Platelet profile and its correlation to paediatric patients with acute malaria in a tertiary care hospital

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Abstract

Introduction: Few studies are available as regards status of platelets in malaria in paediatric patients.

Objectives: To correlate factors such as age, type of malaria species and degree of parasitaemia with the degree of thrombocytopenia and to correlate the mean platelet volume and platelet distribution width with the malaria species.

Method: A prospective observational study was conducted on patients 1 to 17 years of age admitted to the department of paediatrics of a tertiary level hospital from January 2014 to November 2014 with a history of acute fever (less than 5 days) and peripheral blood smear positive for malarial parasites with the rapid diagnostic test. A detailed history and examination of the patients along with the demographic profile was entered in the predesigned proforma. Automated Coulter haematology analyser (Abacus) was used for investigations. The data was analysed by SPSS 16 statistical analysis. Comparison among three groups of continuous data was done using a One-way ANOVA, whereas data not conforming to normal distribution were compared by a Kruskal-Wallis Test. Categorical data were compared using Pearson Chi-Square Test.

Results: There were 105 patients who met the inclusion criteria. Of them, 60% had vivax malaria, 33% had falciparum malaria and the rest had mixed malaria. Thrombocytopenia was present in 85%, severe thrombocytopenia (<50,000/cu mm) being present in 36%. The platelet count significantly correlated with the type of malaria and the degree of parasitaemia. The platelet count decreased as the age increased in moderate to severe thrombocytopenia. There was also correlation between the mean platelet volume but not the platelet distribution width and the malaria species.

Conclusion: Thrombocytopenia was present in 85% of patients, the degree of thrombocytopenia correlating significantly with the degree of parasitaemia and the type of malaria. The MPV but not the PDW correlated significantly with the type of malaria species.

(Key words: Malaria, thrombocytopenia, rapid diagnostic test, mean platelet volume, platelet distribution width).

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Introduction

India accounts for about 50% of the 2 million reported cases of malaria in the World Health Organization South-East Asia Region[1]. About 80% cases of malaria reported in India are confined to areas comprising 20% of the population residing in tribal, hilly, difficult and inaccessible areas[2]. Haematological abnormalities such as anaemia, thrombocytopenia and leucocytosis or leucopenia have been observed in patients with malaria[3].

Objectives

To correlate factors such as age, type of malaria species and degree of parasitaemia with the degree of thrombocytopenia and to correlate the mean platelet volume (MPV) and platelet distribution width (PDW) with the malaria species.

Method

A prospective observational study was conducted on patients 1 to 17 years of age admitted to the department of paediatrics of a tertiary level hospital from January 2014 to November 2014 with a history of acute fever (less than 5 days) and peripheral blood

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smear positive for malarial parasites with the rapid diagnostic test (RDT). Patients with acute fever with RDT negative for malaria, those with chronic fever, only smear positive for plasmodium gametocytes, patients with signs and symptoms of acute viral fever, either on or had taken antimalarial treatment, were excluded from the study. A detailed history and examination of the patients including the type of fever and its duration, signs and symptoms suggestive of malaria along with the demographic profile was entered in the predesigned proforma. Basic screening for malaria was done by performing RDT using RDT kits (MALARIAGEN) available in the Institute. Venous blood was collected for haematological investigations. Automated Coulter haematology analyser (Abacus) was used for investigations. Peripheral blood smear was used for detection of malarial parasites and also for platelets wherever necessary. The data were analysed by SPSS 16 version for statistical analysis. A 'p' value <0.05 was taken as significant for statistical analysis. Comparison among three groups of continuous data was done using a One-way ANOVA, whereas data not conforming to normal distribution were compared by a Kruskal-Wallis Test. Categorical data were compared using Pearson Chi-Square Test.

Results

During the study period there were 105 patients who met the inclusion criteria. Of them, 60% had vivax malaria, 33% had falciparum malaria and the rest had mixed malaria. Sixty two percent were male. Thrombocytopenia was categorized as mild (100,001-150,000/cu mm), moderate (50,000-100,000/cu mm) and severe (<50,000/cu mm). Correlation of platelet counts with the type of malaria species is shown in Table 1. This was statistically significant ($p<0.05$).

