Association between Hb and BMI among Medical students of CMH Kharian Medical College

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ABSTRACT

Objective: Obesity is associated with low-grade inflammation, frequently related with anemia and predisposes to long-lasting diseases in old age. Objectives: To assess the relationship of blood hemoglobin with body mass index among medical students of CMH Kharian Medical College.

Material and Methods: Total 200 medical student of CMH Kharian medical college were recruited for the study. Consent was taken. Students were given and asked to complete a questionnaire based on anthropometric estimates. Level of hemoglobin was estimated by sysmex analyzer. BMI was calculated by taking the weight and height of students. SPSS v 22 was used to assess the relation between HB and BMI index with p value set at 0.05.

Results: Among these students, 60 % were female and 40 % were male. Statistical analysis showed significantly high level of Hb in both gender with mild variation in the values of BMI in comparison to their controls. However, a non-significant positive correlation was observed between BMI and hemoglobin. Females were more underweight than males, though their percentage as normal and obese was also greater than males.

Conclusion: A positive non-significant correlation between Hb and BMI was observed. Anemia screening is important for the identification of at-risk population as well as for the determination of treatment modality in adolescents.

Key Words: Basal Metabolic Index, Hemoglobin, Anemia, Obesity.

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INTRODUCTION

Malnutrition has two life-threatening complication pillars that include anemia and obesity either due to under-nutrition or over-nutrition. Obesity is presiding as epidemic, known in every age group. Similarly, anemia remains insufficiency of micronutrient worldwide[1].

Anemia or iron deficiency anemia (IDA) is considered as worldwide health issue, which may be a reason of altered cognitive ability of people, morbidity and if not cured may lead to mortality[2]. In developing world about 1/3rd of adolescents suffers from anemia especially in Asia and Africa with a prevalence rate of 49%. In medical students, the reason of developing anemia includes stress, lengthy schedule of duties, inappropriate diet especially in hostilities and extracurricular activities[3,4]. It is more common among female medical students due to menstrual irregularities and poor dietary habits[5].

Amongst adolescents, the incidence of IDA was very high in girls belonging to low socioeconomic status[6]. Working status of these girls, iron and ascorbic acid consumption and protein intake per day may be related with the anemia[7]. Besides, In women, there is extra demand of iron due to menstruation, pregnancy and lactation[8,9].

Obesity is associated with low-grade inflammation, frequently related with anemia and predisposes to long-lasting diseases in old age. Excessive intake of calories with sedentary lifestyle increases the risk of obesity. Factors related with obesity in adolescent include skipping breakfast, high intake of snacks, and reduced intake of

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vegetables and fruits along with usage of processed food containing considerable number of calories. These all factors can lead to the development of anemia and other chronic diseases[10]. Furthermore, taking of these junk food c then reduced reading skills with lack of interest in class room studies[11].

Body Mass Index (BMI) is a known tool for screening the body weight and to find the potential of individual for developing obesity and predisposition to anemia. It is an estimate of body weight in relation to height and given as kg/m2 and may be classified as overweight (BMI ≥25 kg/m2 to <30 kg/m2) and obese (BMI >30 kg/m2). Adolescents face a two-fold more risk of becoming obese with a substantial risk of developing diseases like cardiovascular disorder, type II diabetes, hypertension and polycystic ovary syndrome[12]. Prevalence of iron deficiency led anemia increases with subject's BMI. Moderate state of anemia with hemoglobin 7.0 to 9.0 g/dl may have an impact on psychological, physical and work ability of adolescent. This may be a factor of coupling of obesity with anemia, and results in impairment of agility of the students both mentally and physically[13].

It is proposed that obesity as low-grade inflammation stimulates the synthesis of various cytokines and adipokines like leptin. Studies have demonstrated that leptin upregulate the levels of hepcidin in adipocytes[14]. This may cause the accumulation of fat and decrease the stores of iron in adolescents. Hepcidin binds with ferroportin and degrade it and therefore reduces the absorption of iron and its release from the cells. Hereafter, hepcidin arbitrates anemia via obesity persuaded inflammation[1].

In Pakistan, there is paucity of data associating hemoglobin with BMI. Dietary and lifestyle changes globally have made the malnutrition that is over nutrition and under nutrition both non-favorable issues. This study may be helpful to assess the knowledge and awareness among medical students to think for a healthy lifestyle and prevent them from various preventable diseases. Thus, present study was carried out to estimate the values of Hb and BMI and correlate them in undergraduate medical students.

MATERIALS AND METHODS

Cross sectional study was conducted at CMH Kharian Medical college and pathology lab of CMH Kharian after taking ethical approval from the institutaional board of CMH Kharian Hospital. Duration of study was six months. Two hundred consented medical students of first year and second year MBBS were selected as study population. Participants receiving iron therapy or vitamin supplement or having any chronic / hematological diseases were excluded from study. Systematic random sampling technique of probability sampling was used. Blood samples were collected in EDTA containing tubes for estimation of hemoglobin using a hematoanalyzer (Sysmex). BMI was measured by using a Stadiometer (Wunder, Itlay) and was calculated as the ratio of weight (kg) to the square of height (m^2). IDA was defined as having both haemoglobin levels of <10 g/L2(Habib). SPSS 22 was used for data analysis using the techniques of univariate/ multivariate techniques. Correlation between BMI and Hb was seen by applying Pearson Correlation test. P value of < 0.05 was taken as significant.

Results: Hemoglobin of all students varied from 9.12-15.5 mg/dL. Basal metabolic index of all students varied from 20.10- 24.50 kg/m^2.

