

Association between Platelet and Iron Parameters in Patients with Iron Deficiency Anemia

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ABSTRACT

Iron deficiency anemia is the most prevalent anemia type and is identified by the use of blood tests for iron levels. In iron deficiency anemia, reactive thrombocytosis is a common complication. The study's primary goal is to determine if there is a relationship between platelet and iron parameters in patients with iron deficient anemia.

Place and Duration: This cross-sectional research was done among patients with iron deficiency anemia in the Department of Medicine and Pathology, Sharif Medical College, Lahore for one-year duration from January 2021 to December 2021.

Method: This Observational research was conducted in the Department of Medicine and Pathology order to collect information. The platelet and iron parameters of 70 iron deficiency anemia patients were determined using blood samples taken from the patients. The data was analyzed with the help of SPSS version 20.

Results: Patients with iron deficiency anemia were found to have thrombocytosis in 58 (82.9 percent) of the cases. When serum iron, percentage saturation, and platelet distribution were taken into consideration (all $p < 0.001$), platelet count was shown to be adversely connected to these variables, but a positive association was found between plateletcrit and platelet count (all $p < 0.05$). There was a negative link between serum iron and plateletcrit ($p < 0.001$) and PDW ($p < 0.05$), but only a positive relationship was found with TIBC, mean platelet volume ($p < 0.05$), and platelet (all $p < 0.05$). There was a significant negative relationship between platelet count and mean platelet volume ($p < 0.001$). Platelet and mean platelet volume correlated positively ($p < 0.05$), while plateletcrit and mean platelet volume correlated negatively ($p < 0.05$). Neither a correlation nor a non-correlation between iron parameters and mean platelet volume were discovered ($p > 0.05$).

Conclusion: When it comes to patients with iron deficient anemia, thrombocytosis is more prevalent than thrombocytopenia. The most critical factors impacting platelet count are serum iron and percentage saturation.

Keywords: Hemoglobin, thrombocytosis and iron deficiency anemia.

INTRODUCTION

According to WHO hemoglobin levels should be 12 gm/dl in females and 13 gm/dl in men^{1,2}. Iron deficiency anemia seems to be the utmost communal kind of anemia, accounting for about half of all cases worldwide^{3,4}. The most frequent way to detect IDA is to look for a change in your behavior iron research. In reactive mechanisms and neoplastic overproduction, platelet properties are often changed^{5,6}. Reactive thrombocytosis is caused by infections, severe bleeding, and IDA. The specific mechanism of IDA is unclear; however, it is a prevalent cause of reactive thrombocytosis⁷. Previous research revealed that the change in platelet parameters in IDA is caused by the morphological characteristics of the platelet^{8,9}. The goals of this research are to determine the Association between iron and platelet parameters in iron deficiency anemia.

MATERIAL AND METHODS

This cross-sectional research was done among patients with iron deficiency anemia in the Department of Medicine and Pathology, Sharif Medical College, Lahore for one-year duration from January 2021 to December 2021. According to the study's ethical permission, the Institutional Review Committee gave its approval. A total of 70 patients were encompassed in this study. Each participant signed a written informed consent form before taking part in the study. Women must have hemoglobin < 12 gm/dl and males must have hemoglobin < 13 gm/dl in order to be considered. The transferrin saturation (Tfsat) levels of < 13 percent and Serum ferritin levels of < 6 g/l are considered low. Between 1 and 3 hours after sampling with a fresh blood EDTA solution, fresh blood containing EDTA was used to assess red platelet and blood cell parameters. The Maglumi Chemiluminescence Analyzer was used to assess parameters of serum iron such as TIBC, serum iron, ferritin and Tfsat after four hours.

The data was analysed using SPSS 20.0. The association between platelet metrics such plateletcrit, platelet count, platelet

distribution width, mean platelet volume and iron variables were investigated using Pearson's correlation. A $P < 0.05$ was used to govern statistical significance.

RESULTS

There were 14 (20.9 percent) males and 56 (79.01 percent) females among the 70 patients in this research. The average age was 44.20 ± 5.2 years. The average hemoglobin level was 7.2 ± 2.1 gm/dl. Thrombocytosis was detected in 54 (77.1%) of patients with IDA, whereas thrombocytopenia was seen in 4 (5.7%) of patients. 12 patients (17.1%) had a normal platelet count.

Table 1: shows the patient's hematological data.

