Original Research Article

A cross sectional study of association of anaemia with BMI in medical and paramedical students

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ABSTRACT

Background: Anaemia is a global health problem. Anaemia is one of most commonly recognized disorders. In view of ever increasing burden of anaemia in India and its detrimental effects on academic performance of students, it is necessary to find out the association of anaemia with BMI of medical and para medical students. This study was undertaken to find out association of anaemia with BMI among medical and para medical students of Rohilkhand Medical College, Bareilly.
Methods: This cross sectional study was conducted in 344 medical and para medical students of Rohilkhand Medical College and Hospital, Bareilly. A structured schedule was used to collect the information regarding anaemia and BMI. Data was analyzed using SPSS software. Chi square test was applied.
Results: Over all prevalence of anaemia was 29.07% prevalence was higher among female students (41.92%), among those aged between 25-26 years (75.00%) and among Muslims (40.54%), prevalence of anaemia among normal weight (31.92%) followed by underweight (27.02%) than in preobese (25.86%) while least among obese (20.83%).
Conclusions: Anaemia is prevalent even in medical and para medical students who are well educated and well oriented about nutrition and its ill effect on health. BMI exhibits higher prevalence of anaemia among normal weight, followed by underweight, preobese and obese.

Keywords: Anaemia, Haemoglobin, BMI, Medical and para medical students

INTRODUCTION

Anaemia is characterized by low haemoglobin level or less number of red blood cells.[1] Anaemia is one of the most common nutritional disorders and it has public health importance in developing countries like India where it is the most widespread nutritional problem.[2,3]

The economic and social consequences of anaemia, as yet un-quantified, are thought to be enormous including a significant drain on health care, educational resources and labour productivity, reduced physical and mental capacity of large segments of the population. Anaemia results from nutrition related causes and from inflammatory or infectious diseases, worm infestations and from blood loss. Iron deficiency anaemia resulting from inadequate intake and low absorption of dietary iron is the most common form of anaemia in India.[4,5] Haemoglobin concentration is an important diagnostic indicator for the wellbeing of an individual. In prepubertal period there is

no major difference between sexes in haemoglobin concentration. It is only after the onset of menstruation that the differences emerge.[6]

Many low and middle income countries are facing the double burden of disease. Along with under nutrition, there is a rapid increase in noncommunicable risk factors such as obesity and overweight.[7] Obesity had been reported to be associated with anaemia in adults. A significant association had been found between serum iron, soluble tranferrin receptors, fat mass and BMI.[8,9] A few studies were done to know the association between anaemia and BMI. The study had shown 8% female students were anaemic in Himalayan Institute of Medical Sciences and also found a negative association between Hb and Body mass index (BMI) whereas study in medical students of Amritsar had shown a positive correlation of haemoglobin with grades of BMI in both boys and girls but none of the correlation was up to significance level of <0.05.[10,11] There is paucity of study regarding the association of anaemia with BMI in northern India. Also, there is disparity in the previous study results so the present study is undertaken to know the association between anaemia and BMI among medical and para medical students in both males and females.

METHODS

A cross sectional study of one academic year duration from 2015 to 2016 was conducted in Rohilkhand Medical College and Hospital, Bareilly, U.P. Ethical committee approval was taken before the start of the study and informed consent was obtained from the students taking admission in medical and para-medical courses in Rohilkhand Medical College and Hospital, Bareilly.

Sample size is all the students taking admission in medical and para-medical courses in Rohilkhand Medical College and Hospital, Bareilly, U.P. India

Inclusion and exclusion criteria

All students admitted to medical and para medical courses in Rohilkhand Medical College and Hospital were included in the study. Those students who refused to participate were excluded.

For haematological investigations, 2 ml of venous blood from each study respondent was taken in a pre-numbered vial containing EDTA (anticoagulant). All the sample vials were sent to the central laboratory, where the haemoglobin estimation was done by the cyanmethemoglobin method using photoelectric colorimeter.

Any anaemia was defined as Hb<12 g/dl1. Severe, moderate, and mild anaemia was defined as Hb below 7 g/dl, 7-9.9 g/dl and 10-11.9 g/ dl respectively.[12]

Height and weight of the subjects were recorded. Height was taken with the help of measuring tape to the nearest 0.1 cm. The weight was recorded to the nearest 0.5 kg using portable weighing machine and wearing minimum clothing. Body mass index (BMI) was computed by using the standard equation

$BMI=$ weight (in kg)/height^2 (in meters).

