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Research Article

A Study to Assess the Effectiveness of Lemon Juice in Improving Hemoglobin Level Among Adolescent Girls in Selected Schools of Jabalpur City

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Abstract

Aim: The study aimed to access the effectiveness of the lemon juice in improving hemoglobin level among adolescent girls.

Material and Methods: Quasi-experimental pre- and post-test only control group design two group control group and experimental group design was carried out in selected schools with similar setting in Jabalpur city. Purposive sampling technique was used for the study. Sample study for this study was 120 adolescent girls in the total of those 60 were selected for experimental group 30 and 30 in the control group. The experimental groups were given lemon juice whereas the control groups were not given any intervention.

Results: The comparison between pre- and post-score was statistically tested by applying t-test method at the level of 0.05%. In this case, the calculated value of paired *t*-test = 0.657463 is less than the table value ("*t*" 29=2.05, $P < 0.05$); hence, the result was insignificant. The comparison between experimental group and control group hemoglobin score made by unpaired *t*-test is 8.56 ("*t*" 29=1.699, $P < 0.05$) greater than the table value. It shows that lemon juice administration for 1 month is increasing hemoglobin in adolescent girls.

Conclusion: From the study findings, it is concluded that there are significant differences on the adolescent girls before and after administration of lemon juice. The present study also proved that there was a significant difference on the increase hemoglobin level between experimental and control group. Hence, it may be stated that the lemon juice has an effect on increasing hemoglobin level among adolescent girls.

Keywords: Adolescent girls, effectiveness, hemoglobin, lemon juice

Introduction

Health is a fundamental human right and health is central to the concept of quality of life girls often fear that they cannot bring all of who they are into relationship and that they have to silence large part to silence large part of themselves to be loved by others.

Adolescence is the period of life spanning the ages between 13 and 18 years. This is the formative period of life when the maximum amount of physical, psychological, and behavioral changes take place. Anemia is widely prevalent in India and affects both sexes and all age groups. Adolescence is a vulnerable period in the human life cycle for the development of nutritional anemia, which has been constantly neglected by public health programs.

Body iron and its physiological role – most well-nourished people have 4–5 g of iron in their bodies. Of this, about 2.5 g is contained in the hemoglobin needed to carry oxygen through the blood, and most of the rest (approximately 2 g in adult men,

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and somewhat less in women of childbearing age) is contained in ferritin complexes that are present in all cells, but most common in bone marrow, liver, and spleen. The liver's stores of ferritin are the primary physiologic source of reserve iron in the body. The reserves of iron in adults tend to be lower in children and women of child-bearing age, than in men and in the elderly. Women who must use their stores to compensate for iron lost through menstruation, pregnancy, or lactation have lower body stores, which may consist of 500 mg or even less.[1]

The prevalence of iron deficiency anemia (IDA), which primarily affects young women of reproductive age and children under the age of five, especially during pregnancy, has reached epidemic levels in poor nations and has become a significant global public health issue. A lack of iron can have fatal consequences for the generation of energy, muscles, and red blood cells. Therefore, weakness and poor development, motor, and cognitive function are the pathological characteristics linked to IDA. IDA has an impact on young people's well-being and the economic development of developing nations like India. IDA is the result of an imbalance between iron intake, absorption, storage, and utilization.[2]

Hemoglobin is a protein which is rich of iron which can be found in the red-blood cells. It is in charge of transporting oxygen every part in your body; however, the main function would be bringing oxygen from lungs toward the tissues in the body, for living cells to function properly. Moreover, hemoglobin also supports in transporting the carbon dioxide out of cells and back to lungs due to the extremely important role of hemoglobin in maintaining healthy daily life, it is significantly essential to keep it at normally functional level within your blood.[3]

Lemon juice contains Vitamin C is an anti-oxidant that reduces the oxidative stress in the cells caused by any inflammation and should work in patients with anemia of chronic diseases rising their hemoglobin, decreasing their inflammatory state, and improving their quality of life. Vitamin C is an essential nutrient required for healthy bones and teeth. It also promotes iron absorption. Vitamin C deficiency is characterized by weakness, bleeding gums, and defective bone growth. Vitamin C is abundantly available in fresh amla, citrus fruits, lemon, guava, banana, and certain vegetables such as tomatoes. However, it is very susceptible to destruction by atmospheric oxidation. It is for this reason that when vegetables become dry and stale or cut and exposed to air most of the Vitamin C originally present in destroyed.

