



RED CELL PARAMETERS AND PLATELET PARAMETERS IN WOMEN WITH IRON DEFICIENCY ANEMIA.

Pathology

Dr. Chethan Sagar S Assistant Professor, Department of Pathology, SIMS, Shivamogga

Dr Veena S* Assistant Professor, Department of Pathology, SIMS, Shivamogga *Corresponding Author

ABSTRACT

Background: In iron deficiency anemia (IDA), several changes in platelets have been reported. Therefore, a relationship between iron metabolism and thrombopoiesis should be considered. The aim of this study was to evaluate the platelet parameters in women with IDA.

Materials and Methods: Eighty-six women of mean age 38 ± 8 (18-72) years with IDA were enrolled in this study. The relationship between serum iron parameters (such as iron, iron-binding capacity, iron saturation and ferritin) and platelet parameters (such as platelet counts, platelet crit, mean platelet volume and platelet distribution width) were evaluated by using Pearson correlation test.

Results: Platelet counts were normal in 120 patients with IDA. Thrombocytosis and thrombocytopenia were detected in 48 (27.9%) and 04 (2.3%) patients. Platelet counts were increased when serum iron, iron saturation, ferritin and mean platelet volume were decreased in this study. There was a linear relationship between platelet counts and platelet crit ($p < 0.001$) but inverse relationships between platelet counts and both mean platelet volume and iron saturation ($p < 0.001$, for both). Also there were a linear relationship between platelet distribution width and mean platelet volume ($p < 0.001$) and an inverse correlation between platelet distribution width and mean corpuscular volume ($p < 0.001$).

Conclusion: In IDA, the most important factor affecting platelet counts was iron saturation. This study suggested that decreased iron saturation might stimulate megakaryopoiesis. Moreover, iron may have an inhibitor effect on platelet counts.

KEYWORDS

Platelets, iron deficiency anemia, thrombocytosis

INTRODUCTION:

Iron deficiency anemia (IDA) is the most common hematological disorder in the community.¹ In IDA, several changes in platelets have been reported. So, a relationship between iron metabolism and thrombopoiesis should be considered.^{2,3} A biphasic pattern of platelet response was noted in patients with IDA. Moderate IDA is usually associated with reactive thrombocytosis.^{4,6} Thrombocytopenia can be seen in patients with severe IDA, especially when hemoglobin level is < 7 g/dL.^{3,7,9} Several studies reported an inverse relationship between mean platelet volume and platelet counts in patients with IDA.⁹⁻¹¹

Aim and Objectives:

1. To study the variation of red cell and platelet parameters in women with IDA.
2. To study the variation of iron parameters in women with IDA.

Methodology:

Blood specimens for hematological parameters, including hemoglobin, hematocrit, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, red blood cell counts, red cell distribution width, white blood cell counts, platelet counts, platelet crit, mean platelet volume and platelet distribution width were evaluated using hematoanalyser after 1-2 hours. Iron parameters are obtained from the biochemical analyser.

MATERIALS AND METHODS:

Source of data:

All the blood samples submitted to central laboratory, Macggon hospital attached to SIMS, Shivamogga for hematological evaluation during the study period.

Study type: Prospective, descriptive study.

Study period: Sep 2016 to Dec 2017

Study duration: 4 months.

Sample size: 172.

Methods of collection of data: Blood specimens for hematological parameters, including hemoglobin, hematocrit, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, red blood cell counts, red cell distribution width, white blood cell counts, platelet counts, platelet crit, mean platelet volume and platelet distribution width, were collected in tubes with EDTA and were analyzed after 1-2 hours.

Plan of data analysis:

Data were recorded and analyzed using SPSS 10.0. Values were shown as means \pm standard deviation. The correlation of platelet counts, platelet crit, mean platelet volume and platelet distribution width with

other variables, including hemoglobin, hematocrit, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, red blood cell and white blood cell counts, serum iron, iron-binding capacity, iron saturation and ferritin, were analyzed by Pearson's correlation test ($r > +0.225$ and $p < 0.05$). P values < 0.05 were considered as statistically significant.

Inclusion Criteria:

All the women with diagnosis as iron deficiency anemia.

Exclusion Criteria:

- Male and pediatric patients with iron deficiency anemia.
- Patients with acute hemorrhage and infections, neoplastic and chronic inflammatory disorders such as rheumatoid arthritis, ankylosing spondylitis and systemic lupus erythematosus were excluded.

Ethical clearance have been obtained from the institution board.

