

# **DETERMINING THE ANEMIA LEVEL AND IT'S ASSOCIATION WITH BMI AMONG THE UNDERGRADUATE FEMALE STUDENTS BELONGING TO THE SCHOOL OF ALLIED HEALTH SCIENCES**

Submitted in partial fulfillment of the requirements for the award of  
Bachelor of Science degree in Clinical Nutrition and Dietetics

by  
J.LITHIKA(40736004)



**DEPARTMENT OF CLINICAL NUTRITION AND DIETETICS  
SCHOOL OF ALLIED HEALTH SCIENCES**

## **SATHYABAMA**

**INSTITUTE OF SCIENCE AND TECHNOLOGY**

### **(DEEMED TO BE UNIVERSITY)**

**Accredited with Grade "A" by NAAC**

**JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119**

MAY - 2023



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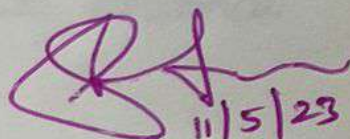
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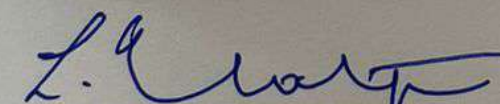
### BONAFIDE CERTIFICATE

This is to certify that this Project Report is the Bonafide work of **J.LITHIKA(40736004)** who had carried out The project "**DETERMINING THE ANEMIA LEVEL AND IT'S ASSOCIATION WITH BMI AMONG THE UNDERGRADUATE FEMALE STUDENTS BELONGING TO THE SCHOOL OF ALLIED HEALTH SCIENCES**" under supervision of **DR.S.PADMAPRIYA** From **June 2022 to May 2023**



11/5/23

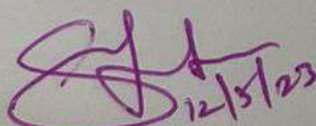
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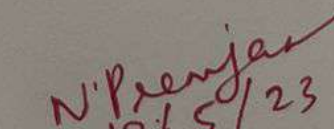
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## DECLARATION

I J.LITHIKA(40736004) hereby declare that the Project Report entitled DETERMINING THE ANEMIA LEVEL AND IT'S ASSOCIATION WITH BMI AMONG THE UNDERGRADUATE FEMALE STUDENTS BELONGING TO THE SCHOOL OF ALLIED HEALTH SCIENCES done by me under the guidance of DR. S. PADMAPRIYA is submitted in partial fulfillment of the requirements for the award of Bachelor of Science Degree in Clinical Nutrition and Dietetics

DATE: 11/05/23

PLACE: Chennai

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SIGNATURE OF THE CANDIDATE

# **DECLARATION**

I **J.LITHIKA(40736004)** hereby declare that the Project Report entitled **DETERMINING THE ANEMIA LEVEL AND IT'S ASSOCIATION WITH BMI AMONG THE UNDERGRADUATE FEMALE STUDENTS BELONGING TO THE SCHOOL OF ALLIED HEALTH SCIENCES** done by me under the guidance of **DR. S. PADMAPRIYA** is submitted in partial fulfillment of the requirements for the award of **Bachelor of Science Degree in Clinical Nutrition and Dietetics**

**DATE:**

**PLACE:**

**SIGNATURE OF THE CANDIDATE**

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## ABSTRACT

Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (WHO,2023).

Anaemia is a condition in which the number of red blood cells or the haemoglobin concentration within them is lower than normal. Haemoglobin is needed to carry oxygen and if you have too few or abnormal red blood cells, or not enough haemoglobin, there will be a decreased capacity of the blood to carry oxygen to the body's tissues. This results in symptoms such as fatigue, weakness, dizziness and shortness of breath, among others (WHO,2023).

Prevalence of anemia was high among all women in Andhra Pradesh. In all 32.4% of women had mild (100-109.99 g/l for pregnant women, 100-119.99 for non-pregnant women), 14.19% had moderate (70-99.99 g/l), and 2.2% had severe anemia (<70 g/l) M E Bentley *et al* (2003).

