

A Comparative Study of Plasma Protein and Hemoglobin in 18-21 Years Age Group Students of MGM Medical College, Jamshedpur, Jharkhand

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ABSTRACT

Background: Anaemia is a global public health problem. In India, Jharkhand state is one of the states where under nutrition is highly prevalent. Most of the health problems like low immunity, Anaemia, hypoproteinemia arise due to low protein intake. During erythropoiesis, Haemoglobin synthesis requires protein, Vitamin B₁₂, Folic acid, Vitamin C as well as minerals like Fe, Cu etc. Adequate nutrition is of prime importance and this is reflected in plasma also.

Objectives: To assess the level of Hb and plasma protein among study subjects with a co-relation of Hb with plasma protein.

Materials and Methods: Present study was undertaken at MGM Medical College, Jamshedpur. 177 participants were selected for the study and the data were obtained on different variables. Blood samples were also taken from the participants.

Results: Most of the study subjects were anaemic. Anaemia was more common among female subjects in comparison with males. The present study found a positive co-relation between Hb and Plasma protein.

Conclusion: There is a strong co-relation observed between plasma protein, daily protein intake, and BMI with haemoglobin.

Keywords: Plasma Protein-PP, Hemoglobin-Hb, Hypoproteinemia, Anemia, Protein intake, Body Mass index-BMI.

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INTRODUCTION

Anemia and under nutrition remains a global public health problem despite the economic and social development in world. The scenario of under nutrition remains a major challenge for us. As per NFHS-4 survey, it has been found that approximately 22.9% of females and 20.2% males were undernourished in the country. Similarly, 53% of females and 23% of males were found anemic.¹ With the similar observation of NFHS-4, Jharkhand also has a high prevalence of both under nutrition and anemia. Approximately, 31.5% of females and 23.8% males were found undernourished whereas 65.2% of females and 29.9% males were anemic in Jharkhand.¹ A similar study was conducted by IMA in 2015 through camp survey in Jharkhand reported the prevalence of anemia among young adult female was 75%. A similar observation by UNICEF in the year 2013 found a prevalence of 56.2% anemic in Jharkhand.

The basic physiology of heme synthesis depends on various factors including amino acids, Fe⁺⁺, Cu, B₁₂ Folic acid, Vit C, Erythropoietin, Thyroxin etc.²

The relation of protein to Hemoglobin building was stated by P.B Pearson in 1937 in rats.³

Various studies have established the relationship between hypoproteinemia and under nutrition. Inadequate dietary protein intake may lead to anemia. The relation between serum albumin and Hemoglobin has been found to be strongly associated.⁴

WHO has recommended the normal level of plasma protein varies between 6gm/dl to 8.5gm/dl, and the level below 6gm/dl of plasma protein is marked as Hypoproteinemia.

