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ESTIMATION OF PREVALENCE OF ANAEMIA, VITAMIN B12, VITAMIN D & FOLIC ACID DEFICIENCY IN FIRST YEAR MBBS STUDENTS OF A TERTIARY MEDICAL COLLEGE IN EASTERN INDIA

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ABSTRACT Medical students are more vulnerable to develop nutritional anemia (i.e. haemoglobin, iron , vit B12, folate deficiency) & vitamin D deficiency due to irregular eating habits & hectic study schedule. Anemia among this age group has significant health consequences (e.g. poor cognition, decreased attention span , depressed immunity, repeated infections, increased fatigue etc) . So the present study was planned to ascertain the prevalence of anemia , iron , folic acid ,vit B12 & D deficiency among young adult female & male medical 1st year MBBS students of Medical College Kolkata,(batch 2019-2020) ,West Bengal,India and to suggest intervention strategies. 63 % & 37% female & male students respectively were found to be anaemic & low level of hemoglobin is significantly associated with type of family as 22% of study subject's belonged to joint family and 78% subjects belong to nuclear family. (p=0.002) & there came out to be no significant association between socio-economic status and anemia (p=0.213) . Among these subjects with anemia 12 had iron deficiency . Serum folic acid levels were normal in the 100 study subjects . 30% students had low serum levels of vitamin B12 , and there was no gender preference (9 suffered from severe deficiency, 21 students were in low normal range) . In this study, moderate Vitamin D deficiency was found to be present in 42% subjects, mild insufficiency in 57% subjects, and adequate serum Vitamin D levels in just 1%. Periodical and routine health check-up and haemoglobin estimation of the students at the time of entrance to Medical Colleges should be done. Iron and folic acid tablets and deworming drugs in therapeutic doses should be provided to the anaemic students. Students should be motivated and educated to take balanced diet, rich in green leafy vegetables and fruits.

KEYWORDS : MBBS students, iron, folic acid, vitamin B12, vitamin D, anaemia.

INTRODUCTION:

Micronutrient deficiency, also known as the "hidden hunger", is a global health threat that it is frequently linked to impaired hematopoiesis which presents as anemia. It is especially prevalent in patients that have iron, vitamin B12 or folic acid deficiency. The combined deficiency of multiple different micronutrients is a common problem in the developing world [1][2][3].

The etiologies attributed to these deficiencies vary from inadequate nutritional intake [4], malabsorption [5][6], chronic use of high risk medications [7], infections [8] and auto-immune pathology, such as pernicious anemia, notoriously known to lead to a deficiency in vitamin B12 [9].

India has high prevalence of iron-deficiency anemia among women. Between 60-70% women are anemic, a condition that can result in adverse pregnancy outcomes or even maternal death, as well as reduced work productivity and impaired physical capabilities.[10] The principal cause of iron deficiency anemia in premenopausal women is blood lost during menses[11] .The other causes of anemia are insufficient iron in the diet, malaria, intestinal worms, and HIV/AIDS. Adult males may also be at risk where there is chronic energy malnutrition due to inadequate food intake or frequent parasitic infection.

Medical students are more vulnerable to develop anemia due to irregular eating habits due to hectic study schedule. Anemia among this age group has significant health consequences resulting in poor cognition, decreased attention span and memory affecting the performance, depressed immunity, repeated infections, increased fatigue, shortness of breath, dizziness, blurred vision, low endurance and irregular menstruation. It significantly result in decreased work output and work capacity. It has a gradual onset and is not detected unless person becomes symptomatic.

It has been observed that 1g/dl increase in hemoglobin level is associated with increase in 1.7IQ points. [12]

Vitamin D deficiency continues to be an unrecognized epidemic globally. 25(OH)D is a precursor of active hormone, 1,25-dihydroxyvitamin D (1,25[OH]2D) and is the best indicator of total Vitamin D stores and its availability for biological functions.

Some studies done on the medical students and resident doctors in other parts of world have found a high prevalence of Vitamin D deficiency.[13,14].

The first year of MBBS is the starting of professional carrier which is important and they need to look into their correct dietary and living habits. So the present study was planned to ascertain the prevalence of anemia , iron , folic acid ,vit B12 & D deficiency among young adult female & male medical 1st year MBBS students of Medical College Kolkata, (batch 2019-2020) ,West Bengal,India and to suggest intervention strategies.

