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Status of Anemia among Undergraduate Students of a Medical College of Central Nepal

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ABSTRACT

Background: Anemia is a public health concern with adverse health consequences. The vast nature of medical curriculum demands rigorous efforts and stress putting health science students at risk of anemia. In the present study, we aim to estimate the hemoglobin level of undergraduate health science students at Chitwan Medical College.

Methods: This cross-sectional study included all 386 year I and II undergraduate health science students enrolled at Chitwan Medical College. An informed consent was obtained from all the participants and hemoglobin values were obtained using Sahli's hemoglobinometry at Physiology laboratory of basic science complex during March to August 2019. Ethical approval was obtained from CMC-IRC (Ref: CMC-IRC/075/076-125). Chi-squared test was done to seek the association of various demographic factors with hemoglobin values.

Results: Anemia was found among 37.8% undergraduate health science students as per World Health Organization (WHO) criteria. A total of 44.7% males and 32.3% females were found to have anemia. Statistical significant association was observed between body mass index (BMI) and hemoglobin level with higher BMI contributing to higher hemoglobin values. There was no association of hemoglobin level with sex, place of origin and stream of study.

Conclusions: Almost 4 out of 10 undergraduate medical students enrolled at Chitwan Medical College had lower hemoglobin values for age and sex as suggested by WHO.

Keywords: anemia; health science; hemoglobin; students; undergraduate.

INTRODUCTION

Anemia is significant public health problem and is associated with poor health conditions.[1] It is a clinical state in which the quantity or quality of circulating red blood cells, hemoglobin or hematocrit level is reduced below the reference range for healthy individuals of the same age, sex, and race, under similar environmental conditions. The complete blood count (CBC) with red cell indices offers clue to diagnosis.[2,3] Symptoms of anemia may vary from none, mild fatigue to weakness and reduced cognitive performance.[4] The ever demanding medical curriculum exhausts students forcing them skip meals, attend long classes, live sedentary life making them vulnerable to several medical conditions including anemia.[5] Also, undergraduate students fall under anemia vulnerable age-group. Independent studies in different medical colleges of Nepal have reported the prevalence of anemia among undergraduate students at around 30%.[6] The present study aims at estimating hemoglobin levels to find the prevalence of anemia among undergraduate medical students.

METHODS

This cross-sectional study was conducted among undergraduate health-science students of Chitwan Medical College from March 2019 to August 2019 after obtaining ethical approval from IRC-CMC. (Ref: CMC-IRC/075/076-125) All 391 undergraduate health science students in 1st and 2nd year were recruited from a pool of "School of Medicine", "School of Dental Surgery", "School of Nursing" and "School of Allied Sciences". Students with systemic illnesses, bleeding disorders, and on medications that interfered with red blood cell production, iron and folic acid metabolism were excluded from the study. An informed consent was obtained from all the students for participation in the study.

Demographic information including age, sex, height, weight, place of origin and stream were recorded. Hemoglobin estimation was done by using Sahli's hemoglobinometry. The hemoglobin value was checked and confirmed by all the investigators and recorded independently. Any

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values that did not match the independent investigators recordings were discarded. WHO guideline was used for interpretation of hemoglobin values. Hemoglobin level below 12.0 gm% in females and 13.0 gm% in males was considered anemic.[7] WHO criteria for BMI was utilized and participants were categorized as either underweight, normal, overweight or obese. Statistical analysis was done using SPSS version 20. Numerical values were expressed as mean ± SD and categorical variable as percentage. Shapiro-Wilk test was done to find the normality of hemoglobin values. Chi- squared test was done to find the association between different demographic variables and hemoglobin values.

RESULTS

All 391 year I and year II undergraduate health science students of various streams enrolled at Chitwan Medical College underwent hemoglobin estimation by Sahli's hemoglobinometry. Among them 5 reports obtained from independent investigators did not match and were excluded from the study. The hemoglobin was non normally distributed. Among 386 study participants were 170 males and 216 females. The mean age of the students was 19.72±1.54 years (range =17-29 years). Based on WHO criteria for BMI, 71.8% participants had normal BMI and 6.7% were underweight (Table 1).

