CORRELATION BETWEEN HEMOGLOBIN LEVELS AND BMI IN DENTAL STUDENTS: A CROSS - SECTIONAL STUDY

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ABSTRACT

OBJECTIVES

This study aimed to determine the frequency of anemia in undergraduate dental students and the relationship between hemoglobin level and body mass index (BMI) in dental students.

METHODOLOGY

A cross-sectional study was conducted at a dental college in Peshawar. with 370 out of 400 students participating after ethical approval. Questionnaires were distributed, and consent was obtained for hemoglobin testing. Students with blood disorders, cardiovascular issues, or eating disorders were excluded. Five milliliters of venous blood were collected under aseptic conditions for a complete blood count using an automatic analyzer. Height and weight were measured to calculate BMI (BMI = weight (kg) / height (m²)). Participants were classified into anemic and non-anemic groups based on WHO guidelines. Data analysis was conducted using SPSS version 24, employing Pearson correlation to explore the relationship between anemia and BMI.

RESULTS

Among the students (n=370) who took part in our research, 149 (40.2%) were male, and 221 (59.8%) were female. Among them, only 6 (4%) male and 181 (81.9%) female students were anemic. The mean hemoglobin value in males was 13.38 gm/dl (± 1.70); in females, it was 11.75 gm/dl (± 1.15). According to the World Health Organization (WHO), a hemoglobin level of < 12 gram/deciliter is considered anemic. Of the female students, 94 (42.5%) were underweight. 127 female students, or 57.4% of the total, had a BMI that was within the healthy range. Not a single female student was obese. Thirteen (8.7%) male students were overweight, whereas 136 (91.2%) fell within the acceptable body mass index (BMI) range. No male student was underweight. The correlation between Hb and BMI was r=-0.49, P<0.001.

CONCLUSION

A strong negative correlation of hemoglobin level with body mass index was found. Anemia is more prevalent in females, which is of concern and must be addressed.

***KEYWORDS:** Hemoglobin, Body Mass Index (BMI), Dental Students, Anemia*

INTRODUCTION

Anemia is one of the biggest problems worldwide, particularly in underdeveloped nations.[1] The World Health Organization (WHO) defines anemia as low hemoglobin levels caused by dietary deficiencies, regardless of the cause.[2] Most cases of iron deficiency anemia affect adolescent college students.[3,4] Diminished hemoglobin levels and being overweight or underweight according to one's body mass indices (BMI) exert a detrimental influence on individuals' health, contributing to heightened morbidity and mortality.[5] Anemia screening is crucial in identifying the population at risk and determining the best course of treatment for each individual.[3] Low hemoglobin concentrations and aberrant body mass index (BMI) have a negative impact on people's health, increasing morbidity and mortality rates.[6] Their abnormal BMI puts them at a greater risk of getting anemia. Iron depletion and the risk of iron deficiency anemia are caused by being underweight.[7,8] Individuals who are overweight or obese have abnormal iron levels and, therefore, have a high tendency of anemia.[9] Overweight and obesity can result in low-grade systemic inflammation and elevated hepcidin secretion, decreasing iron absorption and promoting iron sequestration in various cells, including enterocytes, hepatocytes, and macrophages, exacerbating anemia.[10] The medical community is one of society's more educated and well-read segments.[11] Medical and dental students are expected to have an in-depth understanding of the advantages of a healthy diet and way of life.[12]

They are vulnerable to nutritional disorders, such as obesity and anemia, due to the stress of the curriculum and significant changes in lifestyle and behavior, increased consumption of readily available, inexpensive fast food, and inadequate and inappropriate dietary habits.[13] Dental students may suffer from anemia due to their busy schedules in college, clinical labs, and extracurricular activities. The correlation between anemia and BMI, a measurement of adult dietary status, has had mixed results.[14,15] However, there is a dearth of information linking hemoglobin to BMI. The current study aimed to determine whether there was a relationship between dental undergraduates' hemoglobin levels and BMI.

