

# Effectiveness of Nutritional Intervention in Treating Anemia among Adolescent Girls

D. Kalaichelvi<sup>1</sup>, Nalini Jeyavantha Santha<sup>2</sup>

<sup>1</sup>PhD Nursing, Professor, Mother Teresa College of Nursing, Durg  
Email: [kalaichelvi.dscn\[at\]gmail.com](mailto:kalaichelvi.dscn[at]gmail.com)

<sup>2</sup>PhD Guide, Principal, Sacred Heart Nursing College, Madurai  
Email: [nalinishanthi19\[at\]gmail.com](mailto:nalinishanthi19[at]gmail.com)

**Abstract:** Anemia is the major nutritional problem in India. The prevalence of anemia is higher among developing nations, because of low socioeconomic status and lack of access to the healthcare services. Adolescent period is signalized by marked physical activity and rapid growth spurt; therefore they need additional nutritional supplements and are at risk of developing nutritional anemia. A quantitative approach with true experimental, pre test and post test control group design was used for the study. **Methods and materials:** Four schools were selected homogenously. Totally 240 adolescent girls, 12 to 15 years of age were selected. The blood samples were taken to identify the hypochromic and microcytic anemia. Pre and post assessment was done using the checklist for assessing the signs and symptoms of anemia and cyanmethemoglobin method for checking hemoglobin level. **Results:** After nutritional intervention 40% of the adolescent girls had a normal hemoglobin level (above 12gm/dl) and majority of anemic symptoms disappeared in the experimental group. **Conclusion:** This study indicates a need to educate the adolescent girls about anemia and its prevention, importance of intake of local available iron rich food. Regular screening of adolescent girls is a major source to rule out anemia.

**Keywords:** Nutritional Intervention, Iron Deficiency Anemia, Adolescent girls, Effectiveness

## 1. Introduction

Anemia is one of the most common micronutrient deficiencies and a major global problem affecting 20 to 70 percent of the population in various countries. Nutritional anemia is an important public health problem affecting many people in India. The prevalence of anemia is high in all vulnerable groups and in almost all states of the country, irrespective of both rural and urban areas. The most prevalent nutritional and hematologic disorder among adolescent girl is iron deficiency caused by a lack of sufficient iron for the synthesis of hemoglobin. The term anemia indicates a low red cell count and a below normal hemoglobin or hematocrit level. Anemia can be defined as a reduction in hemoglobin concentration, hematocrit or red cell mass.

Iron plays an important role in the brain development. Iron deficiency causes irreversible effects on brain development and behavior of an adolescent. Iron deficiency anemic adolescents have lack of concentration, impaired thinking, memory, short attention span, poor stamina, poor school performance and behavioral problems. Five - to - ten - point deficiencies occurs in intelligence quotient in anemic adolescent girls (American Society of Hematology).

The alternative therapy in treating anemia is consumption of iron rich diet. Rice flakes also found to be rich in iron, Vitamin B, Vitamin C and dietary fiber. It helps to improve hemoglobin level and also builds immunity. Consumption of jaggery helps to reduce iron deficiency anemia, eases premenstrual syndrome by releasing endorphins, which offer relief in pre - menstrual syndrome and boosts immunity. Amla or Indian gooseberry is rich in vitamin C which helps in absorption of iron.

### 1.1 Statement of the Problem

A study on effectiveness of nutritional intervention in treating iron deficiency among adolescent girls.

### 1.2 Objectives

- 1) To assess the iron deficiency anemia among adolescent girls with anemia.
- 2) To find out the effectiveness of nutritional intervention on iron deficiency anemia among adolescent girls with anemia.
- 3) To find out the relationship between anemic sign and hemoglobin level among adolescent girls with anemia.
- 4) To find out the association between the demographic variables and post test hemoglobin of adolescent girls with anemia.

### 1.3 Hypothesis

Hypothesis was tested at 0.05 level of significance.

H<sub>1</sub> - The mean post test anemic sign of adolescent girls with anemia in experimental group who had nutritional intervention will be significantly lower than the mean pre test anemic sign.