Objectives of the study

- Assess the existing hemoglobin level among the adolescent girls in experimental and control group.
- Assess the effectiveness of lemon juice for improving hemoglobin level among adolescent girls in experimental and control group.
- Compare the level of hemoglobin between experimental and control group after consuming lemon juice.
- Associate the level of hemoglobin with the demographic characteristics of the adolescent girls in experimental and control group.

Hypothesis

- On the basis of the objectives, the following hypothesis has been formulated.
- H1: There will be a significant difference in the level of hemoglobin among adolescent girls between experimental and control group after consumption of lemon juice.
- H2: There will be a significant relationship between the hemoglobin level and sociodemographic variables in both experimental and control group.

Material and Methods

Research approach

An quantitative and evaluative research approach was used in the study.

Research design

Quasi-experimental research design (pre- and post-research control research design).

Population

Target population

The population for the study includes adolescent girls (13–18 years) in selected schools of Jabalpur city (MP).

Accessible population

The population for the study includes adolescent girls group (13–18 years) 10th, 11th, 12th class and whose HB below 10.5 g/dl in at the time of data collection.

Setting of the study

Setting refers to the area where the study is conducted. This study is proposed to be conducted at selected schools of Jabalpur city.

Sample size

Total sample 120 those were 60 (30 experimental group and 30 control group).

Sampling technique

Sampling technique – purposive sampling technique.

Results

Table 1 dispatches that – Majority of the participant are from the age group 15–16 years having frequency 101 (83.16%). Majority of the participants 50 (41.66%) are undergraduate educated father while 50 (48.33%) are the undergraduate mothers. Seventy-two (60%) participants are from joint family and majority of the participants 70 (58.33%) having monthly income Rs.7000–8000, majority of the participants having source of prior information about hemoglobin test were 86 (71.66%), adolescent girls in the age 12 years where their menstruation has started are 92 (76.66%), 91 (75.83%)

Table 1: Distribution of demographic variables (*n*=120)

S. No.	Variables	Frequency (n)	Percentage
1.	Age		
	A. 13–14 years	0	0
	B. 15–16 years	101	83.16
	C. 17–18 years	19	15.83
	D. Above 18 years	0	0
2.	Education status of father		
	A. Under graduate	50	41.66
	B. Graduate	37	30.83
	C. Post graduate	28	23.33
	D. Illiterate	05	4.16
3.	Education status of mother		
	A. Under graduate	58	48.33
	B. Graduate	42	35
	C. Post graduate	12	10
	D. Illiterate	8	6.6
4.	Type of family		
	A. Nuclear	44	36.66
	B. Joint	72	60
	C. Extended family	0	0
	D. Single parent family	4	3.3
5.	Socioeconomic status of family (monthly income)		
	A. Below Rs 4000	2	1.6
	B. Rs 5000–Rs 6000	20	16.66
	C. Rs 7000–Rs 8000	70	58.33
	D. Above Rs 8000	28	23.33
6.	Source of prior information about hemoglobin test		
	A. Mass media	8	6.6
	B. Health personnel's	26	21.66
	C. No information so far	86	71.66
	D. Neighbors	0	0
7.	Menstruation has started at the age of		
	A. 10 years or below	0	0
	B. 11 years	02	1.6
	C. 12 years	26	21.66
	D. 13 years and above	92	76.66
8.	Any previous history of anemia in the family		
	A. Yes	29	24.16
	B. No	91	75.83
9.	Any allergy to lemon including		
	A. Cough and cold	9	7.5
	B. Swelling	2	1.6
	C. Itching	10	8.3
	D. None of the above	99	82.5
10.	Source of prior information about Vitamin "C"		
	A. Mass media	16	13.33
	B. Health personnel's	54	45
	C. No information so far	50	41.66
11.	Whether suffering from gastrointestinal problems		
	A. Hemoptysis	0	0
	B. Melana	1	0
	C. Hematemesis	0	0.83
	D. None of the above	119	99.16
12.	Dietary habit includes		
	A. Vegetarian diet	64	53.33
	B. Non vegetarian diet	30	25
	C. Egg vegetarian diet	26	21.66
13.	Taking iron supplementation in daily diet		
	A. Yes	26	21.66
	B. No	94	78.33
14.	Any previous history of worm infestation		
	A. Yes	21	17.5
	B. No	99	82.5

Table 2: Assessment of pre-test and post-test hemoglobin estimation score in control group and experimental group (*n*=60+60)

S. No.	Assessment	Mean		SD	
		Control group	Experimental group	Control group	Experimental group
1.	Pre-test score of hemoglobin	9.54	9.31	0.80	0.72
2.	Post-test score of hemoglobin	9.43	11.27	0.80	0.71

participants do not have any previous history of anemia in the family, while 99 (82.5%) participants do not have any allergy to lemon, majority of the participants were the source of prior information about Vitamin C was health personnels, that is, 54 (45%), no any participant was whether suffering from gastrointestinal problems 119 (99.16%), the majority of the participants are vegetarian dietary habit, that is, 64 (53.33%), and majority of the participants not taking iron supplementation in daily diet 94 (78.33%), while 99 (82.5%) participants not have any previous history of worm infestation.