RESULTS

Table 1 shows anthropometric parameters and hemoglobin concentration of total participants. Out of 150 students, 60% were females and 40% were male. In both male and female anemic students, the values of BMI were higher in comparison of their controls. On the other hand, the level of hemoglobin in both male and female anemic subjects was significantly decreased ($p<0.001$) in comparison of the values of their respective controls.

Table 2 describes the gender distribution of students who participated in the study according to their BMI categories. Among 90 female students, 13 were underweight, 50 were in normal range, and 20 were overweight and 07 girls were in obese category. Among boys, 08 were underweight, 30 were in normal range, 17 overweight and 05 were obese. A total of 22 % of male students had high BMI and 20% female students had high BMI.

A non-significant positive correlation was observed between hemoglobin level and BMI in both genders, which was evaluated by Pearson's correlation coefficient [Table 3].

DISCUSSION

Association between levels of hemoglobin and BMI has diversity given by many studies. According to our study female students were more anemic than male students. This study is in accordance with another study carried out in students of Bangladesh who also observed that females were more anemic than males and stated that low hemoglobin in female may be due to loss of blood in menstruation and also the type of food consumed by

Table 1-Anthropometric parameters and Hemoglobin level in male/ female medical students.

Parameters	Male anemic (n=30) (Mean± SD)	Male control (n=30) (Mean± SD)	Female anemic (n=45) (Mean± SD)	Female control (n=45) (Mean± SD)
Age (years)	19.93±1.13	19.91±1.14	19.41±1.26	19.51±1.28
BMI (kg/m2)	23.53±0.58	22.63±0.61	20.92±0.50	21.89±3.59
Hb (mg/dL)	12.33±4.80**	14.5±1.03	10.05±1.21**	12.69±0.78

**p<0.001= highly Significant

Table 2-Distribution of male and female according to basal metabolic index (BMI). BMI was used to classified student as underweight, normal, overweight, and obese.

Body Mass Index	Total Frequency / percentages (n=150	Female Frequency / percentages (n=90)	Male Frequency / percentages (n=60)
Underweight	28(18.6)	13(14.4)	08(13.3)
Normal	68(45.3)	50(55.5)	30(50)
Overweight	42 (28)	20(22.2)	17(28.3)
Obese	12 (8)	07(7.77)	05(8.3)

students was not balanced[15].

A mild variation in the values of BMI was observed in both male / female subjects in comparison to their control. This study is in line with other studies who observed a mild variation in BMI in both male and female subjects[16]. It is stated, though obesity may not alter erythropoiesis, it may be possible that high BMI or obesity may cause a release of hepcidin, inhibitor of iron absorption[17].

The percentage of underweight, normal weight and overweight females was more than males. It is stated that the transition of nutrition from simple food to junk food in developing countries play a significant role of gaining weight in both sexes but may had high impact on lifestyle of female[18]. The transition of nutrition may be due to economic, environmental and cultural level changes in society that damagingly affect both energy expenditure and energy intake[19]. Fast urbanization and the increased domestic facilities, usage of edible oils may be the reason of increase body weight. Besides diets having large amount of sugar, fat and refined starch, and sedentary lifestyle also reason of becoming over-weight[20].

In this study, a non-significant positive association was observed between Hb and BMI. However, previous studies found a significant correlation of BMI with Hb in males, but in females non-significant negative correlation BMI with Hb was observed[21]. In another study, a negative correlation between BMI and Hb status in medical students was reported. It is stated that positive association between BMI and anemia might decrease with increase in nutritional status[10,22]. Various studies found that obese or over-weight adolescents have reduced level of circulating iron with impair absorption of iron may be a primary indicator of obesity[9,23] and therefore obese adolescents have two times more a chance of developing anemia in comparison to normal weight adolescent even if their iron intake is normal[24].

CONCLUSION

A positive non-significant correlation between Hb and BMI was observed. Anemia screening is important for the identification of at-risk population as well as for the determination of treatment modality in individuals. Further studies with large and diverse sample are recommended to find out association between Hb and BMI.

Pakistan is third world country with economic problem. There is a need of efforts at national level to alleviate the burden of IDA. It should involve programs such as iron supplementation and long-term horizontal programs including wheat flour fortification.

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Table-3: Correlation between hemoglobin concentration and basal metabolic index.

Characteristics	Correlation Coefficient	P-value
Hemoglobin gm/dl	0.28	N.S
Body mass Index (BMI)		

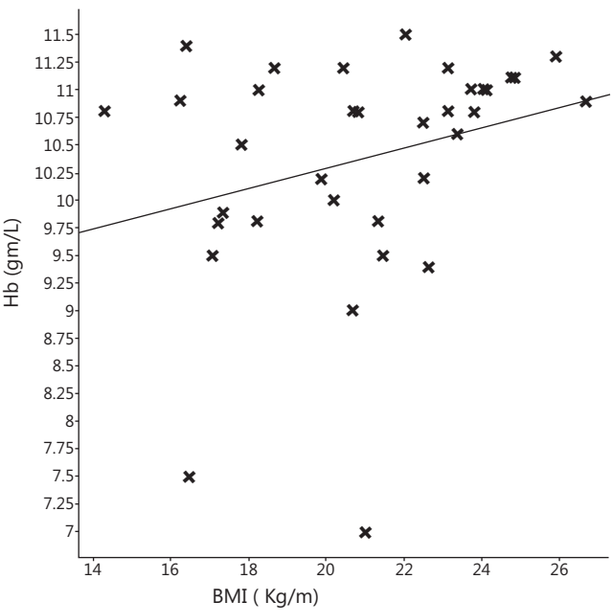

Figure-1: Scatter diagram showing correlation between BMI and Hb.

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