H<sub>2</sub> - The mean post test anemic sign of adolescent girls with anemia in the experimental group who had nutritional intervention will be significantly lower than the mean post test anemic sign of the control group.

H<sub>3</sub> - The mean post test hemoglobin level of adolescent girls with anemia in experimental group who had nutritional intervention will be significantly higher than the mean pre test hemoglobin level.

H<sub>4</sub> - The mean post test hemoglobin level of adolescent girls with anemia in the experimental group who had nutritional

intervention will be significantly higher than the mean post test hemoglobin level of the control group.

H<sub>5</sub> - There will be a significant negative relationship between anemic sign and hemoglobin level of adolescent girls with anemia.

H<sub>6</sub>. There will be a significant association between the post test hemoglobin level and selected demographic variables of adolescent girls with anemia in the experimental and control group.

## 2. Research Methodology

A quantitative approach with true experimental, pre test and post test control group design was used for the study. Among 17 schools, 10 were selected homogenously with same criteria such as age, class, medium of instruction, student's strength, fee structure, socio economic status and physical facilities of the school. By using the lottery method, four schools were selected. Two schools were assigned randomly to experimental group and two schools were assigned randomly to control group.

Totally 240 adolescent girls with anemia were selected among which 120 samples in experimental group and 120 samples in control group were assigned randomly. Samples were selected based on the criteria of age group from 12 to 15 years, Hb level of 7 to 12gms/dl, who have hypochromic and microcytic anemia by assessing the peripheral blood smear. By using stratified sampling technique, 20 samples were selected from 12 to 13 years, 20 samples from >13 to 14 years and 20 samples from >14 to 15 years.

Pretest was conducted for four - week period. The investigator assessed the signs and symptoms of anemia by using observation checklist on signs and symptoms of anemia. By using cynmet hemoglobin method, hemoglobin level was checked. The adolescent who had hemoglobin level of 7 to 12 gms/dl for them Peripheral blood smear was taken to identify hypochromic and microcytic anemia by using wedge blood smear method. Demographic data was collected and the subjects were dewormed by Tab. Albendazole 400mg.

The nutritional intervention was given for eight weeks to the experimental group. The control group was maintained by regular dietary practices. No intervention was given. On ninth week and tenth week, post test - I was conducted. At thirteenth and fourteenth week, post test - II was conducted among 10 adolescent girls with anemia per day.

### 2.1 Research Tool

Tool consists of four parts.

- Part I - It comprised of demographic variables.

- Part II - Observational checklist on signs and symptoms of anemia was used to assess the signs and symptoms of iron deficiency anemia.
- Part III - It consists of bio – physiological approach to estimate the haemoglobin status among adolescent girls using cynmethaemoglobin method.
- Part IV - It consists of bio – physiological approach to estimate the Peripheral blood smear among adolescent girls to assess the hypochromic and microcytic anemia.

### 2.2 Nutritional intervention

It refers to the administration of 100 gms of nutritional ball which is made by the mixture of 60 gms of roasted rice flakes and 40 gms of jaggery. It provides 13.14 mgs of iron. For the absorption of iron, vitamin C that is 4gms of amla fruit powder was given.

### 2.3 Validity and reliability of the tool

The validity of the tool was established in consultation with nursing experts, nutritionist, pediatrician, psychologist and biostatistician. The reliability was established by intra rater reliability for the physiological measurement. Karl Pearson's correlation coefficient formula was used. The obtained 'r' value for observation checklist on signs and symptoms of anemia was 0.91, for hemoglobin level was 0.87, 0.84 for peripheral blood smear.

## 3. Results and Discussion

Regarding father's educational status and mother's educational status, 62 (51.7%) and 46 (38.3%) in the experimental group, 66 (55%) and 43 (35.8%) in the control group were graduates. The majority of the participants 48 (40%) had an income of above Rs.30, 000/month in the experimental group and 62 (51.7%) had an income of Rs.20, 000 – Rs.30, 000/month in the control group.