Table 1: ***Correlation of platelet counts with type of malaria species***

Platelet count/cu mm	Plasmodium vivax	Plasmodium falciparum	Mixed	Total (%)
<50,000	16	20	2	38 (36.2)
50,000 -100,000	23	7	1	31 (29.5)
100,001-150,000	13	4	3	20 (19.0)
>150,000	11	4	1	16 (15.2)

Correlation of age with platelet counts in malaria is shown in Table 2. Platelet counts decreased as the age increased in moderate to severe thrombocytopenia in malaria. This was statistically significant ($p<0.05$).

Table 2: ***Correlation of age with platelet counts in malaria***

Platelet count/cu mm	1-5 years	6-10 years	11-17 years
<50,000	05	11	22
50,000 -100,000	00	05	11
100,001-150,000	08	04	08
>150,000	03	07	21
Total	16	27	62

Mean platelet count (MPC) of the 105 malarial patients in the study was 84,653±63,592. Correlation of the MPC with the degree of parasitaemia is shown in Table 3. There was an inverse correlation between the MPC and degree of parasitaemia which was statistically significant ($p<0.05$).

Table 3: ***Correlation of mean platelet count with degree of parasitaemia***

Parasitaemia	Mean platelet count/cu mm
+1	128,385 ± 72,315
+2	93,242 ± 51,569
+3	70,133 ± 76,187
+4	65,727 ± 40,579

Correlation of MPV with the type of malaria species is shown in Table 4. Plasmodium Vivax had highest degree of correlation followed by Plasmodium Falciparum and mixed species respectively, all being statistically significant ($p<0.05$)

Table 4: ***Correlation of mean platelet volume with type of malaria species***

Malaria species	Mean platelet count (femtolitre-fL)	95% Confidence interval	
Plasmodium Vivax	9.8825 ± 0.66999	8.7138	9.0513
Plasmodium Falciparum	7.5171 ± 0.81403	7.2375	7.7968
Mixed	8.5000 ± 0.66833	7.8819	9.1181

However, correlations between MPC and age, severity of parasitaemia and severity of thrombocytopenia, splenomegaly and severity of thrombocytopenia, platelet distribution width (PDW) and type of malaria were not significant ($p>0.05$).

Discussion

This study was carried out in a tertiary hospital of industrial, urban and coastal city of Surat in Gujarat State of India. The urban population of Surat is about 4-4.5 million and consists of inhabitants from all over India. The average annual precipitation is around 150-200 cm per year and the city is an endemic and high risk zone for malaria. Thrombocytopenia is a common finding in several acute infective diseases including malaria[4,5,6]. In our study, thrombocytopenia was present in all types of malaria species which was similar to findings in other Indian studies[7,8]. However, severe thrombocytopenia was more common in falciparum malaria in our study. Thrombocytopenia was inversely proportional to age, the platelet count decreasing as the age of patients increased. Although severe thrombocytopenia was associated with a higher degree of parasitaemia (+3 to +4), this was not statistically significant. Ladhani et al had similar results[9].

Though severe thrombocytopenia was present in 42% of the malaria patients in our study, there was no bleeding in any patient, similar findings being observed in studies by Shetty S[8] and Jadhav U[10]. The reason for rare bleeding episodes in malaria may be the hypersensitive platelets, which are thought to enhance haemostatic responses which have been reported despite thrombocytopenia[11,12,13]. In a study by Chandra[14] the MPV of more than 8fL was a comparatively more sensitive indicator for vivax malaria (70.8%) than falciparum (50.4%). Our findings were similar as we had MPV of 9.8fL in vivax malaria compared with a MPV of 7.5fL in falciparum malaria which was statistically significant ($p<0.05$). In a study by Maina et al, MPV was more in patients with malaria than non malaria[4]. Nayar et al, in a study of patients aged 3-62 years from Tamilnadu (India) reported increase in both MPV and PDW in malaria patients with thrombocytopenia, compared to controls, which was statistically significant[15]. In the study by Chandra, PDW, in the range of 6-10, was a more sensitive indicator for falciparum (82.6%) than vivax (69.5%) malaria[14]. In our study, PDW was 10.4 in vivax and 9.2 in falciparum malaria, which was not significant ($p>0.05$). Although spleen enlargement was maximum (42%) in severe thrombocytopenia, this was not statistically significant ($p>0.05$) in our study.

Conclusions

- Thrombocytopenia was seen in 85% of malaria patients.
- Degree of thrombocytopenia correlated well with the degree of parasitaemia and the type of malaria species and this was statistically significant ($p<0.05$).
- The MPV but not the PDW correlated significantly ($p<0.05$) with the malaria species.

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