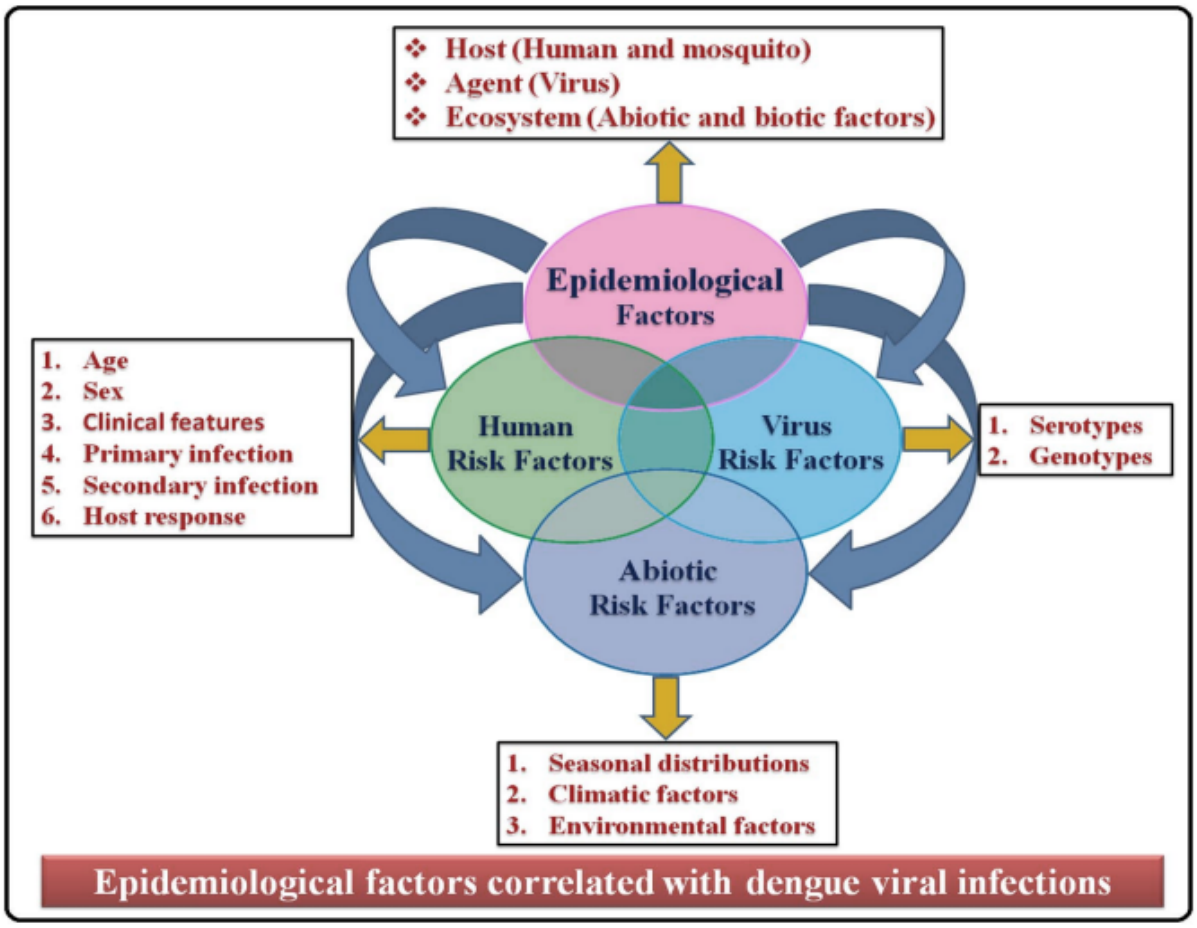

Figure 1: Epidemiological factors correlated with dengue viral infections.

The Department of Pathology at Jawahar Lal Nehru Medical College and its affiliated group of hospitals in Ajmer conducted a retrospective study titled "A study of seasonal variation in dengue fever in Ajmer region." The current study included all admitted patients with probable dengue infection and clinical characteristics (per WHO criteria). [10]

Table 1: Sex Wise Distribution of Serologically Positive Dengue Cases

S.No.	Sex	Suspected Cases	Positive Cases
1	males	283	120 (42.40%)
2	females	190	74 (38.94%)
Total		473	194 (41%)

In the current study, the proportion of males with dengue was higher than that of females (1.6:1).