The majority of the subjects, 37 (30.8%) attained menarche before 12 years in the experimental group and 48 (40%) attained menarche before >12 to 13 years in the control group. 62 (51.7%) in the experimental group and 70 (58.3%) in the control group were having normal and regular menstrual cycle.

The majority of the subjects, 95 (79.2%) in the experimental group and 91 (75.8%) in the control group had never taken deworming drugs. Regarding the history of gastritis and medicine intake, 118 (98.3%) in the experimental group and 116 (96.7%) in the control group had no history of gastritis.

**Objective 1:** To assess the iron deficiency anemia among adolescent girls with anemia.

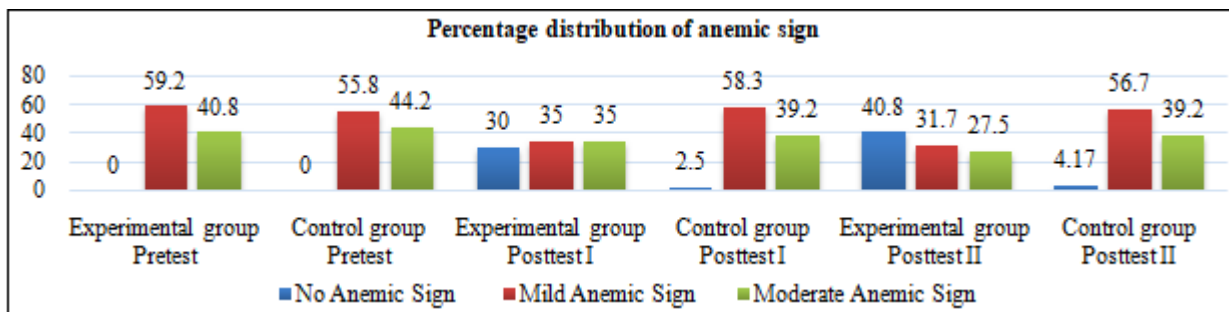


Figure 1: Percentage distribution of anemic sign in pretest, posttest –I and posttest –II among adolescent girls with anemia in experimental group and control group

Fig - 1: Represented that in the experimental group, 30% had no anemic sign in posttest I and in the posttest II 40.8% had no anemic sign in the posttest II. In the control group, 4.17% had no anemic sign in the posttest II.

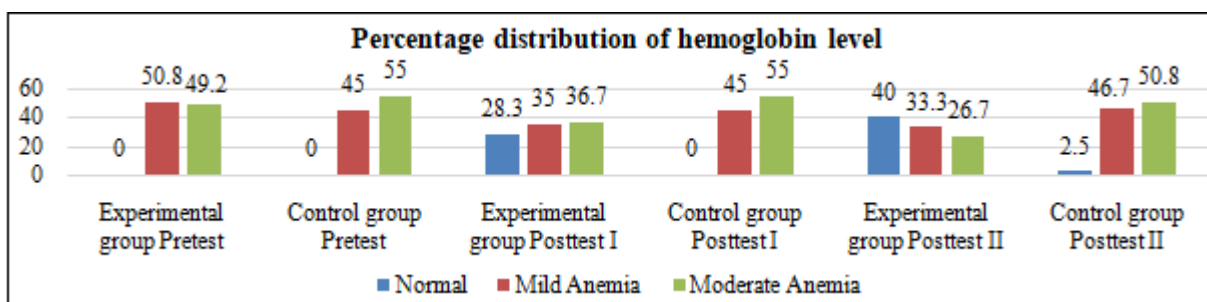


Figure 2: Percentage distribution of hemoglobin level in pretest and posttest –II among adolescent girls with anemia in experimental group and control group

Figure 2: Showed that in the experimental group, none of them have normal hemoglobin level in the pretest. 28.3% & 40% had normal hemoglobin level (> 12gm/dl) in the post test - I & post test - II. In the control group, 2.5% had normal hemoglobin level (> 12gm/dl) in the post test - II.

Objective 2: To find out the effectiveness of nutritional intervention on iron deficiency anemia among adolescent girls with anemia.

