

## **Efficacy of Oral Supplementation of Arachis Hypogaea in Combination with Sesamum Indicum, Eleusine Coracana, Saccharum Officinarum in Improving Hemoglobin Among Teenage Girls**

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### **KEYWORDS**

Arachis Hypogaea  
,Eleusine Coracana ,  
Hemoglobin,  
Sesamum Indicum,  
Saccharum  
Officinarum, Teenage  
girls.

### **ABSTRACT**

A pre experimental one group pretest posttest study was conducted to investigate the Efficacy of Oral Supplementation of Arachis Hypogaea in Combination with Sesamum Indicum, Eleusine Coracana, Saccharum Officinarum in Improving Haemoglobin Among Teenage Girls in GEMS High School. Teenage girls between the age group of 13-15 years, who having Hemoglobin level according to World Health Organization (WHO) classification of anemia with mild anemia (11.0-11.9gm/dl) and Moderate anemia (8.0 to 10.9gm/dl) were recruited as study participants. After obtaining a written consent the hemoglobin level was monitored using Sahli's hemoglobinometer and girls' hemoglobin level less than 12gm/dl consumed one nutritional ball after breakfast along with one amala once in a day for the duration 60 days. The results of the study concluded that nutritional intervention on iron deficiency anemia was effective with paired 't' test, t values were calculated as 9.261 which were statistically significant at 0.05 level. The average score regarding level of hemoglobin before and after nutritional intervention in the subjects were 11.03 and 11.35 respectively. Mean difference in level of hemoglobin was .32. The paired t test statistics (paired 't' value=9.261, table value=2.05) shows that there was an increase in level of hemoglobin as a result of nutritional intervention was statistically significant at 0.05 level. It was found that there was significant association between the socio demographic variables such as family income, type of family and education of mother. The result of the study indicates that the oral supplementation nutritional ball helps to improve hemoglobin level.

## **1. Introduction**

Teenage is a period of transition from a child to adulthood, during which certain health problems and risk behaviours prevalent during this period influence their future health [1]. About 1/6th of the global population are adolescents that ranges from 10 to 19 years of age [2]. Anemia is a condition in which the number of RBCs of the body is not sufficient to meet physiological needs [3]. And in which Haemoglobin (Hb) concentration and or red blood cell (RBC) numbers are lower than the normal and insufficient to meet an individual's physiological need and affects roughly one third of the world population [4]. It occurs as a result when the body's red blood cell production declines or the cells' structural integrity is down [5]. Over 2 billion people around the world suffer from deficiency anemia by iron which is the most commonest type of anemia [6]. Chronic blood loss or insufficient food intake are the most common causes of iron insufficiency [7]. It arises when the iron intake balance, iron stores, and iron loss from the body is insufficient [8].

According to the World Health Organisation (WHO), in 2019, the prevalence of anaemia in women aged 15-49 years globally was 29.9% and In India, 57% of women were found to be anaemic [9]. In India, recent data from the District Nutrition Project (ICMR) in 16 districts and 11 states on prevalence of anaemia in non-pregnant adolescent girls (11-18 years) showed rates as high as 90.1% with severe anaemia (Hb ≤ 7gm/dl) in 7.1% [10]. It can significantly effect the behavior and learning, reproductive health, working abilities, and psychological and physical development. It occurs at a result of low iron intake, decreased dietary iron bioavailability, elevated iron requirements, chronic blood loss, and parasite infections [1].

Diagnosis of anaemia should be done in Precisely and accurately for the correct treatment in time [11]. Routine blood tests, commonly include a complete blood count (CBC) is used to diagnose. Low haemoglobin (Hb) and a low haematocrit value are the characteristic of anaemia. Further studies will be undertaken to terminal the anaemia's cause. If the anaemia is due to deficiency of iron one of the first abnormal values to be

noted on a CBC, as the body's iron stores begin to be depleted, will be a high red blood cell distribution width (RDW), reflecting an increased variability in the size of red blood cells (RBCs) [12]. A low mean corpuscular volume (MCV) also appears during the course of body iron depletion. It indicates a high number of abnormally small red blood cells. A low MCV, a low mean corpuscular haemoglobin or mean corpuscular haemoglobin concentration, and the corresponding appearance of RBCs on visual examination of a peripheral blood smear narrows the problem to a microcytic anaemia (literally, a "small red blood cell" anaemia). Because the majority of teenage girls nowadays aim to maintain a thin figure, the rate of deficiency anemia by iron within them is perpetually high. Fast food and junk food consumption will lower eating habits for foods high in iron [13].