RESULTS:

One seventy two women of mean age $38 + 08$ (18-72) years with IDA were included. In the etiology of IDA, Chronic blood loss and vaginal blood loss due to myoma uteri; and dysfunctional hemorrhage of uterus were detected in 74 and 88 patients, respectively. No cause was recorded in eight cases.

Platelet counts were normal in 120 patients with IDA. Thrombocytosis and thrombocytopenia were detected in 48 (27.9%) and 04 (2.3%) patients. When Pearson's correlation test was performed, inverse correlations between platelet counts and hemoglobin, hematocrit, mean platelet volume, ferritin, iron saturation, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration; and linear correlations between platelet counts and platelet crit, red cell distribution width were determined.

Logistic regression test, an inverse relationship between platelet crit and mean corpuscular volume ($p < 0.05$), and a linear relationship between platelet counts and platelet crit ($p < 0.001$) were identified.

Linear correlations between mean platelet volume and both hematocrit and platelet distribution width, and an inverse correlation between mean platelet volume and platelet counts were obtained in correlation test.

Mean corpuscular volume and men corpuscular haemoglobin showed linear correlation with platelet distribution width where as an inverse correlation was obtained between the platelet distribution width and mean platelet volume.

Table 1 : Hematological data in patients with iron deficiency anemia

Red cell parameters	Patients (n=172)	Normal values
White blood cell counts ($\times 10^3/\mu\text{L}$)	6.4 ± 1.5	3.5-9.8
Red blood cell counts ($\times 10^3/\mu\text{L}$)	2.8 ± 0.5	4.4-5.1
Hemoglobin (g/dL)	10.3 ± 1.4	12.3-15.3
Mean corpuscular volume (fL)	32 ± 3.5	36-45
Mean corpuscular hemoglobin (pg)	70.7 ± 7.2	80-96
Hematocrit (%)	23.4 ± 3.4	27.5-33.2
Mean corpuscular hemoglobin concentration (g/dL)	32.4 ± 1.3	33.3-35.5
Red cell distribution width	16.5 ± 2.1	12-13.6

Table 2 : The results of pearson's correlation test in patients with iron deficiency anemia.

Parameters	Serum iron	Iron Saturation	Iron Binding Capacity	Ferritin
Platelet Counts				
r	-0.347	0.195	0.026	0.268
p	<0.001	<0.05	>0.05	<0.05
Platelet Crit				
r	-0.248	0.232	0.022	-0.104
p	>0.05	<0.05	<0.001	>0.05
Mean Platelet volume				
r	0.084	0.032	0.450	-0.075
p	>0.05	>0.05	<0.05	>0.05
Platelet Distribution width				
r	-0.143	0.126	-0.091	-0.072
p	>0.05	>0.05	>0.05	>0.05

DISCUSSION:

There was an inverse relationship between platelet count and iron saturation where no correlation with other iron parameters. Even the other platelet parameters such as platelet crit, mean platelet volume and platelet distribution width had no correlation with iron parameters like serum iron, iron binding capacity, ferritin and platelet parameters.

In our study, although serum iron and ferritin levels had effects on platelet counts, iron saturation was the most important parameter. This was probably due to stimulation of megakaryopoiesis due to decrease in iron saturation. In recent studies it was reported that increased levels of endogenous erythropoietin would stimulate megakaryopoiesis⁴⁵.

The relationship between platelet counts and mean platelet volume has been of special interest in IDA and healthy persons in literature¹²⁻¹⁴. In some studies, an inverse correlation between platelet counts and mean platelet volume, and a linear correlation between platelet counts and platelet crit were detected.

In one clinical study, while platelet distribution width in patients with IDA was higher than controls, mean platelet volume was not different¹⁵.

Our study showed a inverse correlation between platelet count and mean platelet volume and linear correlation between platelet crit and mean platelet volume probably because of short maturation time and increased polypoidy of megakaryocytes as it is known fact that youngest platelet have the largest size.^{10,11}

CONCLUSION:

Our study concludes that even though RBC parameters have a effect on IDA patients platelet parameters had significant correlation out of which both thrombocytosis and thrombocytopenia can occur in women with IDA. Changes in platelet parameters were attributed to change in morphology of platelets. Thrombocytosis was more evident in our study which prominent in women with low iron saturation. These changes in the platelet parameters may be related to low levels of tissue iron. The most important factor affecting platelet counts was iron saturation in women with IDA. Limitation of our study was that patients were not evaluated after treatment because of difficulty in follow up.

REFERENCES: