



EFFECTIVENESS OF ARBITRATION ACTIVITIES ON PHYSICAL AND BIOCHEMICAL INDICES AMONG ADOLESCENT GIRLS WITH ANEMIA – AN INTERVENTIONAL PILOT STUDY

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Anaemia is the most common nutritional disorder worldwide. According to WHO adolescent age group is defined as life span between 10-19 years¹. In India the prevalence of anaemia among adolescent girls were 56% and this amounts to an average 64 million girls at any point in time². The Comprehensive National Nutrition Survey (CNNS) 2016–2018 is the nationally representative survey to measure hemoglobin, haemoglobinopathies, biomarkers of micro-nutrient deficiencies, diet and social factors in Indian adolescents aged 10–19 years. Using CNNS data, it was found that 28.5% of adolescents (girls: 39.6%, boys: 17.6%) were anemic, with variation by region or state. From 2005~2006 to 2019~2021, National Family Health Surveys NFHS estimates indicate that anemia prevalence among Indian adolescents aged 15~19 years has slightly increased (girls: 55.8% to 59.1%, boys: 30.2% to 31.1%) as per the International Institute for Population Sciences (2022). India's Adolescent Anemia Control Program was initiated as a pilot program in 2000 in five states with three interventions targeting girls aged 10–19 years: weekly iron folic acid (IFA) supplementation, monthly nutrition and health education and biannual de-worming prophylaxis (UNICEF, 2018). In 2018, the program added a 'test and treat' strategy with revised coating and dosage for the IFA supplements (aligned to WHO standards) and other selected interventions to tackle non-nutritional causes, re-branded as the 'Anaemia-Free India Program'³.

Abstract

A quasi experimental study was conducted to assess the effectiveness of arbitration activities on physical and biochemical indices among adolescent girls with anemia. 20 adolescent girls with anaemia were participated in the study. 10 were in the experimental and 10 were in the control group. Arbitration activities such as IEC with Video show, Drumstick leaves soup consumption, Pamphlets and Nutritional Exhibition were provided to the experimental group, for the control group routine care advised. This study revealed that Drumstick leaves soup intake increased the Hb level, also reduced the risk factors of anaemia when it was given along with other behaviour modification strategies. This study concluded that that Drumstick leaves Soup is effective in improving the hemoglobin level among adolescent girls which is simple, safe, cost effective and non-pharmacological method which could be easily prepared by anybody at home and it does not cause any side effects.

Keywords:

Effectiveness: Refers to the outcome of arbitration activities on physical indices using WHO BMI value, check list of signs & symptoms and biochemical indices using-digital Hemoglobinometer which will be assessed after 2 weeks and 4 weeks of intervention.

Arbitration activities: Refers to the structured group of activities devised by an investigator such as IEC with Video show, Drumstick leaves soup consumption, Pamphlets and Nutritional Exhibition to improve the physical and biochemical indices among adolescent girls with anemia.

Video show on causes, sign and symptoms, diagnosis, management and prevention of anemia

Drumstick leaves juice – Handpicked, cleaned and washed Drumstick leaves of 50gm will be boiled in 300 ml of water and make it boil for 5 to 7 minutes in low flame and strain it well. It will give 200 ml of drumstick Leaves Soup.

Pamphlets – Distributed on dietary resources to manage and prevent anemia

Nutritional exhibition – will be conducted on healthy eating, Dietary resources, healthy food habits and practices to manage and prevent anemia.

Physical indices: Refers to the assessment of Body Mass Index by using WHO BMI value, assessing the signs and symptoms of anemia with the check list which was developed by the investigator.

Biochemical indices: Refers to the clinical assessment of the Hemoglobin level by using digital Hemoglobinometer by the investigator.

Adolescent girls with anemia: Refers to the girls between the age group of 13 to 19 years and having the hemoglobin level 7 to 11.9 gm/dl of blood which will be assessed by the digital hemoglobinometer.

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INTRODUCTION

“Healthy adolescent girls of today are the healthy mothers of tomorrow”

Adolescence is a phase of rapid growth and development during which physical, physiological and behavioral changes occur. They constitute more than 1.2 billion worldwide, and about 21% of Indian population⁴. About 3,000 adolescents in the age group of 10-19 years die every day, which is one death every 30 seconds. In 2016, more than 1.1 million adolescents lost their lives⁵.

Nutrition is a critical part of health and development. Better nutrition is related to improved infant, child and maternal health, stronger immune systems, safer pregnancy and childbirth, lower risk of non-communicable diseases and longevity. Iron deficiency anemia was the second leading cause of years lost by adolescents to death and disability. The drumstick leaves are a low cost, locally available food material which is effective to combat the highly prevalent problem of anemia in adolescent girls: also useful to the economically weaker section of the society. Keep above points in view; the researcher would like to do the study to improve the hemoglobin level among the adolescent girls

STATEMENT OF THE PROBLEM: A Quasi experimental study to assess the effectiveness of arbitration activities on physical and biochemical indices among adolescent girls with anemia in selected rural community.

