

Original article :

Relationship between Haemoglobin Levels and Body Mass Index amongst Patients Reporting to Tertiary Care Centre

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Abstract

Background: Anaemia is a clinical condition characterised by decrease in level of haemoglobin or decrease in the red blood cell count. Haemoglobin levels have also been associated with body mass index but the association is not very clear. There is scarcity of data on the population in general but certain studies have been conducted amongst medical students. Therefore the present study was conducted to establish an insight towards the association between haemoglobin levels and body mass index amongst general population reporting to the department.

Materials and methods: The present prospective study was cross sectional in nature and was conducted in the Department of Medicine, Major S D Medical College, Farrukhabad, Uttar Pradesh, India. The study was conducted over a period of 1 year. Body mass index was measured using the formula weight divided by height in square meter. BMI greater than 25 kg/m² were obese. Patients with haemoglobin levels less than 11gm/dl were considered as anemic. The entire data was arranged in a tabulated form and analysed using SPSS software. Student t test was applied as a test of significance and p value of less than 0.05 was considered significant.

Results: The present study enrolled 300 subjects; the mean age of the subjects was 37.48 +/- 4.67 years. Out of these 62% (n=186) were males and 38% (n=114) were females. There were only 10.2% (n=19) males with haemoglobin levels less than 12 gm/dl compared to 62.3% (n=71) females. There were 89.8% (n=167) males and 37.7% (n=43) females with haemoglobin levels more than 12 gm/dl. BMI was less than 18.5 kg/m² in 4.8% (n=9) males and 8.7% (n=10) females.

Conclusion: In our study, anaemia was more common amongst women. No significant difference was observed in the body mass index between males and females but the level of haemoglobin showed significant variation between males and females.

Keywords: Anaemia, Haemoglobin, Obesity, Prevalence.

INTRODUCTION

Anaemia is a clinical condition characterised by decrease in level of haemoglobin or decrease in the red blood cell count.¹ It is prevalent in both developed and developing nations of the world. According to World Health Organisation, anaemia is prevalent in 29% of males and females aged between 15-49 years of age.² According to a survey anaemia is prevalent in 50.8% of females and 19% males of Karnataka.³

The economic and social development of a nation along with the person's health are influenced by levels of haemoglobin. Various factors affecting the levels of haemoglobin are dietary intake, presence or absence of infections, deficiency of micronutrient and intestinal infections. Decrease in the level of haemoglobin decreases the productivity of humans and influences its cognitive and physical development.⁴ Various non-communicable diseases like obesity and overweight are at surge in

developing nations along with undernutrition.⁵ Correlation between Iron levels, fat masses and Body mass index have been established by various studies.^{6,7} Haemoglobin levels have also been associated with body mass index but the association is not very clear. There is scarcity of data on the population in general but certain studies have been conducted amongst medical students. According to a study conducted by Saxena et al amongst students of Himalayan medical institute, there is an inverse relationship between haemoglobin levels and body mass index.⁸ Therefore the present study was conducted to establish an insight towards the association between haemoglobin levels and body mass index amongst general population reporting to the department.

MATERIALS AND METHODS

The present prospective study was cross sectional in nature and was conducted in the Department of Medicine, Major S D Medical College, Farrukhabad, Uttar Pradesh, India. The study was conducted over a period of 1 year. Ethical committee clearance was obtained from the institutional ethical board prior to the initiation of the study. All the subjects were informed about the study and a written consent was obtained from everybody in their vernacular language. Subjects more than 55 years and less than 20 years were excluded from the study. Patients belonging to ASA III or IV were excluded from the study. Subjects taking any medications that can cause weight gain or weight loss were also excluded from the study. Trained personnel collected all the measurements in a standardised manner. Height of the subjects was measured using a wall mounted measuring tape. Weight was measured in kilograms and the subjects were wearing light clothes. Body mass

index was measured using the formula weight divided by height in square meter. Body mass index is a marker that is not dependent on age and gender of the subjects. Overweight subjects had BMI more than 23 kg/m². BMI greater than 25 kg/m² were obese. Sahli's Haemoglobinometer was used to measure the haemoglobin levels. Patients with haemoglobin levels less than 11gm/dl were considered as anemic. The entire data was arranged in a tabulated form and analysed using SPSS software. Mean +/- SD was used to express the entire data. Student t test was applied as a test of significance and p value of less than 0.05 was considered significant.

