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#### **ORIGINAL ARTICLE**

# IMPACT OF RESISTANCE EXERCISE VERSUS DIET SUPPLEMENTS ON IRON DEFICIENCY ANEMIA IN GIRLS

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#### ABSTRACT

Background of the Study: The objective of the study to determine the effect of resistance exercise versus diet supplements on iron deficiency anemia in girls. Anemia is a decreased hemoglobin level and red blood cells. Iron deficiency anemia is a common nutritional disorder affecting 30% of the adolescent. Nowadays most of the teenage girls are prone to IDA and 10 million cases are reported per year in India. Resistance exercise improves the muscle strength and it also enhances the demand of oxygen level, the underlying mechanism RBCs mainly comes from the bone marrow and it stimulates the erythropoiesis along with hyperplasia in hemopoietic bone marrow. Diets supplements are higher dosage of iron content are essential. The iron rich foods such as dried fruits, whole grains, ragi, spinach, soya beans, and sunflower seeds can be prescribed. Methodology: The experimental study was conducted in ACS Medical College and hospital, Medical Department.30 Subjects will be selected by convenient sampling method and dividing into two groups randomly. The subjects were treated 3 sessions per week for about 3 months. Girls with age of 16-25 years and hemoglobin level 6-11g/dl was been included systemic illness, congenital anomalies, recent surgeries were excluded. Hemoglobintest were the outcome measure in the study. Results: On comparing Pre-test and Post-test within Group A & Group B on hemoglobin level shows highly significant difference in Mean values at  $P \le 0.001$ . **Conclusion:** This study concludes that the resistance exercise along with diet supplement had considerable effect in improving the hemoglobin concentration among the subject with IDA. However, the resistance exercise along with diet group was considered to be more effective than the diet supplements alone.

Keywords: Resistance exercise; Diet supplements; Teenage girls; Lack of interest.

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#### INTRODUCTION

Anemia is a decreased hemoglobin level and number of red blood cells is reduced than normal size<sup>1</sup>. Anemia is of five types such as hemorrhagic anemia, hemolytic anemia, and nutritional anemia, anaplastic and chronic diseases. Iron deficiency anemia is the one of the nutrition deficiencies in women with poor iron content in the body. IDA characterized by the weakness, tiredness, fatigue and dizziness, shortness of breath<sup>2</sup>.

Prevalence of IDA in globally 2 billion people is affected in worldwide and it is equal to one fifth of the world's population, increases in number. Anemia ranges between the 80-90 % of menstruating females, pregnant women and lactating women are affected <sup>3-4</sup>.In India about 60-70% women are anemic. In 2003 shows that 70% of young age groups are affected because of lack in the nutritional support.

The major cause for IDA is heavy blood loss and lack of iron content in the body. Majority of the women are feeling tired and weakness and to sought out this problem many people peoples are taken the pharmacological management and some peoples are taken the dietary supplements. poor iron rich are the common risk factor for the IDA and which includes the multiple parity, reduced pregnancy time. IDA has a harmful effect on the cognitive, mental problems, reduces work load.

Iron is the essential component of the body and it regulates the oxygen mechanism and other systems. Major role of iron is to transport the oxygen to the tissues and distribution of iron hemoglobin 65%, 10% for the muscle fibers. Adequate amount of iron requirement is equal to the iron loss. Iron is absorbed into the duodenum and upper jejunum and it is absorbed through the cells present in the intestine (enterocytes) by pinocytosis and transported through the blood. Bile is important for the absorption of iron. Iron storage is less during menstruation and pregnancy and then absorption of iron is increases. Iron mainly present in the form of ferric ( $Fe^{3+}$ ) and its converted into the ferrous form ( $Fe^{2+}$ ) it is absorbed through the blood.

Gastric juice and HCL makes the ferrous iron dissolve and it could be converted into the ferric iron by the catalyst enzyme ferric reductase from the entrecotes cells. Ferric iron is transported into blood in the form of protein called ferroprotein and in the blood ferric iron is changes into ferrous iron and transported. Non-heme iron is increased by factors are ascorbic acid, HCL. Iron absorption is impaired by milk, phytate, tea etc<sup>5.</sup>

Transportation of iron: instantly after the into blood and iron combines with the  $\beta$  globulin and it is called apo transferrin secretes by the liver cells through the bile. Finally, it results in the iron is transported in blood in the form of transferrin.