Table 1: Comparison of pretest and post test –II anemic sign in the experimental group among control group of adolescent girls with anemia. (n=120)

Experimental Group	Mean	Std. Deviation	Paired t - test	P - value
Pre test	9.47	3.076	2.923	P<0.01
Post test –II	5.88	2.423		
Control Group				
Pre test	9.62	3.101	0.209	0.850
Post test –II	9.53	3.087		

P<0.01\*\* Highly significant

The mean post test - II anemic sign (5.88) was lower than the pretest anemic sign (9.47) in the experimental group. There was a significant difference in anemic sign between the post test - II and pretest in the experimental group which was statistically highly significant (t=2.923, p < 0.01).

Table 2: Comparison of pretest and post test anemic sign between the experimental and control group of adolescent girls with anemia. (n=240)

Anemic Sign	Group	Mean	Std. Deviation	Independent T value	F value
Pretest	Experiment	9.47	3.076	9.756	F (2, 476) =36.75
	Control	9.62	3.101		
	Total	9.55	3.088		
Post test - I (9 <sup>th</sup> & 10 <sup>th</sup> week)	Experiment	7.53	2.743	P<0.001***	P<0.01**
	Control	9.69	3.113		
	Total	8.61	2.928		
Post test - II (13 <sup>th</sup> & 14 <sup>th</sup> week)	Experiment	5.88	2.423	P<0.001***	
	Control	9.53	3.087		
	Total	7.71	2.755		

P < 0.001 level\*\*\* - Very Highly Significant; P<0.01\*\*Highly significant

It summarizes that comparing between the experimental and control group in the post test - I anemic sign, the obtained 't' value was 9.756 and in the post test - II anemic sign, the 't' value was 15.767 which was very highly significant at P<0.001.

Repeated ANOVA was used to compare the total mean difference between the pretest, post test - I and post test - II anemic sign level in the experimental and control group. The obtained 'F' ratio was 36.75, which was statistically significant P<0.01 level. This revealed that there was a significant reduction in anemic sign of adolescent girls with anemia in the experimental group than in the control group.

**Table 3:** Comparison of pretest and post test - II hemoglobin level in the experimental group among control group of adolescent girls with anemia. (n=120)

Experimental Group	Mean	Std. Deviation	Paired t - test	P - value
Pre test	9.69	3.112	3.031	P<0.01
Post test -II	12.16	3.487		
Control Group				
Pre test	9.76	3.123	0.414	0.764
Post test -II	9.79	3.129		

P<0.01\*\* Highly significant

The mean post test-II hemoglobin level (12.16) was higher than the mean pretest hemoglobin level (9.69) in the experimental group. There was a significant difference in hemoglobin level between the pre test and post test - II in the experimental group which was statistically highly significant ( $t=3.031$ ,  $p < 0.01$ ). The mean post test hemoglobin level of adolescent girls with anemia in experimental group who had nutritional intervention was significantly higher than the mean pre test hemoglobin level.

**Table 4:** Comparison of pre test and post test hemoglobin level between the Experimental group and control group of adolescent girls with anemia. (n=240)

Hemoglobin level	Group	Mean	Std. Deviation	Independent T value	F value
Pretest	Experiment	9.69	3.112	12.292	F(2, 476) = 38.65
	Control	9.76	3.123		
	Total	9.725	3.112		
Post test - I (9 <sup>th</sup> & 10 <sup>th</sup> week)	Experiment	11.68	3.418	P<0.001***	P<0.01**
	Control	9.79	3.129		
	Total	10.35	3.181		
Post test - II (13 <sup>th</sup> & 14 <sup>th</sup> week)	Experiment	12.16	3.487	15.265	P<0.001***
	Control	9.79	3.129		
	Total	10.99	2.217		

P < 0.001 level\*\*\* - Very Highly Significant; P<0.01\*\*Highly Significant

Table - 4 summarizes that comparing between the experimental and control group in the post test - I hemoglobin level, the obtained 't' value was 12.292 which was very highly significant at P<0.001. In the post test - II hemoglobin level, the 't' value was 15.265 which was very highly significant at P<0.001.

