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RESEARCH ARTICLE

RELATIONSHIP BETWEEN HEMOGLOBIN AND PLATELET COUNT AMONG MBBS STUDENTS

Abirlal Sen[1] and Geeta Baruah[2]

1. MD Physiology, Former Post Graduate Trainee,Dept. of Physiology,Jorhat Medical College, Assam, India.
2. Professor, Head, Dept. of Physiology, Jorhat Medical College, Assam, India.

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Abstract

Introduction: Haemoglobin is the red colour pigment present inside RBC. All the blood components are derived from the haematopoietic stem cells of the same bone marrow. Factors affecting the bone marrow also affects all the cells including the haemoglobin level and the platelet count. Less is known on the relationship between low or high level of haemoglobin on platelet count. This work was therefore carried out to determine this relationship.

Materials And Methods: The study was done in Dept. of Physiology, Jorhat Medical College. Study population included 100 undergraduate medical students of age 18-25 years . Haemoglobin Estimation & Platelet Count will be measured by ACCUREX ACCULAB CBC 360+ HEMATOLOGY Analyser Machine. Ethical Clearance was obtained from Institutional Ethical Committee (H), Jorhat Medical College, Jorhat. Student's unpaired t- test was used to compare the mean values of study variables and other parameters in relation to the study. The P value <0.05 was considered as significant.

Results: We found that mean Hb count is 10.91±1.05 and 10.22±0.83 respectively when platelet count in between 1.5- 2.5 lakhs/mm^3 and >2.5 lakhs/mm^3. Mean Platelet count came 2.59±0.58 lakhs/mm^3 and 1.89±0.62 respectively when Hb between 9 – 11 gm/dl and >11 gm/dl.

Conclusion: The reason for the relationship between low and high platelet count on hemoglobin level may be linked to the normal physiology of hematopoiesis where the origin of all blood components occurs in the bone marrow. This leaves scope for further research to use in therapy like Plateletpheresis where lower hemoglobin concentrations meant higher platelet yield and vice versa.

Introduction:-

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%.[1]

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 .[2,3]

Corresponding Author:- Abirlal Sen
Address:- MD Physiology, Former Post Graduate Trainee, Dept. of Physiology, Jorhat Medical College, Assam, India.

Normally, around 10^{11} - 10^{12} blood cells are produced everyday to maintain homeostasis. All blood components are derived from the haematopoietic stem cells of same bone marrow as seen in normal adult haemopoiesis. [4,5] Factors affecting bone marrow also affects all cells including haemoglobin level and platelet count.

Most platelet disorders are associated with Anaemia. Also, it is found that in Plateletpheresis, donor platelet count and hemoglobin concentrations influence platelet yield. Higher platelet count leads to higher yield while hemoglobin shows inverse relationship i.e lower Hb concentration means higher the platelet yield and vice vesa.

There is a recent interest about the Plateletpheresis procedure regarding the importance of donation and the need for research as it may be one of the most often conducted procedures in transfusional medicine.[6]

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. [7,8]

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 scholars.

Aim And Objective:-

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

Materials And Methods:-

The present study was done in Dept. of Physiology, Jorhat Medical College. Study population included 100 undergraduate medical students of Jorhat Medical College. It was a institution based cross-sectional observational study. Sampling technique used was simple random sampling.

The study included students volunteers of age 18-25 years who gave consent for the study and whose Hemoglobin and platelet count were within normal range i.e Hb (male 11-14gm/dl and females not less than 9 mg/dl, and platelet: 1.5 to 4 lacs/mm^3.

3 ml of blood was collected from each subject, from a prominent vein,using the standard venepuncture techniques. This was dispensed into EDTA anticoagulant bottle.

Haemoglobin Estimation and Platelet Count was measured by ACCUREX ACCULAB CBC 360+ HEMATOLOGY Analyser Machine. Consent letter was obtained from all subjects before collection. Ethical Clearance was obtained from Institutional Ethical Committee (H), Jorhat Medical College, Jorhat.

Statistical Analysis

The response frequencies and descriptive statistics like mean and standard deviations were calculated and analyzed using MS Excel. Student's unpaired t- test was used to compare the mean values of study variables and other parameters in relation to the study. The P value <0.05 was considered as significant and P<0.01 and P<0.001 was considered as highly and extremely highly significant respectively.

