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HEMATOLOGICAL PROFILE OF DENGUE PATIENTS: INSIGHTS FROM A TERTIARY CARE CENTRE STUDY

Dr Prakash J Vidja[1], Dr Jigisha Rameshbhai Bhoya[2*]

[1]Senior Resident, Department of Pathology, GMERS Medical College, Morbi, Gujarat

[2]Assistant Professor, Department of Microbiology, Parul Institute of Medical Sciences and Research, Vadodara, Gujarat

Corresponding Author: **Dr. Jigisha Rameshbhai Bhoya**

Email: drjigishabhoya1990@gmail.com

ABSTRACT

Introduction: Dengue fever is a viral infection that is transmitted primarily by Aedes mosquitoes. Hematological characteristics encompass alterations or irregularities detected in the bloodstream of individuals affected with dengue fever. It is imperative to acknowledge that the course and intensity of dengue can differ, and patients may not manifest identical hematological characteristics.

Aims and Objectives: To study hematological characteristics of dengue disease patients.

Material and Method: A total 200, IgM positive patients, the study's rigorous research methodology is applied to investigate the characteristics and prevalence of dengue fever. The study takes place in a tertiary care center. The study involves careful data collection, SPSS statistical analysis, and ethical considerations.

Result: The Study's result presents a demographic and hematological profile of 200 respondents with dengue fever. The majority of respondents are in the age range of 21-30 (29%) and 15-20 (27%), with 63.5% being male. Leukocyte count reveals 51.5% with counts <4000, while hematocrit levels show 54.5% with levels <40%. Thrombocytopenia grades indicate 60.5% with moderate thrombocytopenia. Hemoglobin levels range predominantly from 12-15 (57%). Bleeding manifestations are present in 14%, with a correlation between thrombocytopenia and bleeding. The clinical spectrum includes 84% with dengue fever (DF), 14% with dengue hemorrhagic fever (DHF), and 2% with dengue shock syndrome (DSS).

Conclusion: A definitive evident found that hematological profile affects significantly in dengue patients. As the severity of thrombocytopenia rises, the likelihood of experiencing bleeding manifestations also increases.

Keywords: Dengue Fever, hematological characteristics, bleeding manifestations, thrombocytopenia.

INTRODUCTION

Dengue, a highly formidable pathogen within the domain of infectious diseases, presents itself in the form of a self-limiting, acute systemic viral infection. The dengue virus, which is responsible for the disease, belongs to the Flaviviridae family. Its consequences have had an international impact. The prevalence of dengue fever (DF) has experienced a concerning increase in recent years, leading to dengue becoming a widespread health issue on a global scale. (1), (2)

Dengue, a viral infection transmitted by mosquitoes, has had a lasting impact on international health, recurring in epidemic fashion throughout tropical, subtropical, and temperate zones for centuries. The historical sequence of dengue outbreaks can be traced back to the 17th century, when the initial documented epidemic occurred in the French West Indies in 1635. It is noteworthy that historical records suggest the existence of a dengue-like disease outbreak in China as early as 992 AD, demonstrating the persistent worldwide prevalence of this contagious ailment. (3)

The dengue landscape in the Indian subcontinent emerged during the mid-20th century. The first documented case of dengue fever in India occurred in Vellore in 1956, signifying the commencement of a chronic health issue that would continue to affect the area. Significantly, the first dengue hemorrhagic fever outbreak occurred in Calcutta in 1963, further exacerbating the pre-existing health concerns by introducing a more lethal aspect to the severity of the disease.(4) Since then, the insurmountable persistence of dengue in India has presented a substantial public health dilemma.

India, renowned for its extensive geography and varied climate, encounters an annual dengue incidence that fluctuates between 7.5 and 32.5 million cases, underscoring the disease's pervasive repercussions throughout the country. The virulence of dengue is further exacerbated by the presence of all four serotypes in the Indian population (Dengue 1, 2, 3, and 4). The presence of various serotypes in the population further complicates the management of diseases and emphasizes the need for comprehensive public health approaches to alleviate the effects of each serotype. (5)

Infection with the Dengue virus can result in undifferentiated febrile illness (viral syndrome), dengue fever (DF), dengue hemorrhagic fever (DHF), and dengue shock syndrome (DSS), all of which may be asymptomatic. Despite being a self-limiting illness, Dengue infection can be fatal if not detected and treated promptly. Dengue is diagnosed through viral isolation, reverse transcription polymerase chain reaction (RTPCR) detection of the viral genomic sequence, and NS1 antigen detection. (6), (7), (8), (9)

The platelet count is the hematological parameter that holds the utmost significance in the diagnosis of dengue. (7), (8), (9), (10) As a recovery and prognostic parameter for DHF/DSS, a rise in hematocrit and a decrease in platelet count have been demonstrated to be crucial in numerous studies and publications. (11) Additional hematological parameters, such as the atypical lymphocyte count and total white cell count, contribute to the diagnosis and prognosis of dengue. (11), (12), (13)

AIMS AND OBJECTIVES

To study hematological characteristics of dengue disease patients.