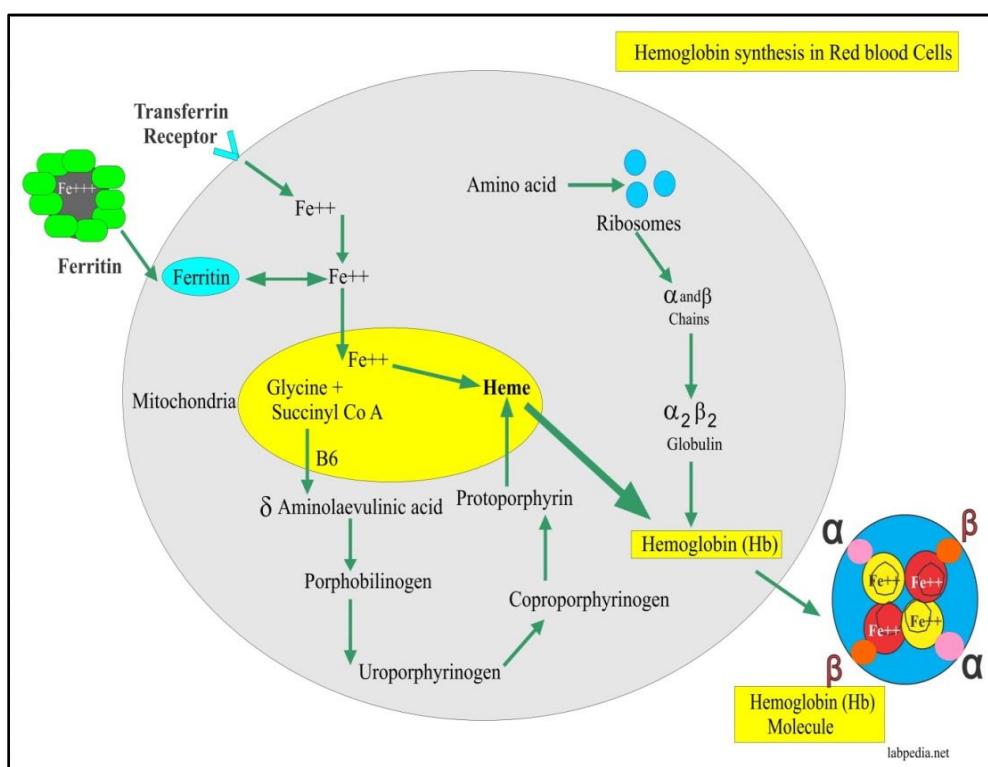
The fractions and functions of total Plasma protein is as shown in following table 1.

(NCBI Bookshelf <https://emedicinemedscope.com>)

Table 1: Fractions and functions of total Plasma protein

Type of Protein	Fraction	Function
Albumin	60% (3.5 - 5 gm/dl)	Oncotic pressure & Transport of many substances
Immunoglobulin	18% (1 - 1.5 gm/dl)	Immunity
β globulin	1% (0.1gm/dl)	Transport
Fibrinogen	4% (0.3-0.45 gm/dl)	Blood Coagulation

Agrawal R in his study found a role of vitamins such as Vit.B₁₂, Folic acid, minerals such as iron and protein is well established for the synthesis of Hemoglobin with the help of hormone "Erythropoietin".⁵ Dietary Proteins after digestion and absorption gets converted into Amino acids and the protein synthesis takes place in liver. The level of total Plasma protein can be low due to low intake of protein in diet. Anemia and Protein energy malnutrition remains a major health problem in the country with its impact on Jharkhand widely because of cultural, social and economic factors. The state has also adopted the Government of India policy of "Anemia Mukt Bharat". Protein remains a major constituent part of balance diet as per recommendation. In presence of PEM, the protein demand increases. This present study has been selected to assess the status of protein intake among medical and paramedical students as well as to study the presence of anemia among these sub-groups along with a correlation between plasma protein and hemoglobin.

**Fig: Physiology of Hemoglobin Synthesis (Source: labpedia.net)**

OBJECTIVE

- To assess the serum level of plasma protein and hemoglobin level among 18-21 years age group students of MGMMC, Jamshedpur.
- To study the co-relation of plasma protein with hemoglobin level in studied participants.

MATERIALS & METHODS

The present study is an observational cross-sectional study carried out at MGM Medical College, Jamshedpur of East Singhbhum district. The study subjects were the students of MGM Medical College both medical and paramedical students. The age group of study subject were between 18-21 years. The study was conducted from September 2018 to July 2019. The sample size calculated as per formula was 267.

Due to constraints and non-availability of participants with consent, only 177 students participated in the study. The students were counselled in the class room regarding the purpose of study. Written consent was obtained from study subjects. The study subjects were interviewed in details one by one by the research team in a preformed pre-tested questionnaire form, after obtaining written consent. The study subjects were provided a Performa to fill regarding diet history of previous day to calculate the dietary intake. The diet history was obtained for seven continuous days. A systemic examination of all study subjects was done. The blood sample was collected on 8th day of the study subjects.

Total number of study subjects: 177

Study Area: Mahatma Gandhi Memorial Medical College, Jamshedpur, East Singhbhum.

Study Period: September 2018 to June 2019.