Table 2 depicts that data in the above pre-test score of hemoglobin in the control group was 9.54 with SD of 0.78 and during the post-test in control group, the mean score of hemoglobin was 9.43 with SD of 0.80. While the pre-test score of hemoglobin in the experimental group was 9.31 with SD of 0.72 and during the post-test in experimental group, the mean score of hemoglobin was increased to 11.27 with SD of 0.71.

Table 3 depicts that data in the above pretest score of hemoglobin in the control group, the comparison between pre- and post-score made by *t*-test the pre-test and post-test score was statistically tested by applying t-test method at the level of 0.05%. In this case, the calculated value of paired t-test=0.65 ($'t'_{29} = 2.05$, $P < 0.05$) is less than the table value (2.05. while in the experimental group, The comparison between pre- and post-score made by *t*-test the pre-test and post-test score was statistically tested by applying t-test method at the level of 0.05%. In this case, the calculated value of paired t-test=6.99 is ($"t"_{29} = 2.05$, $P<0.05$) greater than the table value (2.05); hence, the result was significant.

Table 4 shows the association between pre-test knowledge scores of hemoglobin level among adolescent girls with selected demographic variables in control group statistically tested by applying Chi-square test. The variables age, type of family, menstruation start the age of, any previous history of anemia, allergy with lemon, source of prior information about Vitamin "C", gastrointestinal problem previous history of worm infestation, were found most significant and socioeconomic status of family, prior information about hemoglobin test, dietary habit includes, iron supplementation in your daily diet was found significant and education status of father, education status of mother was found not significant.

Table 5 reveals that the association between pre-test knowledge score of hemoglobin level among adolescent girls with selected demographic variables in experimental group statistically tested by applying Chi-square test. The variables like menstruation have started at the age of, any

Table 3: Comparison of mean pre-test and post-test hemoglobin estimation score among in the control group (*n*=60+60)

Test	Mean	SD	Mean difference	Paired t-test	Table value
Control group					2.05
Pre-test	9.54	0.78	0.14	0.65	
Post-test	9.43	0.80			
Experimental group					0.08
Pre-test	9.31	0.72	1.96	6.99	
Post-test	11.27	0.71			

allergy to lemon. Taking iron supplementation in daily diet, any previous history of worm infestation was found most found significant. The variables such as age, education of father, education of mother, type of family, socioeconomic status of family (monthly income), source or prior information about hemoglobin test, any previous history of anemia in the family, source of prior information about Vitamin "C," whether suffering from gastrointestinal problems, and dietary habits were found significant.

Discussion

An intervention study was conducted including 104 single adolescent females in order to investigate the effects of dietary behaviour change and iron supplementation on the treatment of iron deficiency anaemia. Anthropometric measurements and hemoglobin estimate were used to gather the pertinent data and pre-tested questionnaires were used to gather socioeconomic status. For 3 months, the girls received iron, folate, and calcium tablets every other day. Results showed that hemoglobin increased by 19.5% in the group of girls taking IFA supplements, whereas it slightly dropped in the girls in the control group. Girls in the intervention group experienced a considerable weight gain of 2.66 kg, but there was little weight gain among the control group. In conclusion, adolescent females in the control group for the prevention of anemia, taking into account the biological feasibility and effectiveness of the intervention.[4]

To determine the nutritional value of underutilized green vegetables and the impact of leaf mixture supplementation on the hemoglobin levels of anemic teenage females in Jaipur, a comparative study was carried out. The four less-used green leafy vegetables were procured from the strategic market location and then washed, sun-dried, and powdered. The leaves were found to be rich in protein, iron, carbohydrates, and ash when the powders were utilized for chemical analysis. The study found that supplementing with leaf mixture considerably raised the hemoglobin levels of anemic patients.[5]

Table 4: It deals with the analysis of association of hemoglobin score with selected demographic variables in control group (n=60)