According to a study published in the Indian Journal of Community Medicine in 2015, the prevalence of anemia among women in Chennai was found to be 53.4%. The study included a sample of 1,143 women between the ages of 15 and 49 year S.Sathiyasekaran *et al* (2015).

Objectives of the present study is to estimate the prevalence of anaemia among the female students belonging to AHS. To assess the anthropometric measurements using height and weight and calculating BMI. To find out the association between anaemia and BMI among the female students belonging to AHS.

A cross sectional study was adapted. Around 30 participants belonging to Allied Health Science from Sathyabama Institute of Science and Technology were willing to participate in the survey were selected. Height ,weight and blood samples were collected from the participants. The statistical analyzation includes the percentage

distribution of BMI and anaemia level and association between BMI and anaemia using chi-square test.

The result of the study revealed that the percentage of participants according to their BMI, it was found that 66.66% of participants belonged to normal weight, 13.33% belonged to pre-obesity and 10% belonged to obesity class-1 and 6.66% of participants belonged to underweight.

The percentage of participants according to their anaemia level, it was found that 46.66% of participants belonged to normal category, 46.66% of participants belonged to mild category and 6.66% belonged to moderate category.

Significant association was found between anaemia and BMI by chi-square test and the calculated chi -square value is 38.964. There is an association at 0.05 level.

Diet plays a very important role in the prevention of anaemia, proper attention and care must be given to the anaemic patients for the betterment of their life. Having well balanced meals with iron rich foods with proper appropriate diet counselling and nutrition education can prevent anaemia.

Key words: Anaemia, BMI, Weight.

## LIST OF ABBREVIATIONS

| ACRONYM | ABBREVIATION    |
|---------|-----------------|
| NS      | Non-significant |
| *       | significant     |

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## **Chapter – 1**

### **INTRODUCTION**

#### **1.1 YOUTH**

WHO defines Youth as the 15-24 year age group. While 'Young People' covers the age range 10-24 years.

There are about 360 million youth comprising about 20% of the population in the countries of the South-East Asia Region. The transition from childhood to adulthood involves dramatic physical, sexual, psychological and social developmental changes, all taking place at the same time. In addition to opportunities for development this transition poses risks to their health and wellbeing. Contrary to popular perception that this is a health age group, the adolescents do have several public health issues.

Investing in youth health ensures triple dividends in terms of health during youth, health during later adulthood by preventing risk factors for chronic conditions like non-communicable diseases as well as health of the future generation by ensuring health of the offspring of women who themselves remained healthy (WHO, 2022)

#### **1.2 ANAEMIA**

Anaemia is a serious global public health problem that particularly affects young children and pregnant women. WHO estimates that 42% of children less than 5 years of age and 40% of pregnant women worldwide are anaemic.

Anaemia is a condition in which the number of red blood cells or the haemoglobin concentration within them is lower than normal. Haemoglobin is needed to carry oxygen and if you have too few or abnormal red blood cells, or not enough haemoglobin, there will be a decreased capacity of the blood to carry oxygen to the body's tissues. This results in symptoms such as fatigue, weakness, dizziness and shortness of breath, among others. The optimal haemoglobin concentration needed to meet physiologic needs varies by age, sex, elevation of residence, smoking habits and pregnancy status. The most common causes of anaemia include nutritional deficiencies, particularly iron deficiency, though deficiencies in folate, vitamins B12

and A are also important causes; haemoglobinopathies; and infectious diseases, such as malaria, tuberculosis, HIV and parasitic infections.