MATERIAL AND METHOD

The study aimed to investigate the hematological characteristics of dengue disease patients through a rigorous research methodology. A randomized, prospective study was conducted in a tertiary care center, involving 200 patients diagnosed with IgM positive dengue. Study Design: A randomized, prospective study was conducted in the tertiary care center. Participants: The study included 200 patients admitted to the hospital, diagnosed with IgM positive dengue. Patient selection was based on randomization. Written informed consent was obtained from each participant after comprehensive counseling. Inclusion Criteria: Serologically confirmed (IgM positive) dengue fever patients admitted to the medicine ward and Patients willing to actively participate in the study. Exclusion Criteria: Age less than 15 years or more than 60 years, Preexisting substantial chronic liver, kidney, or heart disease, History of hematological disorders. Data Collection: Detailed history and complete general and systemic examination were conducted for cases recruited in the study using a specified Performa. The following investigations were performed: Dengue IgM by ELISA, Complete blood count (hematology autoanalyzer Sysmex XS-800i), Peripheral blood film for cell morphology, Thick and thin blood smear for malaria parasite and parasite count, Specific malarial antigen test, Random blood sugar, Urine examination, Liver function test, Renal function test, Blood and urine culture and sensitivity, Chest X-ray PA view, Ultrasonography of the abdomen.

Statistical Analysis: Statistical analysis was carried out using the Statistical Package for the Social Science System (SPSS) version 17. Data collected were analyzed using descriptive statistics such as frequency, percentage, mean, and standard deviation (S.D).

Ethical Considerations: Written informed consent was obtained from each participant. The study adhered to ethical guidelines and principles for human research.

Limitations: The study is limited to the specified time frame and location. Exclusion criteria may limit the generalization of findings to certain age groups or individuals with specific health conditions.

RESULTS

The results and discussion section presents detailed findings from the study, including the demographic distribution of age and gender, prevalence of thrombocytopenia, hematocrit levels, hemoglobin values, and bleeding manifestations among dengue patients. The discussion compares the study findings with previous research, highlighting similarities and differences in the prevalence of hematological characteristics among dengue patients.

Table 1: Age of the respondents

Age of the respondents		
	Frequency	Percentage
15-20	54	27%
21-30	58	29%
31-40	42	21%
41-50	32	16%
51-60	14	7%
Total	200	100%

The above table discusses the age of the respondents. In 15-20 years group, frequency is 54 and percentage is 27%. In 21-30 years group, frequency is 58 and percentage is 29%. In 31-40 years group, Frequency is 42 and percentage is 21%. In 41-50 years group, Frequency is 32 and percentage is 16%. In 51-60 years group, frequency is 14 and percentage is 7%.

Table 2: Gender of the respondents

Gender of the respondents		
	Frequency	Percentage
Male	127	63.5%
Female	73	36.5%
Total	200	100%

The above table discusses the frequency and percentage of gender of the respondents. In male group, Frequency is 127 and Percentage is 63.5%. In Female group, frequency is 73 and percentage is 36.5%.

Table 3: Leukocyte count

Leukocyte count.		
TLC (cell/mm3)	Frequency	Percentage
<4000	103	51.50%
>11000	9	4.50%
4000-11000	88	44%
Total	200	100%

The above table discusses the frequency and percentage of Leukocyte count. In <4000, frequency is 103 and percentage is 51.50%. In >11000, Frequency is 9 and percentage is 4.50%. In 4000-11000, Frequency is 88 and percentage is 44%.

Table 4: Hematocrit count

Hematocrit count		
	Frequency	Percentage
<40%	109	54.50%
40-45%	66	33%
>45%	25	12.50%
Total	200	100.00%

The above table discusses the frequency and percentage of Hematocrit count. In <40%, Frequency is 109 and percentage is 54.50%. In 40-45%, frequency is 66 and percentage is 33.0%. In >45%, Frequency is 25 and percentage is 12.50%.

Table 5: Grade of Thrombocytopenia

Grade of Thrombocytopenia			
Grade	Platelets count	Frequency	Percentage
Low normal	>1,00,000	21	10.50%
Mild	60,000-100,000	29	14.50%
Moderate	20,000-60,000	121	60.50%
Severe	<20,000	29	14.50%
Total		200	100.00%

The above table discusses the frequency and percentage of Grade of Thrombocytopenia.

In Low Normal:

- Platelet Count: >1,00,000
- Frequency: 21 cases
- Percentage: 10.50%

In Mild Thrombocytopenia:

- Platelet Count: 60,000-100,000
- Frequency: 29 cases
- Percentage: 14.50%

In Moderate Thrombocytopenia:

- Platelet Count: 20,000-60,000
- Frequency: 121 cases
- Percentage: 60.50%

In Severe Thrombocytopenia:

- Platelet Count: <20,000
- Frequency: 29 cases
- Percentage: 14.50%

Table 6: Hemoglobin level.

Hemoglobin level.		
HB (gm %)	Frequency	Percentage
<10	9	4.50%
10-12	67	33.50%
12-15	114	57%
>15	10	5%
Total	200	100%

The above table discusses the Frequency and percentage of Hemoglobin level. In <10, Frequency is 9 and percentage is 4.50%. In 10-12, Frequency is 67 and percentage is 33.50%. In 12-15, Frequency is 114 and Percentage is 57.0%. In >15, Frequency is 10 and percentage is 5%.