S. No.	Variable	14 g/dl healthy	12 g/dl or More not anemic	8–11 g/dl-mild to moderate anemia	6–7 g/dl marked anemia	4–5 g/dl-severe anemia	<4 g/dl-critical	Total	df	CHI-square	Probability	Interference
1	Age											
	13–14	0	0	0	0	0	0	0	15	0	0.00	MS
	15–16	0	0	28	0	0	0	28				
	17–18	0	0	2	0	0	0	2				
	Above18 years	0	0	0	0	0	0	0				
2	Education status of father											
	Undergraduate	0	0	11	0	0	0	11	15	0.21	0.544	NS
	Graduate	0	0	11	0	0	0	11				
	Postgraduate	0	0	7	0	0	0	7				
	Illiterate	0	0	1	0	0	0	1				
3	Education status of mother											
	Undergraduate	0	0	11	0	0	0	11	15	3.32	0.56	NS
	Graduate	0	0	15	0	0	0	15				
	Postgraduate	0	0	2	0	0	0	2				
	Illiterate	0	0	2	0	0	0	2				
4	Type of family											
	Nuclear	0	0	13	0	0	0	13	15	0	0.00	MS
	Joint	0	0	16	0	0	0	16				
	Extended family	0	0	0	0	0	0	0				
	Single parent family	0	0	1	0	0	0	1				
5	Socioeconomic status of family (monthly income)											
	Below 3000Rs	0	0	0	0	0	0	0	15	0.08	0.039	S
	4000–5000RS	0	0	5	0	0	0	5				
	6000–7000 RS	0	0	17	0	0	0	17				
	Above 8000Rs	0	0	8	0	0	0	8				
6	Source of prior information about hemoglobin test											
	Mass media	0	0	2	0	0	0	2	15	003	0.06	S
	Health Personnel's	0	0	3	0	0	0	3				
	No information So far	0	0	25	0	0	0	25				
	Neighbors	0	0	0	0	0	0	0				
7	Menstruation has started at the age of											
	10 years or below	0	0	0	0	0	0	0	15	0	0.0	MS
	11 years	0	0	1	0	0	0	1				
	12 years	0	0	7	0	0	0	7				
	13 and above	0	0	22	0	0	0	22				
	Any Previous history of anemia in the family											
	Yes	0	0	2	0	0	0	2	5	0	0.00	MS
	No	0	0	28	0	0	0	28				
9	Any allergy to lemon											
	Cough and cold	0	0	0	0	0	0	0	15	0	0.00	MS
	Swelling	0	0	0	0	0	0	0				
	Itching	0	0	0	0	0	0	0				
	None of the above	0	0	30	0	0	0	30				
10	Source of prior information about Vitamin **"C"**											
	Mass media	0	0	5	0	0	0	5	10	0.059	0.03	MS
	Health Personnels	0	0	17	0	0	0	17				
	No information so far	0	0	8	0	0	0	8				

(*Contd...*)

Table 4: (*Continued*)

S. No.	Variable	14 g/dl healthy	12 g/dl or More not anemic	8–11 g/dl-mild to moderate anemia	6–7 g/dl marked anemia	4–5 g/dl-severe anemia	<4 g/dl-critical	Total	df	CHI-square	Probability	Interference
11	Whether suffering from gastrointestinal problems											
	Hemoptysis	0	0	0	0	0	0	0	15	0.23	0.00	MS
	Melana	0	0	0	0	0	0	0				
	Hematemesis	0	0	0	0	0	0	0				
	No I have	0	0	30	0	0	0	30				
12	Dietary habit in- Including											
	Vegetarian diet	0	0	15	0	0	0	15	10	0.06	0.043	S
	Non-vegetarian diet	0	0	8	0	0	0	8				
	Egg- vegetarian diet	0	0	7	0	0	0	7				
13	Taking iron supplementation in daily diet											
	Yes	0	0	0	0	0	0	0	5	0.07	0.036	S
	No	0	0	30	0	0	0	30				
14	Any previous history of worm infestation											
	Yes	0	0	0	0	0	0	0	5	1.39	0.0	MS
	No	0	0	30	0	0	0	30				

Result significant at 0.05% level of significance). *MS: Most significant. **S: Significant. ***NS: Not significant. ****NP: Not possible

Table 5: Analysis of association of hemoglobin score with selected demographic variables in experimental group ($n=60$)

