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Original Research Article

Hematological profile of pediatric patients with dengue in district hospital Samba

Arshee Pattu*

Department of Pediatrics, Alchemist Hospital, Panchkula, Haryana, India

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***Correspondence:**
Dr. Arshee Pattu,
E-mail: arsheepattu800@gmail.com

ABSTRACT

Background: Dengue is an acute viral illness spread by vector aedes mosquito and caused by RNA virus of the family *Flaviviridae*. Dengue presents with high fever, severe headache, vomiting, arthralgia, myalgia. Laboratory findings include thrombocytopenia and leukopenia. Dengue is self-limiting illness. Objectives were to study hematological profile of pediatric patients with dengue in district hospital samba from September to November 2022.
Methods: Dengue patients aged 0-18 years detected by ELISA NS1 antigen assay in DH samba were included in the study. CBC of all these patients was analyzed on day of presentation to hospital and day of dengue positivity.
Results: There were 50 participants in this study. Out of these 35 (70%) were males and 15 (30%) were females, 11 patients were 1-5-year-old (22%); 16 patients were 6-12-year-old (32%); 23 patients were 13-18-year-old (46%), 21 patients (42%) had thrombocytopenia at presentation. 29 out of 50 (58%) were anemic, 19 out of 50 (38%) patients had leukocytopenia. Statistically significant association were seen between age group and platelet counts; platelet and leukocyte count.
Conclusions: Teenagers were most commonly affected. Males were affected 3× more than females. Although thrombocytopenia was not universal at presentation but it was observed in less than half (42%) of study participants. One third of study participants (38%) had leukocytopenia at presentations. Thrombocytopenia was most predominant in adolescent age group. Leukocytopenia and thrombocytopenia were associated with each other.

Keywords: Dengue, Thrombocytopenia, Leukocytopenia, Hematological

INTRODUCTION

Dengue is an acute viral illness (Simmons et al).[1] It is spread by vector aedes mosquito and caused by RNA virus of the family *Flaviviridae*. 50 million people get affected by dengue every year as per world health organization statistics. Ninety percent of these cases are of pediatric age group.

Aedes aegypti bites during day time and breeds in small water collections especially during rainy season hence accounting for increased cases during the same. Dengue has an incubation period of 3-7 days.

Dengue presents with high fever, severe headache (especially in the retro-orbital area), vomiting, arthralgia, myalgia. It may be accompanied by anorexia, abdominal pain, bleeding manifestations. Rash may occur occasionally. Coryza is frequently seen in pediatric population. Dengue is endemic in 112 countries in the world (Malavige et al).[2] Children do present with high fever but are mostly not as symptomatic as adults.

Dengue has 3 main phases-initial febrile phase, a critical phase (at the time of defervescence), and a recovery phase. Febrile phase-has above mentioned clinical features. Laboratory findings include mild-to-moderate thrombocytopenia and leukopenia. Defervescence is associated with vascular leak. Vascular leak may ultimately lead to haemoconcentration, ascites, effusions and hypoproteinaemia. This critical phase lasts for around 24-48 hours followed by spontaneous recovery (Simmons et al).[1]

Dengue is a self-limiting illness. Current dengue is treated Supportively with analgesics, hydration with fluid replacement, and bed rest (Hasan et al).[3]

Objectives

The objective of this study was to analyze the hematological profile of pediatric patients attended as case of dengue in district hospital samba from September to November 2022.

METHODS

All patients aged 0-18 years who were attended in district hospital samba from 1st September 2022 to 30th November 2022 as inpatient or outpatient were taken as part of study. This study was an original cross-sectional study. Study has no ethical conflicts.

Sampling

All children aged 0-18 years presenting with fever for more than 48 hours were tested and ELISA NS1 antigen positive children were taken as a part of study.