RESULTS

The present study enrolled 300 subjects; the mean age of the subjects was 37.48 +/- 4.67 years. Out of these 62% (n=186) were males and 38% (n=114) were females. Majority of the subjects were between 20-30 years of age i.e. 35.7%. There were 35% (n=105) aged between 31-40 years. Least number of subjects were between 51-55 years i.e. 10% (n=30). There were 19.3% (n=58) subjects aged between 41-50 years. (Table 1, graph 1) Table 2 shows the haemoglobin levels and BMI between males and females involved in the study. There were only 10.2% (n=19) males with haemoglobin levels less than 12 gm/dl compared to 62.3% (n=71) females. There were 89.8% (n=167) males and 37.7% (n=43) females with haemoglobin levels more than 12 gm/dl. BMI was less than 18.5 kg/m² in 4.8% (n=9) males and 8.7% (n=10) females. BMI was between 18.5- 22.9 in total of 47% (n=141) subjects. There were 37.1% males and 63.2% females in this group. There were 48.9% (n=91) males and 22.8% (n=26) females with BMI between 23-24.9 kg/m². BMI was more than 25 in only 7.7% subjects i.e. 23 subjects. Table 3 shows the mean value of various variables. The mean age

amongst males and females was 35.24 +/- 2.78 and 32.28 +/- 2.82 respectively. There was no significant difference between mean age of males and females. The mean haemoglobin concentration was 14.79 +/- 1.55 amongst the males and 13.25 +/- 2.16 amongst the females. On applying student t test, there was a significant difference in the haemoglobin values amongst males and females. The mean height amongst males and females was 15.31 +/- 1.41 and 12.43 +/- 3.62 respectively. There was a significant difference between height of males and females. The mean weight amongst males and females was 75.87 +/- 5.47 and 68.59 +/- 6.12 respectively. There was significant difference in the weight amongst males and females. The mean BMI amongst males was 24.62 +/- 4.51 and females were 22.38 +/- 2.27. There was no significant difference amongst them

DISCUSSION

Anaemia is indicative of poor nutrition and poor general health of the subjects. Vast majority of reasons are responsible of anaemia. Various factors affecting the levels of haemoglobin levels leading to anaemia are dietary intake, presence or absence of infections, deficiency of micronutrient and intestinal infections. The demographic distribution in the present study was, majority of the subjects were between 20-30 years of age i.e. 35.7%. There were 35% (n=105) aged between 31-40 years. Least number of subjects were between 51-55 years i.e. 10% (n=30). There were 19.3% (n=58) subjects aged between 41-50 years. Decrease in the level of haemoglobin decreases the productivity of humans and influence its cognitive and physical development. The major cause in developing nations is iron deficiency. The problem of obesity is becoming an increase

concern of health in developing and developed nations.^{9,10} Obesity is also associated with increased risk of cardiovascular diseases, mortality and nutritional problems.^{11,12} Obesity is multifactorial in etiology as both genetic and environmental factors play a role in its causation. There is an increased uptake of fermentable carbohydrates and sedentary lifestyles that are increasing the incidence of obesity.^{13,14} Environmental factors include improper eating habits like the use of fermentable carbohydrates.^{13,14} In the present study, there were only 10.2% (n=19) males with haemoglobin levels less than 12 gm/dl compared to 62.3% (n=71) females. There were 89.8% (n=167) males and 37.7% (n=43) females with haemoglobin levels more than 12 gm/dl. BMI was less than 18.5 kg/m² in 4.8% (n=9) males and 8.7% (n=10) females. BMI was between 18.5- 22.9 in total of 47% (n=141) subjects. There were 37.1% males and 63.2% females in this group. There were 48.9% (n=91) males and 22.8% (n=26) females with BMI between 23-24.9 kg/m². BMI was more than 25 in only 7.7% subjects i.e. 23 subjects. Prevalence of anaemia was lesser amongst males compared to females due to the effect of testosterone which increase the production of haemoglobin and rate of erythropoiesis. Few studies establish this correlation. There was a positive correlation between the serum iron levels and waist to hip ratio, according to a study by Ausk KJ.¹⁶ In our study, the mean haemoglobin concentration was 14.79 +/- 1.55 amongst the males and 13.25 +/- 2.16 amongst the females. On applying student t test, there was a significant difference in the haemoglobin values amongst males and females. The mean height amongst males and females was 15.31 +/- 1.41 and 12.43 +/- 3.62 respectively. There was a significant difference between height of males and females. The mean weight amongst males and females was 75.87 +/- 5.47 and 68.59

+/- 6.12 respectively. There was significant difference in the weight amongst males and females. The mean BMI amongst males was 24.62 +/- 4.51 and females were 22.38 +/- 2.27. There was no significant difference amongst them. Obesity and overweight have no direct affect on the levels of haemoglobin or rate of erythropoiesis but they affect the level of ferritin. There is an inverse relationship between anaemia and Body mass index. Obese subjects are less likely to be anemic.