OBJECTIVES

- To determine the effectiveness of arbitration activities on physical and biochemical indices among adolescent girls with anemia between experimental and control group.
- To identify the relationship between the physical and biochemical indices among adolescent girls with anemia in experimental and control group.
- To find the association of selected demographic variables with the mean difference level of physical and biochemical indices among adolescent girls with anemia in experimental and control group.
- To compare the associative risk factors of anemia in experimental and control group.
- To assess the relationship between the associative risk factors and the level of anemia in experimental and control group

MATERIALS and METHODS

Research approach: Quantitative research approach
Research design: Quasi-Experimental Non-

Equivalent Control Group Pretest Post test Design.

Variables

Independent Variable: Arbitration activities.

Dependent Variables: Physical and Biochemical Indices.

Demographic Variables: Age, education, religion, type of family, number of siblings, monthly income of the family, source of information, birth order, total number of family members, family history of anemia, father & mother education, father & mother occupation, Dietary habit, Regularity of menstruation, Age at Menarche, Nature of Menstrual cycle, and De-worming

Setting of the study: Selected rural areas at Madurai

Target Population: All the adolescent girls with anemia.

Accessible Population: All the adolescent girls with anemia who were staying in the selected rural community, Madurai.

Sample: Adolescent girls with anemia who have fulfilled the eligibility criteria.

Sampling technique: Non probability Purposive sampling technique

Sample size: 20. Totally 22 adolescent girls were tested for anemia. Out of 22 girls 20 were having anemia. Every alternative girl-10 girls assigned as experimental group, remaining 10 were assigned in to control group.

TOOL FOR DATA COLLECTION

PART I SCREENING

Adolescent girls are screened for anemia using DIGITAL HEMOGLOBINOMETER for recruitment of the samples. Mild and Moderate anemia recruited for the study

PART II: Demographic Variables

PART III: Observation - Computation of Body Mass Index.

PART IV: Check list - Assessment of Signs and Symptoms of Anemia

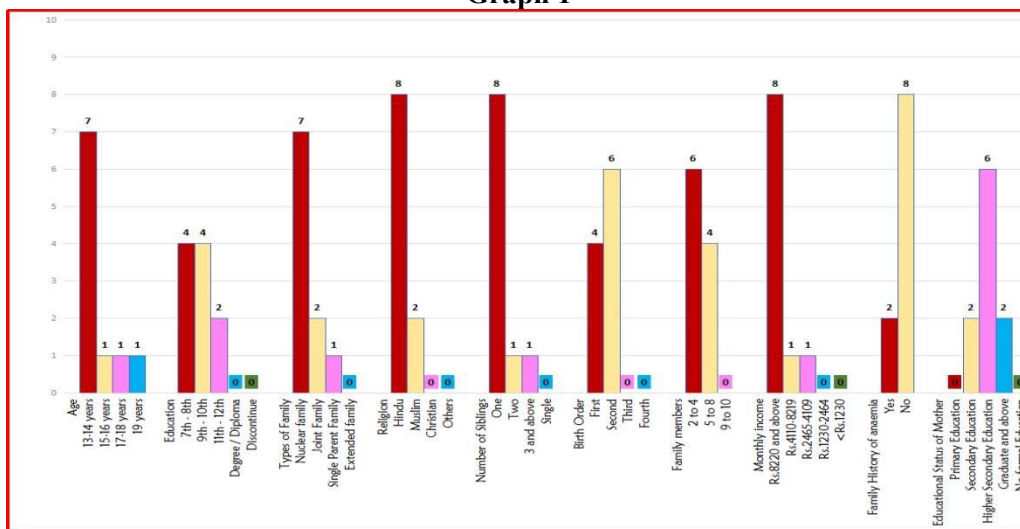
PART V: Assessment of associative risk factors of anemia (Menstrual, Dietary and Helminthic factors)

Data analysis

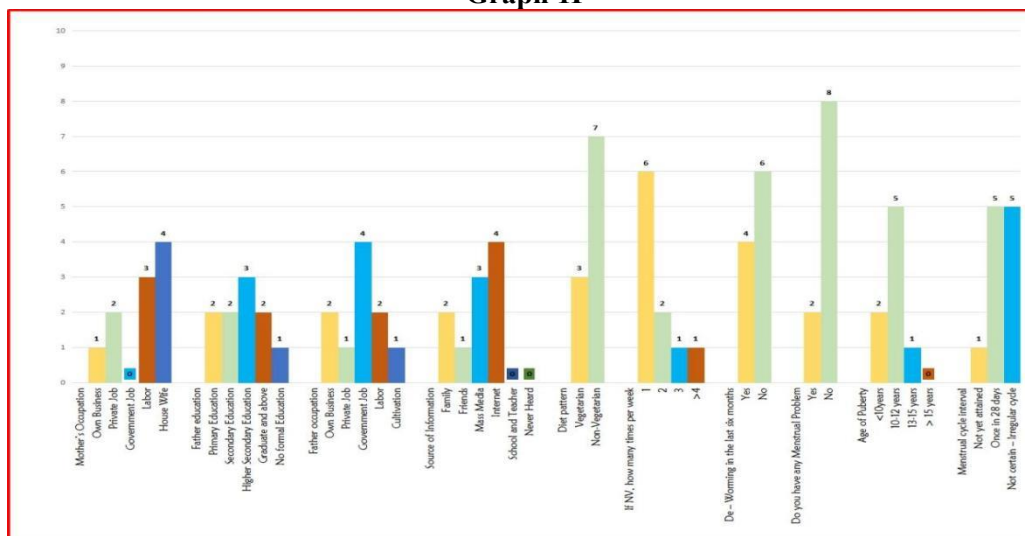
Descriptive Statistics and Inferential statistics used to analyse the data.