Dengue was diagnosed by ELISA NS1 antigen (enzyme-linked immunosorbent assay for dengue non-structural protein) positivity. The complete blood count (CBC) of all these patients was collected and analyzed. Parameters primarily taken into account were hemoglobin, platelet count, total leukocyte count (TLC). The cbc considered for study was collected on the day of presentation to the hospital (mostly on day 3rd-5th of fever) and the day of dengue positivity. The initial cbc was followed by serial cbc which were not included in this study. TLC was categorized as leukocytosis, normal and leukocytopenia on the basis of age and gender related cut offs.[4] Patients were categorized as anemic and not anemic according to WHO age and gender related cut offs for hemoglobin (WHO).[5] Platelet count was classified as low that is less than 1.5 lakh, low normal between 1.5-2 lakh, normal between 2 and 4.5 lakh and high more than 4.5 lakh.

Statistics

All the relevant data was collected and entered in Microsoft excel spreadsheet. The data was analyzed with the help of Jamovi 2.3.21 software. The relation between categorical variables was expressed with the help of chi-square test.

Inclusion criteria

The patients of age 18-year-old and ELISA NS1 positive were included in study.

Exclusion criteria

Dengue patients with >18-year-old and patient tested dengue positive by methods other than ELISA NS1 ANTIGEN assay were excluded.

RESULTS

The 35 (70%) participants were males and 15 (30%) were females.

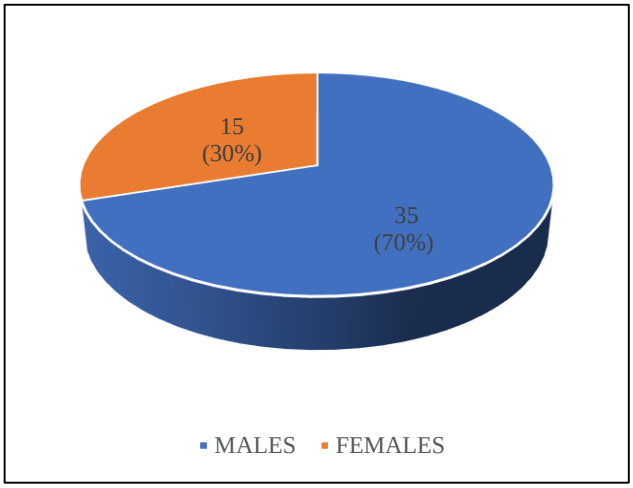

Figure 1: Gender wise distribution of cases.

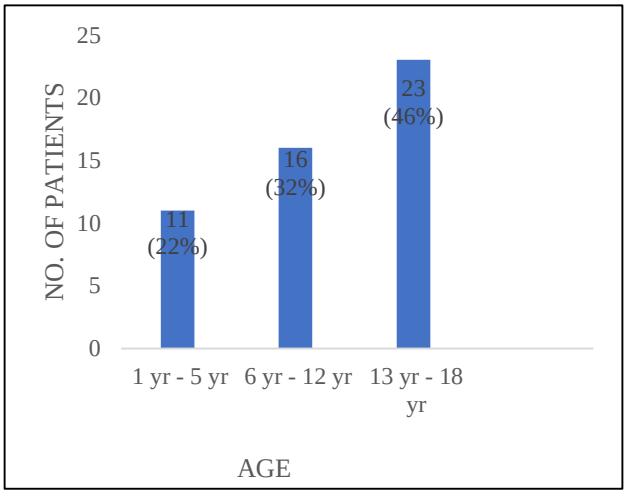

Figure 2: Age group wise patient distribution

The 23 (46%) participants in our study belonged to adolescent group. There was an increasing trend of disease with increasing age.

Table 1: Description of age variable.

Variables	Age (in years)
Mean	11.17
Median	12
Mode	18
Standard deviation	5.47
Minimum	5 months
Maximum	18

Mean age at presentation was 11.16 years with standard deviation of 5.46 years. Median was 12 years.

