The Association between Hemoglobin Level and Body Mass Index in Female College Students of West Tripura

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Abstract: *Purpose: Anemia is a very common medical problem which develops when there is an insufficient hemoglobin or healthy red blood cells in blood. Nutritional anemia occurs due to lack of one or more vital nutrients and due to increased demand for the need of micronutrients and blood loss at the time of menstruation. The prevalence of nutritional anemia among female especially of age group between 19 - 22 years are at high risk. Methods: The present work is taken to determine the prevalence of anemia in college female students of Bhavan's Tripura College of Science & Technology. It helps to determine correlation of Hb level with BMI. The present study was conducted among 97 female college students studying in Bhavan's Tripura College of Science and Technology. Hemoglobin level is estimated by cyanmethemoglobin method. BMI is calculated by measuring height and weight using appropriate equipment. Results: From the Study, it is found that the percentage of non - anemia students were 47.42%, mild anemic was 21.65%, moderate anemic was 28.87% and severe anemic were 2.06%. The BMI calculation shows that 62.88% of girls belongs to normal weight while 7.22% students had under - weight, 22.68% students had overweight and 7.22% girls had obesity. Conclusion: From the Study we conclude that females especially the adolescent girls are the common victims of nutritional anemia. That can be treated and prevented by consuming proper diet containing necessary micronutrients, providing iron supplementation, frequent screening for presence of anemia, routine health checkup and hemoglobin estimation of the students should be done. If all these measures are taken then the increasing rate of anemia among the adolescent girls can be in control.*

Keywords: Nutritional status, Hemoglobin level, BMI, female college students. Tripura

1. Introduction

Firstly, Anemia is not a specific disease. It is a disorder where the blood's capacity to carry oxygen is diminished because of either a lower - than - normal number of red blood cells or a decrease in haemoglobin or haemoglobin abnormalities. Number of RBC less than 3.5 million/cu mm for females and less than 4.0 million/cu mm for males. Anaemia is indicated by a haemoglobin level of less than 10.8 g/100 ml in males and less than 9.5 g/100 ml in females.

As per 'World Health Organization, anemia is a comprehensive community health related problem distressing globally 1.62 billion people, which resembles to 24.8% of the population [1, 2]. During 2005 - 6, 50.9% of female in urban areas and 57.4% of female in rural areas are suffered from anemia according to the census report of India (2013) [3]. It was observed that the anemia affected age group was split among 15 - 19 years, 20 - 29 years, 30 - 39 years and 40 - 49 years during the same period [3 - 7]. India has the greatest frequency of anaemia among all nations in the globe. "Nutritional Anemia", is the most world - wide problems which have the highest prevalence in developing countries. Anaemia is a sign of inadequate nutrition as well as ill health. Nutritional anemia can affect an individual's development, growth, resistance to infections and overall others development, including human well - being, as well as country's economic growth [8]. Numerous demographic

factors, including age, sex, social class, eating habits, and infections, are etiological causes of nutritional anaemia [9]. Recent research has disclosed that how chronic malnutrition hamper body growth, delay mental development, lessen motivation, stamina, lessen concentration, efficiency resulting in decreased educational achievement, health and survival of learners [10]. Generally speaking, malnutrition is a chronic illness brought on by either excessive or insufficient intake of any one or more vital macro or micronutrients [11 - 13]. Deficiency and malabsorption of iron, vitamin B12, protein, folate and other vitamins and minerals needed for the formation of hemoglobin can lead to nutritional anemia.

According to an NFHS study, anemia prevalence is greater in rural about 56% than in urban regions among young girls between the age group of 15 to 24years [6]. Anemia is a widespread nutritional issue with a prevalence that ranges from 32 to 55 percent, according to multicounty research on the nutritional condition of adolescents conducted by the International Center for Research on Women, compared to folate or vitamin B12 is the most frequent reason iron deficiency anaemia [14]. The most common nutritional cause of anemia which is distributed globally is 'Iron Deficiency Anemia'. It can affect almost every age group people but particularly effects young children, pregnant & post - partum women, menstruating girls & women as they lose highest amount of iron at the time of menstruation. Either insufficient intake or poor absorption of dietary iron due to excessive loss

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from the body can result in iron insufficiency. Iron is included in almost all regular meals in sufficient amounts, although only a tiny portion is absorbed. This low bioavailability is thought to be a primary cause of iron deficiency's widespread occurrence [8]. A person's BMI is calculated by dividing their weight in kilograms by their height in meters squared. BMI has a significant impact on the hemoglobin level of an individual. Such study reveals how inadequate care in diet and exercise leads to problems of Anemia and can cause damage to a person's wellbeing, leading to problems of anemia varying from moderate to severe and overweight to obesity and can affect reproductive capacity and other lifestyle disorders [15 - 17]. Therefore, the current study was designed to measure the haemoglobin levels and the prevalence rate of anaemia among the female students using haemoglobin percentage as the cut - off value provided by WHO 2008 in order to raise awareness of this kind among college girls, particularly since they are at high risk due to menstrual cycles [18] and to compare it with nutritional status (BMI). And making them more health conscious which will help them to become healthy and creative and to lead a wholesome life.

It is very significant to increase awareness about the causes of anemia and to know that how proper nutrition and a healthy diet is essential to deal with anemia and other lifestyle disorders. As Anemia is most frequent among women and adolescent girls as the loose considerable amount of blood during menstruation. The present work was done to access the prevalence of anemia and its impact among undergraduate female students of Bhavan's Tripura College of science and technology. The main purpose of this study helps to determine the prevalence of anemia in college female students and to compare it with nutritional status in terms of BMI (Body Mass Index).