Storage of iron: large amount of iron is stored into the reticuloendothelial cells and hepatocytes and other cells are stored in small amount of iron. Cytoplasm cells large amount of iron is stored in the form of ferritin and rather than small amount of iron is stored in the form of hemosiderin.

Daily iron loss in females, amount of iron loss is very high because of menstruation normally 100ml of blood contains the half of the iron. Iron loss are common in hemorrhage and surgery, blood donation. Regulation of iron: mopping up and excretion of iron is maintained equally. When the iron storage is saturated in the body and spontaneously reduces the absorption of iron in from the gastro intestinal tract<sup>6</sup>.

**Resistance Exercise:** Resistance exercise it improves the muscle strength and it will increase the demand of oxygen. It also raises the resting metabolic rate 6- 8 percentage resistance exercise increases the red blood counts in younger age group. Long term resistance exercise it will improves the hemoglobin concentration. Resistance exercise triggers the changes in erythrocyte system of the peripheral blood supply it results in increase the oxygen carrying capacity of the blood and exercise will improve red blood cells <sup>(7),</sup>mild resistance exercise raise in leukocytes was observed in young adults<sup>8.</sup>

**Diet Supplements:** Animal protein it enhances the iron content and some greens such as spinach, soy protein, are inhibit the iron absorption<sup>9</sup>. Dietary intervention isimproving the iron status. Meat also promotes non-heme iron absorption and it also stimulates the higher-level gastric acid production. Dietary products it will changes their regulations of the system and then it utilizes the iron and it will result in increased iron absorption and iron status.

#### METHODOLOGY

Study design is Quasi Experimental study and the study type is Pre and post-test type and study setting was on Outpatient Medical Department, A.C.S Medical College and Hospital, Velappanchavadi, Chennai. Study samples divided in to two groups by random sampling method. Total sample was 30 subjects and treated for duration of 3 months. The subjects were aged 16-25years and with hemoglobin level in 6-11mg/dl & Exclusion Criteria consists of Systemic illness and recent surgeries and Congenital anomalies. Materials used in the study were dumbbells and Footsteps.

#### Outcome measure:

**Hemoglobin level test:** A blood test was taken from eachsubject among the groups. Blood test are taken before and after the study to check the hemoglobin level. Subject are asked to lie in half lying position with comfortably and then antecubital site was clean with the alcohol. Blood sample are drawn from each subject by a sterile syringe by venipuncture to estimate the hemoglobin level<sup>10.</sup>

Procedure: Anemic girls are selected in the study ranges from 16-25 years of age, were recruited from the medicine department, A.C.S Medical College and Hospital. An informed consent was signed by the subjects to participate in the study. Girls were screened by both inclusion and exclusion criteria. Subjects vital signs, BMI and hemoglobin values are noted before the treatment session starts. Hemoglobin values were recorded for the pretest and after the measurements of each individuals with the total subjects of 30 with the Hb divided below 12 were divided into two groups randomly. Subjects of both the group were given the warm up exercise and stretching before the treatment sessions<sup>11</sup>.

The allocated groups, Group A (resistance exercise and diet) and then Group B (diet supplements). Therapist was informed about the exercise, repetition, and then duration of the treatment sessions. Wall pushups, shoulder raise, knee raise, calf raise and cuffed leg raise were resistance exercise in Group A. The treatment protocol for each exercise 8 repetitions. In between the exercises, rest time was given to the participants.

The total duration of the treatment session was about 30 minutes per day and 3 day for a wk /3 months. Girls were encouraged to do the exercise in order to increase the hemoglobin level.

Diet supplements were alone in Group B. Dietitian were prescribed the iron rich diet to the girls. After the treatment period is over. Girls vital signs, BMI, Hb values were measured for the post-test evaluation.

Resistance exercises: Wall Pushups, Shoulder

raise, Side bends with dumb bell, Cuffed side leg raise, Calf raise, Knee raise, Abs curls<sup>12.</sup>

Diet Supplements: Subjects are advised to take iron rich foods such as spinach, soy protein and other products, as per the advice of the dietitian. Subjects are requested to follow the diet chart and maintain a diary and are asked to weekly once come and meet the therapist<sup>13.</sup>

#### **GROUP-B**

Dietsupplements: Subjects are advised to take iron rich foods such as spinach, soy protein and other products, as per the advice of the dietitian. Subjects are requested to follow the diet chart and maintain a diary and are asked to weekly once come and meet the therapist<sup>14.</sup>

