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Original Research Article

A CLINICO-EPIDEMIOLOGICAL STUDY ON DENGUE AMONG CHILDREN IN FIROZABAD, UTTAR PRADESH

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Abstract

Background: For the past two decades, the number of dengue cases has gradually increased in India. There has also been a major shift in the geographical range of the disease. Dengue had been restricted to urban areas, but it has now spread to rural regions. **Materials and Methods:** This study was conducted to estimate the incidence of laboratory-confirmed dengue cases and to correlate with clinical-epidemiological factors with ELISA-IgM-positive dengue cases. **Result:** Total hundred ELISA-IgM positive cases and 100 ELISA-IgM negative controls were analysed. There was male dominance among cases (54%) as well as controls (55%). The majority of ELISA-IgM positive cases (81%) was belonging age-group of 5-15 years followed by 1-5 years age group children. Male gender, positive history of vomiting (OR = 4.3, P = 0.047), thrombocytopenia at the time of presentation were independently associated with DHF cases. **Conclusion:** This study has analyzed the association of various risk factors for dengue infection among children. It continues to involve newer areas, newer populations and is increasing in magnitude.

INTRODUCTION

The global incidence of dengue fever (DF) and dengue hemorrhagic fever (DHF) has increased dramatically in recent decades and has turned this disease into a serious public health problem, especially in tropical and sub-tropical countries. [1-3]

For the past two decades, the number of dengue cases has gradually increased in India. The total number of dengue cases has significantly increased in India since 2001. In the early 2000s, dengue was endemic in a few southern (Maharashtra, Karnataka, Tamil Nadu and Pondicherry) and northern states (Delhi, Rajasthan, Haryana, Punjab and Chandigarh). Now it has been spread to many states, including the union territories.[4] In addition to the increased number of cases and disease severity, there has also been a major shift in the geographical range of the disease. Dengue had been restricted to urban areas, but it has now spread to rural regions.[5]

Dengue is driven by complex interaction between the host, vector and virus that are influenced by climatic factors. In India on reviewing an extrinsic incubation period (EIP) and its variability in different climatic zones of states of Punjab, Haryana, Gujarat, Rajasthan and Kerala, it is suggested that temperature is important in virus and may be useful in understanding spatio-temporal variations in dengue risk.[6]

This study has reported the experience of a tertiary care hospital in Firozabad, Uttar Pradesh in the 2021 dengue outbreak. During this outbreak, a database of laboratory-confirmed dengue cases (ELISA-IgM positive) admitted to the hospital was established. This study was conducted to estimate the incidence of ELISA-IgM-positive dengue cases and to correlate the clinical-epidemiological factors with ELISA-IgM-positive dengue among children.

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MATERIALS AND METHODS

Study area: This study was carried out in Department of Pediatrics, a tertiary care hospital of Autonomous State Medical College, Firozabad, Uttar Pradesh.

Study Type- An analytical, case control study

Study Period: The study was conducted during a period of 3 months (September 2021-November 2021).

Study Population: All clinically suspected dengue children up to 15 years of age admitted in Pediatric ward were included. These dengue suspected children were subjected for ELISA-IgM test for laboratory confirmation of Dengue. During this period a database of laboratory-confirmed dengue cases (ELISA-IgM positive) admitted to the hospital was established.

Methodology: Total 100 cases ((ELISA-IgM positive) and 100 controls (ELISA-IgM negative) were selected randomly to find the variables aimed to explore the correlate the clinical-epidemiological factors and to correlate them.

Selection of Cases

1. All ELISA-IgM-confirmed children
2. Age up to 15 years
3. Male and female both

Exclusion criteria:

1. Patient of age above 15 years
2. LAMA/Referred patients
3. Not gave consent for the study

Considering above selection criteria, total 100 laboratory-confirmed (ELISA-IgM positive) dengue cases were selected randomly.

Selection of Controls: Hundred laboratory-not confirmed (ELISA-IgM negative) children were selected as controls after matching through by age, gender, and geographic locations. The clinical, epidemiological, and laboratory findings along with disease severity, of these study subjects were recorded.

Ethical Approval and Consent: The study was commenced after approval from the institutional scientific committee and written consent of the study subjects.

Data collection & analysis: The detailed responses were recorded in Microsoft Excel sheet and verified for completeness. The final dataset was transferred to visual dashboard of Epi-info 7.1.3.0 version software and coded for analysis. The frequency presentation has been done in the form of tables and graphs. First, the Chi-square ($\chi 2$) test and odds ratio test was done in order to test the significant differences of variables between cases and controls as well as screened the variables of interest.