RESULTS and DISCUSSION
DISTRIBUTION OF DEMOGRAPHIC VARIABLES
Experimental group

Graph 1

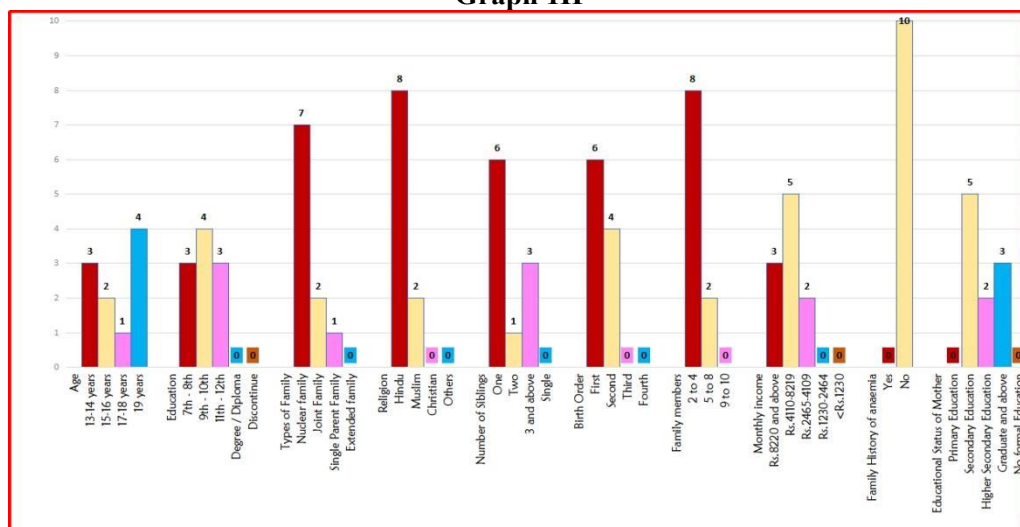


Graph II

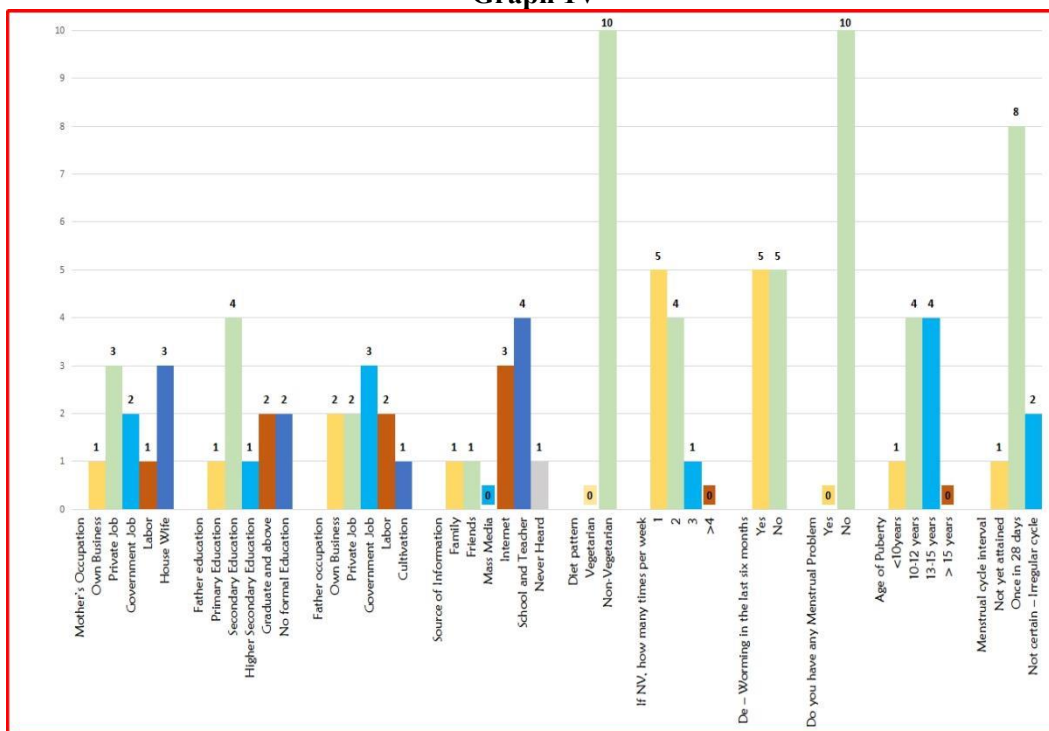


Control group

Graph III



Graph 1V



Objective 1: To determine the effectiveness of arbitration activities on physical and biochemical indices among adolescent girls with anemia between experimental and control group Body Mass Index score between Experiment and Control group adolescents