Anaemia is an indicator of both poor nutrition and poor health. It is problematic on its own, but it can also impact other global nutritional concerns such as stunting and wasting, low birth weight and childhood overweight and obesity due to lack of energy to exercise. School performance in children and reduced work productivity in adults due to anaemia can have further social and economic impacts for the individual and family (WHO,2022)

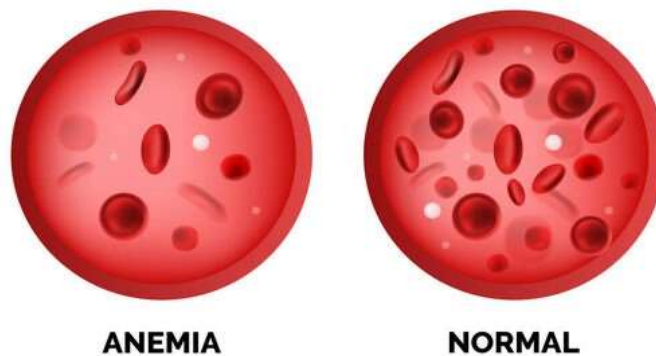


Fig 1.1 Anaemic and Normal RBC.

### 1.3 SYMPTOMS

Anaemia can cause a range of non-specific symptoms including tiredness, weakness, dizziness or light-headedness, drowsiness, and shortness of breath, especially upon exertion. Children and pregnant women are especially vulnerable, with more severe cases of anaemia leading to an increased risk of maternal and child mortality. Iron deficiency anaemia has also been shown to affect cognitive and physical development in children and reduce productivity in adults.

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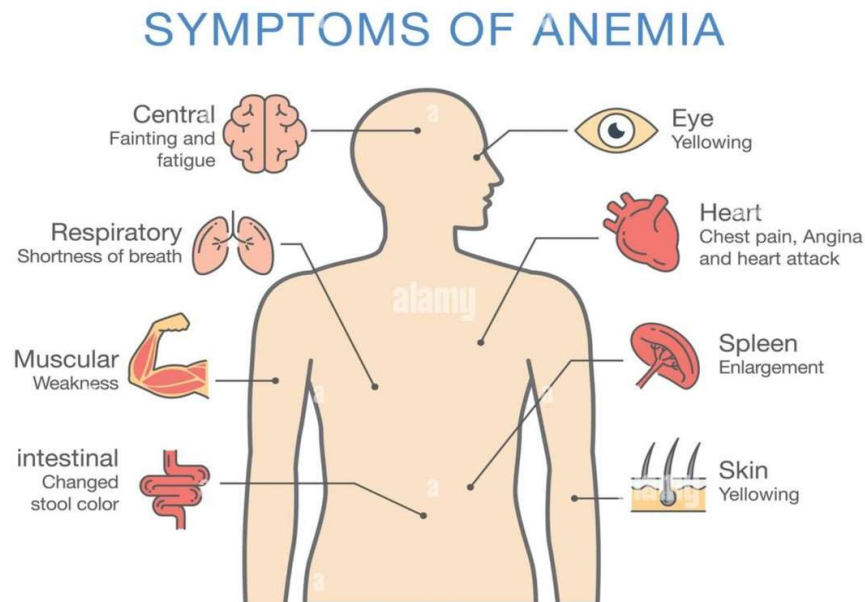


Fig 1.2 Symptoms of Anaemia

## 1.4 EPIDEMIOLOGY

Anaemia is an extremely common disease affecting up to one-third of the global population. In many cases, it is mild and asymptomatic and requires no management.

The prevalence increases with age and is more common in women of reproductive age, pregnant women, and the elderly.

The prevalence is more than 20% of individuals who are older than the age of 85. The incidence of anaemia is 50%-60% in the nursing home population. In the elderly, approximately one-third of patients have a nutritional deficiency as the cause of anaemia, such as iron, folate, and vitamin B12 deficiency. In another one-third of patients, there is evidence of renal failure or chronic inflammation

Classically, mild iron-deficiency anaemia is seen in women of childbearing age, usually due to poor dietary intake of iron and monthly loss with the menstrual cycles.

Anaemia is also common in elderly patients, often due to poor nutrition, especially of iron and folic acid. Other at-risk groups include alcoholics, the homeless population, and those experiencing neglect or abuse.

