Correlation between Iron Parameters and Platelet Parameters in Iron Deficiency Anemia

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ABSTRACT

Introduction

Iron deficiency anemia is the most common type of anemia and is diagnosed by iron studies. Reactive thrombocytosis is usually seen in iron deficiency anemia. The objectives of the study is to correlate between iron parameters and platelet parameters in patient with iron deficiency anemia.

Methods

This was a cross-sectional study done in Department of Pathology at Kathmandu Medical College, Sinamangal between December 2018 to May 2019. Blood samples of 81 iron deficiency anemia patients were analysed to determine iron parameters and platelet parameters. SPSS version 20 was used to analyse the data.

Results

Thrombocytosis was seen in 62 (76.5%) patient with iron deficiency anemia. Platelet count was negatively correlated with serum iron, percentage saturation and platelet distribution width (p<0.001, for all) while positive correlation was obtained between platelet count and plateletcrit (p<0.05). Plateletcrit showed negative correlation with serum iron (p<0.001) and platelet distribution width (p<0.05) while positive correlation was obtained with mean platelet volume, total iron binding capacity and platelet (p<0.05, for all). There was negative correlation between mean platelet volume and platelet count (p<0.001). Positive correlation was obtained between mean platelet volume and plateletcrit (p<0.05). Correlation was not found between mean platelet volume and iron parameters (p>0.05). Platelet distribution width showed negative correlation with total iron binding capacity, platelet (p<0.001, for both), plateletcrit (p<0.05).

Conclusion

Thrombocytosis is more commonly observed as compared to thrombocytopenia in patient with iron deficiency anemia. Serum iron and percentage saturation are the most important parameters affecting the platelet count.

Keywords: *Iron deficiency anemia, platelet parameters, thrombocytosis*

INTRODUCTION

Anemia is defined by World Health Organization (WHO) as hemoglobin (Hb) level <12.0 gm/dl in women and <13.0 gm/dl in men.[1] Iron deficiency anemia (IDA) is the most common type of anemia worldwide and is estimated to be the cause of 50% of anemic cases.[2] IDA is commonly diagnosed by change in iron studies.[3]

Platelet parameters usually altered in reactive mechanism and neoplastic overproduction.[4] Infections, acute bleeding and IDA causes reactive thrombocytosis. IDA is a common cause of reactive thrombocytosis the exact mechanism of which is unknown.[5]

Previous studies suggested that platelet parameter change in IDA is because of morphological features of platelet.[6,7] The aim of the study is to evaluate the relation between iron parameters and platelet parameters in IDA patients.

METHODS

This was a cross-sectional study conducted among patient visiting Kathmandu Medical College Public Limited, Sinamangal, Nepal from December 2018 to May 2019. The ethical approval for the study was taken from Institutional Review Committe of Kathmandu Medical College Teaching Hospital, Sinamangal. The written informed consent was obtained from each participants. The inclusion criteria includes: hemoglobin less than 12 gm/dl in women and 13 gm/dl in men. Serum ferritin less than 6 µg/l and transferrin saturation (Tfsat) less than 13%. These reference values are used in the pathology lab of Kathmandu medical college public limited. The patient with other causes of reactive thrombocytosis (acute hemorrhage, infection, malignancy and chronic inflammatory disease) were excluded from the study.

Fresh blood with ethylene diamine tetraacetic acid (EDTA) was analyzed to determine red blood cell and platelet parameters between 1 to 3 hours after sampling using Nihon Kohden coulter model number MEK-6410K. Blood sample for serum iron parameters including serum iron, Total iron binding capacity (TIBC), Tfsat and ferritin were collected in tubes without anticoagulant and were analyzed after four hours using Maglumi Chemiluminescence Analyzer.

The data was analyzed using SPSS Statistics version 20.0. The values was shown as mean±standard deviation. The correlation of platelet parameters which includes platelet count, plateletcrit (PCT), mean platelet volume (MPV) and platelet distribution width (PDW) with iron parameters were analyzed by Pearson's correlation. P value <0.05 was considered as statistically significant.

RESULTS

Among 81 patient enrolled in this study, 17 (20.9%) were male and 64 (79.01%) were female. The mean age was 45.46 year. The mean Hb level was 7.4 gm/dl. In patients with IDA, thrombocytosis was seen in 62 (76.5%) patient and thrombocytopenia was seen in 3 (3.7%) patient. Sixteen (19.75%) patient had normal platelet count. Hematological data of patient are shown in table 1. Pearson's correlation between platelet parameters and iron parameters as well as between platelet parameters are shown in table 2 and 3.

Platelet count showed negative correlation with serum iron, Tfsat, PDW (p<0.001, for all), MPV (p<0.05) while positive correlation was obtained between platelet count and PCT (p<0.05).

PCT showed negative correlation with serum iron (p<0.001) and PDW (p<0.05) whereas positive correlation was obtained with MPV, TIBC, platelet (p<0.05, for all).