2. Methodology

At first all the female students are informed of the present study and also how they will be awarded of their own health conditions. For hemoglobin estimation blood samples were collected from each student by pricking with a sterile needle in the finger. In a properly equipped clinical laboratory,

haemoglobin was precisely and accurately estimated using the cyanmethemoglobin method. In a test tube with a 1: 250 dilution, 20 microliters of blood are added to 5 millilitres of Drabkin's solution. The mixture is then thoroughly mixed and allowed to stand for three to five minutes before the test and standard readings are taken using a photoelectric colorimeter set to 540 nm. Then BMI was calculated for each student, height was measured using standardized anthropometric rod, students are instructed to take off their shoes & to stand straight, head facing forward. For weight measurement the students were again instructed to stand straight on the electronic weighing machine and to take off their shoes and other accessories so that nothing can hamper the weight measurement. The scales calibrated and checked accurately after every weight measurement. After that to find out the Body Mass Index the calculation was done by using the standard formula of Body weight (kg) / Height^2 (in meter).

3. Results

The results of the current study's haemoglobin levels are displayed in table 1 as follows, along with the percentage and numbers of students that had severe, moderate, mild, and non - anaemic haemoglobin levels:

Table 1: Distribution of college girls according to severity of anemia (gm/dl)

	Severe <8	Moderate 8 - 10.9	Mild 11 - 11.9	Non – Anemic >12	Total
No. of students	2	28	21	46	97
Percentage of students	2.06	28.87	21.65	47.42	100

From the study we get to know that the percentage of non - anemic student is 47.42% while the remaining percentage is having mild, moderate & severe anemia of 21.65%, 28.87% & 2.06% respectively.

The BMI values of the female students in this study were also computed and divided into four groups: underweight, normal weight, overweight, and obesity. The results are shown in table 2 below:

Table 2: Distribution of college girls according to prevalence of nutrition based on BMI

BMI value	Underweight <18.5	Normal weight 18.5 - 24.9	Overweight 25 - 29.9	Obesity >30	Total
No. of students	7	61	22	7	97
Percentage of students	7.22	62.88	22.68	7.22	100

The study shows that only 62.88% of girls belong to normal weight while 7.22% students are underweight, 22.68% students are overweight and 7.22% of girls are obese. Multiple correlation of Hb with BMI showed positive association among girls. There was no negative association in the studied population. Significant correlation found that among girls in underweight students at p<0.05 level. This correlation is showed in table 4

Table 4: Multiple Correlation of hemoglobin level with grades of BMI in girls (n=97) of undergraduate students

BMI (kg/m^2)	Girls			
	r	r^2	Adjusted r^2	p - value
Underweight (<18.5 kg/m^2)	0.607	0.369	0.327	0.01*
Normal (18.5 kg/m^2 - 23 kg/m^2)	0.135	0.083	0.009	0.078
Overweight (>23 kg/m^2)	0.687	0.471	0.366	0.088
Total	0.151	0.023	0.009	0.196

(*Significant p value <0.05)

4. Discussion

Now a days anemia is a common health problem worldwide. Especially adolescent girl students are suffered from anemic condition during menstruation time. Types of anemia among children and adolescents (aged 1 - 19 years) was characterized in a recent study. About 26.6% of the anaemic teenagers in this study had folate and vitamin B12 deficiency without iron deficiency, while 21.3% had iron shortage alone (iron deficiency anaemia). About 18.2% of people suffer with iron plus folate or vitamin B12 insufficiency, often known as dimorphic anaemia.3.4% of people suffer from anaemia from other causes, such as inflammation or deficiencies in iron, folate, or vitamin B12.

Such study on schedule cast of Punjab that high prevalence (70.75%) of anemia including 12.83% girls who had suffered in severe anemia [19]. Similarly other such study reported that, significant correlation was prevalent in underweight, as well as overweight and obese student in relation to nutritional anemia among female medical students in Karad, Maharashtra [20]. Numerous studies [21 - 27] among adolescent girls have shown that prevalence of anemia ranges from 22.00 - 96.50% in India. The present study helps to detect prevalence of anemia associated with correlation between BMI and Hb level which helps to determine health problems of the female college students. 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.

5. Conclusion

It has been observed that how iron deficiency is becoming a matter of concern among adolescents. Action should be taken to minimize before it becomes an adverse condition for the society. Adolescents are need to be more conscious about their health and should take care of their diet as it will fall impact on their academic performance on their career and livelihood, as a whole it will be a worse situation for the socio - economic condition of the country. Students should be motivated to add green leafy vegetables, nuts, seeds, fruits, fish, meat and dietary products in their daily food chart as these are rich in iron, folate, vitamin B12 and many more nutrients. The students' haemoglobin levels should be estimated and a regular, periodic health checkup should be conducted. Adolescent females receiving iron supplements can help manage the issue rather effectively. The high prevalence of anaemia should be made known to all young adult females in our society. They should be educated that proper nutrition plays the key role for this growing condition. If they notice any symptoms of anemia on their own, they should seek medical attention rather than ignoring. The present study made a significant impact on the female students of "Bhavan's Tripura College of Science and Technology". Such type of programs should be done in every educational sector to spread more awareness and to educate the students about anemia and to find out the exact proportion of prevalence of anemia.

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