Later, a binary logistic regression analysis was employed by stepwise procedure to analyze further the statistically significant variables found in the chi square test affecting dengue incidence. $P < 0.05$ value was set for the significance level of the $\chi 2$ test and logistic regression. In addition, odd ratio (OR) with 95% confidence intervals (CIs) were used to express the degree of associations and determine the risk and protective factors.

RESULTS

Total hundred ELISA-IgM positive cases and 100 ELISA-IgM negative controls were analysed children. There was male dominance among cases (54%) as well as controls (55%). The majority of ELISA-IgM positive cases (81%) was belonging age-group of 5-15 years followed by 1-5 years age group children. While among ELISA-IgM negative controls, distribution is different as age-group of 5-15 years was 65% and followed by 1-5 years age group children was 27%. When analysed about area of residence of study subjects, the number of cases was more from rural area than controls (54% Vs 47%) [Table 1].

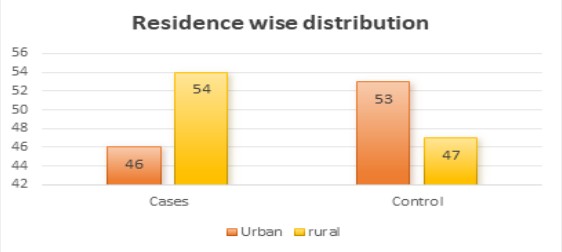

Figure 1: Residence wise distribution of study Cases & Controls

Clinical findings: Fever at time of admission was most common clinical feature among study cases & study controls. Out of 100 study cases, 74 (74%) were presented with fever as the chief compliant while among study controls fever was presenting feature among 79% of children. The male-to-female ratio in DF was 1.0:0.7; in DHF it was 1.6:1.0. Fever with associated gastrointestinal features were most frequent in the time of presentation in both DF and DHF patients. In our study subjects, fever with vomiting in 9% Vs 7%, abdominal pain in 2% Vs 1% and lose motion in 1% Vs 3% of cases and controls. Symptoms such as headache and retro-orbital pain, which are generally considered cardinal features of DF, were not very frequently seen in our patient population. Body aches were reported by 1% of cases and 2% controls.

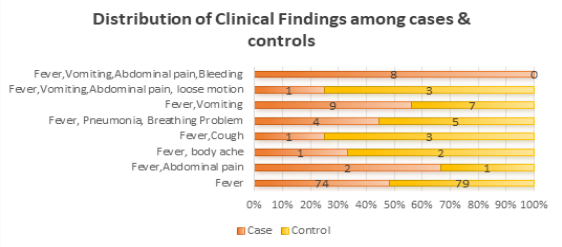

Figure 2: Clinical profile of Dengue Cases and Controls

Other DHF features like Gum bleeding, epistaxis and hematemesis were seen in 8 (8%) cases along with

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fever and abdominal pain. Respiratory symptoms like pleural effusion, breathlessness and pneumonia have seen in were present in 4% cases vs 5% controls. [Table 2]

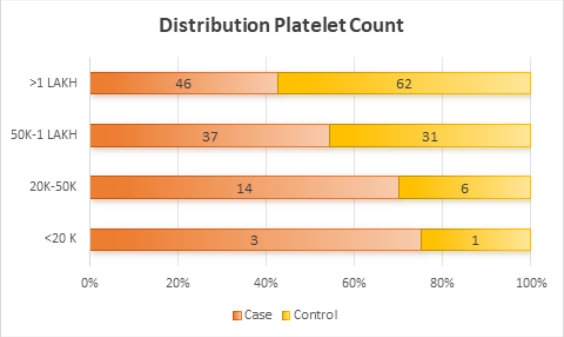

Figure 3: Laboratory profile of Dengue Cases and Controls (Platelet count)

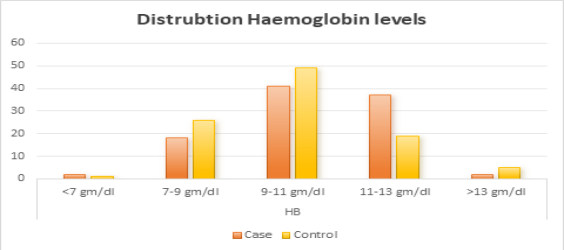

Figure 4: Laboratory profile of Dengue Cases and Controls (Hemoglobin)

Laboratory findings: Maximum number of Thrombocytopenia (platelet count < 100,000 cells per microliter of blood) was seen in 54% dengue IgM-positive cases in comparison to controls (38%). The lowest platelet count(<20k) was found in 3% cases.