Table 1: Distribution of Pretest, Post test-I and Post test-II Level of BMI score among Experiment and Control group of adolescents

Assessment	Level of BMI	Group				Chi-square value	P value
		Experimental Group (n=10)		Control Group (n=10)			
		No.	%	No.	%		
Pre-test	Normal	2	20.00%	3	30.00%	1.20	0.55 (NS) DF=2
	Over weight	0	0	0	0		
	Obese	1	10.00%	0	0.00%		
	Underweight	7	70.00%	7	70.00%		
Post test-I	Normal	4	40.00%	3	30.00%	1.48	0.48 (NS) DF=2
	Over weight	0	0	0	0		
	Obese	1	10.00%	0	0.00%		
	Underweight	5	50.00%	7	70.00%		
Post test-II	Normal	6	60.00%	3	30.00%	3.60	0.17 (S) DF=2
	Over weight	0	0	0	0		
	Obese	1	10.00%	0	0.00%		
	Underweight	3	30.00%	7	70.00%		

DF= Degrees of freedom S= significant NS= not significant P>0.05 not significant P≤0.05 significant ***P≤0.001 very high significant

Above table compares the level of BMI score between experimental and control group In pretest and Post Test I there is no significant difference between experimental and control group. But in Post Test-II, there is a significant difference in level

of BMI score between experimental and control group. The significant P- value 0.17 indicates, the level of BMI score was significant at 0.05 level. Statistical significance was calculated using chi square test.

GRAPH V: Simple bar with standard error compares the adolescents BMI score between experimental and control group during pretest, post test-I, and post test-II.

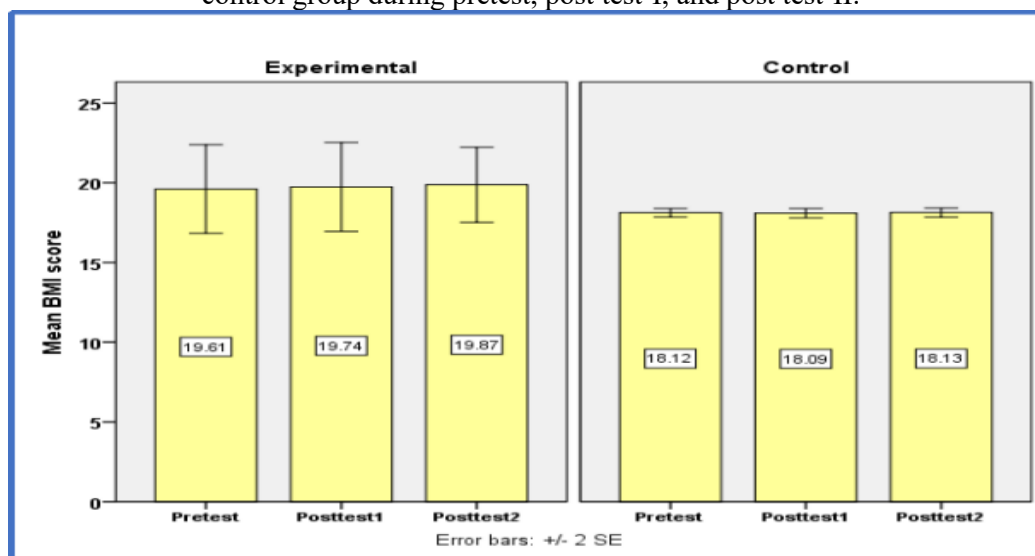


Table 2: Signs & Symptoms of anemia score between Experiment and Control group of adolescent girls

Signs & Symptoms score	Group				Mean Difference	Student independent t-test
	Experimental (n=10)		Control (n=10)			
	Mean	SD	Mean	SD		
Pretest	2.30	2.16	3.30	2.98	1.00	t=0.86 p=0.40(NS)
Post test-I	2.00	2.31	3.20	2.86	1.20	t=1.03 p=0.32(NS)
Post test-II	1.40	1.71	3.30	2.26	1.90	t=2.12 p=0.05*(S)

NS = Not significant P>0.05 is not significant DF= Degrees of Freedom S= significant *P<0.01 highly significant ***P<0.001 very high significant

The above table describes the comparison of experimental and control group of adolescents in Signs & Symptoms of anemia score during Pretest, Post test-I, Post test-II. In pretest and in posttest1 there is no significant difference between

experiment and control group. In post test II there is a significant difference between experiment and control group. Statistical significance was confirmed using independent t test.