S. No	Variable	14 g/dl healthy	12 g/dl or more not anemic	8-11 g/dl-mild to moderate anemia	6-7 g/dl marked anemia	4-5 g/dl-severe anemia	<4 g/dl-critical	Total	DF	Chi-square	Probability	Interference
1	Age											
	13–14	0	0	0	0	0	0	0	15	30.00	0.003	S
	15–16	0	0	23	0	0	0	23				
	17–18	0	0	6	1	0	0	7				
	Above18years	0	0	0	0	0	0	0				
2	Education status of father											
	Under graduate	0	0	19	0	0	0	19	15	1.831	0.046	S
	Graduate	0	0	8	0	0	0	8				
	Post graduate	0	0	1	1	0	0	2				
	Illiterate	0	0	1	0	0	0	1				
3	Education status of mother											
	Under graduate	0	0	18	0	0	0	18	15	3.765	0.596	S
	graduate	0	0	6	0	0	0	6				
	Post graduate	0	0	4	0	0	0	4				
	Illiterate	0	0	1	1	0	0	2				
4	Type of family											
	Nuclear	0	0	9	0	0	0	9	15	3.2	0.035	S
	Joint	0	0	20	0	0	0	20				
	Extended family	0	0	0	0	0	0	0				
	Single parent family	0	0	0	1	0	0	1				

(*Contd...*)

Table 5: (*Continued*)

S. No	Variable	14 g/dl healthy	12 g/dl or more not anemic	8-11 g/dl-mild to moderate anemia	6-7 g/dl marked anemia	4-5 g/dl-severe anemia	<4 g/dl-critical	Total	DF	Chi-square	Probability	Interference
5	Socioeconomic status of family (monthly income											
	Below 3000 Rs	0	0	0	1	0	0	1	15	4.3	0.069	S
	4000–Rs 5000Rs	0	0	5	0	0	0	5				
	6000–7000 Rs	0	0	18	0	0	0	18				
	Above 8000Rs	0	0	6	0	0	0	6				
6	Source or prior information about hemoglobin test											
	Mass media	0	0	1	1	0	0	2	15	2.551	0.071	S
	Health personnel's	0	0	10	0	0	0	10				
	No information so far	0	0	18	0	0	0	18				
	Neighbours	0	0	0	0	0	0	0				
7	Menstruation has started at the age of											
	10 years or below	0	0	0	0	0	0	0	15	0.095	0.00	MS
	11 years	0	0	0	0	0	0	0				
	12 years	0	0	7	1	0	0	8				
	13 and above	0	0	22	0	0	0	22				
8	Any previous history of anemia in the family											
	Yes	0	0	0	1	0	0	1	5	2.298	0.07	S
	No	0	0	29	0	0	0	29				
9	Any allergy to lemon											
	Cough and cold	0	0	0	0	0	0	0	15	0.56	0.00	MS
	Swelling	0	0	0	0	0	0	0				
	Itching	0	0	0	0	0	0	0				
	None of the above	0	0	29	1	0	0	30				
10	Source of prior information about vitamin "**C**"											
	Mass media	0	0	2	1	0	0	3	10	0.31	0.045	S
	Health personnel's	0	0	10	0	0	0	10				
	No information so far	0	0	17	0	0	0	17				
11	Whether suffering from gastrointestinal problems											
	Hemoptysis	0	0	0	0	0	0	0	15	0	0.043	S
	Melana	0	0	0	0	0	0	0				
	Hematemesis	0	0	0	0	0	0	0				
	No I have	0	0	29	1	0	0	30				
12	Dietary habit including											
	Vegetarian diet	0	0	17	0	0	0	17	10	0.905	0.039	S
	Non-vegetarian diet	0	0	6	1	0	0	7				
	Egg- vegetarian diet	0	0	6	0	0	0	6				
13	Taking iron supplementation in daily diet											
	Yes	0	0	0	0	0	0	0	5	0.51	0.0	MS
	No	0	0	29	1	0	0	30				
14	Any previous history of worm infestation											
	Yes	0	0	0	0	0	0	0	5	0.31	0.00	MS
	No	0	0	29	1	0	0	30				

Result significant at 0.05% level of significance). *MS: Most significant. **S: Significant. ***NS: Not significant. ****NP: Not possible