Results:-

Distribution of 100 participants showed that 59% students had Hb between 9-11gm% while 41% had Hb between 11- 14 gm% **(Figure 1)**

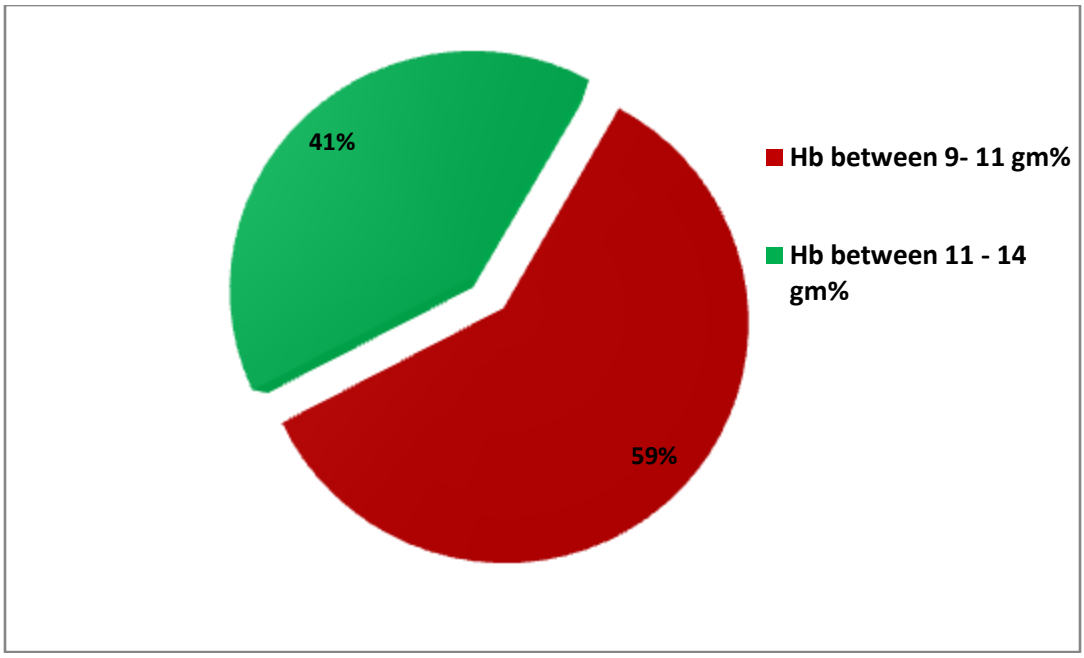

Figure 1:- Distribution of Study participants on the basis of Hb%.

Distribution of 100 participants showed that 68% students had platelet count between 1.5 -2.5 lakh/mm^3 while 32% had platelet count between >2.5 lakh/mm^3 **(Figure 2)**