Table 3: Comparison of mean Signs & Symptoms of anemia score in the Pretest, Post test-I and Post test-II among experimental and control group

	Pre-test		Post test-I		Post test-II		Mean difference	Friedman Repeated measures ANOVA F-test
	Mean	SD	Mean	SD	Mean	SD		
Experimental	2.30	2.16	2.00	2.31	1.40	1.71	0.90	F=9.81 p=0.001*** (S)
Control	3.30	2.98	3.20	2.86	3.10	1.85	0.20	F=0.15 p=0.86 (NS)

In experimental group, Repeated measures F-test analysis revealed that, the overall mean score of Signs & Symptoms of anemia is sharing statistically significant difference between pre-test and post test-II (F = 9.81, P = 0.58). Therefore, we can conclude that an arbitration activities

reducing the Signs & Symptoms of anemia significantly among adolescent girls with anemia. Similarly, in control group, Repeated measures F-test analysis shows that, mean overall Signs & Symptoms of anemia is not statistically significant different between pre-test and post test-II (F = 0.15, p=0.86). Therefore, we can conclude that a

routine care is not reducing Signs & Symptoms significantly among adolescent girls with anemia. Since standard deviations are larger non parametric

Friedman repeated measures of analysis of variance test used.

HEMOGLOBIN LEVEL

Table 4: Hemoglobin score between Experiment and Control group of adolescents

Hb score	Group				Mean Difference	Student independent t-test
	Experimental (n=10)		Control (n=10)			
	Mean	SD	Mean	SD		
Pre test	9.65	1.49	9.50	1.24	0.15	t=0.24 p=0.81(NS)
Post test-I	10.20	1.61	9.52	1.26	0.68	t=1.05 p=0.31(NS)
Post test-II	10.83	1.41	9.55	1.27	1.28	t=2.14 p=0.05*(S)

NS = Not significant P>0.05 is not significant DF= Degrees of Freedom S= significant *P≤0.01 highly significant ***P≤0.001 very high significant

The above table describes the comparison of experimental and control group of adolescent's hemoglobin score during Pre test, Post test-I, Post test-II. In Pretest and PosttestI there is no significant difference between experiment and

control group. In Post test II there is a significant difference between experiment and control group. (Statistical significance was confirmed using independent t test)

Table 5: Comparison of mean Hb score During Pretest, Post test-I and Post test-II among experimental and control group (within group analysis)

Groups	Pre-test		Posttest-I		Posttest-II		Mean difference	Friedman Repeated measures ANOVA F-test
	Mean	SD	Mean	SD	Mean	SD		
Experimental	9.65	1.49	10.20	1.61	10.83	1.41	1.18	F=4.87 p=0.001 (S)
Control	9.50	1.24	9.52	1.26	9.55	1.27	0.05	F=0.38 p=0.69 (NS)

In experimental group, Repeated measures F-test analysis shows that, mean overall Hb score is shows statistically significant different between pre-test and post test-II (F = 4.87, p = 0.001). Therefore, we can conclude that an arbitration activities improving Hb significantly among adolescent girls with anemia. Similarly, in control group, Repeated measures F-test analysis shows

that, mean overall Hb score is not statistically significant different between pre-test and post test-II (F = 0.38, p=0.69). Therefore, we can conclude that a routine care not improving Hb significantly among adolescent girls with anemia. Since standard deviations are larger non parametric Friedman repeated measures of analysis of variance test used.

Graph V1: Comparison of Hb score between experimental and control group in post test-II

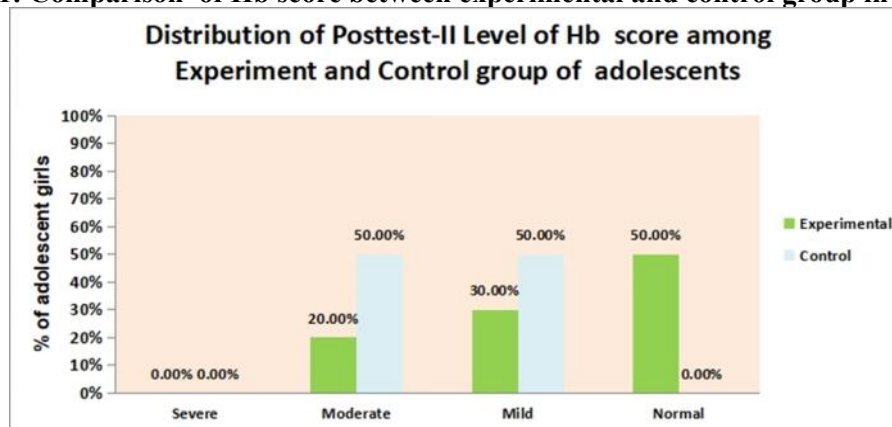


Table 6: Comparison the level of Hb score between experimental and control group

Assessment	Level of Hb	Group				Chi-square value	P value
		Experimental (n=10)		Control Group (n=10)			
		No.	%	No.	%		
Pre-test	Severe	0	0.00%	0	0.00%	2.22	0.33 (NS) DF=2
	Moderate	4	40.00%	5	50.00%		
	Mild	4	40.00%	5	50.00%		
	Normal	2	20.00%	0	0.00%		
Post test-I	Severe	0	0.00%	0	0.00%	3.61	0.16 (NS) DF=2
	Moderate	4	40.00%	5	50.00%		
	Mild	3	30.00%	5	50.00%		
	Normal	3	30.00%	0	0.00%		
Post test-II	Severe	0	0.00%	0	0.00%	6.78	0.05* (S) DF=2
	Moderate	2	20.00%	5	50.00%		
	Mild	3	30.00%	5	50.00%		
	Normal	5	50.00%	0	0.00%		

