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Awareness and Prevalence of Nutritional Status of Female College Students in Terms of BMI And Level of Hemoglobin

Shilpi Saha [1,*], Puja Saha [1], Satyapriya Roy [2]

[1] Department of MLT, Bhavan's Tripura College of Science and Technology (BTCST), Anandanagar, West Tripura, India.
[2] Department of Human Physiology, Government Degree College Kamalpur, Dhalai Tripura, India.
* Corresponding author email shilpisaha_07@yahoo.com
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Abstract

Introduction: The WHO (World Health Organization) evaluate those 1.62 billion peoples worldwide, or 24.8% of the population, are affected with anemia in both developing and developed countries and specially age group 15-49.99 years non pregnant women are affected highest in number. Prevalence of anemia during pregnancy and maternal fatalities as a result of anemia are greater in India than would be expected given the country's population density. Since girls are particularly at danger due to menstrual cycles and nutritional deficiencies, it is important to raise consciousness and educate children, adolescents, undergraduates, and those approaching marriage in light of these worrying conditions. Boys are still susceptible to this issue. The objective of the current study was to determine the prevalence and awareness of anemia especially female college students and also to compare anemia with nutritional status in terms of BMI (Body Mass Index). **Methods:** This cross-sectional study was conducted among 211 female college students studying in Bhavan's Tripura College of Science and Technology, west Tripura. After their written consent a general information regarding signs and different symptoms of anemia, and dietary habits was collected. This study is carried out to measure the prevalence of anemia among college girls and to compare the level of hemoglobin with their nutritional status (BMI). **Results:** Prevalence of anemia is observed in study population is 78 (36.97%) students were suffering from anemia. On the basis of severity of anemic condition only 5 (2.37%) students had severe anemia, about 29 (13.74%) had moderate and 44 (20.85%) had mild anemia. Regarding Body Mass Index, 16 (7.58%) were underweight, while 21 (9.95%) were overweight and 8 (3.79%) were obese. In our present study there was a significant relationship was observed between hemoglobin levels and BMI. **Conclusion:** The overall findings of this research highlight that anemia can affect college girls who are a susceptible group unexpectedly suffering from deficiencies of nutrients. Thus, this study highlights the necessity for interventional plans at primary health-care systems and awareness programmed in college's girls for development in their nutritional status of anemic girls to diminish future complications.

Keywords: Nutritional anemia, Body mass index, Female college students, Tripura

Conciencia y prevalencia del estado nutricional de las estudiantes universitarias en términos de IMC y nivel de hemoglobina

Resumen

Introducción: La OMS (Organización Mundial de la Salud) evalúa que 1.620 millones de personas en todo el mundo, o el 24,8% de la población, padecen anemia tanto en países en desarrollo como desarrollados, y especialmente el grupo de edad de 15 a 49,99 años, las mujeres no embarazadas son las más afectadas. La prevalencia de anemia durante el embarazo y las muertes maternas como resultado de la anemia son mayores en India de lo que se esperaría dada la densidad de población del país. Dado que las niñas están particularmente en peligro debido a los ciclos menstruales y las deficiencias nutricionales, es importante crear conciencia y educar a los niños, adolescentes, estudiantes universitarios y aquellos que se acercan al matrimonio a la luz de estas condiciones preocupantes. Los niños aún son susceptibles a este problema. El objetivo del presente estudio fue determinar la prevalencia y el conocimiento de la anemia, especialmente en estudiantes universitarias, y también

comparar la anemia con el estado nutricional en términos de IMC (Índice de Masa Corporal). **Métodos:** Este estudio transversal se realizó entre 211 estudiantes universitarias alojadas en Bhavan's Tripura College of Science and Technology, al oeste de Tripura. Después de su consentimiento por escrito, se recopiló información general sobre los signos y diferentes síntomas de anemia y los hábitos alimenticios. Este estudio se lleva a cabo para medir la prevalencia de anemia entre estudiantes universitarias y para comparar el nivel de hemoglobina con su estado nutricional (IMC). **Resultados:** La prevalencia de anemia observada en la población de estudio es de 78 (36.97%) estudiantes que padecían anemia. Sobre la base de la gravedad de la condición anémica, solo 5 (2.37%) estudiantes tenían anemia severa, alrededor de 29 (13.74%) tenían anemia moderada y 44 (20.85%) tenían anemia leve. Con respecto al índice de masa corporal, 16 (7.58%) tenían bajo peso, mientras que 21 (9.95%) tenían sobrepeso y 8 (3.79%) eran obesos. En nuestro estudio actual se observó una relación significativa entre los niveles de hemoglobina y el IMC. **Conclusión:** Los hallazgos generales de esta investigación resaltan que la anemia puede afectar a las estudiantes universitarias que son un grupo susceptible que inesperadamente sufre de deficiencias de nutrientes. Por lo tanto, este estudio destaca la necesidad de implementar planes de intervención en los sistemas de atención primaria de salud y programas de concientización para las estudiantes universitarias, con el fin de mejorar el estado nutricional de las niñas con anemia y así disminuir las complicaciones futuras.