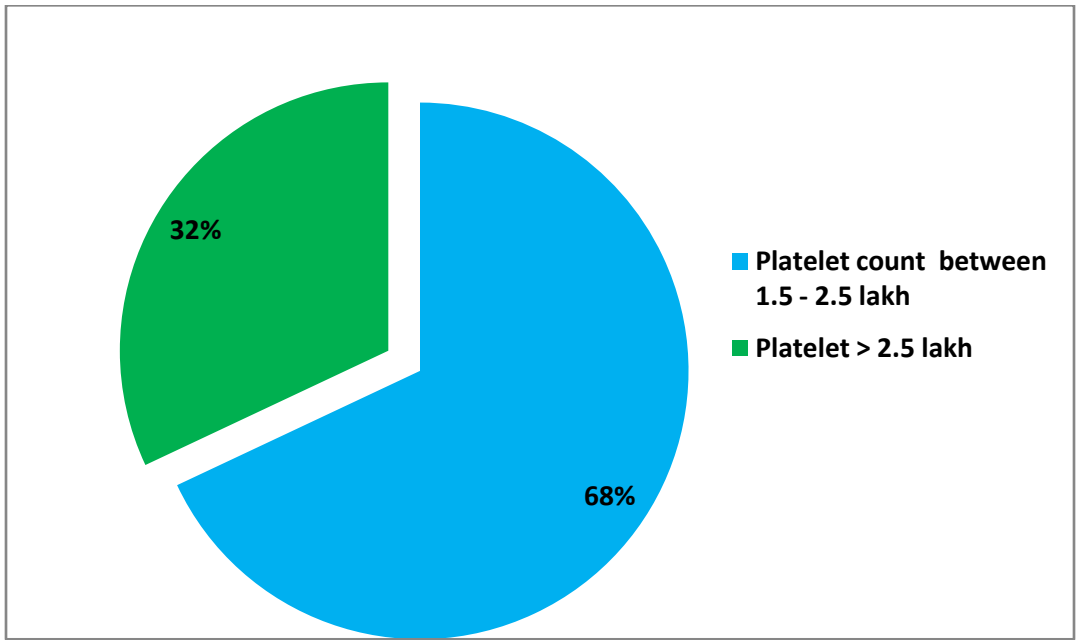

Figure 1:- Distribution of Study participants on the basis of Platelet count.

Table 1 shows that mean Hb count in gm/dl when platelet count in between 1.5- 2.5 lakhs/mm^3 is 10.91±1.05 while mean Hb count in gm/dl when platelet count >2.5 lakhs/mm^3 is 10.22±0.83. This came out to be significant by Student's t-test.(p = 0.0008).

Table 1:- Mean and SD of Hbg/dl level that falls within platelet count of 1.5-2.5 lakh/mm^3 (n=68) and Hbg/dl level that fall within 251 - 400xl09/L platelet count(n=32).

Parameter	Platelet count between 1.5-2.5 lakh/mm^3	Platelet count >2.5 lakh/mm^3	P value
Hb in gm/dl	**10.91±1.05**	**10.22±0.83**	**p = 0.0008**

Table 2 shows that mean Platelet count in lakhs/mm^3 when Hb between 9 – 11 gm/dl is 2.59±0.58 and mean Platelet count in lakhs/mm^3 when Hb is >11 gm/dl is 1.89±0.62 This came out to be significant by Student's t-test (p value<0.0001) .

Table 2:- Mean and SD of Platelet count that fall within Hb level less than ll(eleven) g/dl, (n=59) and platelet Count that fall within Hbg/dl level 11-14 g/ld, (n=41).

Parameter	Hb between 9 – 11 gm/dl	Hb between 11-14 gm/dl	P value
Platelet count in lakhs/mm^3	**2.59±0.58**	**1.89±0.62**	**p <0.0001**

Discussion:-

This study was conducted to find out the relationship between platelet count and haemoglobin level. In our study, we found that 59% students had Hb between 9-11gm% while 41% had Hb between 11- 14 gm% **.**Our study finding was similar to the findings of Okoroiwu et al where 67% students had Hb between 9-11gm% while 33% had Hb between 11- 14 gm%.[5]

Also, in our study, 68% students had platelet count between 1.5 -2.5 lakh/mm^3 while 32% had platelet count >2.5 lakh/mm^3. It was in accordance with the findings of Okoroiwu et al[5] where 57% students had platelet count between 1.5 -2.5 lakh/mm^3 while 43% had platelet count >2.5 lakh/mm^3.

Our study found significantly (p = 0.0008) higher mean Hb count (10.91±1.05 gm/dl) when platelet count was in between 1.5- 2.5 lakhs/mm^3 compared to Hb count (10.22±0.83 gm/dl) when platelet count was >2.5 lakhs/mm^3 .Similar significant fining was observed in the study conducted by AS Berad et al.[4] Study conducted by Okoroiwu et al[5] 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 gm/dl. Similar significant fining was observed in the study conducted by AS Berad et al [4] and study by Okoroiwu et al.[5]

Similarly, a study done by J. Borawski et al showed that some factors involved in platelet aggregation process exert an inhibitory effect on erythropoiesis.[9]

From the result above, it is observed that when there is low platelet count (1.5- 2.5 lakhs/mm^3) there is higher haemoglobin level and when platelet count is high (>2.5 lakhs/mm^3) haemoglobin level is comparatively reduced. Also, when there is low haemoglobin level, (below 11 mg/dL), there is higher platelet count and if haemoglobin level is high (ll-14g/dl),there is compartatively low platelet count.

