



## Gender Corellation of Haemoglobin and Haematocrit with Body Mass Index in Medical Students

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### Abstract

**Background And Aim:** *Aim of the study is to correlate the hemoglobin and hematocrit values with body mass index between male and female medical students.*

*Anemia exists globally and cuts across all the sections of the population. Considerable changes in growth pattern, lifestyle, dietary habits & behavior are likely to influence the hemoglobin levels among male and female, body mass index is reliable indicator of health and nutritional status of human beings. It expresses the relationship between the two most widely used parameters to monitor linear and ponderal growth (height and weight). Hemoglobin concentration is an important diagnostic indicator for the wellbeing of an individual. In prepubertal period there is no major difference between sexes in hemoglobin concentration. It is only after the onset of menstruation that the differences emerge. The total amount of hemoglobin in the body increases more in boys than in girls at puberty. Menstruation is the principal cause of blood loss in women. In present study an attempt has made to study body mass index, hemoglobin and hematocrit estimation on medical students.*

**Methods:** *60 healthy medical students of age 17 -20yrs studying at Raichur institute of medical sciences belonging to both the sexes were taken for the purpose of the study. After taking consent, linear height was measured by measuring tape mounted on the wall and Weight was recorded by weighing machine. Hemoglobin and hematocrit were estimated by using automatic analyzer machine. Statically analysis was done by using mean, standard deviation, student's t test and studied the gender differences of hemoglobin and hematocrit in relation to body mass index.*

**Results:** *Among 30 males 3 were anemic 9 were having HCT<42% 7 were having BMI <18.5Kg/m<sup>2</sup>. Among 30 females 13 were anemic. (std values were taken according to who guidelines with <12gm% of hemoglobin). 14 were having HCT<38%, 9 were having BMI<18.5kg/m<sup>2</sup>. BMI and HB both were below normal limits in females compared to males So under nutrition and anemia is seen more in females when compared to males.*

**Conclusion:** *Study showed that there was difference in HB and HCT concentration between males and female subjects which was statistically significant, however correlation of HB and HCT with BMI between males and females showed slight variation, but statistically it was not significant. 42.9% of female subjects were anemic compared to males (10%). 80% of females have HCT<38% compared to males (50% <42%). Regarding BMI 20% of females were having <18.5kg/m<sup>2</sup> compared to males (19%).*

**Keywords:** *Anemia, hemoglobin, hematocrit, body mass index.*

## INTRODUCTION

Anemia is a worldwide problem with the highest prevalence of nutritional deficiency in developing countries. It frequently occurs due to inadequate iron intake, chronic blood loss or disease, malabsorption or a combination of all these factors.<sup>1</sup>the most significant contributor to the onset of anemia is iron deficiency. The other causes of anemia are heavy blood loss, parasitic infections, acute and chronic infections, micronutrient deficiency and hemoglobinopathies. (Kurz KM 1996). Anemia among women causes many serious health problems<sup>2</sup>. It affects one's development, growth and resistance to infections and is associated with mortality among younger adults than two years old. Iron deficiency anemia is also a form of nutritional anemia which is distributed universally. The most affected population groups are infants aged between four and twenty four months old, School age children, female adolescents, pregnant women and nursing mother<sup>1</sup>.Anemia among women causes many serious health problems and is pervasive in developing countries. Anemia can result in adverse pregnancy outcomes, and severe anemia can lead to maternal deaths, reduced work productivity and impaired physical capabilities.(ICRW) Iron deficiency anemia is the third leading cause of DALY(disability adjusted life years) for females aged 15-45 years. In country like in India, adolescent girls face serious health problems due to socioeconomic conditions, nutrition and gender discrimination<sup>2</sup>. A vast majority of girls in India are suffering from either general or specific morbidities (Balasubramaniam, 2005)<sup>5</sup>. Diet and health are synonymous with the well-being of an individual. In absence of proper and adequate nutrition, a person can develop several developmental malformations. Many research studies have documented that malnutrition affects body growth and development, especially during the crucial period of adolescence (Babitha 2003)<sup>6</sup>. Under-nutrition among adolescent girls can severely limit their growth spurts (Bahl, 1994)<sup>7</sup>. As per report published by International center for research on

women (ICRW 2006)<sup>8</sup>, anemia is a very serious problem among adolescent girls in India.

<sup>2</sup>Adolescence or early adulthood is one of the most vulnerable periods to anemia in human life when nutritional requirements increases due to the growth spurt. Study done by; Aggarwal, 1998; among adolescent girls have shown that prevalence of anemia ranges from 22.00-96.50% in India. Very few studies have been conducted on anemia and little is known about anemia among College students in the state of Karnataka, raichur district.

The association between Anemia and body mass index (BMI); a measure of nutritional and health status of adults <sup>[9]</sup>, has been controversial. While earlier studies have shown the occurrence of Anemia in both undernourished and over-nourished individuals, representing the low and high socioeconomic classes, respectively <sup>[10-12]</sup>, studies elsewhere <sup>[13,12]</sup> have associated Anemia with low body mass index. Although Anemia is more prevalent in the pregnant and lactating women and children, adult males and non-pregnant women may also be at risk where there is chronic malnutrition due to inadequate food intake and frequent parasitic infections <sup>[14]</sup>

The present study was conducted to asses this problem at an early stage so that strategic intervention can be planned.

This study was planned to determine and correlate haemoglobin concentration between males and females in relation to body mass index.