Hemoconcentration was recorded in a small number of cases (8.0%) and all of these patients were classified into the DHF category. Anemia was present in 20% of the dengue IgM-positive cases in comparison to controls (27%). [Table 3]

Comparative analysis to assess the factors associated with disease severity: Patients were broadly grouped into DHF based on the presence of petechiae, ecchymoses or purpura. In addition, patients with bleeding from mucosa, hematemesis or melena and thrombocytopenia with platelet count ≤100 000 cells/mm3 were categorized as DHF. Of 100 randomly selected dengue IgM-positive cases, 8% met the criteria of DHF at time of admission. One patient with DHF on presentation later developed DSS. Factors significantly associated with disease severity in univariate analysis were male gender, positive history of abdominal symptoms, thrombocytopenia at the time of presentation. The significant associations of male gender, positive history of vomiting, thrombocytopenia at presentation and monocytosis were further confirmed by multivariate analysis. Total 6 out of 8 (75%) with DHF cases were required platelet transfusions because of severe thrombocytopenia (platelet count <20 000/mm3). Normal saline infusions were also more commonly used in patients with DHF (57.5%) compared with those with DF (20.5%).

Table 1: Epidemiological profile of ELISA-IgM-positive dengue cases.

Demographics Variables	Sub-category	Cases	Controls
Gender	Male	54	55
	Female	46	45
Age	0-1 Year	7	8
	1-5 year	12	27
	5-15 year	81	65
Type of Residence	Urban	46	53
	Rural	54	47

Table 2: Clinical profile of Dengue Cases and Controls

Clinical profile	Presenting features	Cases	Controls
Generalized features	Fever	74	79
	Fever, Headache, and retro-orbital pain	1	2
GI features	Fever, Vomiting	9	7
	Fever, Abdominal pain	2	1
	Fever, Vomiting, Abdominal pain, loose motion	1	3
	Fever, Vomiting, Abdominal pain, Bleeding	8	0
Respiratory Features	Fever, Cough	1	3
	Fever, Pneumonia, Breathing Problem	4	5

Table 3: Laboratory profile of Dengue Cases and Controls

Laboratory Findings		Cases	Controls
Platelet Count cells per microliter of blood	<20 K	3	1
	20K-50K	14	6
	50k-1 Lakh	37	31
	>1 Lakh	46	62
Hemoglobin (Hb)	<7 gm/dl	2	1
	7-9 gm/dl	18	26
	9-11 gm/dl	41	49
	11-13 gm/dl	37	19
	>13 gm/dl	2	5

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DISCUSSION

Dengue is a major public health problem in India. Some studies have reported that an epidemiological shift in dengue viruses and climate change might be responsible for the observed increase in dengue burden across India. [7,8]

Recent studies have shown that seasonal mean temperature in India has increased significantly over the past 100 years, with an increase of 0.9 °C during the post-monsoon period and 1.1 °C during winter.[9] Slight increases in temperature can increase the dengue risk by increasing the mosquito development rat and shortening the virus incubation time, thereby increasing the rate of transmission. Present study has reported the experience of a tertiary care hospital in Firozabad, Uttar Pradesh in the 2021 dengue outbreak during the period of 3 months (September 2021-November 2021). A recent study has compiled all dengue outbreaks in India.[10]

showing that most dengue outbreaks occurred in Punjab, Haryana, Rajasthan, Gujarat and Kerala states during the monsoon or post-monsoon period. Thus, all study states are influenced by strong seasonality, underscoring the roles of both rainfall and ambient temperature in the potential transmission of dengue virus during monsoon and post-monsoon periods. Further studies are required to develop seasonal forecasting of dengue incidence in India. The role of environmental factors in infectious diseases is well-known. In most countries, dengue epidemics are reported to occur, during the warm, humid, and rainy seasons, which favour abundant mosquito growth and shorten the extrinsic incubation period as well. [11-13]

In our study, the largest proportion of serologically positive cases was recorded in the post-monsoon period, which is in agreement with previous studies. [12,14]