BMI is age and sex independent and a known epidemiological marker of nutritional status of adolescents. International obesity task force (IOTF-2000) has proposed the standards for adult's obesity in Asia and India as follows: A cut off point of 18.5 kg/m^2 is used to define thinness or acute under nutrition and a BMI of 23 kg/m^2 indicates over nutrition. A BMI of over 25 kg/m^2 refers to obesity.[13]

Table 1: Criteria for nutritional status of students according to BMI.

BMI (kg/m^2)	Nutritional status
>23 kg/m^2	Over nutrition
18.5-23 kg/m^2	Adequate nutrition
<18.5 kg/m^2	Under nutrition

It is a simple index for weight for height used to classify underweight, overweight and obesity.

- Underweight <18.50

- Normal range 18.50-24.99

- Overweight >25.00

- Pre-obese 25.00-29.99

- Obese >30.00

BMI values are age- independent and same for both sexes.

Statistical analysis

Statistical package for social science (SPSS) version 21.0. Descriptive statistics were used to show the socio-demographic characteristics of the anaemic, like age, sex, religion. Cross tabulations were used to see the association between different attributes.

RESULTS

About One fifth of students were underweight while nearly one fifth had an increased BMI (Table 2).

A higher proportion of females were found to be underweight while a higher percentage of males were found to be overweight or obese (Table 3).

Nearly 31.92% of students with a normal BMI were found to be anemic (Table 4).

Table 2: BMI distribution of students.

BMI	Male	Female	Frequency	X^2 (P-value)
Underweight	23 (15.76) (31.08)	51 (25.76) (68.92)	74 (21.51) (100.00)	
Normal weight	71 (48.63) (37.77)	117 (59.09) (62.23)	188 (54.65) (100.00)	
Pre-obese	35 (23.97) (60.34)	23 (11.62) (39.66)	58 (16.87) (100.00)	21.12 (0.0000)
Obese	17 (07.54) (70.83)	07 (03.03) (29.17)	24 (04.94) (100.00)	
Total	146 (100.00) (42.44)	198 (100.00) (57.56)	344 (100.00) (100.00)	

Table 3: Relationship of BMI with socio demographic factors in students.

	Underweight (%)	Normal (%)	Preobese (%)	Obese (%)	Total (%)	X^2 (P-value)
Socio demography						
17-18	31 (41.89) (23.85)	72 (38.30) (55.38)	17 (29.31) (13.08)	10 (41.67) (07.79)	130 (37.79) (100.00)	
19-20	29 (39.20) (20.28)	66 (35.11) (46.15)	34 (58.62) (23.78)	14 (58.33) (09.79)	143 (41.57) (100.00)	
21-22	11 (14.86) (24.44)	29 (15.43) (64.44)	05 (08.62) (11.12)	00 (00.00) (00.000)	45 (13.08) (100.00)	
23-24	00 (00.00) (00.00)	09 (04.78) (100)	00 (00.00) (00.00)	00 (00.00) (00.00)	09 (02.62) (100.00)	27.148 (0.027)
25-26	02 (02.70) (25.00)	04 (02.13) (50.00)	02 (03.45) (25.00)	00 (00.00) (00.00)	08 (02.32) (100.00)	
>26	01 (01.35) (11.11)	08 (04.25) (88.89)	00 (00.00) (00.00)	00 (00.00) (00.00)	09 (02.62) (100.00)	
Total	74 (100) (21.51)	188 (100) (54.65)	58 (100) (16.86)	24 (100.00) (06.98)	344 (100.00) (100.00)	
Gender						
Male	23 (31.08) (15.75)	71 (37.77) (48.63)	35 (60.34) (23.97)	17 (70.83) (11.65)	146 (42.44) (100)	
Female	51 (68.92) (25.76)	117 (62.23) (59.09)	23 (39.66) ((11.62)	07 (29.17) (03.53)	198 (57.56) (100.00)	21.122 (0.000)
Total	74 (100.00) (21.51)	188 (100.00) (54.65)	58 (100.00) (16.86)	24 (100.00) (06.98)	344 (100.00) (100.00)	
Religion						
Hindu	66 (89.19) (22.30)	155 (82.45) (52.37)	54 (93.10) (18.24)	21 (87.50) (05.07)	296 (86.05) (100.00)	
Muslim	04 (05.41) (10.81)	27 (14.36) (72.97)	03 (05.17) (08.11)	03 (12.50) (08.11)	37 (10.76) (100.00)	
Christian	03 (04.05) (30.00)	06 (03.19) (60.00)	01 (01.73) (10.00)	00 (00.00) (00.00)	10 (02.90) (100.00)	
Sikh	01 (01.35) (100.00)	00 (00.00) (00.00)	00 (00.00) (00.00)	00 (00.00) (00.000	01 (00.29) (100.00)	
Total	74 (100.00) (21.51)	188 (100.00) (54.65)	58 (100.00) (16.86)	24 (100.00) (06.98)	344 (100.00) (100.00)	

Table 4: Relationship of anaemia with BMI in students.