Table 1. Hematological parameters in patients with iron deficiency anemia

Variables	Mean±SD	Normal value
Red blood cell parameters		
Hemoglobin (gm/dl)	7.4±1.3	12-16
Hematocrit (%)	23±5.1	36-45
MCV(fl)	67.1±5.1	80-100
MCH(pg)	20.6±2.8	27-33
MCHC (gm/dl)	27.3±2.3	33-37
RDW (%)	20.2±2.1	11-14
Platelet parameters		
Platelet (x10³/µL)	455.6±139	150-450
MPV (fl)	8.3±0.9	9-13
PCT (%)	0.3±0.06	-
PDW (%)	44.1±4.9	-
Iron parameters		
Serum iron (µg/dl)	30.1±3.5	60-150
TIBC (µg/dl)	511.4±47.2	250-450
Percentage saturation (%)	6.1±2.07	18-45
Ferritin (µg/l)	4.5±0.99	15-70

Table 2. Correlation between platelet parameters and iron parameters

Para-meter	Platelet	PCT	MPV	PDW
Serum iron				
r	-0.05	-0.0009	0.1519	0.07
p value	<0.001	<0.001	0.214	0.367
Serum ferritin				
r	0.07	0.108	0.0178	-0.059
p value	0.196	0.450	0.289	0.698
TIBC				
r	0.199	0.15	0.0169	-0.309
p value	0.665	0.012	0.965	<0.001
Tfsat				
r	-0.11	-0.161	0.078	0.147
p value	<0.001	0.734	0.864	0.112

r= correlation coefficient

Table 3. Correlation between platelet parameters

Parameter	Platelet	PCT	MPV	PDW
Platelet				
r	-	0.265	-0.144	-0.298
p value		0.023	0.012	<0.001
PCT				
r	0.265	-	0.029	-0.281
p value	0.023		0.043	0.039
MPV				
r	- 0.144	0.029	-	-0.198
p value	0.012	0.043		0.346
PDW				
r	-0.298	-0.281	-0.198	-
p value	<0.001	0.039	0.346	

r= correlation coefficient

There was negative correlation between MPV and platelet count (p<0.001) where as positive correlation was obtained between MPV and PCT (p<0.05). Correlation was not found between MPV and Iron parameters.

PDW showed negative correlation with TIBC, platelet (p<0.001 for both), PCT (p<0.05).

DISCUSSION

Our study showed IDA was common in female 64 (79.01%). Similar results were obtained by Al-alimi et al[7] and Mishra et al[8] in their study and they concluded that inadequate intake of dietary iron, inadequate intake of dietary micronutrients, lack of awareness of iron deficiency, excessive menstrual loss, pregnancy and nutritional status were the possible cause.

The relationship between IDA and thrombocytosis remains unclear however various studies suggested that iron deficiency causes megakaryocytic expansion and stimulates megakaryocytic differentiation, independently from thrombopoietin (TPO), interleukin-6 and interleukin-11.[9] Bilic and Bilic in their study explained that homology between the aminoacid sequence between TPO and erythropoietin (EPO) results in thrombocytosis in children with IDA.[10] Some studies have also reported that thrombocytopenia is seen in severe IDA because of high EPO response.[11] In the present study thrombocytosis was seen in 62 (76.5%) patient while thrombocytopenia was seen in 3 (3.7%) patient. Findings of the present study show similar result to that of Kadikoylu et al[12] and Kuku et al[13].

Our study showed platelet count negatively correlated with serum iron, Tfsat, PDW, MPV. There was positive correlation between platelet and PCT. The result coincides with the result of Park et al[6],

Kadikoylu et al[12], Kuku et al[13] and Han et al[14]. Serum ferritin measurement is one of the most accurate diagnostic test for IDA.[6] In the current study, no correlation was obtained between serum ferritin and platelets. Kuku et al[13] also found no correlation between serum ferritin and platelet in their study but contradict to the result of our study, Kadikoylu et al[12] found significant correlation between serum ferritin and platelets.

Special interest was shown in the literature between platelet count and MPV. In the current study there was negative correlation between MPV and platelet count where as positive correlation was obtained between Platelet crit and MPV. Similar findings were obtained in the study done by Levin and Bessman and Giles C and explained that the possible is due to decrease in maturation time of platelet and increase in polypoidy of megakaryocytes as the youngest platelet have largest size.[15,16]

There are few limitations in our study as comparision of parameters in non anemic patient were not done and also re-evaluation of statistically significant parameters were not done after the end of treatment. Furthermore we didn't assess thromboembolic events in our patient.

CONCLUSION

Thrombocytosis is most commonly observed as compared to thrombocytopenia in patient with iron deficiency anemia. Serum iron and percentage saturation are the most important parameters affecting the platelet count.

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CONFLICT OF INTEREST

None declared.

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