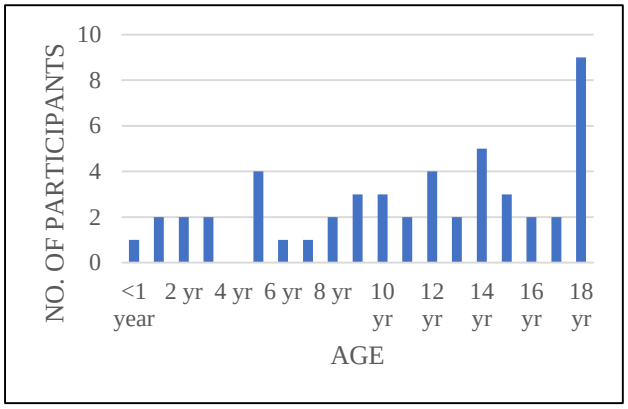

Figure 3: Age wise distribution of patients.

Nine out of 50 (18%) participants were 18 years old.

Table 2: Statistical description of variables.

Variables	Platelet	Hemoglobin	TLC
Mean	1,78,000/µL	11.4 g/dl	5371/µL
Median	1,55,000/µL	11.1 g/dl	4340/µL
Mode	1,55,000/µL	10.2 g/dl	4000/µL
Standard deviation	86,300/µL	1.8 g/dl	3350/µL
Minimum	63,000/µL	7.1 g/dl	2064/µL
Maximum	5,89,000/µL	15.2 g/dl	22000/µL

The platelet counts of study participants ranged from 63000/ µL to 5,89,000/µL. The mean average platelet counts of 50 patients observed in the study was 1,78,000/ µL with standard deviation of 86000 and median of 1,55,000/µL.

The hemoglobin level in study participants ranged from 7.1 g/dl to 15.2 g/dl. Average hemoglobin was 11.4 g/dl with standard deviation of 1.8 and median of 11.1 g/dl. Out of 50 patients 29 (58%) were anemic according to who standards of lower limit of normal as per age and gender. Most of anemic patients were in age group of 6-12 years (chi-square=6.68, df-6, p=0.035).

The TLC of study participants ranged from 2064/µL to 22000/µL. Mean TLC of 50 patients was 5371/µL with standard deviation of 3350 and median was 4340/µL.

Table 3: Platelet count in study participants.

Platelet count	N	Percentage (%)
<1,50,000/ µL (thrombocytopenia)	21	42
1,50,000-2,00,000/ µL (low normal platelet count)	15	30
2,00,000-4,50,000/ µL (normal platelet count)	13	26
>4,50,000/ µL (thrombocytosis)	1	2

More than 1/3rd (42%) of patients presented with thrombocytopenia at admission and another 1/3rd (30%) had platelet counts towards lower end of normal range.

Table 4: TLC in study participants.

TLC	N	Percentage (%)
Leukocytopenia	19	38
Noral leukocyte count	29	58
Leukocytosis	2	4

Majority (58%) of patients presented with normal leukocyte count but more than 1/3rd (38%) patients had leukocytopenia at admission.

Table 5 shows that 13 out of 21 (61.9%) participants with thrombocytopenia belonged to adolescent age group of 13-18 year. This result was statistically significant with p value less than 0.28 and chi square of 14.2 with degree of freedom 6. This concludes that, adolescent age group with dengue are more likely to present with and have thrombocytopenia than other pediatric age group patients.

The 11 out of 21 (52.4%) patients with thrombocytopenia had leukocytopenia as well or conversely 11 out of 19 (57.9%) patients with leukocytopenia had thrombocytopenia had well. Chi square test of association showed statistically significant correlation between platelet count and WBC count with p value of less than 0.001, chi square value of 30 with degree of freedom of 6. This means that low platelet count and low WBC count were associated with each other more often than would be expected by chance in dengue patients.

Table 5: Association between platelet count and age group.