The study's objective was to evaluate how hemoglobin levels changed throughout the menstrual cycle. This study included 15 women and the materials and methods employed. During the follicular and luteal phases, heparinized whole blood samples were taken, and the hemoglobin levels were measured using a colorimetric method. Statistics were used to analyses the data. In the follicular phase, the mean hemoglobin concentration is 12.88 1.1 g/dl, and in the luteal phase, it is 13.06 0.93 g/dl]. The hemoglobin levels varied significantly (P = 0.05) during the menstrual cycle, as indicated by the P-value of 0.041. In the current investigation, it was discovered that the menstrual cycle causes statistically significant change in hemoglobin levels.[6]

Two hundred and seven post-adolescent girls in Bangalore between the ages of 18 and 25 were studied to determine the effects of educational intervention on nutritional awareness of iron deficient anemia. In terms of anemia prevalence, 53.14% of people were found to be moderately anemic, 42.51% to be mildly anemic, and 2.89% to be severely anemic. Only 1.44% of people were found to have normal hemoglobin levels. In the study population, anemia was present in 98.66% of people.[7]

An assessment of the effectiveness of lemon juice in modulating haemoglobin levels among adolescent females residing in certain urban slums of Indore. The sample consisted of sixty adolescent females selected using a purposive sampling technique. Chi-square analysis between pre-test level and selected demographic variables revealed a significant association with type of meals and number of diaper/clothing changes per day. The mean pre-test Hb level was 8.71 gms%, whereas the mean post-test Hb level was 10.57 gms%, which was substantially higher than the mean pre-test level (t=12.24, P=0.05). There is a significant effect of administration of lemon juice on the level of hemoglobin in adolescent girls, as demonstrated by the study's finding that the level of hemoglobin in adolescent girls improves 1 month after administration of lemon juice. If adolescent females continue to consume lemon juice, they can maintain their hemoglobin level, and lemon is a cost-effective, daily treatment for food-related anemia.[8]

When compared to other nations, South-east Asian States ranked second highest for anemia, with almost 50% of instances of anemia being caused by iron deficiency. Due to biological processes including menstruation, pregnancy, and childbirth as well as dietary factors, women are more susceptible to anemia. Indonesia has a prevalence of anemia of 21.7%, with urban areas accounting for 20.6% and rural areas for 22.8%. The goal of this study was to ascertain whether feeding beetroot juice to teenage girls attending an Islamic boarding school would improve their blood's hemoglobin levels. Pre-experimental research methodology with a single group pretest-post-test design was used in this study. For 7 days, 200 ml of beetroot juice per day is consumed to eat 60 g of beetroot. Teenage girls attending an Islamic boarding school had significantly lower hemoglobin levels before and after receiving beetroot juice (P = 0.001). Beetroot juice consumption causes a rise in hemoglobin levels in adolescent females.[9]

Conclusion

The study revealed out that there was a great increase in the hemoglobin levels between experimental group and control group of the adolescent girls. Hence, it can be said that lemon juice is effective in increasing levels of hemoglobin among adolescent girls.

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Conflicts of Interest

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References

1. Schrier SL, Angelucci E. New strategies in the treatment of the thalassemias. Annu Rev Med 2005;56:157-71.
2. Kumar SB, Arnipalli SR, Mehta P, Carrau S, Ziouzenkova O. Iron deficiency anemia: Efficacy and limitations of nutritional and comprehensive mitigation strategies. Nutrients 2022;14:2976.
3. Hemoglobin and Functions of Iron. Available from: https://www.ucsfhealth.org/education/hemoglobin-and-functions-of-iron [Last accessed on 2023 Jun 30].
4. Bhanushali MM, Shirode AR, Joshi YM, Kadam VJ. An intervention on iron deficiency anemia and change in dietary behavior among adolescent girls. Int J Pharm Pharm Sci 2011;3:40-2.
5. Joshi P, Mathur B. Effect of consumption of dehydrated green leaf mixture on the hemoglobin levels of the anemic adolescent girls. Int J Med Sci 2015;8:10-9.
6. Kotwaney S, Shetty P. Variation in haemoglobin levels during menstrual cycle. J Health Allied Sci NU 2014;4:108-9.
7. Savita SM, Nath KG, Sharan S. Impact of education intervention on nutrition knowledge of iron deficiency anaemia among post adolescent girls. Asian J Dairy Foods Res 2013;32:214-9.
8. Singh S. Pre-experimental study to assess the anemia and effectiveness of lemon juice among adolescent girls in selelected rural area indore. Int J Sci Res 2015;10:17-8.
9. Pibriyanti K, Safira H. The effectiveness of giving beetroot juice on increasing Hemoglobin (HB) levels of adolescent women in islamic boarding school. Darussalam Nutr J 2021;5:55-60.

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