Variables	Mean \pm SD	Standard value
Red blood cell parameters		
Hemoglobin (gm/dl)	7.2 \pm 2.1	16-Dec
Hematocrit (%)	22 \pm 4.9	36-45
MCV(fl)	68.4 \pm 6.2	80-100
MCH(pg)	21.2 \pm 2.9	27-33
MCHC (gm/dl)	28.1 \pm 2.2	33-37
RDW (%)	22.1 \pm 1.2	14-Nov
Platelet parameters		
Platelet (x103/ μ L)	448.8 \pm 140	150-450
MPV (fl)	8.1 \pm 0.8	9-13
PCT (%)	0.4 \pm 0.07	
PDW (%)	43.2 \pm 5.2	
Iron parameters		
Serum iron (μ g/dl)	29.8 \pm 3.2	60-150
TIBC (μ g/dl)	508.8 \pm 45.9	250-450
Percentage saturation (%)	6.2 \pm 2.10	18-45
Ferritin (μ g/l)	4.1 \pm 0.98	15-70

Although there was a negative link between platelet count and MPV ($p < 0.001$), there was a positive correlation between PCT and MPV ($p < 0.05$). There was no link institute between iron levels and MPV.

TIBC, platelets (both $p < 0.001$), and PCT all demonstrated a

negative connection with PDW ($p < 0.05$).

Table 2: Correlation between iron and platelet parameters

Parameter	Platelet	PCT	MPV	PDW
Serum iron				
r	-0.04	-0.0008	0.152	0.06
p value	<0.001	<0.001	0.210	0.370
Serum ferritin				
R	0.08	0.0110	0.018	0.060
p value	0.188	0.431	0.29	0.71
TIBC				
r	0.194	0.13	0.017	0.311
p value	0.670	0.014	0.097	<0.001
Tfsat				
R	-0.10	-0.170	0.079	0.148
p value	<0.001	0.715	0.87	0.114

Table 3: Association between platelet parameters

Parameter	Platelet	PCT	MPV	PDW
Serum iron				
r		0.270	-0.138	-0.301
p value		0.027	0.018	<0.001
PCT				
R	0.270		0.030	-0.278
p value	0.027		0.046	0.040
MPV				
r	-0.139	0.030		-0.200
p value	0.011	0.048		0.350
PDW				
R	-0.301	-0.274	-0.200	
p value	<0.001	0.040	0.350	

DISCUSSION

IDA was shown to be prevalent in females aged 64 and above in our research (82.9 percent). In their studies, Mishra et al and Al-alimi et al found similar findings and concluded that dietary iron deficit, dietary micronutrient shortage, excessive menstrual loss, absence of iron deficiency awareness, nutritional status and pregnancy were the likely causes¹⁰⁻¹¹. Although the exact association between iron deficit and thrombocytosis is still unclear, some studies have demonstrated that iron shortage induces megakaryocytic growth and differentiation, which occurs independently of interleukin-6, interleukin-11 and 9, thrombopoietin (TPO)¹²⁻¹³. Children with IDA suffer from thrombocytosis, as indicated by Bilic in their research, because of a homology in the amino acid sequence between TPO and erythropoietin (EPO), which occurs when the two proteins are homologous¹⁵⁻¹⁶. Some studies have also found that severe IDA is associated with thrombocytopenia as a result of the strong EPO response. 11 Patients with thrombocytosis (77.1 percent) were found in the current investigation, while patients with thrombocytopenia (5.7 percent) were found in three patients. The current study's findings are consistent with those of Kuku et al and Kadikoylu et al, who found comparable results¹⁷⁻¹⁸.

In this study, it was discovered that platelet count was associated negatively with Tfsat, serum iron, MPV and PDW levels. PCT and platelet count were shown to be associated with one another. The results are congruent with those made by another researchers¹⁹⁻²⁰. According to Park et al, Bessman and Levin and Giles C, the potential is associated with a reduction in platelet maturation time and an increase in megakaryocyte ploidy²¹⁻²³.

Some limitations of our study include the absence of comparisons of parameters in non-anemic individuals and the absence of re-assessment of statistically substantial constraints after treatment. In addition, we were unable to assess the patient's risk of thromboembolic complications.

CONCLUSION

When it comes to patients with iron deficient anemia, thrombocytosis is more prevalent than thrombocytopenia. The

most critical factors impacting platelet count are serum iron and percentage saturation.