Table 7: Bleeding Manifestation

Bleeding Manifestation.						
Bleeding	Frequency	Percentage	Frequency	Percentage	Frequency Total	Percentage Total
	Male		Female			
Present	18	9%	10	5%	28	14%
Not Present	108	54%	64	32%	172	86%
Total					100	100%

The above table discusses frequency and percentage of Bleeding Manifestation. In male group, 18 (9%) are present and 108 (54%) are not present. In Female group, 10 (5%) are present and 64 (32%) are Not present.

Table 8: Correlation of thrombocytopenia with bleeding in population

Correlation of thrombocytopenia with bleeding in population		
Thrombocytopenia (<100,000 lakhs)	Total (180 Cases)	No. of Cases with Bleeding
60,000-100,000	28	0 (0%)
20,000-60,000	122	14 (11.47%)
<20,000	30	14 (46.66%)

The above table discusses the Correlation of thrombocytopenia with bleeding in population. In 60,000-100,000, Cases are 28 and No. of Cases with Bleeding are 0 (0%). In 20,000-60,000, Cases are 122 and No. of Cases with Bleeding are 14 (11.47%). In <20,000, Cases are 30 and No. of Cases with Bleeding are 14 (46.66%).

Table 9: Clinical spectrum of dengue positive cases

Clinical spectrum of dengue positive cases		
Diagnosis	Frequency	Percentage
DF	168	84%
DHF	28	14%
DSS	4	2%
Total	200	100%

The above table discusses the Frequency and percentage of Clinical spectrum of dengue positive cases. In DF, Frequency is 168 and percentage is 84%. In DHF, frequency is 28 and percentage is 14%. In DSS, Frequency is 4 and percentage is 2%.

DISCUSSION

Dengue fever is among the most significant arbuscular diseases. In India, it has developed into a significant global public health concern. Presently, epidemics are occurring more frequently. Classical dengue fever is an acute febrile illness; however, a minority of dengue infections result in DHF, a more severe form of the disease. Timely identification and rigorous control are critical in order to preserve invaluable human lives in the face of this fatal ailment.

In our study majority of patients i.e., 29% were in the age group of 21-30 years. It was more prevalent among the younger population. The findings of Farhan F et al. indicated that a significant proportion of patients (30%) fell within the age range of 21-30 years, which is nearly consistent with the present investigation. (14)

In their research, Singh NP et al. also reported a mean age of 26±10 years. (15) This may be the result of increased outdoor activity among young adults. The current study comprised 127 (63.5%) male patients and 73 (36.5%) female patients. 90% of the patients in the present study had thrombocytopenia (less than 100,000). Singh NP et al., Khan E et al., and Farhan F et al. reported thrombocytopenia incidence rates of 61.39 percent, 67.2 percent, and 73 percent, respectively, which are lower than the current study. (14), (15), (16) In our study, the average hematocrit of dengue-positive patients was 39.08%. Elevated hematocrit levels were observed

in both DHF and DSS. A hematocrit value exceeding 45% was detected in 13% of the patients. 45% hematocrit in 19% of patients. (14) At the tertiary care level of the present study, the hospital received the majority of its patients from other facilities who required primary care with intravenous fluids. Thus, the majority of patients had hematocrits within the normal range. The mean hemoglobin value reported by Trupti D et al. was 11.95g/dL, which is close to the value found in the present study. (17) In contrast to the findings of Nazish et al., who recorded a range of hemoglobin from 3.6 to 16.6 g/dL with an average of 10.5 g/dL, the current study reveals a hemoglobin value of 12.62 g/dL across 7.5 to 17.5 g/dL. (18)

Ole Wichmann et al. observed that 53.2% of the patients exhibited leucopenia. (12) Nazish et al. discovered that among 104 patients, leucopenia affected 55 (52.8%), which is nearly identical to the present study. (18) Farhan F. et al. identified instances of bleeding in 21% of the cases, which is a higher proportion than the current study. (14) The severity of thrombocytopenia was associated with an increased incidence of bleeding in the present study. A correlation was also observed between bleeding and the severity of thrombocytopenia, with 80% of patients exhibiting a platelet count below 25,000/µl, according to Khan et al. exhibited bleeding as a symptom. (16)

CONCLUSION

Our study's findings regarding the universal prevalence of thrombocytopenia are consistent with the findings from previous studies, confirming the importance of this condition among the population under investigation. The present study examined the relationship between thrombocytopenia and bleeding, uncovering a noteworthy pattern in which the occurrence of bleeding manifestations increased as the severity of thrombocytopenia escalated.

Healthcare professionals can enhance treatment allocation, reduce superfluous interventions, and customize their approach to individual patients by reserving transfusions for those who are at an elevated risk of experiencing bleeding. In addition, this promotes a more prudent and patient-centric healthcare practice by considering the potential risks associated with platelet transfusions through the implementation of such a nuanced approach.

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