New-onset anaemia, especially in those over 55 years of age, needs investigating and should be considered cancer until proven otherwise. This is especially true in men of any age who present with anaemia.

Apart from age and sex, the race is also an important determinant of anaemia, with the prevalence increasing in the African American population( Abu-Ouf *et al.*2015).

## **1.5 ETIOLOGY**

The etiology of anaemia depends on whether the anaemia is hypoproliferative (i.e., corrected reticulocyte count <2%) or hyperproliferative (i.e., corrected reticulocyte count >2%).

Hypoproliferative anaemias are further divided by the mean corpuscular volume into microcytic anemia (MCV<80 fl), normocytic anaemia (MCV 80-100 fl), and macrocytic anaemia (MCV>100 fl) (Usuki K,2015)

## **1.6 PATHOPHYSIOLOGY**

The pathophysiology of anaemia varies greatly depending on the primary cause. For instance, in acute hemorrhagic anaemia, it is the restoration of blood volume with intracellular and extracellular fluid that dilutes the remaining red blood cells (RBCs), which results in anaemia. A proportionate reduction in both plasma and red cells results in falsely normal haemoglobin and hematocrit.

RBC are produced in the bone marrow and released into circulation. Approximately 1% of RBC are removed from circulation per day. Imbalance in production to removal or destruction of RBC leads to anaemia (Badireddy *et al.*2022)

The main mechanisms involved in anaemia are listed below:

### **1. Increased RBC destruction**

- Blood loss

- Acute- hemorrhage, surgery, trauma, menorrhagia
- Chronic- heavy menstrual bleeding, chronic gastrointestinal blood losses (in the setting of hookworm infestation, ulcers, etc.), urinary losses (BPH, renal carcinoma, schistosomiasis)
- Hemolytic anaemia
  - Acquired- immune-mediated, infection, microangiopathic, blood transfusion-related, and secondary to hypersplenism
  - Hereditary- enzymopathies, disorders of hemoglobin (sickle cell), defects in red blood cell metabolism (G6PD deficiency, pyruvate kinase deficiency), defects in red blood cell membrane production (hereditary spherocytosis and elliptocytosis)

## 2. Deficient/defective erythropoiesis

- Microcytic
- Normocytic, normochromic
- Macrocytic

## 1.7 COMPLICATIONS

Anaemia, if undiagnosed or left untreated for a prolonged period of time can lead to multiorgan failure and can even death.

Pregnant women with anaemia can go into premature labor and give birth to babies with low birth weight (O'Farrill-Santoscoy F *et al.* 2013). Anaemia during pregnancy also increases the risk of anaemia in the baby and increased blood loss during pregnancy.

Complications are more predominant in the older population due to multiple comorbidities. The cardiovascular system is the most commonly affected in chronic anaemia. Myocardial infarction, angina, and high output heart failure are common complications. Other cardiac complications include the development of arrhythmias and cardiac hypertrophy.

Severe iron deficiency is associated with restless leg syndrome and esophageal webs. Severe anaemia from a young age may lead to impaired neurological development in the form of cognitive, mental, and developmental delays. These complications are unlikely to be amenable to medical management (Triscott JA *et al.* 2015)

## **1.8 ANAEMIA DIAGNOSIS**

Flow Cytometry (FCM) +Tri-angle laser scatter + Chemical dye method for WBC 5-part differential analysis and WBC counting thus creating the possibility for a better 5-part WBC differentiation even on samples with high Eosinophil.

## **1.9 SOURCES**

There are 2 types of iron, haem and non-haem iron haem iron is a constituent of Hb and myoglobin and is present in meat, fish and in blood products. Non haem iron is found to varying degrees in all foods of plant origin. Besides the food, the diet may also contain exogenous iron originating from the soil, dust, and water or cooking vessels.

### **1.9.1 ABSORPTION**

The absorption of dietary iron is influenced by the amount and chemical form of iron, the consumption of factors enhancing or inhibiting iron absorption and the health and iron status of the individual Iron absorption occurs from the duodenum. Iron absorption is increased with decreased iron stores, increased erythropoietin activity and during pregnancy.