REFERENCES

- Han DD, Ma C, Zhao L, Gao YJ, Su YH. Relationship between iron metabolism and platelet parameters in patients with iron deficiency anemia. Zhongguo shi yan xue ye xue za zhi. 2018 Dec 1;26(6):1738-41.
- Song AB, Kuter DJ, Al-Samkari H. Characterization of the rate, predictors, and thrombotic complications of thrombocytosis in iron deficiency anemia. American Journal of Hematology. 2020 Oct;95(10):1180-6.
- Song AB, Kuter DJ, Al-Samkari H. Characterization of the rate, predictors, and thrombotic complications of thrombocytosis in iron deficiency anemia. American Journal of Hematology. 2020 Oct;95(10):1180-6.
- Huscenot T, Darnige L, Wagner-Ballon O, Ronchetti AM, Loussteau V, Limal N, Morbieu C, Gobert D, Rohmer J, Mathian A, Le Cann M. Iron deficiency, an unusual cause of thrombocytopenia: results from a multicenter retrospective case-controlled study. Annals of Hematology. 2019 Oct;98(10):2299-302.
- Özdemir ZC, Düzenli Kar Y, Gündüz E, Turhan AB, Bör Ö. Evaluation of hypercoagulability with rotational thromboelastometry in children with iron deficiency anemia. Hematology. 2018 Oct 21;23(9):664-8.
- Giordano L, Llanos-Chea A, Monde A, Mulinge I, Dighe D. Recurrent severe iron deficiency anemia and thrombocytopenia in an adolescent male. Journal of Pediatric Hematology/Oncology. 2019 Mar 1;41(2):e116-8.
- Chalise S, Acharya N, Pradhan SB. Correlation between Iron Parameters and Platelet Parameters in Iron Deficiency Anemia. Journal of Institute of Medicine Nepal. 2019 Dec 30;41(3):35-8.
- Lambert MP, Witmer CM, Kwiatkowski JL. Therapy induced iron deficiency in children treated with eltrombopag for immune thrombocytopenia. American journal of hematology. 2017;92(6).
- Gkamprela E, Deutsch M, Pectasides D. Iron deficiency anemia in chronic liver disease: etiopathogenesis, diagnosis and treatment. Annals of gastroenterology. 2017;30(4):405.
- Aly SS, Fayed HM, Ismail AM, Abdel Hakeem GL. Assessment of peripheral blood lymphocyte subsets in children with iron deficiency anemia. BMC pediatrics. 2018 Dec;18(1):1-6.
- Jimenez KM, Gasche C. Management of iron deficiency anaemia in inflammatory bowel disease. Acta haematologica. 2019;142(1):30-6.
- Babikir M, Ahmad R, Soliman A, Al-Tikrity M, Yassin MA. Iron-induced thrombocytopenia: a mini-review of the literature and suggested mechanisms. Cureus. 2020 Sep 2;12(9).
- Holbro A, Volken T, Buser A, Sigle JP, Halter JP, Passweg JR, Tichelli A, Infanti L. Iron deficiency and thrombocytosis. Vox sanguinis. 2017 Jan;112(1):87-92.
- Al-Amer O, Hawasawi Y, Oyouni AA, Alshehri M, Alasmari A, Alzahrani O, Aljohani SA. Study the association of transmembrane serine protease 6 gene polymorphisms with iron deficiency status in Saudi Arabia. Gene. 2020 Aug 15;751:144767.
- ÇAKMAK HM, SUNGUR MA, KOCABAY K. Evaluation and Management of Severe Childhood Anemia: A Single Center Experience. Duzce Medical Journal. 2020 Jan 1;22(1):46-50.
- Hasanefendić B, Hajrović A, Begović E, Uzunalić H. The ratio of hematological parameters and markers of inflammation in patients with iron deficiency and pernicious anemia. InCMBEIH 2017 2017 (pp. 769-773). Springer, Singapore.
- Akter T, Akhter QS, Amran MS, Lisa SH, Sultana A, Sultana F, Ahmad R, Kamal ST, Habib TB, Rahman F. Haematopoietic Effects of Amlolol (Emblca officinalis) in Pregnancy with Iron Deficiency Anaemia. Journal of Biosciences and Medicines. 2020 Dec 24;8(12):157.
- Drexler C, Macher S, Lindenau I, Holter M, Moritz M, Stojakovic T, Pieber TR, Schlenke P, Amrein K. High-dose intravenous versus oral iron in blood donors with iron deficiency: The IronWoMan randomized, controlled clinical trial. Clinical Nutrition. 2020 Mar 1;39(3):737-45.
- Hegde AN, Puranik N. Assessment of Neutrophil-Lymphocyte Ratio and Platelet-Lymphocyte Ratio in Iron Deficiency Anemia. International Journal of Clinical and Experimental Physiology. 2020;7(4):146-50.
- Kalra PA, Bhandari S, Spyridon M, Davison R, Lawman S, Mikhail A, Reach D, Pritchard N, McCafferty K, Moore10 J. NIMO-CKD-UK: a real-world, observational study of iron isomaltoside in patients with iron deficiency anaemia and chronic kidney.
- Al-Tikrity M, Babikir MM. Thrombocytopenia secondary to iron deficiency anemia respond to Iron with a transient drop in platelets. Authorea Preprints. 2020 Sep 21.
- Martin-Garcia AC, Arachchilage DR, Kempny A, Alonso-Gonzalez R, Martin-Garcia A, Uebing A, Swan L, Wort SJ, Price LC, McCabe C, Sanchez PL. Platelet count and mean platelet volume predict outcome in adults with Eisenmenger syndrome. Heart. 2018 Jan 1;104(1):45-50.
- Gupta A, Gupta S, Singh A, Khajuria A. Estimation of impedance platelet count and mean platelet volume in cases of severe microcytosis-A prospective study. Indian J Pathol Oncol. 2018 Apr;5:294-7.