DF= Degrees of freedom S= significant NS= not significant P>0.05 not significant P≤0.05 significant ***P≤0.001 very high significant

Above table compares the level of Hb score between experimental and control group. In pretest and Post Test I there is no significant difference between experimental and control group. In post

test-II, there is a significant difference in level of Hb score between experimental and control group. The significant P- value 0.05 indicates, the level of Hb score was not similar in both the groups.

Objective 2: To identify the relationship between the physical and biochemical indices among adolescent girls with anemia in experimental and control group.

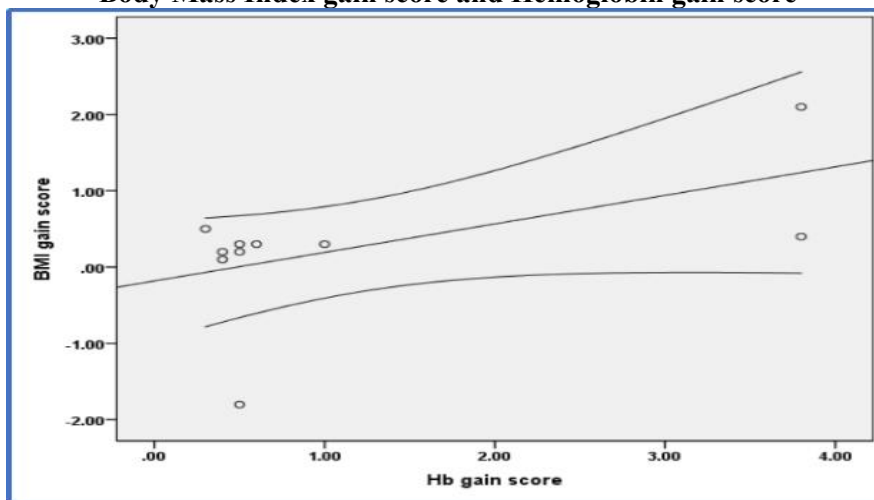
Table 7: Correlation between Body Mass Index gain score, signs and Signs & Signs & Symptoms of anemia, Hemoglobin gain score, Risk factors of anemia (Experimental group)

Group	Correlation between	Mean gain score Mean±SD	Karl Pearson Correlation coefficients	Interpretation
Experimental	Hb score Vs BMI score	1.18±1.39	r= 0.46 P=0.05*	Significant positive moderately correlation
Control		0.05±0.25	r= 0.07 P=0.85	
Experimental	Hb score Vs Signs & Symptoms score	1.18±1.39	r= 0.37 P=0.05*	Significant positive fair correlation
Control		0.05±0.25	r= 0.17 P=0.25	
Experimental	Hb score Vs anemia risk score	1.18±1.39	r= 0.24 P=0.05*	Significant positive moderate correlation
Control		0.05±0.25	r= 0.14 P=0.22	
Experimental	BMI score Vs Signs & Symptoms score	8.65±1.61	r= 0.28 P=0.05*	Significant positive fair correlation
Control		0.01±0.42	r= 0.18 P=0.09	
Experimental	BMI score Vs anemia risk score	8.65±1.61	r= 0.19 P=0.05***	Significant positive poor correlation
Control		0.01±0.42	r= 0.13 P=0.24	
Experimental	Signs & Symptoms score Vs anemia risk score	8.65±1.61	r= 0.14 P=0.05*	Significant positive poor correlation
Control		0.20±1.40	r= 0.10 P=0.45	

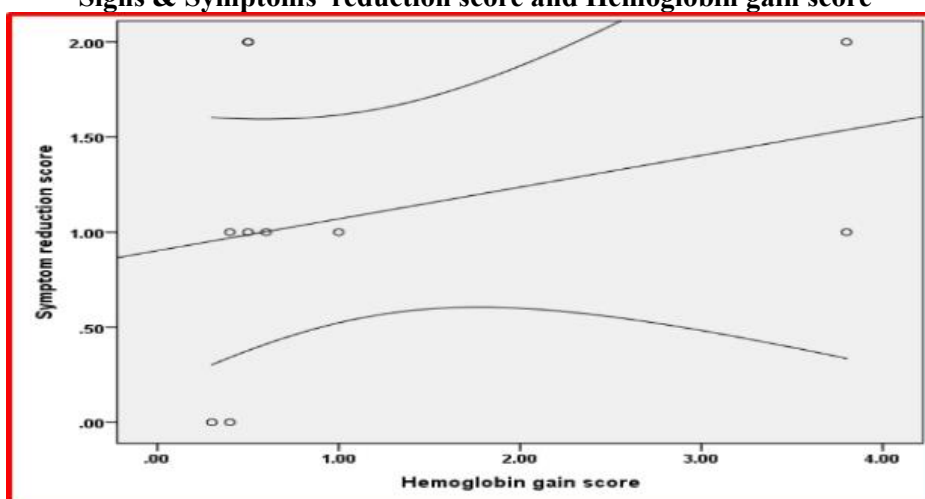
Interpretation for R-value_Karl Pearson correlation coefficient is denoted by “r” “r” always lies between -1 to +1 0.0 – 0.2 poor correlation 0.2 -