The factors like ascorbic acid, meat, poultry, fish and low ph enhance non ham iron absorption. Factors like phytates and tannins inhibit non haem iron absorption.

### **1.9.2 IRON REQUIREMENTS**

A dietary intake of iron is needed to replace the iron lost in stools, urine and during menstruation in women. Average of 1.25 mg / day is lost during menstruation.

## 1.10 EVALUATION

Approach to anaemia includes identification of the type of anaemia: (Jamwal M et al.2020) (Mumford J et al.2019)

1. Complete blood count (CBC) including differential
2. Calculate the corrected reticulocyte count = percent reticulocytes x (patient's HCT/normal HCT)

For normal HCT, use 45% in men and 40% in women

If result > 2, this suggests hemolysis or acute blood loss, while results < 2 suggests hypoproliferation.

3. After calculating the reticulocyte count, check the MCV.

- MCV (<80 fl)
  - Iron deficiency- decreased serum iron, percent saturation of iron, with increased total iron-binding capacity (TIBC), transferrin levels, and soluble transferrin receptor
  - Lead poisoning- basophilic stippling on the peripheral blood smear, ringed sideroblasts in bone marrow, elevated lead levels
  - AOCD- may be normocytic
  - Thalassemia- RBC count may be normal/high, low MCV, target cells, and basophilic stippling are on peripheral smear. Alpha thalassemia is differentiated from beta-thalassemia by a normal Hgb electrophoresis in alpha thalassemia. Elevated Hgb A2/HgbF is seen in the beta-thalassemia trait.
  - Sideroblastic anaemia- elevated serum iron and transferrin with ringed sideroblasts in the bone marrow
- MCV (90-100fl)
  - Renal failure: BUN/Creatinine
  - Aplastic anaemia- ask for drug exposure, check for infections (EBV, hepatitis, CMV, HIV), test for hematologic malignancies and paroxysmal nocturnal hemoglobinuria (PNH)
  - Myelofibrosis/myelophthisis- check bone marrow biopsy
  - Multiple myeloma- serum and urine electrophoresis
  - Pure red cell aplasia- test for Parvovirus B19, exclude thymoma

- MCV (>100 fl) ○ B12/folate levels- B12 and folate deficiency can be differentiated by an elevated methylmalonic and homocysteine level in B12 deficiency and only an elevated homocysteine level in folate deficiency.

Methylmalonic levels are relatively normal.

- MDS- hyposegmented PMNs on peripheral smear, bone marrow biopsy
- Hypothyroidism- TSH, free T4 ○ Liver disease- check liver function ○ Alcohol- assess alcohol intake
- Drugs

### **1.11 PREVALENCE OF ANEMIA IN INDIA**

Prevalence of anaemia was high among all women in Andhra Pradesh. In all 32.4% of women had mild (100-109.99 g/l for pregnant women, 100-119.99 for non-pregnant women), 14.19% had moderate (70-99.99 g/l), and 2.2% had severe anaemia (<70 g/l) M E Bentley et al (2003).

### **1.12 PREVALENCE OF ANEMIA IN TAMILNADU**

According to a study published in the Indian Journal of Community Medicine in 2015, the prevalence of anaemia among women in Chennai was found to be 53.4%. The study included a sample of 1,143 women between the ages of 15 and 49 year S. Sathiyasekaran et al (2015).

According to the National Family Health Survey-5 (NFHS-5) conducted in 2019-2020, the prevalence of anaemia among women aged 15-49 years in Tamil Nadu is 24.9%.

## CHAPTER 2

### REVIEW OF LITERATURE

Kaner *et al* (2019) reported changes in body weight and iron parameters of premenopausal Turkish women with overweight and obesity who participated in a weight loss program.

Coimbra *et al* (2017) studied the effect of an eight-month physical exercise programme on hepcidin, inflammation, and iron status in overweight and obese children and adolescents.