Table 2: Age Wise Distribution of Serologically Positive Dengue Cases

S.No.	Age	Suspected Cases	Positive Cases
1	<20	102	33 (32.35%)
2	20 to 40	184	99 (54.80%)
3	40 to 60	88	36 (40.90%)
4	>60	99	26 (26.26%)
Total		473	194 (41%)

The age group of 20 to 40 years old had the largest percentage of dengue-positive cases (54.80%) in the current investigation. As age climbed, the proportion of instances declined. Younger age groups experienced more dengue cases than older age groups. [11]

Table 3: Month Wise Distribution of Suspected and Serologically Positive Cases.

Month	Suspected Cases	Positive Cases
Jan. 2016	34	06 (17.64%)
Feb. 2016	03	Nil
Mar. 2016	12	05 (41.66%)
April 2016	11	01 (0.09%)
May 2016	14	Nil
June 2016	06	Nil
July 2016	07	02 (28.57%)
Aug. 2016	11	02 (18.18%)
Sept. 2016	111	52 (46.84%)
Oct. 2016	141	79 (56.02%)
Nov. 2016	104	4139.82()
Dec. 2016	19	06 (31.57%)
Total	473	194 (41.01%)

In this study, the biggest number of dengue cases (56.02%) occurred in October, followed by September (46.84%) and November (39.82%). [12]

Unplanned urbanization, environmental changes, host-pathogen [6] interactions, and population immunological variables have all been linked to dengue's spread in India. Additionally, ideal conditions for the spread of the dengue virus and its mosquito vectors have been produced by inadequate vector control techniques.

Using the immunochromatographic strip test or the IgM ELISA, 194 (41%) of the 473 clinically suspected cases in this investigation tested positive for dengue infection.

Table 4: Gender Wise Distribution

S. No.	Study and year	Male: Female
1	Carlos et al., 2005 [8]	Males preponderance
2	Ukey et al., 2010 [9]	Males preponderance
3	Kumar et al., 2010 [10]	Males preponderance
4	Jain et al., 2011 [11]	Males preponderance
5	Our study	1.6:1 (Male preponderance)

This finding was consistent with research showing a high prevalence of dengue infection in males by Carlos et al. (2005), Ukey et al. (2010), Kumar et al. (2010), and Jain et al. (2011). [13]

Table 5: Sex Wise Distribution

S. No.	Study and year	Mean Age +SD
1.	Khanna et al., 2004[12]	35.5 years
2.	Daniel et al ., 2005[13]	42.6 + 20 years
3.	Itoda et al., 2006[14]	31.510.5 years
4.	Ahmed et al., 2010[15]	31 I 18.1 years
5.	Our study	30.4 10 years

Younger age groups experienced more dengue cases than older age groups. The study group's age ranged from 20 to 70 years old, with a mean age of 30.4± 10 years.

Season Wise Distribution: Over a one-year period, a dengue seasonal trend was evaluated. Weather data was separated into three periods based on the amount of rainfall: pre-monsoon

(February–May), monsoon (June–September), and post-monsoon (October–January). The current study indicated that the monsoon and post-monsoon seasons had the highest number of dengue cases, at 172 (88.90%). [14,15]

Current global situation of dengue: It is predicted that up to 3.6 billion people currently reside in tropical and subtropical regions where dengue viruses can spread.

Approximately 50 million to 200 million dengue infections, 500,000 episodes of severe dengue (DHF/DSS), and more than 20,000 dengue-related deaths occur each year, while estimates vary globally.

The geographic distribution of dengue cases reported in 2011 is depicted in Figure 2.