0.4 fair correlation 0.4 - 0.6 moderate correlation 0.6 – 0.8 substantial correlation- 1.0 strong correlation

Graph VII Scatter plot with regression estimate shows the positive moderate Correlation between Body Mass Index gain score and Hemoglobin gain score



Graph VIII Scatter plot with regression estimate shows the positive moderate Correlation between Signs & Symptoms reduction score and Hemoglobin gain score



Objective 3: To find the association of selected demographic variables with the mean difference level of physical and biochemical indices among adolescent girls with anemia in experimental and control group.

There is no significant association of selected demographic variables with the mean difference level of physical and biochemical indices among

adolescent girls with anemia in experimental and control group.

Objective 4. To compare the associative risk factors of anemia in experimental and control group

Table 8: Anemia Risk score between Experimental and Control group of adolescent’s girls

Sno	Risk score	Group				Mean Difference	Student independent t-test
		Experimental (n=10)		Control (n=10)			
		Mean	SD	Mean	SD		
Pretest	MENSTRUAL FACTORS	18.90	4.33	17.80	5.25	1.10	t=0.51 p=0.61(NS)
	DIETARY FACTORS	28.70	3.56	27.90	4.56	0.80	t=0.44 p=0.66(NS)
	HELMINTHIC FACTORS	8.30	1.95	9.00	3.37	-0.70	t=0.57 p=0.58(NS)
	Risk Total	55.90	5.17	54.70	8.04	1.20	t=0.40 p=0.70(NS)
Post test	MENSTRUAL FACTORS	16.40	4.84	17.60	5.10	-1.20	t=0.29 p=0.60(NS)
	DIETARY FACTORS	25.70	4.32	27.60	4.65	-1.90	t=0.90 p=0.36(NS)

	HELMINTHIC FACTORS	6.90	1.97	8.80	2.86	-1.90	t=1.99 p=0.10(NS)
	Risk Total	49.00	7.60	54.00	7.67	-5.00	t=2.14 p=0.16(NS)
Post test II	MENSTRUAL FACTORS	14.20	2.70	17.30	3.69	-3.10	t=2.11 p=0.05*(S)
	DIETARY FACTORS	23.40	2.63	27.40	4.48	-4.00	t=2.43 p=0.05*(S)
	HELMINTHIC FACTORS	5.10	.57	8.60	2.76	-3.50	t=3.93 p=0.01**(S)
	Risk Total	42.70	4.81	53.30	6.88	-10.60	t=3.99 p=0.001***(S)

NS = Not significant $P > 0.05$ is not significant DF= Degrees of Freedom S= significant $*P \leq 0.01$ highly significant $***P \leq 0.001$ very high significant

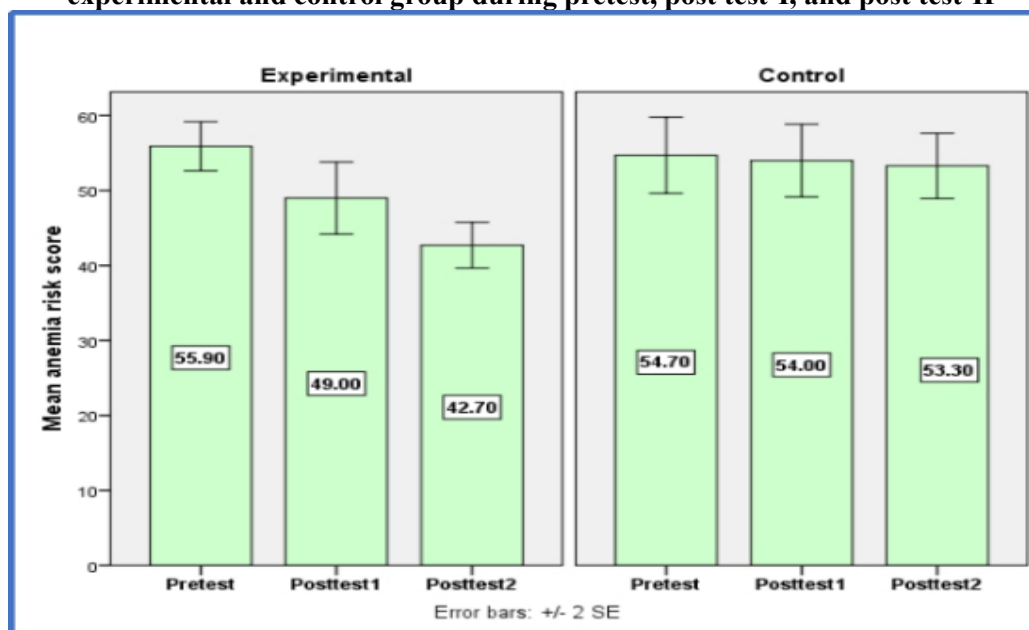
The above table describes the comparison of experimental and control group of adolescent's risk factors score during Pretest, Post test-I, Post test-II. In pretest and in post test-I there is no significant difference between experiment and control group. In post test-II there is a significant difference between experiment and control group. Statistical significance was confirmed using independent t test.

