

Relationship between Hemoglobin and Platelet CountRitika Kansal¹, Kiran², Sachi Gupta³, Amit Joon⁴¹Associate Professor, Pathology, G S Medical College and Hospital, Pilkhuwa, UP^{2,3}Senior Resident, Pathology, G S Medical College and Hospital, Pilkhuwa, UP⁴Associate Professor, Community Medicine, G S Medical College and Hospital, Pilkhuwa, UP

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Conflict of interest: Nil

Abstract:**Background:** The relationship between haemoglobin level and platelet count was carried among 212 patients with respect to differences between platelet counts within haemoglobin (gm%) level within platelet count.**Methods:** Blood samples were collected into EDTA anticoagulant vials for both platelet count and haemoglobin level of patients.**Results:** Statistical analysis showed significant differences ($p < 0.0001$) between haemoglobin level that fall within platelet count 1.5 to 2.5 lacs/mm³ as (11.79±1.20) and haemoglobin level that fall within platelet count 2.51-4.0 lacs/mm³ as (10.74.1±1.20). statistical analysis also show a significant difference ($p < 0.0001$) between platelet count that fall within the haemoglobin level less than 11 gm% as (2.50±0.50) and platelet count that fall within haemoglobin level of 11-14 gm% as (1.94±0.38).**Conclusions:** The above results indicate that there is a relationship between low and high level of haemoglobin on platelet count and vice versa.**Keywords:** Haemoglobin, Platelet Count, Bone Marrow.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Blood consists of protein rich fluid known as plasma, in which are suspended cellular elements RBC, WBC, Platelets [1].

All blood components are derived from the haematopoietic stem cells of same bone marrow as seen in normal adult haemopoiesis. [2,3], RBC (erythrocytes) is biconcave and round in shape. Size is about 7.5 micron in diameter. RBC contains haemoglobin within it. Life span of RBC is 120 days. They are produced in bone marrow and destroyed mainly in spleen. RBC transports O₂ and CO₂. WBC (Leucocytes) is divided into 2 groups' granulocytes and agranulocytes. Granulocyte contains granules in their cytoplasm and lobed nuclei, granulocytes are neutrophils, basophils, eosinophils. Agranulocytes contain no visible granules in cytoplasm their nuclei are round, oval or bean shaped. Agranulocytes include monocytes and lymphocytes. [4] Main function of WBC is in body defence and immunity.

Haemoglobin, the red colour pigment present inside RBC helps to transport oxygen from lungs to tissues and carbon dioxide from tissues to lungs. Normal Hb in females is 11-16 gm% and in males 12-18 gm. Platelets are small colourless, non-nucleated cells, spherical and irregular in shape, diameter 2-4 microns, normal count 1.5- 4

lacs/mm³. Platelet, formed in bone marrow helps in stopping bleeding. Platelet helps in plug formation, clot retraction and repair of damaged blood vessels. [6,7] Hemoglobinopathies are the most common hereditary disorder and a lot of such patients require blood transfusions. So, a clinical and epidemiological link can be implied, justifying the existing interest in research of this type of processes. [8,9] Earlier studies were conducted on relationship between Hemoglobin and platelet count but very little is known on the relationship between low or high level of haemoglobin on platelet count and vice-versa. This work was therefore carried out to determine this relationship which would be of immense value to both physicians and patients.

Aim and Objective

To determine the relationship between the haemoglobin and platelet count of the same blood sample.

Material and Methods

The present study was done in Dept. of Pathology, G.S Medical College & Hospital, Pilkhuwa. Study population included 212 patients of G.S Medical College & Hospital Pilkhuwa. Sampling technique used was simple random sampling.

Subject of study

A total number of 212 blood samples were collected from patients of G.S Medical College & Hospital were between 18-35years.

Sample Collection: 3 ml of blood was collected from a prominent vein, using the standard venepuncture techniques. 3ml of each patient

sample was dispensed into EDTA anticoagulant vial for Haemoglobin estimation and platelet counts. Haemoglobin Estimation and Platelet Count was measured by Mindary BC-5150 Hematology Analyser. Ethical Clearance was obtained from Institutional Ethical Committee (H), G.S Medical College & Hospital Pilkhuwa.