Inclusion Criteria: All medical and paramedical students of medical college who had given consent for study.

The individuals were asked about the personal details as per the pre-designed and pre-tested proforma.

Method of Laboratory Testing

The test for plasma protein was performed by Biuret method with automated chemistry analyser (EM200 by Transasia) and Haemoglobin was measured by HEMOCOR-D (Cyanmethaemoglobin) method based on colorimeter system, in Multi-Disciplinary Research Unit, of MGM Medical College, Jamshedpur. The study was approved by the Ethical Committee of MGM Medical College Jamshedpur, Jharkhand and Local Research Advisory Committee of DHR (ICMR) MoHFW, Government of India. The data was analysed on SPSS.

RESULTS AND DISCUSSION

The sample size for the present study was calculated to be 267, but the data were collected from only 177 students. The samples were collected from both medical students (131) and paramedical Students (46).

Age Distribution of Study Subjects

The mean age of the study subject was 20.08 Years (± 0.926) years with a range of 18-21 years. Three fourth of the students were at the age of 20 and 21 years.

Sex Distribution of Study Subjects

Most of study subjects (74%) were male in both medical and paramedical group.

Table 2: Sex wise distribution of Study Subjects

Gender	Medical	Para-medical	Total
Male	59	72	131 (74%)
Female	32	14	46 (26%)
Total	91	86	177

Height, Weight and BMI of Study Subjects

Mean height of study subjects was $164.38\text{cm} \pm 9.247$ cm with a range of 142 cm to 182 cm. The mean weight was observed $56.23\text{kg} \pm 9.962$ with a range of 37 kg to 86 kg.

The mean BMI of the study subject was 20.86 (± 2.89) years with a range of 15.6-29.4. Two third (66.7%) of the study subjects were having normal BMI (in the range of 18.5-24.99) whereas 23.2% of participants were of low BMI (<18.5) and approximately 10.2% were obese ($BMI \geq 25$).

Protein Intake of Study Subjects

Averages mean daily protein intake among participants was observed 38.338 ± 9.9033 with a range of 13.5 to 86.2 gm.

Plasma Protein of Study Subjects

Measured Plasma protein of participants was observed 7.7180 ± 6.5720 with a range of 4.6 to 10.11 gm.

Protein Intake of Study Subjects

Averages mean daily protein intake among participants was observed 38.338 ± 9.9033 with a range of 13.5 to 86.2 gm.

Hb level of study subjects

As per WHO criteria⁷, almost 50% of study subjects were found anemic. Anemia was more common among female subjects in comparison with males. 21% males were anemic of mild category whereas 76.74% of females were anemic of mild and moderate (45.34%) degree.

Table 3: Variables of Study Subjects

Variables	Minimum	Maximum	Mean \pm SD
Age	18	22	20.08 ± 0.926
Height	142cm	182cm	$164.38\text{cm} \pm 9.247$
Weight	37kg	86 kg	$56.23\text{kg} \pm 9.962$
BMI	15.6	29.40	20.8698 ± 2.89317
Average Daily Protein Intake	13.5gm	86.2gm	38.338 ± 9.9033
Plasma Protein	4.6gm/dl	10.11gm/dl	7.7180 ± 6.5720
Hemoglobin gm%	8.21gm/dl	16.88gm/dl	12.5106 ± 1.90823

Under nutrition and anemia remains a global public health problem. Usually the medical students reside in hostel whereas paramedical students don't have hostel facility and they have to stay on their own arrangements. This differentiates their dietary intake. None of the participants were having any acute or chronic illness and all were in the age group of 18 to 21 years.

In both medical and paramedical group, females (70.6%) were more anemic than males (15.4%). Higher degree of anemia in females may be explained with diet deficient in iron and menstrual blood loss.

The present study was done to assess a co-relation between plasma protein and haemoglobin as well as with daily protein intake and haemoglobin.