Palabras Clave: Anemia nutricional, Índice de masa corporal, Estudiantes universitarias, Tripura

Introduction

Nutritional status of an individual is a result of correlative factors by quantity and quality of food consumption and their physical condition. At higher education, health of human is a vital factor for academic success (Ghosh *et al,* 2013). Anemia now a days is a global health condition which affects 1.62 billion (25%) people worldwide. It is common in any person at any stages of life. Hemoglobin (Hb), the iron-containing blood protein present in erythrocytes (RBC). Its concentration gives information regarding the grade of anemia of the population. Prevalence of anemia is a major health problem in India (Wadgave, 2011). According to the data from a survey conducted by NFHS-5, children 67% age 6-59 months, adolescent girls 59% and nearly 52% of pregnant women are anemic in condition (NFHS-5, 2019-21). It is generally occurring due to insufficient iron, folate-intake because of low vegetable consumption; vitamin-B12 deficiency; chronic blood loss or disease like malaria, tuberculosis, parasitic infections (NNMB, 2002), reduction of abnormal number of RBC (red blood cell), packed red cell volume and hemoglobin; or insufficient dietary iron from the fiber, phytate rich Indian foods are the major causes. It affects person's development, resistance power and growth.

Iron deficiency anemia (IDA) is also a similar type of nutritional anemia which distributed universally. As claimed by WHO, in 2001, approximately 2 billion people are suffer from anemia worldwide with around 50% of all anemia recorded to IDA (WHO, 2001). Until, IDA is one of the maximum prevalent and common type of micro elements lack in developing countries which lead to inadequate iron imbalance. IDA is characterized by the production of small RBC (microcytic) and low level of blood hemoglobin (hypochromic). It affects the immune system and morbidity from all infections at all age groups; & also affects the structure of tissue & the utilization of energy source by muscular tissue (UNICEF & UNU, 2001). Common sign and symptoms of IDA are pale skin, pink eyelid, atrophy of lingual papillae, gastritis, loss of appetite etc. IDA increases the risk for preterm labour, low birth weight and newborn mortality during the first two trimesters of pregnancy (Brabin *et al,* 2001). IDA often spread moderately for the poor bioavailability reason.

Recent studies in rural population of India shows that, nutritional anemia affects mainly children below10 years, women after puberty and older adults (Alvarez-Uria et al, 2014). According to the research, the prevalence of anemia in adolescent girls, aged between 15-24 years is 59% that is increased rate in rural areas than in urban areas in India due to low literacy rate and poor dietary habits.

Girls lose a huge amount of iron especially at the time of menstruation. Person with anemia have a low oxygen level which lead to development of weakness, headache, weak pulse rate, breathlessness, sensitivity of cold, poor concentration towards work, reduced physical capacity, increased heart rate, neurological pain etc. Disturbance in menstruation like menorrhagia, irregularity of flow is also common among girls. The results of different sources have shown that more than 70% of women in pregnancy and adolescence in India were anemic (Black MM, 2009; Chellan & Paul, 2010; Chakrabarti *et al,* 2018).

One significant public health issue affecting children in poor nations is malnutrition. It is a chronic disorder brought on by an excess or deficiency of any one or more vital macro or micronutrients which lead to growth retardation, inhibit mental development and also reduced energy level; their effects are also seen in educational carriers (Omage & Omuemu, 2018).

A recognized epidemiological measure of nutritional status is BMI (Body Mass Index) from height and weight, which is a large study of college students especially of undergraduate medical college students. In most of cases, prevalence of anemia has been performed on undergraduate students, especially girls that might be provoked by their food habit and lack of knowledge (Shill *et al,* 2014). The majority of anaemia cases occur in non-pregnant women under the age of 25, and anaemia can be significantly decreased by women's education and standard of living (Bharati *et al,* 2008). Inadequate food and exercise can result in moderate to severe anaemia and overweight to obesity; these changes impact their ability to reproduce and cause other illnesses of the life cycle (Van den *et al,* 2012). Some of the tips suggested for college students to improve their diet are as follows:

- Balanced diet.
- Be sure to stay hydrated.
- Make use of dairy products.
- Go over the nutrition facts label.
- Eat frequently and in modest portions.