Similar finding was obtained in a study done by S G Rivere et al[10] .In a study done by Ray S et al[11], 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[12] showed inverse relationship between the hemoglobin concentration and the platelet count. In contrast, in a study conducted by Jadhav SU et al[13] the platelet count was found to be decreasing along with the reduction in the hemoglobin concentration level.

Blood components originates from the same bone marrow as seen in normal adult haematopoiesis. Relationship between low and high platelet count on haemoglobin level and low and high haemoglobin level on platelet count can be based on this. Factors affecting the bone marrow also affects all the cells including the haemoglobin level and the platelet count.[14]

The erythropoietin (EPO), regulator of erythropoiesis has structural similarity with thrombopoietin (TPO) , the stimulator of megakaryopoiesis. Increased EPO and its structural analogy to TPO have been also considered as a possible mechanism for such platelet count variation.[10]

Conclusion:-

It is evident from our study that there is variation in platelet count within normal range when Hemoglobin level fluctuates and vice versa.

This evaluated relationship will enable researchers for diagnostic purposes as most platelet disorders are associated with anaemia. Also, in Plateletpheresis , higher platelet count of donor corresponds to higher yield while hemoglobin shows an inverse relationship, i.e., lower hemoglobin concentrations meant higher platelet yield and vice versa.

This leaves scope for further research to use in therapy like Plateletpheresis for better yield of platelets.

References:-

1. Review of medical physiology, Ganong 23rd edition. Blood as circulating fluid. 2010;522.
2. Johnson L. Essentials of medical physiology 3rd edition. 2003;89-91
3. Hall JE, AC G. Guyton and Hall textbook of medical physiology. 13th Edition.
4. Berad AS, Gurbani N. To study relation of haemoglobin level and platelet count. Int J Res Med Sci 2016;4:4759-61.
5. L.I. Okoroiwu , Ifeanyi Emmanuel Obeagu, Doris Adaka et al The Relationship between Platelet Count and Haemoglobin Level Scholars Academic Journal of Biosciences (SAJB) ISSN 2321-6883 (Online) Sch. Acad. J. Biosci., 2015; 3(8):679-682.
6. Gil-Betacur A, Mantilla-Gutiérrez CY, Cardona-Arias JA. Effect of plateletpheresis on hematocrit, hemoglobin and erythrocyte count: meta-analysis 1980–2018. Scientific reports. 2019 Dec 24;9(1):1-8.
7. Mohanty, D., Colah, R. B. & Gorakshakar, A. C. Prevalence of β -thalassemia and other haemoglobinopathies in six cities in India: a multicentre study. Community Genet. **4**(1), 33–42 (2013).
8. Munshi, A. et al. Inherited hemoglobin disorders in Andhra Pradesh, India: A population study. Clin Chim Acta J. **400**(1-2), 117–9 (2009).
9. Borawski J, Rydzewski A, Mazerska M, Kalinowski M, Pawalak K, Mysliwiec M. Inverse relationships between haemoglobin and ristocetin-induced platelet aggregation in haemodialysis patients under erythropoietin therapy. Nephrology Dialysis Transplantation. 1996 Dec 1;11(12):2444-8.
10. Guerrero-Rivera S, Gutiérrez-Espíndola G, Talavera JO, Meillón-García LA, Pedraza-Echevarría M, Pizzuto-Chávez J. Hemoglobin and platelet count effect on platelet yields in plateletpheresis. Archives of medical research. 2003 Mar 1;34(2):120-3.
11. Ray S, Chandra J, Sharma S. Clinico-hematological study of abnormalities of platelet count in children with iron deficiency anemia. Int J Contemp Pediatrics. 2019;6:1519-23.
12. Rammohan A, Awofeso N, Robitaille MC. Addressing female iron-deficiency anaemia in india: is vegetarianism the major obstacle? ISRN Public Health. 2012;2012:1-8.
13. Jadhav SU, Khaparde S. Study of the red cell indices, hemogram and platelet variations in anaemic (<10gm%) patients by automatic cell counter in a tertiary care centre. Ahmednagar, Maharashtra, India. 2017;5:1582-8.
14. Kafle SU, Singh M, Kafle N, Sinha A. Hemogram components and platelets count variation in anemic patients attending Birat Medical College and Teaching Hospital, Morang, Nepal. Journal of Pathology of Nepal. 2021 Mar 20;11(1):1825-9.