MATERIAL AND METHODS

A descriptive,cross-sectional,observational,institution based study was conducted among First year MBBS students who took admission at Medical College Kolkata , West Bengal ,India A total of 100 students were examined in year 2019(October – December 2019). World Health Organization criteria were taken to determine the severity of anemia [15] .

Age group	No anemia	Mild anemia	Moderate anemia	Severe anemia
Non pregnant women (15 years and above)	≥12 g/dl	11-11.9g/dl	8-10.9 g/dl	<8g/dl
Men	≥13g/dl	11-12.9g/dl	8-10.9g/dl	<8g/dl

Modified B.G. Prasad scale was used to assess the socio-economic status of the family. [16]

A pre-designed and pre-tested self administered questionnaire interview method was used after obtaining informed consent. Information on background characteristics, anthropometric parameters and menstrual history was obtained. Classification of BMI for Indians and grading of anaemia was followed as per WHO guidelines.

INCLUSION CRITERIA

Healthy male & female medical students consent to participate in the study.

EXCLUSION CRITERIA

Subjects not willing to give their consent, suffering from any chronic disease, having any contraindication to exposure to sunlight, taking hormone replacement therapy or medications that affect Vitamin D metabolism (e.g., phenytoin); those with a history of inflammatory bowel disease, small bowel surgery, and altered bone metabolism (hyperthyroidism, hyperparathyroidism, and Type 1 diabetes mellitus) were excluded from the study

We excluded those with previous diagnosis of vitamin B12, folic acid

or iron deficiency & those who had used pure vitamin B12, folic acid or iron supplements.

A 15-milliliter phlebotomy was performed under sterile conditions for each participant. The blood obtained was placed in a cool box of 2 to 8 degrees Celsius and transported to the laboratory within 24 hours for further processing including the freezing of the sera at minus 80 degrees Celsius until it was used for all the desired tests. A full blood count and red cells parameters were obtained using automated cell counter . The serum iron, folic acid and vitamin B12 measurements were determined using ECL-based immunoassay technique [17] [18], all of them using the advia centaur analyzer series.

The analysis of outcome dependent variables used both cut-offs as per the standard WHO recommendations [19]

i. Measurement of serum vitamin B12 levels using siemens vitamin B12 kit:
B12 levels below 174 pg/ml (low), 174 – 300 pg/ml (low normal), more or equal to 300 pg/ml (normal)

ii. Measurement of serum folic acid levels using siemens folate kit:
Folate levels below 4 ng/ml (low), more or equal to 4 ng/ ml (normal)

iii. Measurement of serum iron- > konelab kit : males : 60-160 µg/dl, females 35-145 µg/dl.

Serum Vitamin D Level
Measurement of serum 25(OH)D levels was done in the Biochemistry Laboratory of Medical College & Hospital, Kolkata, ADVIA CENTAUR autoanalyzer was used which is based on the principle of chemiluminescence microparticle assay.

Reference range -> 20-70 ng/ml

Body Mass Index (BMI)
Body weight was recorded to the nearest kilogram, height to the nearest centimeter and then BMI was calculated using the standard formula, wherein BMI of the subject = weight in kg divided by height in square meters.

BMI	Body weight status
0-16	Severe underweight
16-18.5	underweight
18.5-25	normal
25-30	overweight
>= 30	obese

RESULTS
A total of 100 students were taken as study subjects including 44(44%) female students and 56(56%) male students. Most of the study subjects, 71 (71%) were in the age group of 17-19 years and 29 (29%) were more than 20 years. All students were unmarried at the time of admission.

Table 1: Baseline anthropometric measurements of the subjects (*n*=100)

Variable	Mean±SD	Range
Age (year)	20.4±1.71	18–22
Weight (kg)	55.94±7.78	44–87
Height (meter)	1.60±0.07	1.35–1.75
BMI (kg/m2)	21.79±3.03	16.26–31

The Difference between the mean levels of hemoglobin across the genders came out be statistically significant (P=<0.001) Anaemic females – 63% (i.e. 28 female students were anaemic) , anaemic males – 37 % (i.e. 21 male students were anaemic) , If we observe about the severity of anemia among students there was mild anemia among 33 (33%) students followed by moderate anemia accounting for 20 (20%) students , none of the study subject had severe anemia.It has been observed in the study that low level of hemoglobin is significantly associated with type of family as 22 (22%) of study subject's belonged to joint family and 78 (78%) subjects belong to nuclear family. (p=0.002) (Table-2).