In that instance, the recent study was created to measure the Hb level in order to determine the prevalence of anaemia in the college females and to compute BMI values in order to determine their body weight condition and nutritional status. These two indicators of overall health condition can assist students, particularly ladies, in becoming more health conscious and may even enable them to better manage their lifestyle. The study's primary goal was to assess the prevalence of anemia among female undergraduate students and inform them of the impending negative consequences it would have on their lives. Additionally, their hemoglobin level and body mass index (BMI) are correlated in this study.

Materials and Methods

211 Female students of Bhavan's Tripura College of Science & Technology, Anandanagar, Tripura, India with the age range between 18 and 21 years were selected for the study randomly. Height and Weight were measured according standard Method standardized by International Society for The Advancement of Kinanthropometry (ISAK, 2024). An Anthropometric Rod (GPM Swiss made) was used for height and electronic weighing scale was used for Body Mass. Proper consent were taken from each participant before the measurements and collection of blood.

Blood sample was taken and Hemoglobin content was measured with standard Biochemical method using a standard Calorimeter (Electra, Digital Colorimeter). As recommended by WHO, criteria for prevalence of anemia among these girls were accepted as Hb value below 12 gm/dl (WHO, 2008). BMI (Body Mass Index) was calculated by dividing body weight with square of height.

BMI (kg/m^2) = mass (kg) / $height^2$ (m)

A pre-structured self-administered questionnaire was designed to collect study related information like their age, food habits, regularity of monthly income, taking junk food and history of chronic disease or infection by worm, any irregularity and duration of menstrual cycle etc.

Results

Globally, nutritional anemia is now more alarming situation in developing countries including rural and urban areas due to high prevalence; but now a days that shows increased prevalence in developing affluent societies (WHO, 2008). Diagnosis of anemia is measured by the Hb cut-off values and the cut-off values defining into mild, moderate and severe anemia which are presented in table I (WHO, 1992).

According to the WHO database on anaemia prevalence worldwide, anaemia is predicted to affect 65.5% of preschool-aged children, 48.2% of pregnant women, and 45.7% of non-pregnant women, for an overall prevalence of 25% (WHO, 2008). In our study out of 211 girls' students 78 (36.97%) students were suffering from anemia. On the basis of severity of anemic condition only 5 (2.37%) students had severe anemia, about 29 (13.74%) had moderate and 44 (20.85%) had mild anemia (Table 2). The present data shows that girls are highly affected by iron deficiency anemia (IDA).

A healthy weight for height is determined by a person's BMI. It can be used as a screening tool to identify health issues including cancer, diabetes, heart disease, etc. Table 3 displays normal BMI levels (CDC; WHO, 1995). In present study, the results reported that in female college students 78.67% were the normal weight range.

Table 1. Label of Hemoglobin to diagnose anemia (g/dl)

Population	Non-anemic	Anemic		
		Mild	Moderate	Severe
Non-pregnant Women (15 years of age or above)	12 or higher	11.0-11.9	8.0-10.9	Lower than 8.0

Table 2. Distribution of college girls according to severity of anemia (gm/dl)

	Severe <8	Moderate 8-10.9	Mild 11.0-11.9	Non-anemic >12	Total
Number of female students	5	29	44	133	211
% of students	2.37	13.74	20.85	63.03	100

Table 3. Categorization of level of nutrition based on BMI

Underweight	Normal weight	Overweight	Obese
BMI is below 18.5	BMI is between 18.5-24.9	BMI is between 25-29.9	BMI is 30 or higher

Regarding Body Mass Index, 16 (7.58%) were underweight, while 21 (9.95%) were overweight and 8 (3.79%) were obese. 166 (78.67%) female students were found within normal range of BMI (Table 4). Hemoglobin levels and BMI were shown to be significantly correlated in our study. Following investigation, it was shown that underweight pupils had a higher prevalence of anemia, whereas overweight students had a lower prevalence.

Table 4. Distribution of college females by BMI-based nutritional prevalence

BMI values	Underweight	Normal weight	Overweight	Obese	Total
Number of female students	16	166	21	8	211
% of students	7.58	78.67	9.95	3.79	100

Table 5. Multiple correlation between girls' hemoglobin levels and BMI grades

BMI (Kg/m^2)	Girls			
	r	r^2	Adjusted r^2	p-value
Underweight (<18.5 kg/m^2)	0.77	0.593	0.525	0.025*
Normal (18.5 kg/m2-23 kg/m2)	0.113	0.013	0.003	0.365
Overweight (>23 kg/m^2)	0.42	0.176	0.085	0.199
Total	0.096	0.009	0.005	0.164

*Significant at p value ≤ 0.05

Multiple correlation of hemoglobin level with grades of BMI exhibited a positive association of BMI with percentage of Hb among girls. There was no negative association in the studied population. Significant correlation was found among girls in underweight students at $p \leq 0.05$ level. However, for the population of girls in the sample under study, neither correlation was significant to p-value ≤0.05 (Table 5).