## MATERIALS AND METHODS

60 healthy medical students studying at Raichur institute of Medical sciences belonging to both sexes were taken for the purpose of the study. The study was conducted in department of physiology during the month of October 2014. After informed consent, the students were asked to report to the department at morning hours. Anthropometry was conducted using standard protocol.

### Subjective parameters

- Standing height was recorded without shoes and with light clothes on a wall

mounted measuring tape to the nearest of centimetres. (<5mm and >5mm).

- Weight was recorded without shoes and with light clothes on a Krupp's weighing machine with a least count of 500gms.

- BMI was calculated by the formula: weight (kg)/height (m<sup>2</sup>).
- Haemoglobin and haematocrit estimation was done by computerised automatic analyser.

International obesity task force (IOTF) for adult obesity as follows

| BMI(kg/m <sup>2</sup> )     | NUTRITIONAL STATUS |
|-----------------------------|--------------------|
| > 23 kg/m <sup>2</sup>      | Over nutrition     |
| 18.5 - 23 kg/m <sup>2</sup> | Adequate nutrition |
| < 18.5 kg/m <sup>2</sup>    | Under nutrition.   |

According to WHO guidelines, haemoglobin <12gm% were considered as anaemic. Haematocrit for males 42% was considered as normal, and for females 38%.

### STATISTICS

Statistical analysis was carried out using spss. Statically significance of difference in mean values between groups was assessed using independent sample t test.

The relationship between haemoglobin and haematocrit and BMI was examined by

calculating the Pearson's correlation coefficient (r) and the significance of correlation (p)

### RESULTS

Anthropometric & blood parameters in medical students. (n= 60)

| PARAMETERS    | BOYS              | GIRLS      | SIGNIFICANCE     |
|---------------|-------------------|------------|------------------|
| BMI           | 21.10±3.93        | 20.60±3.88 | P >0.05(0.622)** |
| HB(gm%)       | 14.57±1.74        | 12.19±1.53 | P < 0.05(0.000)* |
| Hct(%)        | 43.6±9.1          | 39±11      | P < 0.05(0.001)* |
| * significant | **not significant |            |                  |

### CONCLUSION

- The present study reported that 42.9% of girls were anaemic when compared to boys (10%), which was statistically significant.
- 20% of girls were having BMI <18.5kg/m<sup>2</sup>.

- Correlation of haemoglobin to grades of BMI was statistically insignificant.
- Under nutrition and anaemia is observed more in girls rather than boys
- Increase in the prevalence of anaemia in girls can be explained by steady increase in body mass index which

can correlate nutritional status and variation in growth and development.

## DISCUSSION

Nutritional anaemia though global, is more of concern in the developing countries due to high prevalence. Unfortunately it is not restricted to rural and low socio economic status adolescents but shows increased prevalence in developed affluent societies. In the present study among the College students, there were mild anaemia among 50% students followed by moderate anaemia among 20% students but there was only 0.83% students having severe anaemia. The findings corresponds to an ICMR study by Teoteja GS and Singh P who obtained data from 16 districts of 11 states through District Nutrition projects, where prevalence of anaemia among adolescent girls has been found to be as high as 90.1%. Similar studies on anaemia prevalence from different states of rural India, reported high prevalence of anaemia from 46-98%. A study carried out among 265 adolescent girls of Amritsar in 2005 by Sharda Sindu also discovered high prevalence (70-75%) of anaemia including 12.83% girls who had severe anaemia. A study by Passi & Malhotra (2002) found that with the onset of menarche at puberty & in the absence of adequate dietary intake, young girls become highly susceptible to anaemia. After the analysis, it was found that anaemia is more prevalent among the students who are underweight and overweight students have less prevalence of anaemia.

The present study reported that 42.9% of the girl students having Hemoglobin <12 gm%. Compared to boys 10% were having hemoglobin less than 13gm%. 20% of the girls were having BMI < 18.5kg/m<sup>2</sup>. similar to present study was reported by Goel & Gupta among urban adolescents (11%) of 17-19 years of hilly region of Shimla, with 15.5% girls and 14.3% boys having anemia (by Sahli's hemoglobinometer method) <sup>(15)</sup>. Nutrition foundation of India (1999) also found 9.6% of the urban adolescents girls having the hemoglobin <10 g% <sup>(7)</sup>. Prevalence was less than the average prevalence of anemia of 25 –80% seen in several

studies across the Indian subcontinent <sup>(16,17)</sup> with study by ICMR in 16 districts of 11 states reporting a prevalence rate of 90.1% among the adolescent girls of 11-18 years age group <sup>(18)</sup>. Higher prevalence of anemia (32%) was reported by Chaudhary & Dhage among adolescent urban females of Nagpur <sup>(19)</sup>. Nutritional anemia is prevalent even in medical students who are literate, and have free access to the nutritive diet in a good healthy environment. However in order to quantify and access the anemic levels properly, with respect to the altitude, diet and other factors, the study of other biochemical parameters are required.

There was no significant correlation between BMI and haemoglobin was observed in our study among girls who were overweight & obese in both groups. Similar result was observed among non-school going adolescent's girls by Bully et al 2007 and it was statistically significant. Study by Shatha (2003) on 600 Iraqi adolescents girls also found statistically significant negative association between BMI & Hb (r-0.185, p<0.01) which included both schooling and non-schooling population of Baghdad. Negative association in present study could be related to the reduction in levels of oestrogen binding protein levels with increasing adiposity (BMI) with concomitant increase in insulin. Therefore level of free oestrogen may rise up which may cause suppression of erythropoiesis in females (Lukanova 2004).

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