Ahmad R et al,[15] (2018) in their large-scale study elucidated the true relationship among entomological, epidemiological and environmental factors that contributed to dengue outbreak in Malaysia. The study showed that, notified cases were indirectly related with the environmental data, but shifted one week, i.e. last 3 weeks positive PCR; last 4 weeks rainfall; last 3 weeks maximum relative humidity; last 3 weeks minimum and maximum temperature; and last 4 weeks air pollution index (API), respectively. Hence, such model can be used in forestalling dengue outbreak and acts as an early warning system. The existence of relationships among the entomological, epidemiological and environmental factors can be used to build an early warning system for the prediction of dengue outbreak so that preventive interventions can be taken early to avert the outbreaks. Similarly, E. Khana, et al,[16] (2006) has first reported the largest epidemic of dengue haemorrhagic fever (DHF) virus infection (2006) with IgM-confirmed cases from Karachi, Pakistan. Medical records of 172 IgM-positive patients were reviewed retrospectively for demographic, clinical and laboratory data. They were reported the Mean±SD age of the patients was 25.9±12.8 years, 55.8% were males. Male gender [odds ratio (OR) = 14.7, P = 0.003), positive history of vomiting (OR = 4.3, P = 0.047), thrombocytopenia at presentation (OR = 225.2, P < 0.001) and monocytosis (OR = 5.8, P = 0.030) were independently associated with DHF, but not with DF. Ahmed N H, Broor S.,[17] (2015) has reported Dengue Fever Outbreak in Delhi, North India to know the incidence of laboratory-confirmed dengue cases among the clinically suspected patients; to study the clinical profile of dengue-positive cases; and to co-relate the above with the prevalent serotype and environmental conditions. Out of the 4,370 serum samples, 1,700 were positive for dengue-virus-specific IgM antibodies (38.9%). Prevalent serotype was dengue virus type-1. Thrombocytopenia and myalgia were seen in 23.1% and 18.3% of the 1,700 dengue IgM-positive patients, respectively. Also, 10.3% of 1,700 were dengue haemorrhagic fever (DHF) patients; and the mortality in serologically confirmed dengue fever cases was 0.06%. Md Sahidur Rahman et al,[18] (2022) investigated the risk and protective factors associated with the dengue virus infection in Chattogram, Bangladesh. has found that dengue virus infection was higher among the younger people (16–45 years) living in urban and semi-urban areas supported which supported by previous studies. [19,20]

Previous studies done in Hanoi city of Vietnam found that people living in highly populated central cities had a 3.2 times higher chance of contracting dengue fever than those who live in peri-urban districts.[21]

A meta-analysis also showed that 50% of the dengue outbreaks were reported in urban areas, followed by 28.6% in rural areas from 1990 to 2015.[22] On the contrary, a study in Cameroon found the opposite result (Tchuandom et al., 2019) and perhaps the difference between males and females because males are more exposed to mosquitoes at the workplace and outside activities. However, literature has also shown no significant association between gender and dengue in a study done in Saudi Arabia.[23]

One of the main limitations was that absence of large sample size, some of the associations had not shown significant results. We have collected the data from patient's records database during the study period and various other clinic- epidemiological factors were not considered due to unavailability of complete record. Although, study findings have supported by the previous studies regarding the associated risk factors of the dengue virus.

CONCLUSION

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This study has analysed the association of various risk factors for dengue infection among children. It continues to involve newer areas, newer populations and is increasing in magnitude. Living in semi-urban dengue prevalent area and temporarily living dwellings have significantly increased the risk of getting dengue infection.

Dengue outbreak could be influenced by various epidemiological factors at individual and environment level enhancing mosquito breeding and survival. Therefore, sustainable dengue control strategies should be prioritized for mass awareness programs for promoting safe housing and a healthy lifestyle among urban as well as semi urban communities. As no recommended vaccine is available for dengue prevention among children and the adequate vector control measures should be implemented.