METHODOLOGY

It was a cross-sectional study conducted at the dental college of Peshawar. Purposive convenient sampling was used. After ethical approval, data was collected. 400 dental students were encouraged to participate. However, 370 agreed to participate in the research. Students were approached in classrooms, and those who agreed were given a questionnaire to fill in. After providing written approval, they were requested to visit the department to have their hemoglobin concentration estimated. Students with a history of blood disorders, cardiovascular disease, or any eating disorders were not allowed to enroll. Under aseptic conditions for laboratory procedures, a total of 5 ml of venous blood from each participant was drawn into Ethylene Diamine Tetra Acetate (EDTA)-coated vials. Standard methods were followed during blood collection, transportation, storage, and disposal to protect the subjects and the researchers. To rule out non-nutritional causes of anemia, a complete blood count was performed using the automatic analyzer Sysmex KX- 21. Anthropometry was performed per standard procedures. The measuring tape on the wall was used to record the standing height (in centimeters) without shoes. With light clothing and no shoes, the subject's weight was recorded on a Certeza digital weighing scale. BMI was calculated using the formula BMI= weight in kilograms divided by height in meter square.[16] Quetlet's index and hemoglobin concentration-calculated BMI were estimated using Sahli's method. WHO guidelines were used to separate the participants into two groups: anemic and non-anemic.[17] Data was analyzed using SPSS version 24. Pearson correlation was used to analyze the correlation of anemia and BMI.

RESULTS

Of the 370 students in our study, 221 (59.8%) were girls, and 149 (40.2%) were Boys. The students were in the age group 16-24 years. Out of which 181 (81.9%)

female students were anemic and only 6 (4%) Boys had anemia maybe due to inadequate dietary intake, rapid growth during puberty (which increases iron demand), or excessive physical activity leading to higher iron loss. The mean hemoglobin value in Boys was 13.38 gm/dl (± 1.70) and 11.75gm/dl (± 1.15) in girls.
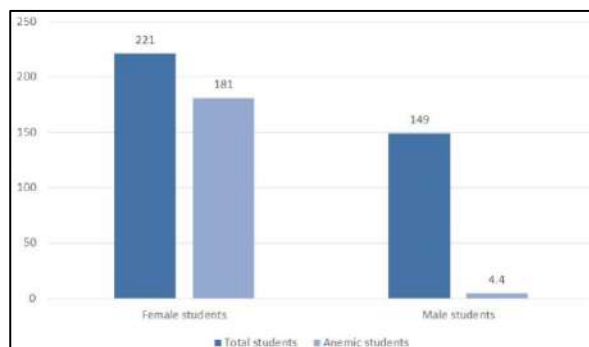

Figure 1: Comparison of Anemic Students of both Genders

Of the 221 female students, 94 (42.5%) were underweight. At the same time, 127(57.4%) female students fell under the healthy BMI category. None of the female students were overweight. No male student was underweight, 136 (91.2%) fell under the healthy BMI category, while 13 (8.7%) were overweight.
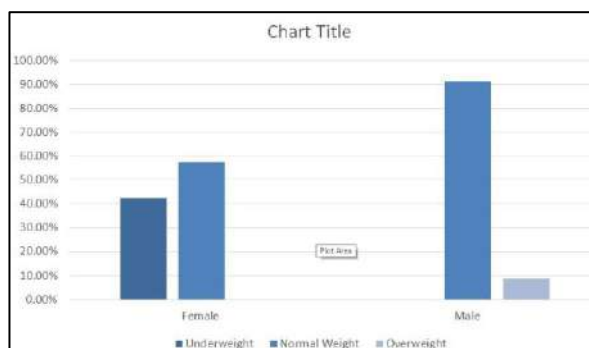