S.N	Time	Meal	Menu	Amount
1.	07:30 – 08:30am	Morning	Ragi porridge/ Vermicelli upma/ Brown bread sandwich.	1 Bowl
			Fruit-(orange/ Guava/Amal with honey)/ Peanut	1 Nos
2. 11:00 – 11:30am		Mid - Morning	Fruit salad (Peach apple (or) Green apple/ Pineapple)/ Darkskinned grapes/ Carrot juice/	1 Plate
			Papaya juice.	
3.	01:00 – 01:30pm	Lunch	Sambar rice(or)Brown rice/Poriyal-(beet root/bottle guard/capsicum/green beans)	1 cup 1cup
			Dhal Non-Veg(fish/egg/liver)weekly twiceButter milk+Ground flax seeds (Weekly Twice)	½ cup 100gm
4.	04:00 – 05:00pm	Evening	Boiled corn / Veg salad (baby corn/carrot/cucumber/spring onion)	
5.	08:00 – 08:30pm	Dinner	Nuts – Walnuts/ Raisins Millet Pongal/Black gram/Phulka-dhal palak/ Chick peas	2 Nos
6.	09:00 – 09:20pm	Bedtime	Skimmed milk /Warm water	1 Glass

Figure 1: Food Chart

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S.N	Time	Meal	Menu	Amount
1.	07:30 -	Morning	Ragi porridge/ Vermicelli upma/ Brown	1 Bowl
	08:30am		bread sandwich.	
			Fruit-(orange/ Guava/Amal with honey)/	1 Nos
			Peanut	
2.	11:00 -	Mid -	Fruit salad (Peach apple (or) Green	1 Plate
	11:30am	Morning	apple/ Pineapple)/ Darkskinned grapes/	
			Carrot juice/ Papaya juice.	
3.	01:00 -	Lunch	Sambar rice(or) Brown rice/Poriyal-(beet	1 cup
	01:30pm		root/bottle guard/capsicum/green	1cup
			beans)	
			Dhal	½ cup
			Non-Veg(fish/egg/liver)weekly twice	
			Butter milk+ Ground flax seeds (Weekly	100gm
			Twice)	
4.	04:00 -	Evening	Boiled corn / Veg salad (baby	
	05:00pm		corn/carrot/cucumber/spring onion)	
			Nuts-Walnuts/ Raisins	2 Nos
5	08.00 -	Dinner	Millet Pongal/ Black gram/Phulka-dhal	2.1100
5.	08.00	Dimici	nalak/ Chick poac	
	00.50410		palary Chick peas	
6.	09:00 -	Bedtime	Skimmed milk / Warm water	1 Glass
	09:30pm			

Figure 2: Food Chart

S.NO	FOODS TO INCLUDE	FOODS TO AVOID			
1.	Garden cress seeds, bajra	Carbonated beverages, excessive			
		tea and coffee			
2.	Lime,guava,milk,egg,dates,figs	processed foods, chocolates			
3.	Pomegranate, black currents, apple, cereals.	Refined flours and products.			
	cereals.				

Figure 3: Food Chart

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#### Data Analysis:

The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters were assessed using statistical package for social science (SPSS) version 24. Paired t-test was adopted to find the statistical difference within the groups&Independent t-test (Student t-Test) wasadopted to find the statistical difference between the groups<sup>(15)</sup>.

#Hb	#Group A		#Group B		t-test	df	significance
	Mean	S.D	Mean	S.D			
PRE-TEST	10.22	.332	10.08	.227	1.34	28	.189*
POST TEST	11.08	.204	10.54	.202	5.81	28	.000***

<sup>#</sup>GROUP A – Resistance Exercise with Diet Supplement, <sup>#</sup> GROUP B – Diet Supplement (\*- P > 0.05), (\*\*\*- P  $\leq$  0.001)

**Table-1**. Comparison of Haemoglobin Values Between Group-A and Group-B In Pre And PostTest

The above table reveals the Mean, Standard Deviation (S.D), t-test, degree of freedom(df) and p-value of the Hemoglobinbetween (Group A) & (Group B) in pre-test and post-test weeks.

This table shows that there is no significant difference in pre-test values of the Hemoglobinbetween Group A & Group B  $(*P > 0.05)^{(16)}$ .