Egwurugwu *et al* (2018) reported that mean serum iron was 72.6, 64.2, 59.1, and 54.7 µg/dl in adult men with normal weight, overweight, grade 1 obesity and grade 2 obesity, respectively. In contrast, it was 61.2, 52.9, 44.8, and 39.6 µg/dl in the adult women.

Lecube *et al* (2006) found that postmenopausal women with obesity had higher soluble transferrin receptor than non-obese postmenopausal women.

Yanoff *et al* (2007) reported an increase in the prevalence of iron deficiency in obese adults with significantly lower serum iron level and higher soluble transferrin receptor level than non-obese adults.

Menzie *et al* (2008) found a significantly lower level of serum iron and transferrin saturation in adults with obesity when compared to non-obese adults.

Paknahad *et al* (2008) found that serum haemoglobin and hematocrit increased significantly across body mass index (BMI) quartiles in adult Iranian women.

Aderibigbe *et al* (2011) showed that waist circumference and waist-hip ratio increased with increasing ferritin concentration in South African women, while serum iron decreased with increasing BMI in women.

Kordas *et al* (2013) investigated the association between iron deficiency, anaemia, and weight status among nonpregnant Colombian women and reported that women with overweight and obesity had a lower likelihood of anaemia.

Zimmermann *et al* (2008) studied the relationship between obesity and iron deficiency among healthy premenopausal women from transition countries using iron isotope labelled test meals and hypothesized that the mechanism might be mediated by inflammation.

Tussing-Humphreys *et al* (2010) measured serum hepcidin in obese and nonobese premenopausal adult women and observed a higher hepcidin level among women with obesity.

Amato *et al* (2010) examined the effect of BMI reduction on serum hepcidin levels and iron status in obese children.

Aigner E *et al* (2014) Although obesity is recognized as an emerging risk factor for iron deficiency, mechanisms of the relationship are still debatable.

D'angelo G (2013) examined that hepcidin level and low-grade chronic inflammation play a central role in the relationship between obesity and hypoferrremia.

Zhao L (2015) Growing evidence supports the existence of an association between obesity and iron deficiency.

Ettyang GA (2003) However, no significant difference in BMI was reported among lactating Kenyan women with different levels of iron depletion (as defined by ferritin), despite haemoglobin was shown to increase with increasing BMI.

Teng IC *et al* A few studies investigated the effect of weight loss on iron status, low-grade chronic inflammation, and/or hepcidin release in individuals with overweight and obesity.

Abdel Hamed ER et al (2015) Another study evaluated serum hepcidin level and iron status and their association with BMI in a sample of children with obesity from Egypt and reported lower hemoglobin and ferritin levels and higher hepcidin level among obese children.

Cheng et al (2012) A better understanding of the relationship between obesity and iron deficiency has been gained when researchers started to measure inflammatory markers and serum hepcidin in addition to various iron status markers.

Stoffel (2020) A recent study reported that overweight and obese women with central adiposity demonstrated higher serum hepcidin, higher inflammation level, lower iron status, and lower iron absorption when fed with supplemental iron.

Amato et al (2010) They observed a significant decrease in hepcidin and leptin levels and a significant increase in iron absorption.

Shekarriz et al (2017) Another study reported a positive association between obesity and inflammation and mild changes in iron markers.

Pinhas-Hamiel et al (2003) Four decades later, a cross-sectional study conducted in 2003 described a higher prevalence of iron deficiency in overweight and obese children and adolescents.

Eckhardt et al (2008) In another study, a lower odds ratio of anaemia was reported in women with overweight and obesity than women with normal weight from Egypt and Peru but not from Mexico.

Zimmermann et al (2008) The traditional way to treat iron deficiency is by providing an iron supplement. However, several studies found that the efficacy of iron supplementation was significantly lower when used among individuals with overweight and obesity compared to those with normal body weight.