Table-2: Association of anemia with type of family

Type of family	Anemia Present	Anemia Absent	Total	□2 (df)	p
	No. %	No. %	No. %		
nuclear	32 46.4	37 53.0	69 100	5.207	0.022
joint	22 71	9 29	31 100	5.207	0.022
total	54	46	100	5.207	0.022

Table-3: Association of anemia with socio- economic status of family

Type of family	Anemia Present		Anemia Absent		Total		□2 (df)	p
	No.	%	No.	%	No.	%		
U Class	31	47.7	34	52.3	65	100	3.097	0.213
UM class	10	62.5	6	37.5	16	100	3.097	0.213
M + other	13	68.4	6	31.6	19	100	3.097	0.213
Total	54		46		100			

In this study, there came out to be no significant association between socio-economic status and anemia (p=0.213) (Table-3).

Among these subjects with anemia 12 had iron deficiency . Serum folic acid levels were normal in the 100 study subjects .

We observed that nearly 30 students among 100 were affected by low serum levels of vitamin B12 ,and there was no gender preference, out of them 9 suffered from severe deficiency, 21 students were in low normal range . The effect of chronic alcoholism or medications that are notoriously known to impair the normal absorption of vitamin B12 was non-existent as they were excluded beforehand. There is a significant association of low or low normal vitamin B12 with history of gastritis/ dyspepsia (OR 1.89, 95% CI [1.01 – 3.53], p = 0.04) though we did not evaluate further the association. There was no association with the history of parasitic infestation or the frequency of consumption of natural sources of vitamin B12 .

The prevalence of anaemia among young adult female medical students had no significant association with height, weight or BMI.

Table 4 : BMI wise distribution of subjects according to serum Vitamin D levels

BMI (kg/m2)	Serum 25(OH)D levels (ng/mL) *n* (%)		
	5–10	10–20	>20
<25	39 (39.00)	48 (48.00)	1 (1.00)
≥25	3 (3.00)	9 (9.00)	0
Total	42 (42.00)	57 (57.00)	1 (1.00)
BMI: Body mass index			

In our study, moderate deficiency was found to be present in 42% subjects, mild insufficiency in 57% subjects, and adequate serum Vitamin D levels in just 1%. At the same time, none of the subjects had severe Vitamin D deficiency.

DISCUSSION
The prevalence of anemia among young adult female & male 1st year MBBS medical students in our study was 53%. This corresponds to an ICMR study by Toteja GS and Singh P[20] who obtained data from 16 districts of 11 states through District Nutrition projects, where prevalence of anemia among adolescent girls has been found to be as high as 90.1%. Similarly, studies on prevalence of anemia from different states of rural India, reported high prevalence of anemia from 46-98%.[21-23] Sharda Sindu[24] in a study carried out among 265 adolescent girls of Amritsar in 2005 also discovered high prevalence (70-75%) of anemia including 12.83% girls who had severe anemia.

This study had maximum number of study subjects in the 18-22 years age group which is similar to the study conducted by Kaur M et al among Medical students of SGRDIMSAR, Amritsar[25] having study subjects 300(100%) in the age group of 17-19 years pursuing their medical course.

In a study conducted by K Subramaniyan et al[26] among 549 health science university students of South India 43% (237) had anemia. They had significance preponderance of female students with anemia as compared to male students (97 vs 68% p=0.0001). Similarly this study is showing more prevalence of anemia among female students (62.96%). It is estimated that 42mg of iron is lost per menstrual cycle as documented by various studies in different areas which is the leading cause of anemia in females.

Finding of this study is in contrast to study conducted by Kanchan

R[27] et al among first year MBBS students at Karnataka, showing more prevalence of anemia among males 42% when compared to females 21%. The reason of this inconsistency among study subjects may be due to differences in socio-cultural, economic and geographical conditions and also demand the frequent hemoglobin monitoring among MBBS students.

Chaudhary SM[28] et al conducted study among adolescent females of Nagpur documented that 72 (69.2%) and 32 (30.8%) of subjects with mild and moderate anemia respectively and none of the subjects had severe anemia which is comparable with this study observation of having mild and moderate anemia and no student having severe anemia.