The nutritional anemia in teenage girls' results in marked difference in perinatal mortality rate, difference in incidence of low-birth-weights. The teenage stage of life is also crucial because there is mounting evidence that preserving a satisfactory iron status during adolescence makes it less challenging to tackle anemia in pregnant women [14]. From the inception of life, an appropriate diet is vital for optimal development, growth, and for active way of living. To create diets that are appropriate and sufficiently nourishing, a range of foods that are easily available and inexpensive to ordinary individuals can be chosen [15].

Iron supplementation may result in adverse gastrointestinal effects, such as abdominal pain, constipation, or nausea. Moreover, non-physiological amounts can increase the associated health risks, such as infections [16]. There are two main strategies to treat deficiency anemia by iron—increasing the intake of foods which are naturally abundant source of iron and ensuring a high bioavailability of iron (by providing enhancers of iron absorption within a meal and decreasing the intake of iron inhibitors). The richest sources of heme iron in the diet are lean meat and seafood, while nuts, beans, vegetables, and fortified grain products provide non-heme iron. According to the WHO, it is recommended to add non-heme iron absorption enhancers, like ascorbic, citric, or malic acid, to a meal or to use food processing techniques like fermentation, soaking, and germination that may increase non-heme iron bioavailability because iron from plant products is less well absorbed. Fortifying fundamental food items like cereals and flour with iron is already a potentially effective tactic [17]. Combination of these ingredients contributes good quality and quantity of nutrients and makes this food supplement as an excellent food item for enhancing the health of the growing children.

Hence the investigators realized the necessity to assess anemia among teenagers. Our aim of study was to concentrate mainly on the effect of nutritional intervention on deficiency anemia among teenagers. Treatment with medicinal iron in pill or tablet form has around for a long time, but produces some side effects like constipation, diarrhea, nausea, and vomiting. So, a diet rich in iron can solve the problem. Here needs the increased knowledge about the source of leafy vegetables and whole grain cereals which are known to be rich in iron. Taking iron rich foods along with vitamin C enhances absorption of heme from the food. Most important is to instigate the intake of low-cost iron rich diet among the people so the investigators intended to intervene by nutritional supplementation of iron rich nutrition balls along with vitamin C rich food to the teenage girls for 30 days. This type of food supplement is an attractive and least expensive strategy to reach the quality food for young children, with these strategies it is hopefully expected to enhance nutritional status and eliminate deficiency anemia by iron among teenage girls. Thereby next generation of younger girls will lead a healthier life. Keeping all these points in mind, the investigators took interest to conduct the present study and therefore the objectives of current study was to assess the pretest and posttest level of hemoglobin among adolescents with iron deficiency anemia, to determine the effectiveness of nutritional intervention on iron deficiency anemia among adolescent girls and to find out the association between the pretest level of hemoglobin with their selected demographic variables.

## **2. Materials and Methods**

**Study design:** One group pretest posttest research design was adopted to investigate the Efficacy of Oral Supplementation of Arachis Hypogaea in Combination with Sesamum Indicum, Eleusine Coracana, Saccharum Officinarum in Improving Hemoglobin Among Teenage Girls. **Study Setting:** The current study was carried out for the duration of 4 months from June 2024 till October 2024 in GEMS High school, Chadayamangalam. **Ethical Approval:** After obtaining ethical clearance from the IEC committee of MES College of Nursing and a formal permission from the principal of GEMS high school Chadayamangalam, the study was conducted. **Study participants:** Teenage girls between the age group of 13-15 years, who are willing and available to participate during the current investigation and having Hemoglobin level according to World Health Organisation (WHO)

classification of anemia with mild anemia (11.0-11.9gm/dl) and Moderate anemia (8.0 to 10.9gm/dl) were recruited as study participants. The study excluded the teenage girls who were above 15 years and below 13 years, already with oral iron supplementations, known allergy to any of the ingredients used for preparation of nutritional ball, active infections, severe malnutrition, anemic associated with other systemic disease condition, who are under treatment with dietary modifications, non-cooperative, history of metrorrhagia/menorrhagia, reproductive disorders. Sampling technique the respondents were recruited through nonprobability purposive sampling technique. Informed consent: The purpose of study was explained clearly to each of study participants and a written consent was obtained from them and their parents. Preliminary Assessment: On DAY-1, Blood samples were collected from the teenage girls and the hemoglobin level were monitored using Sahli's hemoglobinometer and the teenage girls were evaluated for the degree of anaemia as per inclusion criteria. Followed by that, the demographic data were collected. From day-2, the study participants consumed one nutritional ball after breakfast along with one amala once in a day for the duration 60 days. Preparation of nutritional ball: 1 cup of roasted groundnut, half cup of roasted sesame seeds, 3 cups of roasted ragi grinded together and mixed with 1 cup of jaggery. This mixture was then mixed with one teaspoon of ghee. After greasing the hand with ghee, the mixture was rolled into balls of 30gm. The investigator prepared the ball daily and made the girls to consume it along with one amala daily for 60 days. Post assessment: On day-62, adolescent girl's hemoglobin level was rechecked by Sahli's hemoglobinometer.