The average duration of menstrual cycle of the study population was found that about 42 (19.91%) girls had an average 2-4days, 151 (71.56%) had 5-7 days whereas 18 (8.53%) girls had an average of more than 7 days of monthly menstrual cycle as indicated in Table 6.

Table 6. Coordinating the study sample based on the average menstrual cycle duration

Average menstrual period duration	Frequency	Percent
Two to four days	42	19.91%
Five to seven days	151	71.56%
Over 7 days	18	8.53%
Total	211	100%

Anemia is a health problem that as 127 (60.19%) of the respondents said yes to the statement. The 114 (54.03%) of students who were willing to take iron tablets, if prescribed for anemia. Some good awareness level questions to ask were the students whose statements have been prepared in addition to the table 7.

Table 7. The research population's prevalence, awareness, and knowledge of anaemia

Questions	Yes Frequency	Percent	No Frequency	Percent
✓ What do you think anemia is a health problem or not	127	60.19	84	39.81
✓ Have you suffered any chronic disease?	14	6.64	197	93.36
✓ In case of suspect anemia Would you feel necessity for medical attention	134	63.51	77	36.49
✓ Would you include huge green leafy vegetables in your diet if prescribed for anemia?	106	50.24	105	49.76
✓ If you were prescribed iron tablets for anemia, would you be ready to take them?	114	54.03	97	45.97
✓ Do you breakfast daily?	47	22.27	164	77.73
✓ Do you take multivitamins tablet regularly?	31	14.69	180	85.31

Discussion

The most significant nutritional issue facing the globe today is anemia. The majority of those affected are young children, particularly girls, pregnant women, and women in their reproductive years (WHO, 1995). The commonest cause of the anemia is the deficiency of iron and according to WHO statistics in india almost 52% women suffering from anemia at the age between 15-49 years (WHO, UNICEF, UNU, 2001).

Anemia, decreases physical efficiency, impaired immunological function, causes problems in controlling body temperatura, changes in metabolism, causes tension and anxiety, headache, exhaustion, lethargy, dyspnea, palpitations, and a decline in cognitive function are all consequences of nutritional inadequacy. Thought to be more of a problem in developing nations (rural and urban), nutritional anemia is increasingly more common in industrialized, wealthy societies.

An analysis of Punjab's Schedule cast revealed a significant prevalence of anemia (70–75%), with 12.83% of the girls experiencing severe anemia (Sidhu et al, 2005). Anemia prevalence was found to be high in 46–98% of rural Indian states, according to similar research. Among female medical students in Karad, Maharashtra, there was a significant correlation between nutritional anemia and underweight, overweight, and obese students (Vibhute *et al,* 2019). Our finding is consistent with the previous studies, such as the WHO database on worldwide prevalence of anemia, which found a prevalence of 25% overall and estimated that 65.5% of preschoolers, 48.2% of pregnant women, and 45.7% of non-pregnant women had anemia (WHO, 2008). While less number (2.37%) of instances of severe anemia were found in our study, the concerning findings are that 13.74 % of cases of moderate anemia and 20.85 % of cases of mild anemia, respectively, were found. Compared to the general population, this demography should ideally have more alertness and access to diagnosis and treatment of anemia.

The present study revealed that underweight students had a higher prevalence of anemia, while overweight students had a lower prevalence (WHO, 1995). The present study also revealed a significant co-relation between anemia and BMI in underweight girls ($p \leq 0.05$) which was very similar with previous studies by different researchers (Vibhute *et al,* 2019; Sivakumar, 2001; Gawarikar, 2002)

Different studies on teenage girls revealed that the prevalence of anaemia in india varies between 22.00 to 96.50% (Vibhute *et al,* 2019; Jonathan, 2000; Sivakumar, 2001; Gawarikar, 2002). The present study also reveals similar findings with significant co-relation between anemia and BMI in underweight girls ($p \leq 0.05$).

The primary goal of this study was to use haemoglobin levels to determine the prevalence of anaemia in female college students. This cross-sectional study was conducted with the intention of providing an opportunity to intervene at an early stage of life, before the likely health issues worsened later in life.

Conclusion

According to the current study, iron deficiency anemia, in particular, is more common in college girls (n = 78; 36.97 percent). Notably, it was shown that anemia affects college students who are malnourished as well as those who are overweight or obese. This report emphasizes how susceptible female college students are highlighting the critical need for interventional programs on college campuses. For the benefit of all participants, the authors gave lectures on the causes, clinical characteristics, prevention, and treatment methods of anemia, as well as topics related to nutrition, health, and healthy eating habits, at the college.

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Conflicts of interest

There are no conflicts of interest.

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