BMI	Anaemia present (%)	Anaemia absent (%)	Total (%)	X^2 (P value)
Underweight	20 (20.00) (27.02)	54 (22.13) (72.98)	74 (21.51) (100.00)	
Normal weight	60 (60.00) (31.92)	128 (52.46) (68.08)	188 (54.65) (100.00)	
Pre-obese	15 (15.00) (25.86)	43 (17.62) (74.14)	58 (16.86) (100.00)	1.967 (0.579)
Obese	05 (05.00) (20.83)	19 (07.79) (79.17)	24 (06.98) (100.00)	
Total	100 (100.00) (29.07)	244 (100.00) (70.93)	344 (100.00) (100.00)	

DISCUSSION

Anaemia though global, is more of concerned in the developing countries due to high prevalence. Unfortunately it is not restricted to rural and low socio economic status adolescents but shows increase prevalence in developed affluent societies.[15]

In the present study anaemia was found in 29.07% of students out of which prevalence of anaemia was higher among female (41.92%) than male (11.64%) which was statistically significant (0.000). Similarly Gargade et al found prevalence of anaemia (29%) among medical students of whom more common among females (45%) than in males (5%).[16] Pandey et al found prevalence of anaemia 30.20% among medical students out of which prevalence of anaemia was higher among female medical students (47.37%) than males (18.96%).[17] Bano et al found 32% prevalence among medical students while prevalence of anaemia among female was 44% while in males 20%.[18] Kalyanshetti et al found it to be 25.5%.[19] Kaur found prevalence of anaemia among undergraduate students was 35%, more prevalent among girls (44.8%)

than the boys (17.6%) and was statistically significant (p=0.000).[20] Pal et al found prevalence of anaemia among adults 57.23% more prevalent among females (66.87%) than males (46.62%).[21] Metha found prevalence of anaemia among students was 70.83% more prevalent among females (74.47%) than males (35.71%).[22] Debbarma et al found prevalence of anaemia among medical students (26.62%) more prevalent among females (50.00%) than males (6.67%).[23] Saxena et al found prevalence of anaemia among medical students was 8% more prevalent among females (17%) than males (00%).[10] Sah et al found higher prevalence of anaemia among females (11.1%) as compared to males (3.1%).[24] Agarwal et al found higher prevalence of anaemia among females (65.11%).[25] Out of total 198 (57.56%) were females, prevalence of anaemia among females was 41.92% and in males 11.64% which was highly statistically significant. Kalyanshetti et al found prevalence of anaemia among females was 59% while in contrast Verma et al find prevalence of anaemia among young females 29.32% and in males it was 19.53% in 20-29 years age group.[19,26] Sah et al found prevalence of anaemia among females to be 21.77%.[17]

Table 5: BMI of the students.

	Present study (%)	Lakshmi et al[27] (%)	Arifuddin et al[28] (%)	Chitra et al[29] (%)	Gargade et al[16] (%)
Underweight	21.51	20	16.04	48	16.67
Normal weight	54.65	59	55.55	25.86	61.67
Preobese	16.87	10	28.39 combined	26.14 combined	20
Obese	06.98	11			1.66

Relation of anaemia with BMI

In the present study, prevalence of anaemia among normal weight (31.92%) followed by underweight (27.02%) in preobese (25.86%) while least among obese (20.83%). Gargade et al found similar finding of higher prevalence of anaemia among normal weight (55.2%), in underweight (27.6%), in overweight (13.6%) in obese (3.4%).[16]

While Metha found anaemia more prevalent among underweight students (63.33%) and overweight students (0.83%) have less prevalence of anaemia while in normal weight student's prevalence of anaemia was 6.67%.[22] Pandey et al found prevalence of anaemia among underweight (60%), normal weight (27.5%) overweight (12.5%).[17] Gupta et al found higher prevalence of anaemia among underweight (91.4%) in normal weight (83.6%) and in overweight (73.3%).[30]

Pal et al found higher prevalence among underweight males (62.5%), females (80.65%), among normal weight males (45.98%) females (62.67%) and overweight/obese males (19.05%) females (25.0%).[21]

Waseem et al found anaemia in underweight (44.9%), in normal weight (23.67%) while in overweight it was (10%).[31]

Sinha et al found prevalence of anaemia among undernourished women (76.06%) than normal weight (75.28%) in overweight women (66.67%) means negative correlation between anaemia and BMI.[32]

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