This table shows that statistically highly significant difference in posttest values of the Hemoglobinbetween Group A& Group B (\*\*\*-  $P \le 0.001$ )<sup>(Graph-I)</sup>

Both the Groups shows significant increase in the post test Means but (Group-A) which has the Higher Mean value is more effective than (Group-B)



**Graph** – I Comparison of Haemoglobin mean Values Within Group- A & Group- B

#Hb	#Group A		#Group B		t-tost	Significance	
#115	Mean	S.D	Mean	S.D	t-test	Jigimedice	
PRE-TEST	10.22	.332	11.08	.204	-13.79	.189*	
POST TEST	10.08	.227	10.54	.202	-24.36	.000***	

<sup>#</sup>GROUP A – Resistance Exercise with Diet Supplement,<sup>#</sup> GROUP B – Diet Supplement (\*\*\*-  $P \leq 0.001$ )

Table 2: Comparison of Haemoglobin Values Between GROUP A and GROUP B

The above table reveals the Mean, Standard Deviation (S.D), t-value and p-value of the Hemoglobin values between pre-test and posttest within Group – A & Group –  $B^{(17)}$ .

Based on theHemoglobin values, it shows that there is a statistically highly significant difference between the pre-test and post-test values within GROUP A and GROUP B(\*\*\*- $P \le 0.001$ ). <sup>(Graph-II)</sup>



**Graph – II** Comparison Of Haemoglobin Values Within Group – A &Group – B Between Pre & Post Test Values

#### RESULTS

On comparing the Mean values of Group A & Group B on Hemoglobin level, it shows significant increase in the post test Mean values but (Group A - Resistance Exercise with Diet Supplement) shows (11.08) which has the Higher Mean value is more effective than (Group B - Diet Supplement) (10.54) at  $P \le 0.001$ . Hence Null Hypothesis is rejected<sup>(18)</sup>.

On comparing Pre and Post-test within Group A & B on hemoglobin level shows highly significant difference in Mean values at P  $\leq$ 0.001

#### DISCUSSION

The present study was conducted to determine the effect of resistance exercise and diet supplements on iron deficiency anemia in girls. In our study 30 participants continued in the study. This study, toimprove the hemoglobin concentration in the anemic girls Low hemoglobin value is an indication for the iron deficiency. A subject with IDA has increased chances of developing the growth problems, heart problems. Persons will be experienced by the lack of energy, reduced work capacity and

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decreased cognitive devolvement. Many studies are suggested that the complication of IDA is more severe when the condition is a prolonged period of time.

Long term resistance exercise is to improve the hemoglobin concentration. (11) Voluntary resistance exercise is the treatment stagiest for the subjects with IDA. Increased in serum ferritin level, hemoglobin, andtotal Iron binding capacity increased undoubtedly later the 12 weeks of exercise.

Rickman et al, deceased in iron levels liver, spleen it might associated with the raised hemoglobin effect of distribution and repeated use of iron in the body. Diet supplements are increased level of hemoglobin content in the body dietary are the possible solutions to treat the iron deficiency. Supplements include the animal protein, ascorbic acid and it will enhance the iron absorption. Elevated effect of ascorbic acid and animal protein on iron absorption and it may contradict by the synchronous consumption of foods are inhibit. Ascorbic acid is a most effect of increased nonheme iron absorption.

Meat also promotes non-heme iron absorption and it also stimulates the higher-level gastric acid production. Dietary products it will changes their regulations of the system and then it utilizes the iron and it will result in increased iron absorption status. The stastical analysis shows the mean value Group A and Group B on hemoglobin level. It shows the mean value Group A resistance exercise and diet supplements (11.08) which has higher mean values is more effective than Group B Diet supplements (10.54) at  $p \le 0.001$ . The pre-test and post-test within Group A and Group B on hemoglobin level shows highly significant difference in mean values at  $p \le 0.001$ . These findings are support to the difference between the resistance exercise and diet supplements on the anemic girls. Resistance exercise will improve the hemoglobin concentration.

**Ethical clearance:** Ethical clearance was obtained from the ethical Institutional Review Board of Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Chennai with reference No. A-039/PHYSIO/IRB/2017-2018 approval letter dated 10/08/2021.

**Conflicts of Interest:** There is no conflict of interest to conduct this study.

Fund for the study: This is self-funded study.

#### CONCLUSION

This study concludes that the resistance exercise along with diet supplement had considerable effect in improving the hemoglobin concentration among the subject with IDA. However, the resistance exercise along with diet group was considered to be more effective than the diet supplements alone.

**Limitations of the study:** Small sample size, The duration of the study is short, Long term follows up of the subjects was not possible.

**Recommendations Of The Study:** Large sample size can be used, Long duration studies are recommended, With a regular and a long term follow up are recommended.

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