Repeated ANOVA was used to compare the total mean difference between the pretest, post test - I and post test - II hemoglobin level. The obtained 'F' ratio was 38.65, which was statistically significant P<0.01 level. This revealed that there was significant progress in hemoglobin level of adolescent girls with anemia in the experimental group than the control group.

**Objectives 4:** To find out the association between the demographic variables and post test hemoglobin of adolescent girls with anemia.

There was a significant association between age in years, education status and post test - II hemoglobin level in the experimental group. There was a significant association between mother's education status, father's occupation, history of gastritis, peptic ulcer and post test - II hemoglobin level in the control group.

## 4. Major Findings of the Study

- Majority (60%) of the adolescent girls had mild anemic signs and symptoms of tiredness, paleness of conjunctiva, palpitations, headache and lack of concentration, 50% of the study subjects had mild anemia and average intelligence level in the pretest of experimental and control group.
- After 8 weeks of nutritional intervention 40% of the adolescent girls had a normal hemoglobin level (above 12gm/dl) and majority of anemic symptoms was disappeared in the experimental group. The hemoglobin level in pretest was 9.69 gm/dl which was increased to 12.16 gm/dl in post test - II in the experimental group ( $t=3.031$ ,  $p < 0.01$ ). The mean difference of hemoglobin level was 2.47gm/dl.

## 5. Limitations of the study

- Since the understanding level of adolescent was different and fear towards pain during the blood withdrawal the investigator faced difficulty in obtaining the blood samples for peripheral blood smear and checking the hemoglobin level even after explaining the purpose of the study.
- Difficulty in obtaining permission for conducting the study.

## 6. Conclusion

The nurse has a major role in identifying the prevalence of anemia among high - risk populations. An important nursing goal is educating the adolescent girls and parents about iron deficiency anemia and its prevention. Parents and adolescents should also be counseled about the dietary intake of iron. They can be taught about the iron rich foods and then help them to plan meals with iron rich foods. When guiding parents and adolescents, the nurse must take into consideration their financial resources and their cultural food preferences. If the parents and adolescents are resistant to dietary change, the nurse can explain how a diet containing iron can improve the health of all family members.

## References

- [1] Dorothy, R. M., (2002). *Text book of Paediatrics*, 6th Edition, Saunders Publication, Philadelphia, Pp 649 - 652.
- [2] Gopalan, C. et al., (2005). *Nutritive value of Indian foods*, National Institute of Nutrition, ICMR, Hyderabad, Pp 47 - 63.
- [3] Parthasarathy (2006). *Text book of Paediatrics*, 6th Edition, Jaypee Publication, New Delhi, Pp 500 - 503.
- [4] Alaofe, H., Zee, J., O'Brien, H. T. (2007). Dietary iron and iron deficiency anemia among adolescent girls. *RevEpidemiologicalSantePublique*, 55 (3), 187 - 96.
- [5] Angel, M., & Devi, V. K. P. (2012). Effect of garden cress seeds incorporated health mix among selected anemic adolescent girls (12 - 15 years) in DindigulDist, Tamil Nadu. *International Journal of Science and Research*, 3 (11), 64 - 66.

- [6] Damayanthi, M. N., Seema, P., & Kumar, J. K. (2015). Anemia among adolescents in urban field practice area of Bangalore. *Al Ameen Journal of Medical Sciences*, 8 (4), 288 - 292.
- [7] Mageshwari, U. S., & Sharmila, M. J. P. (2012). Nutritional status and impact of functional food supplement on the performance athletes. *Indian Journal of Applied Research*, 1 (7), 94 - 96.
- [8] Ranganath, T. S., & Debata, I. (2015). Assessment of diet and anemia status among adolescent girls in urban Bangalore. *International Journal of Interdisciplinary and Multidisciplinary Studies*, 2 (11), 36 - 42.
- [9] Revathi, P. & Devi, A. T. (2015). Effect of supplementation of iron rich health mix to selected anemic adolescent girls (13 - 18years). *International Journal of multidisciplinary Research Centre*, 1 (4), 1 - 9.