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 OBJECTIVES**

- To estimate the prevalence of anaemia among the female students belonging to AHS.
- To assess the anthropometric measurements using height and weight and calculating BMI.
- To find out the association between anaemia and BMI among the female students belonging to AHS.

#### **3.2 HYPOTHESIS**

H1 - There will be no significant association between BMI and Anaemia.

#### **3.3 RESEARCH DESIGN**

Cross sectional study was done. The study was done at Sathyabama Institute of Science and Technology. Informed consent from the participants were collected, the information regarding age, menstrual history and short clinical details were recorded. Blood samples were collected and analysed.

#### **3.4 SAMPLE SIZE**

Sample size should include 230 participants according to power calculation.

The sample size is calculated from Rao soft software with margin of error 5%, confidence level of 95%, population size 100 and response distribution 50% recommended sample size is 230. As the project focus on the AHS girls, the girl students belonging to AHS were selected, among them only 30 were willing to participate in the study. Hence the sample size is restricted to only 30.

#### **3.5 AREA OF SAMPLE COLLECTION**

Sathyabama Institute of Science and Technology.

### 3.6 SELECTION OF SUBJECT

Female participants of AHS were selected

Inclusion criteria

1. Female of age 18-20 years were included.
2. All those who gave consent to participate in the study.

Exclusion criteria

1. Male participants were excluded.
2. Participants below the age of 18 and above the age of 20.
3. All those who did not give consent to participate in the study.
4. Girls undergoing menstrual cycle.

### 3.7 DETERMINATION OF ANEMIA

| Population                      | Non-Anaemia | Mild Anaemia | Moderate Anaemia | Severe Anaemia |
|---------------------------------|-------------|--------------|------------------|----------------|
| 6-59 months of age              | $\geq 11$   | 10-10.9      | 7-9.9            | $<7$           |
| 5-11 years of age               | $\geq 11.5$ | 11-11.4      | 8-10.9           | $<8$           |
| 12-14 ears of age               | $\geq 12$   | 11-11 9      | 8-10.9           | $<8$           |
| Non-pregnant women (2 15 years) | $\geq 12$   | 11-11 9      | 8-10.9           | $<8$           |
| Pregnant women                  | $\geq 11$   | 10-10.9      | 7-9.9            | $<7$           |
| Men (2 15 years)                | $\geq 13$   | 11-12 9      | 8-10.9           | $<8$           |

Tri-angle Laser scatter + Chemical dye + Flow cytometry technology is used.

### 3.8 ANTHROPOMETRIC MEASUREMENT

Anthropometric measurements are non-invasive quantitative measurements of the body. According to the Centres for Disease Control and Prevention (CDC), anthropometry provides a valuable assessment of nutritional status in children and adults. Typically they are used in the paediatric population to evaluate the general health status, nutritional adequacy, and the growth and developmental pattern of the

child. Growth measurements and normal growth patterns are the gold standards by which clinicians assess the health and well-being of a child. In adults, body measurements can help to assess health and dietary status and future disease risk. These measurements can also be used to determine body composition in adults to help determine underlying nutritional status and diagnose obesity.

The core elements of anthropometry are height, weight, head circumference, body mass index (BMI), body circumferences to assess for adiposity (waist, hip, and limbs), and skinfold thickness.

### **3.8.1 HEIGHT**

#### **STADIOMETER**

The stadiometer consists of a ruler and a sliding horizontal headpiece which can be fixed above the head to measure height. The stadiometer is mounted on the wall for this purpose, and the child is asked to remove any footwear and/or head ornaments before noting the measurement. With the buttocks, the shoulder blades, and the back of the head against the board, the head is oriented in the Frankfurt horizontal plane (FH plane), and the headpiece gets firmly placed on the head. The reading is noted to the nearest tenth of a centimetre. The head is in the Frankfurt horizontal plane when the horizontal line from the ear canal to the lower border orbit is parallel to the floor. The line must also intersect the vertical backboard perpendicularly. The child should be asked to take a deep breath and stand as tall as possible. A deep breath straightens the spine and allows more accurate and consistent measurements.