### 3. Results and Discussion

#### Demographic characteristics

The study findings revealed that out of 30 subjects, 8 (26.6%) respondents belong to 13yrs, 15 (50%) belongs to 14yrs and 7 (23.3%) belongs to 15yrs. 16 (53.3%) were Hindus, 8 (26.6%) were Muslims and 6 (20%) were Christians. It was clearly observed that among 30 subjects, 14 (46.6%) belongs to family of income less than Rs 5000/month, 6 (20%) had family income Rs 5001-10000/month and 10 (33.3%) had family income more than Rs 10000 per month. 21 (70%) belongs to nuclear family and remaining 9 (30%) belongs to extended family. Percentage distribution of subjects according to the education of their mother revealed that 3 (10%) mothers had their education to primary level, 19 (63.3%) had their education equivalent to secondary, 5 (16.6%) had education to higher secondary and 3 (10%) of mothers were graduated. It was observed that out of 30 adolescent girls, 14 (46.6%) had knowledge regarding anemia and 16 (53.3%) had no knowledge regarding anemia.

#### Assessment of pre and post hemoglobin level among teenage girls with anemia

The data revealed that out of 30 respondents in the pretest, around 20 (66%) had mild anemia and 10 (33%) had moderate anemia while none had severe anemia and in the post test, around 7 (23.3%) had no anemia, 18 (60%) had mild anemia, 5 (16.7%) had moderate anemia and none of the respondents has severe anemia (as depicted in Table:1)

**Table 1: Assessment Of Pre and Post Hemoglobin Level Among Teenage Girls With Anemia**

Level of hemoglobin	Pretest		Post test	
	Frequency	Percentage	Frequency	Percentage
Mild anemia (11.0-11.9gm/dl)	20	66%	18	60%
Moderate anemia (8.0 to 10.9gm/dl)	10	33%	5	16.7%
Severe anemia (< 8.0gm/dl)	-	-	-	-
No anemia (> 12 gm/dl)	0	0	7	23.3%

A quasi-experimental study was conducted to assess the effectiveness of nutrient mixture on the level of haemoglobin among the teenagers with anemia at Kondanchery village, Thiruvallur District. 60 participants with anemia selected by Purposive sampling technique. Structured questionnaire was used to collect the socio demographic variables and observation schedule to assess the Haemoglobin level among teenage girls. Among 60 study respondents the pretest mean score of anemia among teenage girls was  $10.29 \pm 1.06$  and posttest mean score of anemia was  $12.63 \pm 1.12$ . The mean difference score was 2.34. The calculated paired 't' test value of  $t=15.305$  was found to be statistically significant at  $p<0.001$  level. Hence the findings of present study concluded that, which clearly infers that the administration nutrition mixture among teenage girls was found to be effective in reducing the level of anemia by increasing the level of haemoglobin in the posttest. [18] In our present study, we have recruited teenagers who are diagnosed as mild and moderate anemia of hemoglobin level less than 12 g/dl. Similarly in our study after consumption of nutritional ball the hemoglobin level has been increased in study participants.

To maintain a normal iron balance, diets should include a variety of iron bioavailable foods. Dietary iron comes in 2 forms: heme and nonheme. Heme iron is contained in foods from animal sources and has higher bioavailability and absorption relative to nonheme iron. When consumed together, heme iron also enhances the absorption of nonheme iron. Consistent intake of heme iron is the most effective way to ensure appropriate iron absorption and iron balance [19]. Hence it has been proved that the nutritional intervention is beneficial to improve the hemoglobin level.