Results

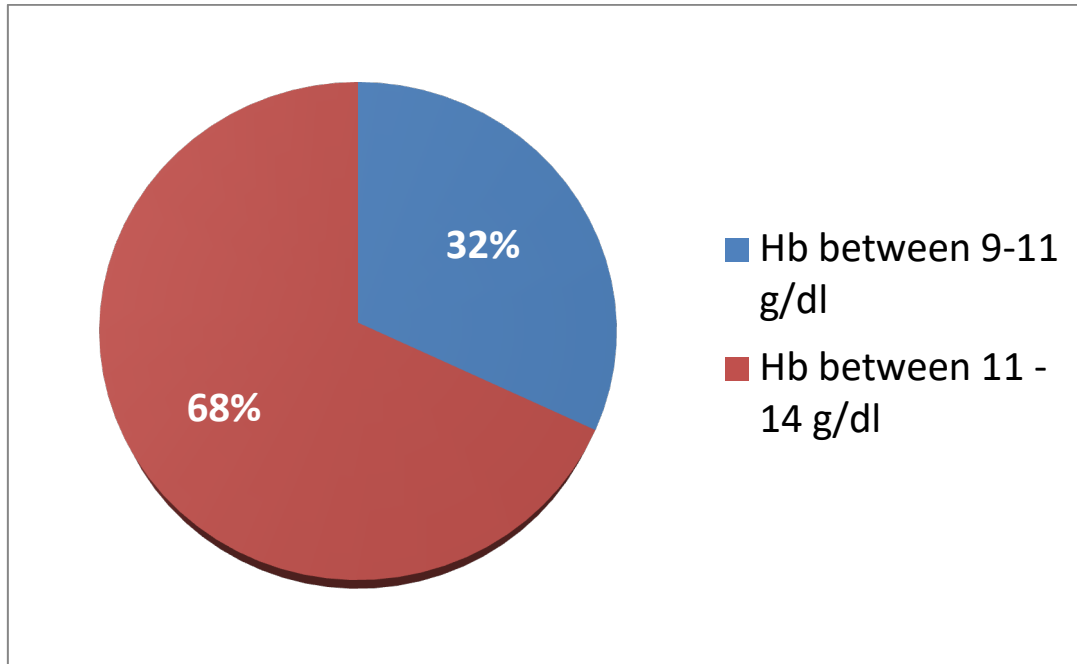


Figure 1: Distribution of 212 patients showed that 32% patients had Hb between 9-11gm% while 68 % had Hb between 11- 14 gm%.

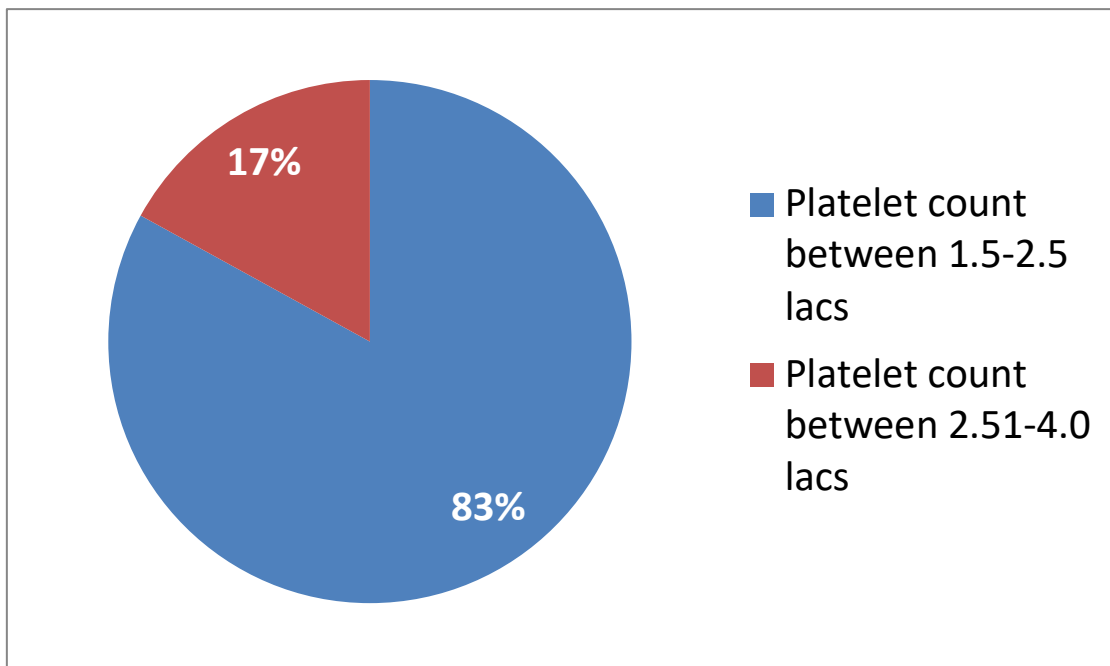


Figure 2: Distribution of 212 patients showed that 83% patients had platelet count between 1.5 -2.5 lacs/mm³ while 17% had platelet count between 2.51-4.0 lacs/mm³.