Figure 2: Comparison of BMI of the Students

The correlation of hemoglobin with BMI showed a strong negative association between anemia and hemoglobin levels. Due to a few physiological and nutritional factors, a higher BMI is strongly linked to a lower risk of anemia and higher hemoglobin levels. Higher BMI individuals frequently consume more iron, vitamin B12, and folate-all necessary for synthesizing hemoglobin and red blood cells. Furthermore, pro-inflammatory cytokines, which can promote erythropoiesis, the process of forming red blood cells, are associated with higher body fat levels. Furthermore, having more muscle mass-typical of people with higher BMIs-may raise the need for oxygen and, in turn, the production of hemoglobin. However, excessive obesity may result in chronic inflammation and hepcidin

upregulation, which can impair iron metabolism over time, even though a higher BMI can protect against anemia.

Table 1: Correlation of BMI and Hemoglobin of the Girls and Boys

		Anemic Status	BMI
Anemic Status	Pearson Correlation	1	-.727**
	Sig. (2-tailed)		.000
	N	370	370
	Pearson Correlation	-.727**	1
	Sig. (2-tailed)	.000	
	N	370	370

**. Correlation is significant at the 0.01 level (2-tailed)

DISCUSSION

The purpose of the current study was to evaluate the relationship between undergraduate medical students' body mass index and hemoglobin level. This study was conducted to find the frequency of anemia in dental students. Of the 370 participating students, 221 (59.7%) were females, and 149 (40.2%) were males. Similarly, a study conducted by S. Jaffar et al. Out of 150 participants, 67(44.7%) were males and 83(55.3%) were females.[18] The frequency of students in a study conducted by U Kannan et al. out of 310, 136 (44%) were males and 174 (56%) were females.[19] Being underweight often indicates a lack of vital nutrients and insufficient body mass to enable appropriate functioning, which can present serious health concerns. It can weaken the immune system, increasing a person's susceptibility to diseases and infections.[20] Additionally, it may result in vitamin and mineral deficiencies, impairing the body's capacity to carry out necessary tasks. Moreover, being underweight may exacerbate conditions, including weakness, exhaustion, and an increased chance of problems during medical procedures or treatments. Sustaining a healthy weight is essential for general health since it promotes energy levels, appropriate organ function, and resistance to various health issues.[21] 94 female students (42.5%) out of the 221 total female students were underweight. 127 female students, or 57.4% of the total, had a BMI that was within the healthy range. Not a single female student was obese. In our study, 181 female students were anemic, and only six male students were anemic. The high frequency of anemia in the female participants in our study may have resulted from a combination of menstrual blood loss and poor dietary iron intake. In a similar survey by Y. Jamali et al. in Khairpur, 55.8% were anemic girls and 33.3% were anemic boys.[22] This was in contrast to a study conducted by R. Kanchana et al..; in their research, 42% were anemic boys, and 21% were anemic girls.[23] Anemia was present in 50.3% of

school-age female adolescents. 6.6%, 19.9%, and 23.8% of the 151 participants had severe, moderate, or mild anemia, respectively. Although the stunting rate was 26.5%, only 2% of the participants were underweight. Other health and wellness issues were linked to the notably high prevalence of anemia among teenage girls.[24] The correlation of hemoglobin with BMI showed a strong negative association between anemia and hemoglobin levels. Based on the findings of a cross-sectional study conducted by U. Kannan et al., it is determined that there is an inverse association between anemia and both overweight/obesity and central obesity within a representative cohort of medical students residing in urban areas.[19] Similarly, in another study conducted in India by Farhana Ahad et al., a positive correlation between hemoglobin and BMI grades was observed in both boys and girls.[25]

LIMITATIONS

This study was conducted on convenient sampling. A larger sample size with randomized sampling would provide more generalized results.

CONCLUSIONS

A concerning observation revealed a high incidence of anemia among female students. It is imperative to recommend dietary counseling and regular health assessments for adults.

CONFLICT OF INTEREST: None

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