Table 9: Comparison of mean risk factors score in Pretest, Post test-I, Post test-II among experimental and control group

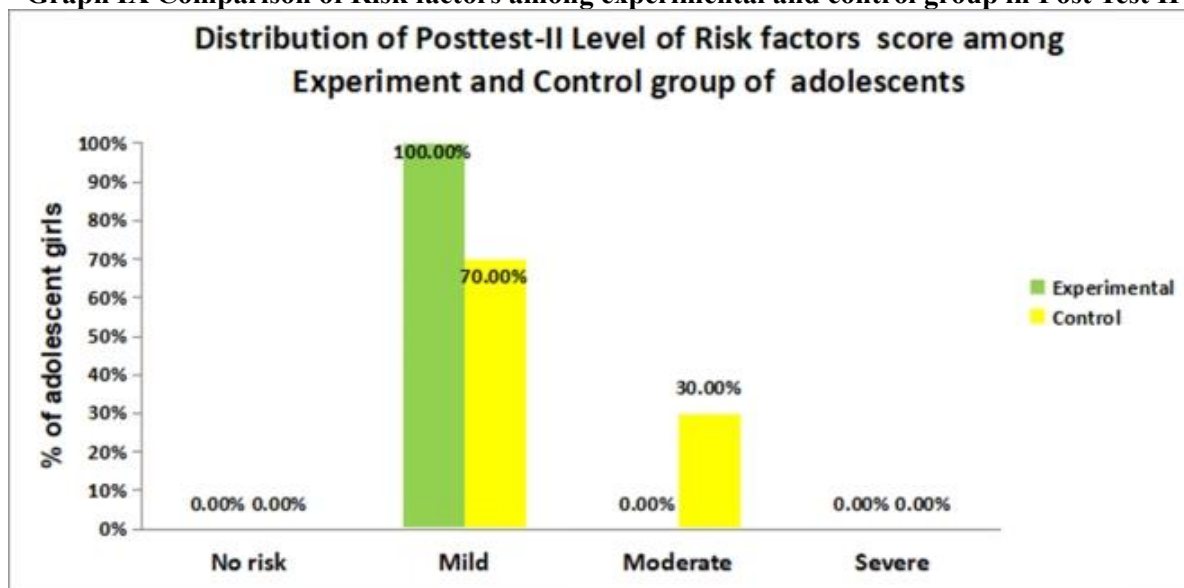
	Pre-test		Posttest-I		Posttest-II		Mean difference	One-way ANOVA F-test	Repeated measures F-test
	Mean	SD	Mean	SD	Mean	SD			
Experimental	55.90	5.17	49.00	7.60	42.70	4.81	13.20	F=36.87 p=0.001 (S)	
Control	54.70	8.04	54.00	7.67	53.30	6.88	1.40	F=3.02 p=0.09 (NS)	

In experimental group, Repeated measures F-test analysis shows that, mean overall risk score is statistically significant different between pre-test and post test-II ($F = 36.87, p = 0.001$). Therefore, we can conclude that a arbitration activities reduces risk factors score significantly among adolescent girls with anemia. Similarly, in control group, Repeated measures F-test analysis shows that, mean overall risk factor score is not statistically significant different between pre-test and post test-II ($F = 3.02, p = 0.09$). Therefore, we can conclude that a routine care not reducing the risk factors score significantly among adolescent girls with anemia.

Graph IX Simple bar with standard error compares the adolescents risk factors score between experimental and control group during pretest, post test-I, and post test-II



Graph IX Comparison of Risk factors among experimental and control group in Post Test II



Conclusion:

In spite of all the meticulous intervention directed to prevent anemia, still the adolescent girls are more prone to get anemia due to their faulty food habits, discrimination, negligence and other physiological factors. So there is a tremendous need to reduce the level of anemia among the future mothers of the nation by low cost, locally available and acceptable strategy in which Drum stick leaves supplementation is the best method to prevent anemia. It's a high time to motivate the young girls to consume drumstick leaves which are available in their door steps. So the investigator felt that there is a tremendous need to reduce the level of anemia among the future mothers of the nation by low cost, locally available and acceptable strategy. It's a high time to improve the health of the adolescent girls in the rural area with the appropriate modes of interventions.

Limitation of the Study: Study results based on the self report from the participants regarding the Drumstick leaves juice consumption.

Ethical Aspects: Followed the recommended ethical principles through out the study including the informed consent, Beneficence and Non-maleficence Free to withdraw from the study, privacy and confidentiality

Conflict of Interest : No conflict of interest

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