Fig 3.1 Stadiometer

### **3.8.2 WEIGHT**

#### **DIGITAL WEIGHING SCALES**

Digital scales are the standard type often used for monitoring human weight by standing on the scale.

This type of scale employs the use of a special electrical circuit. As the weight is applied, the voltage within the circuit changes. Then, a processor calculates the weight. Digital scales can provide multiple units of measure. They tend to be more accurate than mechanical scales.



Fig 3.2 Digital Weighing Scales

### **3.8.3 BMI**

Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m<sup>2</sup>).

Formula:  $\text{weight (kg)} / [\text{height (m)}]^2$  Women were classified by BMI categories as underweight (BMI < 18.5), normal weight (BMI > 18.5 < 24), overweight (BMI ≥ 24 < 28) and obesity (BMI ≥ 28).

### **3.8.4 STATISTICAL ANALYSIS**

The calculated percentage is done for BMI and Anaemia. And association between BMI and anaemia values is done by chi square test.

## CHAPTER 4

### RESULT AND DISCUSSION

The results of the present study are discussed under this chapter.

**Table: 1**  
**Percentage distribution of participants according to their BMI**

| Classification of BMI | Percentage |
|-----------------------|------------|
| Under weight          | 6.66%      |
| Normal weight         | 66.66%     |
| Pre-obesity           | 13.33%     |
| Obesity classs-1      | 10%        |

Table 1 represents the percentage distribution of participants according to their BMI, it was found that 6.66% of participants belonged to underweight under the WHO classification of value ( $<18.5$ ), 66.66% of participants belonged to normal weight under the classification of value (18.5-24.9), 13.33% belonged to pre-obesity under the classification of value (25.0-29.9) and 10% belonged to obesity class-1 under the classification of value (30.0-34.9).

**Table: 2**  
**Percentage distribution of participants according to their Haemoglobin level**

| Classification of anaemia | percentage |
|---------------------------|------------|
| Normal                    | 46.66%     |
| Mild                      | 46.66%     |
| Moderate                  | 6.66%      |

Table 2 represents the percentage distribution of participants according to their haemoglobin level, it was found that 46.66% of participants belonged to normal category under the WHO classification of value (12-16g/dl), 46.66% of participants belonged to mild category under the classification of value (10-12g/dl) and 6.66% belonged to moderate category under the classification of value (8-<10g/dl).

**Table: 3**  
**Association with BMI and anemia level**

|                    | Value   | Df | Asymp.<br>Sig.(2sided) |
|--------------------|---------|----|------------------------|
| Pearson chi-square | 38.964* | 36 | .338                   |
| Likelihood ratio   | 25.397  | 36 | .906                   |
| N for valid cases  | 30      |    |                        |

Table 3 represents the present study at Sathyabama Institute of Science and Technology on the group of Allied health science students on association between BMI and anaemia level. There is an significant association at 0.05 level.

The calculated chi-square value is 38.964\*

**H-1 is been rejected**

## **CHAPTER 5**

### **SUMMARY AND CONCLUSION**

The present study was conducted at Sathyabama Institute of Science and Technology among Allied Health Science. On association between BMI and Anaemia. Majority of the participants 66.66% were normal weight, 13.33% belonged to pre-obesity, 10% belonged to obesity class-1 and 6.66% of participants belonged to underweight.

Majority of the participants were anaemic ,(46.66%) had mild degree of anaemia and 6.66% had moderate degree of anaemia. Significant association was found between anaemia and BMI by chi-square test and the calculated chi -square value is 38.964. There is an significant association at 0.05 level.

### **SUGGESTIONS**

Diet plays a very important role, proper attention and care must be given to the anaemic patients for the betterment of the life.

- Having well balanced meals with iron rich foods with proper appropriate diet counselling and nutrition education can prevent anaemia.
- Therefore, a balanced diet and regular health check-ups are necessary to maintain overall health and prevent anaemia.

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