Age group (in years)	Platelet count, n (%)					Total, n (%)
		>4.5 lakhs	2-4.5 lakh	1.5-2 lakhs	<1.5 lakhs	
0-5	Observed % within column	1 (100)	6 (46.2)	3 (20)	1 (4.8)	11 (22)
6-12	Observed % within column	0 (0)	5 (38.5)	4 (26.7)	7 (33.3)	16 (32)

Continued.

Age group (in years)	Platelet count, n (%)					Total, n (%)
		>4.5 lakhs	2-4.5 lakhs	1.5-2 lakhs	<1.5 lakhs	
13-18	Observed % within column	0 (0)	2 (15.4)	8 (53.3)	13 (61.9)	23 (46)
Total		1 (100)	13 (100)	15 (100)	21 (100)	50 (100)

χ^2=14.2, df=6 and p=0.028

Table 6: Association between platelet count and TLC.

TLC	Platelet count, n (%)					Total, n (%)
		>4.5 lakhs	2-4.5 lakhs	1.5-2 lakhs	<1.5 lakhs	
Leukocytosis	Observed % within row	1 (50)	1 (50)	0 (0)	0 (0)	2 (100)
Normal	Observed % within row	0 (0)	10 (34.5)	9 (31)	10 (34.5)	29 (100)
Leukocytopenia	Observed % within row	0 (0)	2 (10.5)	6 (31.6)	11 (57.9)	19 (100)
Total		1 (2)	13 (26)	15 (30)	21 (42)	50 (100)

χ^2=30, df=6, p≤0.001

DISCUSSION

Gender

The 70% participants were males and 30% were females. This observation may be attributed to fact that females in India are more clothed than males decreasing the chances of mosquito bites and females tend to stay more in home than males who participate more in outdoor activities increasing chances of exposure to vector. Previous studies done by Prasith et al (study had 21,119 out of which 12000-56.8% were males and 9119-43.2% females) and Kumar et al (study had 756 Ns1 positive patients out of which 449-59.3% were males and 307-40.7% were females).[6,7]

Age group

Maximum participants (46%) in our study belonged to adolescent group. This may be attributed to more exposure of adolescents to mosquito vector because of more participation in outdoor activities. The trend seen was that number of cases increased with increasing age.

Platelet count

The 42% of patients presented with thrombocytopenia at admission and 30% had platelet counts towards lower end of normal range. This is in line with earlier studies done by Tewari et al and Nair et al which showed thrombocytopenia in 67% and 42.8% of study participants respectively.[8,9]

Haemoglobin

Mean Hb was 11.4 g/dl with SD=1.8. 29 (58%) patients were anemic according to who standards. Mean Hb level of 11-12 g/dl was seen in study conducted by Shah et al.[10]

TLC

The 58% of patients had normal leukocyte count and more than 1/3rd (38%) patients had leukocytopenia at admission. Earlier studies done by Khatroth and Meena et al showed leukocytopenia in 20% and 51% of patients respectively.[11,12]

Associations

Our study further emphasized that low platelet count and low WBC count were associated with each other more often than would be expected by chance in dengue patients. Also, adolescent age group with dengue are more likely to present with and have thrombocytopenia than other pediatric age group patients.

Limitations

There are not many previous studies done on pediatric dengue and hence limited previous evidences were available for comparison. The study couldn't take into account important parameters like hematocrit due to unavailability of essential lab services.

The study couldn't follow up patients due to high attrition rates. Study was done in OPD of a peripheral hospital and hence critically sick patients were not part of study.

CONCLUSIONS

The most common age group affected in the pediatric population was that of teenagers which accounted for slightly less than half of the study participants. Males were affected 3× more than females. Although thrombocytopenia was not universal at presentation but it was observed in more than one third of study participants. More than half of study participants were anemic. One third of study participants had leukocytopenia at presentations. Thrombocytopenia was most predominant in adolescent age group. Leukocytopenia and thrombocytopenia were associated with each other.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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