REFERENCES

1. Teixeira MD, Costa MC, Guerra Z, Barreto ML. Dengue in Brazil: Situation-2001 and trends. Dengue Bull 2002; 26:70-6.
2. Sukri NC, Laras K, Wandra T, Didi S, Larasati RP, Rachdyatmaka JR, et al. Transmission of epidemic dengue hemorrhagic fever in easternmost Indonesia. Am J Trop Med Hyg 2003; 68:529-35.
3. Barrera R, Delgado N, Jimenez M, Valero S. Eco-epidemiological factors associated with hyper endemic dengue hemorrhagic fever in Maracay city, Venezuela. Dengue Bull 2002; 26:84-95.
4. Chakravarti A, Arora R, Luxemburger C. Fifty years of dengue in India. Trans R Soc Trop Med Hyg 2012; 106: 273–282. 4
5. Arunachalam N, Murty US, Kabilan L et al. Studies on dengue in rural areas of Kurnool District, Andhra Pradesh, India. J Am Mosq Control Assoc 2004; 20: 87–90.
6. Srinivasa Rao Mutheneni, Andrew P Morse, Cyril Caminade & Suryanaryana Murty Upadhyayula (2017) Dengue burden in India: recent trends and importance of climatic parameters, Emerging Microbes & Infections, 6:1, 1-10, DOI: 10.1038/emi.2017.57
7. Halasa YA, Dogra V, Arora N et al. Overcoming data limitations: design of a multi component study for estimating the economic burden of dengue in India. Dengue Bull 2011; 35: 1–14.
8. Dhiman RC, Pahwa S, Dhillon GP et al. Climate change and threat of vector-borne diseases in India: are we prepared? Parasitol Res 2010; 106: 763–773.
9. Arora M, Goel NK, Singh P. Evaluation of temperature trends over India. Hydrol Sci J 2005; 50: 81–93.
10. Chakravarti A, Arora R, Luxemburger C. Fifty years of dengue in India. Trans R Soc Trop Med Hyg 2012; 106: 273–282.
11. Gibbons RV, Vaughn DW. Dengue: An escalating problem. BMJ 2002; 324:1563-6.
12. McBride WJ, Bielefeldt-Ohmann H. Dengue viral infections: Pathogenesis and epidemiology. Microbes Infect 2000; 2:1041-50.
13. Katyal R, Singh K, Kumar K. Seasonal variations in A. Aegypti population in Delhi, India. Dengue Bull 1996; 20:78-81.
14. Chakravarti A, Kumaria R. Eco-epidemiological analysis of dengue infection during an outbreak of dengue fever, India. Virol J 2005; 2:32.
15. Ahmad R, Suzilah I, Wan Najdah WMA, Topek O, Mustafakamal I, Lee HL (2018) Factors determining dengue outbreak in Malaysia. PLoS ONE 13(2): e0193326. https://doi.org/10.1371/ journal.pone.0193326
16. E. Khana,∗, J. Siddiquia, S. Shakoora et. al, Dengue outbreak in Karachi, Pakistan, 2006: experience at a tertiary care center; Transactions of the Royal Society of Tropical Medicine and Hygiene (2007) 101, 1114—1119
17. Ahmed N H, Broor S; Dengue Fever Outbreak in Delhi, North India: A Clinico-Epidemiological Study; Indian J Community Med; 2015;40:135-8.
18. Md Sahidur Rahman, Fatema Mehejabin, Mohammad Arafat Rahman, Rumana Rashid; A case-control study to determine the risk factors of dengue fever in Chattogram, Bangladesh; Public Health in Practice 4 (2022) 100288 Available https://doi.org/10.1016/j.puhip.2022.100288
19. M. R, B. MS, W. S, H. A, A. T, M. DK, et al., Dengue outbreak 2019: clinical and laboratory profiles of dengue virus infection in Dhaka city [Internet], Heliyon (2021 Jun 1) [cited 2023 Jul 12];7(6). Available from: https://pubmed.ncbi.nlm.nih.gov/34141938/.
20. A.H. El-Gilany, A. Eldeib, S. Hammad, Clinico–epidemiological features of dengue fever in Saudi Arabia, Asian Pac J Trop Med 3 (3) (2010 Mar 1) 220–223.
21. Toan DT, Hoat LN, Hu W, Wright P, Martens P. Risk factors associated with an outbreak of dengue fever/dengue haemorrhagic fever in Hanoi, Vietnam. Epidemiol Infect. 2015;143(8):1594-1598. doi:10.1017/S0950268814002647
22. Guo C, Zhou Z, Wen Z, et al. Global Epidemiology of Dengue Outbreaks in 1990-2015: A Systematic Review and Meta-Analysis. Front Cell Infect Microbiol. 2017;7:317. Published 2017 Jul 12. doi:10.3389/fcimb.2017.00317
23. W.A. Abualamah, H.S. Banni, H.A. Almasmoum, Y.A. Allohibi, H.M. Samarin, M. A. Bafail, Determining risk factors for dengue fever severity in jeddah city, a case-control study (2017) [Internet], Polish J Microbiol (2020 Sep 1) [cited 2023 Jul 12];69(3):331. Available from:/pmc/articles/PMC7810113/.

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