Dengue, countries or areas at risk, 2011

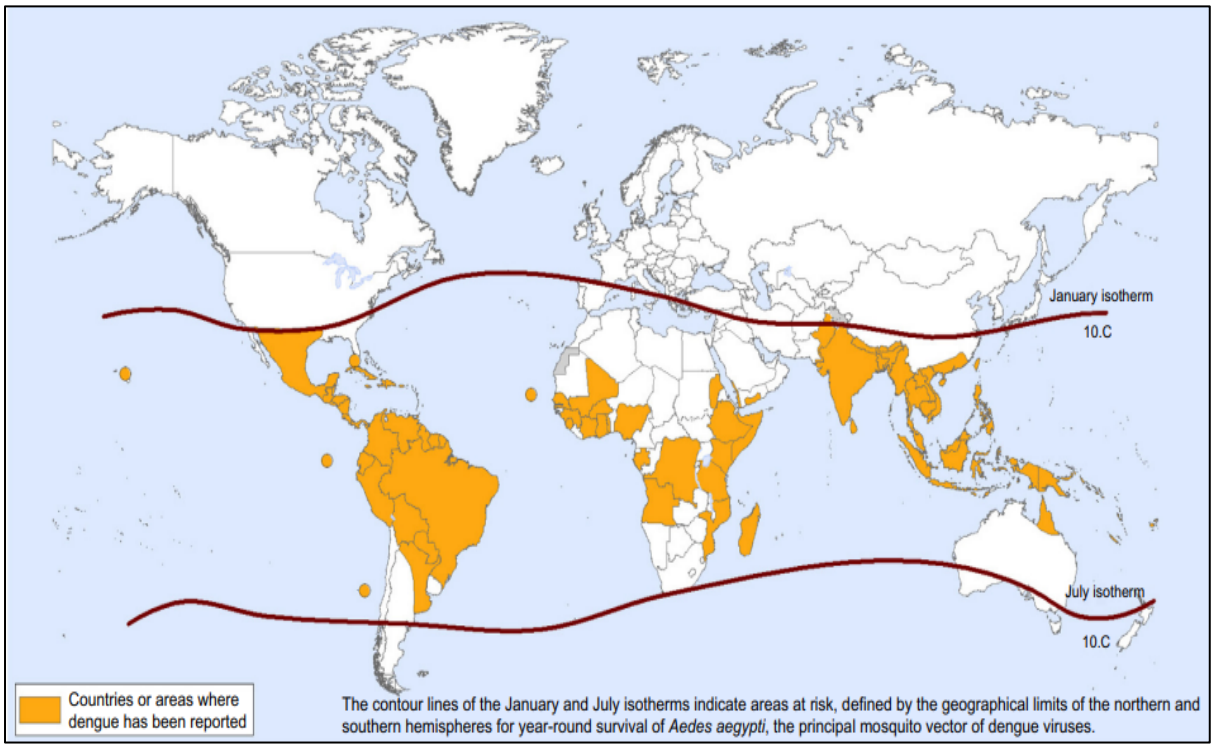

Figure 2: Countries or areas of the world where dengue was reported in 2011, as per data collected by the World Health Organization. [18]

Due to the virus's and its vector's substantial geographic extension into previously untouched areas and the ensuing high cost of sickness, dengue was once again named the "most important mosquito-borne viral disease in the world"6 by the World Health Organization (WHO) in 2012. Although estimates of disability adjusted life years (DALYs) lost as a result of dengue vary, one estimate from 2009 was 700,000 annually. Children bear the primary burden of sickness and mortality in the majority of nations. An ecological investigation of the factors influencing the dengue mortality load was carried out by Dıaz-Quijano and Waldman. In Latin America and the Caribbean, dengue mortality was found to be correlated with population density, rainfall, and the duration of recognized endemicity. [16] We now have proof that dengue transmission is present in every WHO region and that there are over 125 dengue endemic nations worldwide, notwithstanding the degree of uncertainty around the exact figures. Here, we will examine the dengue endemicity data that is currently accessible by WHO area. [17]

Conclusion

We therefore came to the conclusion that dengue is a prevalent illness in this region of India. For children, it is one of the most dreaded fevers. Children between the ages of 10-15 were frequently afflicted by dengue. Although the disease can appear in a variety of ways, early detection and treatment can greatly reduce the case fatality rate. We have included both typical and atypical manifestations in our study. Children are particularly at risk from severe dengue. Larger and more severe outbreaks have been caused by the geographical expansion of all four DENV serotypes throughout the world's subtropical regions, and clinical care, surveillance, pathogenesis research, and vaccine development all depend on the precise and effective identification of the illness. Furthermore, given the challenges of verifying dengue cases only by clinical symptoms,

particularly during inter-epidemic times, an effective diagnosis is a crucial tool to enhance epidemiological surveillance programs.

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