Table 1: Mean and SD of Hb g/dl level that falls within platelet count of 1.5-2.5 lacs/mm³ (n=176) and Hb g/dl level that fall within 251 – 400 x 10⁹/L platelet count(n=36).

Parameter	Platelet count between 1.5-2.5lacs/mm ³	Platelet count 2.51-4.0 lacs/mm ³	P value
Hb in gm/dl	11.79±1.20	10.74±1.20	p < 0.0001

Table 2: Mean and SD of Platelet count that fall within Hb level <11 g/dl, (n=68) and platelet Count that fall within Hb g/dl level 11-14 g/dl, (n=144).

Parameter	Hb between 9 – 11 gm/dl	Hb between 11-14 gm/dl	P value
Platelet count in lacs/mm ³	2.50±0.50	1.94±0.38	p <0.0001

Discussion

This study was conducted to establish the relationship between platelet count and haemoglobin level. Platelets are small, irregular shaped clear cell fragments which lacks nucleus containing DNA, they are derived from the fragmentation of precursor megakaryocytes [10]. They circulate in the blood of mammals and are involved in haemostasis leading to the formation of blood clot.

Haemoglobin is defined as an iron-containing oxygen transport metallo-protein in the red blood cell of all vertebrates [11]. Haemoglobin formation continue in RBC throughout its early development from pro-erythroblast to reticulocyte in bone marrow.[12]

The principal function of haemoglobin is to carry oxygen from the lungs to the tissues to burn nutrients to release energy and also to carry the resultant carbon- dioxide back to the lungs to be dispensed from the organism [13]. This study was conducted to find out the relationship between platelet count and haemoglobin level. In our study, we found that 32% patients had Hb between 9-11gm percent while 68% had Hb between 11- 14 gm%.

In our study, 83% patients had platelet count between 1.5 -2.5 lacs/mm³ while 17% had platelet count 2.51-4.0 lacs/mm³. It was in accordance with the findings of Okoroiwu et al [14] where 57% students had platelet count between 1.5 -2.5 lacs/mm³ while 43% had platelet count 2.51-4.0 lacs/mm³.

Our study found significantly (p value <0.0001) higher mean Hb count (11.79±1.20 gm/dl) when platelet count was in between 1.5- 2.5 lacs/mm³ compared to Hb count (10.74±1.20 gm/dl) when platelet count was 2.51-4.0 lakcs/mm³. Similar significant finding was observed in the study conducted by AS Berad et al. [4] and Sen et al.[15]. Study conducted by Okoroiwu et al [14] found similar findings, however not significant.

Significant difference in Platelet count (p value< 0.0001) within normal range was observed in our study when Hb was between 9 – 11 gm/dl and when Hb 11-14 gm/dl. Similar significant finding was observed in the study conducted by AS Berad

et al [5], Sen et al.15 and study by Okoroiwu et al. [14]

The reason for the relationship between low and high platelet count on haemoglobin level and low and high haemoglobin level on platelet count, may be linked to fact the blood components originates from the same bone marrow as seen in normal adult haematopoiesis. It is assumed that what affects the bone marrow would affect all the cells including the haemoglobin level and the platelet.

Similarly, a study done by J. Borawski et al showed that some factors involved in platelet aggregation process exert an inhibitory effect on erythropoiesis. [16]

Similar finding was obtained in a study done by S G Rivere et al [17]. In a study done by Ray S et al [18], the platelet count was found to be negatively correlated with hemoglobin concentration (r-value - 0.157 and p-value 0.042). Likewise, a study done by Ram Mohan A et al [19] showed inverse relationship between the hemoglobin concentration and the platelet count. In contrast, in a study conducted by Jadhav SU et al [20] the platelet count was found to be decreasing along with the reduction in the hemoglobin concentration level.

Conclusion

Since low platelet count shows increase haemoglobin level, high platelet count showed low haemoglobin level, low haemoglobin level shared high platelet count and high haemoglobin level showed low platelet count, it can be concluded that there is a significant relationship between low and high platelet count on haemoglobin level and low and high haemoglobin level on platelet count. The evaluated relationship will enable scholars for diagnosing purposes.

Ethical Clearance: Taken from ethical committee of G S medical college.

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