CONCLUSION

There is an increase surge of anaemia and obesity in the world. Anaemia and obesity both are responsible for decreasing the productivity of the subjects. It makes the subjects more prone to infectious diseases and decreases the lifespan of the subjects. In our study, anaemia was more common amongst women. No significant difference was observed in the body mass index between males and females but the level of haemoglobin showed significant variation between males and females.

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Table 1: Demographic details

VARIABLE	NUMBER	PERCENTAGE
Age		
20-30	107	35.7
31-40	105	35
41-50	58	19.3
51-55	30	10
Gender		
Male	186	62
Female	114	38

Graph 1: Age distribution of subjects

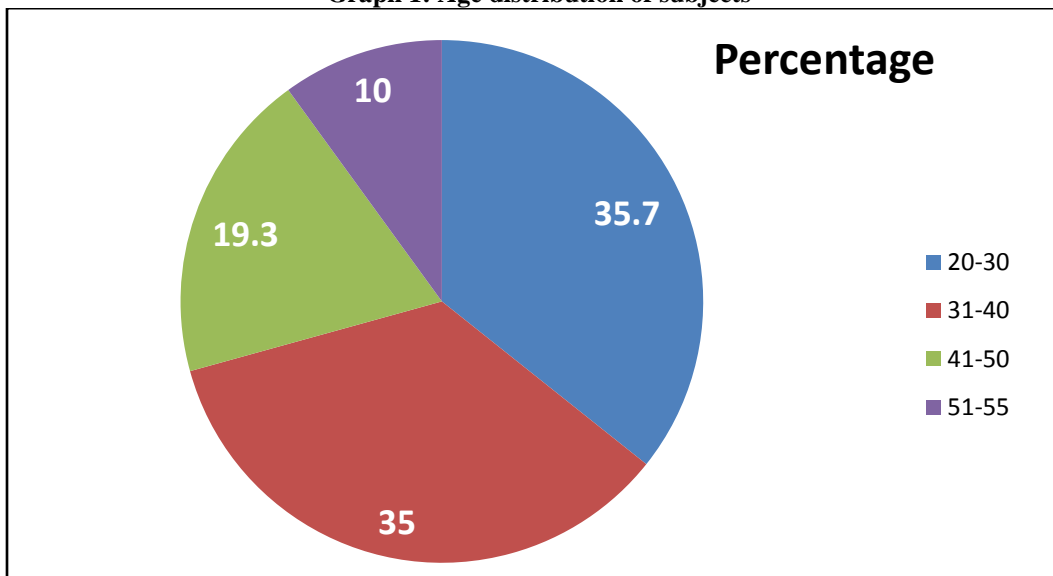


Table 2: Haemoglobin and BMI amongst males and females

VARIABLE	MALE (N/%)	FEMALE (N/%)	TOTAL (N/%)
Haemoglobin level			
<12 gm/dl	19/10.2%	71/62.3%	90/30%
>12 gm.dl	167/89.8%	43/37.7%	210/70%
BMI (kg/m2)			
<18.5	9/4.8%	10/8.7%	19/6.3%
18.5-22.9	69/37.1%	72/63.2%	141/47%
23-24.9	91/48.9%	26/22.8%	117/39%
>25	17/9.1%	6/5.2%	23/7.7%

Table 3: Mean value and correlation between them

VARIABLE	MALE	FEMALE	P VALUE
Age (years)	35.24 +/- 2.78	32.28 +/- 2.82	>0.05
Haemoglobin (gm/dl)	14.79 +/- 1.55	13.25 +/- 2.16	<0.05
Height (m)	15.31 +/- 1.41	12.43 +/- 3.62	<0.05
Weight (kg)	75.87 +/- 5.47	68.59 +/- 6.12	<0.05
BMI (kg/m2)	24.62 +/- 4.51	22.38 +/- 2.27	>0.05