Table1. Characteristics of study participants. (n=386)

Variable	Frequency	Percentage
Sex		
Male	170	44
Female	216	56
BMI (WHO Classification)		
Underweight	26	6.7
Normal	277	71.8
Overweight	68	17.6
Obese	15	3.9
Stream		
School of Medicine	188	48.7
School of Dental Surgery	81	20.9
School of Nursing	69	17.8
School of Allied Science	48	12.6
Place of Origin		
Himalayan Region	13	3.4
Hilly Region	160	41.5
Terai Region	213	55.2

Table 2. Descriptive statistics of participants. (n=386)

Variables	Mean ± SD
Age (year)	19.72±1.54
Height (meter)	1.63±0.07
Weight (kg)	61.45±11.81
BMI (kg/m^2)	23.02±3.48
Hemoglobin g%	12.77±1.38
Hemoglobin Male (g%)	13.03±1.45
Hemoglobin Female (g%)	12.56±1.29

(Table 2) presents the physical characteristics of the study participants. BMI was only sociodemographic factor associated with hemoglobin level. Gender, faculty of study and place of origin was not associated with hemoglobin values (Table 3).

Table 3. Association between anemia and sociodemographic profile. (n=386)

Variable	WHO Classification of Anemia		χ^2	p-value
	Anemic	Non-anemic		
Sex				
Male	76 (44.7)	94 (55.3)	45.02	0.709
Female	70 (32.3)	146 (67.7)		
Place of Origin				
Himalayan Region	4 (30.7)	9 (69.3)	26.54	0.623
Hilly Region	86 (52.7)	74 (47.3)		
Terai region	56 (26.3)	163 (73.7)		
Body Mass Index				
Underweight	12 (46.2)	14 (53.8)	6429.4	<0.001
Normal weight	111(40.1)	166 (59.9)		
Overweight	21 (30.9)	47 (69.1)		
Obese	2 (13.4)	13 (86.6)		
Stream				
School of Medicine	91 (48.4)	97 (51.6)	2.36	0.856
School of Dental Surgery	23 (28.3)	58 (71.7)		
School of Nursing	22 (31.8)	47 (68.2)		
School of Allied Sciences	10 (20.8)	38 (79.2)		

DISCUSSION

Anemia is a global public health concern having several adverse health consequences. It is not only restricted to rural and low socioeconomic status population but is prevalent even in urban and well-off societies. Anemia in the present study was reported at around 37.8% among undergraduate health science students. Some studies report prevalence as high as 45%[8] while some report a much lower prevalence.[6,9] The present study included recently admitted undergraduate medical students where the sheer pressure of the vast curriculum, stress, lack of adequate meals could contribute to the higher prevalence of anemia. Literatures link lower hemoglobin values with junk food consumption and unhealthy life style, however, the present study did not investigate the type of food consumed or the life style of the students.

Anemia is more common among pre-school children, both pregnant and non-pregnant women and elderly females.[10] In contrast to this worldwide finding, there was a higher prevalence of anemia among males than females with 44.7% males and 32.3% females affected.[9,11,12] Menstrual loss of blood and estrogen unlike testosterone, acts as an inhibitor of erythropoiesis increasing female vulnerability to anemia.[2] The reason behind higher

prevalence of anemia among males is not known. Gender association with anemia was not statistically significant. BMI was directly proportional to hemoglobin level with participants having higher BMI were found to have higher hemoglobin values. The present study had similar findings with study from India.[5,13]

The number of red blood cells (RBC) and hemoglobin concentration increases in people dwelling in higher altitudes in order to compensate for low partial pressure of oxygen. In the present study we did not find any statistically significant relationship between hemoglobin concentration and place of origin. This physiological acclimatization to altitude is time dependent and as the study was conducted after over 6 months of residing in Chitwan, no relationship was obtained between place of origin and hemoglobin concentration. Besides, dietary habits and iron profile, an important indicator of anemia was not considered in the study. The present study included students from various faculties namely medicine, dental surgery, nursing and allied health sciences. No association between hemoglobin concentration and stream was observed.

There is limited research assessing undergraduate medical student's hemoglobin level in this part of the country. The sample size of the study is small and cannot be generalized to all health science students, however, it could serve as a baseline for future studies among health science students in this region. We suggest a more comprehensive study of hemoglobin levels among students seeking its association with various factors.

Iron deficiency anemia is the most common form of anemia worldwide. In the present study, we did not seek the causes of anemia and only hemoglobin level according to WHO was used to diagnose anemia. Also, morphological classification, other RBC indices and severity of anemia was not categorized in the present study which is limitation of the study. In the future, we aim to seek the association of anemia with academic performance of the students.

CONCLUSIONS

Almost 4 out of 10 undergraduate medical students attending Chitwan Medical College were found to have low hemoglobin values and were found to be anemic as per WHO Classification of anemia. Anemia was more common among male students than female students. Students with higher BMI had higher hemoglobin values.

RECOMMENDATIONS

Frequent screening for anemia could help decrease anemia related adverse consequences. Correction of anemia among health science students could help improve both health and academic performance.

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