#### Efficacy Of Nutritional Ball Oral Supplementation On Anemia Among Teenage Girls

The data was analyzed using descriptive statistics such as mean and standard deviation and the inferential statistics such as paired 't' test was used to check the difference between the level of hemoglobin before and after the nutritional intervention. The effectiveness of nutritional intervention on iron deficiency anemia was found out with the help of paired 't' test, t values were calculated as 9.261 which were statistically significant at 0.05 level. The average score regarding level of hemoglobin before and after nutritional intervention in the subjects were 11.03 and 11.35 respectively. Mean difference in level of hemoglobin was .32. The paired t test statistics (paired 't' value=9.261, table value=2.05) shows that there was an increase in level of hemoglobin as a result of nutritional intervention was statistically significant at 0.05 level. (As Illustrated in Table:2)

**Table 2: Efficacy Of Nutritional Ball Oral Supplementation On Anemia Among Teenage Girls**

N=30

Hemoglobin level	Pretest		Post test		Mean difference score	Paired t test value
Experimental group	Mean	S.D	Mean	S.D		
	11.03	0.65	11.35	0.69	.32	9.261

t =9.261 p=2.05 at 0.05 level

An experimental study was carried out at a selected nursing colleges in Thanjavur to evaluate the impact of iron supplementary balls on the hemoglobin level of adolescent girls with nutritional deficiency anemia. Under the researcher's supervision, the experimental group sample received an iron supplemental ball intervention after breakfast for 30 days. The researcher evaluated both groups' posttest hemoglobin levels after 30 days. The experimental group's mean value of 10.27 with a standard deviation of 1.91 was greater than the control group's mean value of 9.49 with a standard deviation of 1.38. At the 0.05 level of significance, the "t" test calculated value of 10.933 was more than the table value of 2.05 (CV> TV). The results of the statistical analysis show that the posttest levels varied significantly [20].

Traditionally, ragi (Finger millet: Eleusine coracana), a cereal available in India, has been recommended as nutritional supplement to combat anemia because of its high protein and mineral content as well as anti-microbial property [21]. It contains anti- nutritional constituents such as oxalic acid, phytic acid, condensed tannins that may reduce the bioavailability of divalent metal ions and it is highly enriched with calcium and iron [22]. Groundnuts are rich source of minerals such as K,Na,Ca,Mn,Fe and Zn [23]. Sesame seeds (Sesamum indicum) and jaggery (Saccharum officinarum) grown locally ecologically sustainable and iron-rich foods which can address the problems of Anemia [24]. Amla fruits (Emblica officinalis) used as an acidulant in Indian dietary are claimed to be rich source of ascorbic acid, and has been known to enhance intestinal absorption of dietary iron and is one of the potent promoters of non-haeme iron absorption [25]. By preparing and administering nutritional ball of the combination of these ingredients along with one amala daily for 60 days significantly improved the hemoglobin level of teenage girls

#### Association Between Pre-Test Level Of Hemoglobin And Selected Demographic Variables

The association between the pretest level of hemoglobin and demographic variables was checked by using chi square test. It was found that there was significant association between the socio demographic variables such as family income, type of family and education of mother but there was no association between the variables such as age, religion and knowledge regarding anemia. The significant association between the pretest level of hemoglobin and demographic variables such as family income( $\chi^2=9.075$ ,table value of chi square probability = 5.99), type of family( $\chi^2=6.427$ , table value of chi square probability =5.99) and education of mother( $\chi^2=10.418$ ,table value of chi square probability=7.82) but there was no association between the variables such as age ( $\chi^2=0.13$ ,table value of chi square probability=5.99),religion( $\chi^2=2.335$ ,table value of chi square probability =5.99), and knowledge regarding anemia(  $\chi^2=0.265$ ,table value of chi square probability =3.84)

#### 4. Conclusion

Teenage girls are more vulnerable to anemia, the dietary modification during the period of puberty promises a healthy youth. The result of the study indicates that the oral supplementation nutritional ball helps to improve hemoglobin level and thereby reducing the iron deficiency anemia.

#### ACKNOWLEDGEMENT

Authors would like to appreciate all the study respondents for their co-operation throughout the entire study.

#### AUTHORS CONTRIBUTION

Padmapriya developed the study concept and design. Athira and Nirmala collected the clinical data, performed the statistical analysis and interpretation of data. Padmapriya developed the critical revision of manuscript for the intellectual content and drafting the manuscript. All authors read and approved the final manuscript.

#### CONFLICT OF INTEREST AND FINDING SUPPORT

The authors for the current project has no financial investment and are not the investor in any of the health sectors related to the project and not received any consultation payments. They don't have any patents linked to this project. The authors have no personal or professional contact with any of the health care organizations. The authors are not on the editorial board or referees for this journal.

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