This study claims high prevalence of anemia among the students belonging to joint family 22(71%) which is in contrast to study conducted by Rawat et al[29]showing the prevalence of anemia in joint families and nuclear families 22.75% and 32.25%respectively. In this study there was significant relationship between type of family and anemia ($p<.0001$).

There was no significant association of anemia with socioeconomic status which is similar with the study conducted by Dutt R et al among adolescent girls in rural area of Raigad district. [30] Thus it appears that among study subjects socio-economic status have a lesser influence on anemia status.

Considering this, all young adult female students should be appraised about high prevalence of anaemia and regular checking of haemoglobin level should be ensured among them. Studies have also reported successful management of anaemia with weekly iron supplementation to adolescent girls which could also be tried out. [31-32]

Vitamin B12 deficiency: The current study involving 100 1st year MBBS students documents a prevalence of vitamin B12 deficiency of 30% using the standard WHO definition. This prevalence is higher than that found in citable population-based studies done in the United Kingdom and the United States which have documented a prevalence of vitamin B12 deficiency ranging from 3-6 % [33][34]. Although this prevalence is much lower than that observed in a similar study done in Jordan, the proportion of marginal vitamin B12 levels remains alarmingly high and should be looked at as a significant public health concern [35]. In our developing world, most of the research work related to B complex vitamins has mainly been spearheaded by the diagnostic work up for cytopenias or designed to address health issues affecting specific populations such as childhood malnutrition and psychosis [36][37]. One of the pitfalls encountered whenever the evaluation of these vitamins is tailed to a specific clinical question such as anemia, is the fact that all the B12 deficient states do not always translate in clinically detectable anemia.

Association with B12 deficiency: In our study, we observed an association between low or low-normal vitamin B12 deficiency with gastritis/ dyspepsia, with the high proportions being seen in the young age groups. Although this finding was not thoroughly evaluated, in our resources limited countries it re-emphasizes the need to orient further our efforts of combating Vitamin B deficiencies .

The present findings are consistent with the studies conducted by Hasanato et al.,[38] Al-Elq et al.,[39] Inam-ul-Haq et al.,[40] and Walia et al.[41] who reported that hypovitaminosis D was high among female medical students.

Similar to our results, some studies done on the medical students and resident doctors in other parts of world have found a high prevalence of Vitamin D deficiency.[42,43] In the present study, mean BMI was 21.79 ± 3.03 kg/m2. Majority (88%) had normal BMI. Hasanato *et al*.[44] have also reported a similar range of BMI. Among obese students (12) in our study, 25% (3) had moderate deficiency, while the rest had mild insufficiency. Obesity and low vitamin D levels complement each other, with obesity being considered as a risk factor for low Vitamin D levels. In obese people, there is a suppressing effect of high quantity of subcutaneous fat on circulating Vitamin D.[45] Florez *et al*.,[46] Hypponen E and Power C (2007),[47] Looker *et al*.,[48] and Le Goaziou *et al*.[49] all have demonstrated that overweight or obesity and not participating in outdoor sports are risk factors for hypovitaminosis D. Several factors are postulated for low Vitamin D levels in females including dietary habits, lack of sun exposure, sunscreen use, skin hyperpigmentation, poor dietary intake, their longer indoor stay in the college as well as at home.[50]

CONCLUSION

There occurs high degree of variability in the prevalence of anemia among studies conducted by various researchers. The reason for increased prevalence of anaemia, vitamin B12 & D deficiency among study subjects could be low intake of iron rich food, menstrual loss, erratic eating habits. It is more prevalent in both sexes due to growth spurt. Irregular & less intake of healthy iron & vitamin B12 & D reach foods , long stressful indoor works like hospital rounds, study, lack of rest & increased consumption of junk foods , lack of sun exposure & lack of outdoor gaming were found to be the main cause of vitamin D , vitamin B12 deficiency & nutritional anaemia in 1st year MBBS students of Medical College & Hospital, Kolkata.

Iron deficiency anaemia is more prevalent among females especially adolescent girls due to causes like menstrual blood loss, poor diet and under nutrition as compared to males. Periodical and routine health check-up and haemoglobin estimation of the students at the time of entrance to Medical Colleges should be done. Iron and folic acid tablets and deworming drugs in therapeutic doses should be provided to the anaemic students. Students should be motivated and educated to take balanced diet, rich in green leafy vegetables and fruits. Nutritional anemia is easily preventable as well as treatable and the available control measures are affordable.

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