Table 4: Statistical Results of present study

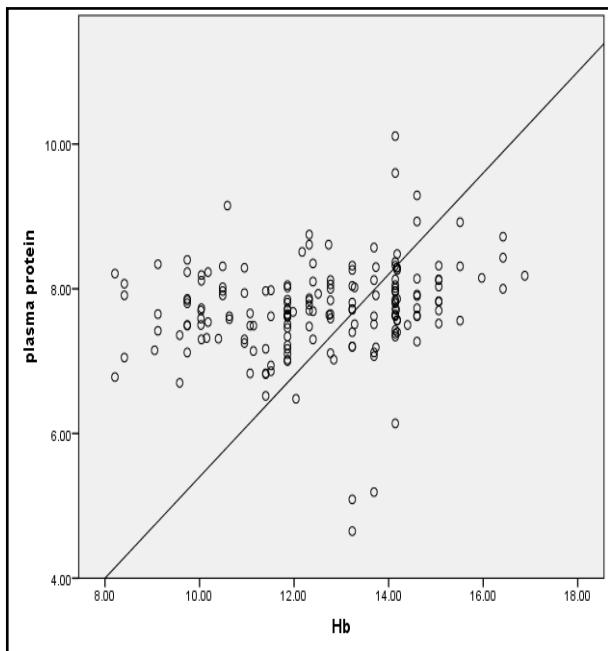
Variables	Pearson Correlation Value (r-value)	P-Value
Sex	0.728	0.000
Height	0.563	0.000
Weight	0.467	0.000
BMI	0.154	0.041
Daily Protein Intake	0.255	0.001
Plasma Protein	0.192	0.011

A significant ($p<0.05$) positive co-relation was observed between plasma protein ($r=0.192$) and haemoglobin. Similar results were found with daily protein intake, and Body Mass Index.

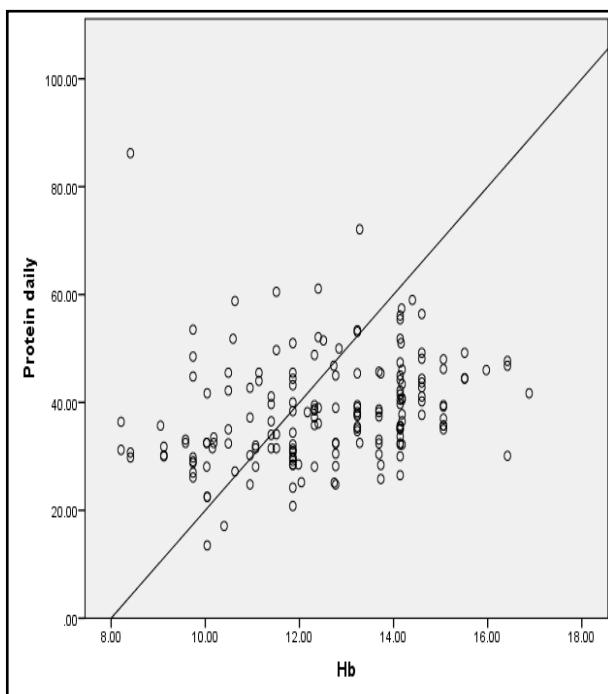
Pearson P.B et al in his experiment in the year 1937 on Rats found a strong relation of plasma protein to Hemoglobin building.

Role of dietary protein in hemoglobin formation was also stated by Orten Aline underhill has in his study in 1943.⁶ There was a relation between hemoglobin and serum Albumin. Agrawal R et al. in their study on hemodialysis patients observed a strong association between serum albumin and erythropoietin sensitivity.⁵ As the previous study on this co-relation were not available, it is very difficult to compare. This needs further research on this subject.

Graph 1: Co-relation between Plasma protein and Haemoglobin



Graph 2: Co-relation between Daily protein intake and Haemoglobin



LIMITATIONS

The study includes the medical and paramedical students, which may not represent the entire population with respect to region or ethnicity. This study is a descriptive cross-sectional study. A significant correlation was observed between Hemoglobin with different variables, further studies required to be carried out to establish.

FINANCIAL SUPPORT

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Conflict of Interest: None Declared.

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