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A QUASI EXPERIMENTAL STUDY TO EVALUATE THE EFFECTIVENESS OF BEETROOT JUICE ON IRON DEFECIENCY ANAEMIA AMONG AGE GROUP OF 18-20 YEARS GIRLS IN SELECTED ARTS AND SCIENCE COLLEGES AT TRICHY DISTRICT

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ABSTRACT

Adolescence is a time of intense physical growth. It is also a stage of stress and strain. Most of them are having poor access to proper health care, nutrition and education. All adolescents girls are at higher risk for iron deficiency anaemia therefore prevention of this anaemia in these adolescent girls is very important. Iron deficiency anaemia is a chronic hypo chromic, microcytic anemia resulting from an insufficient supply of iron in the body, without iron. It is necessary to improve the hemoglobin level for preventing anemia. Beetroot juice is particularly beneficial as an anemia remedy for women, children and teenagers. In this study a quasi-experimental, non-randomized pretest –posttest design control group was adopted. Purposive sampling technique was used to select each 30 samples in experimental and control group who fulfilled the inclusive criteria. The freshly prepared beetroot juice was administered to the samples for 30days in mid-morning. Observational checklist was used for assessing the signs and symptoms of iron deficiency anaemia and Pre and Posttest level of haemoglobin is assessed by sahli's hemoglobinometer method.The data analysis was done by using descriptive and inferential statistics. It was found that there was a significant improvement in the level of hemoglobin after giving the beetroot juice. The effectiveness of beetroot juice was found to be t=36.812, p<0.0001.

INTRODUCTION

WHO defines Iron deficiency anaemia as a condition in which the haemoglobin content o blood is lower than normal as a result of deficiency of iron which is essential nutrients, regardless of the cause of such deficiencies. Iron deficiency anaemia impairs the well-being in women and increases the risk of maternal and. neonatal adverse outcomes. Iron deficiency anaemia due to inadequate supply of nutrient like iron, folic acid and vitamin B12, protein, amino acids, vitamin A,C and other vitamins of B-complex group i.e. niacin, panatothenic acid are also involved in the maintenance of haemoglobin level. India has the largest population of adolescent girls which include adolescent in the world being home are 243 million individuals with the age group of 17-29 years which constitutes 20 percentages of world's 1-2 billion adolescents. Globally 1.62 billion people affected with

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anemia, among those 468.4 million non-pregnant women are affected with anaemia.[1]

Adolescent are especially likely to develop iron deficiency anaemia for several reason. Adolescent loses so much iron due to her menstrual period is more exposed to iron deficiency, inadequate iron intake and inability to absorb iron certain disorder or surgeries. Iron deficiency anaemia plays several physical, physiological and behavioral changes in all of the people especially in adolescent. These physical changes such as tiredness, pallor in nail beds, palm and conjunctiva. Physiological changes such as tachycardia, lethargic, lack of concentration and irritability. The consequence of this anaemia during adolescent has negative effects on fertility of the individual in future and risk of poor reproductive health, premature birth, maternal death, heart problem and death.

The Objectives of the study were

- To assess the pretest and posttest level of hemoglobin among age group of 18-20 years girls at selected arts and science colleges in experimental and control group,
- To evaluate the effectiveness of beetroot juice in experimental group,
- To find the association between the pretest level of hemoglobin with selected demographic variable of experimental and control group.

Anaemia is a reduction in the oxygen carrying capacity of the blood; this may be caused by a decrease in red blood cell (RBC) production, or reduction in haemoglobin content of the blood, or combination of these. It is also a contributing factor to women developing health problems and dying during pregnancy and childbirth. In order to help to prevent anaemia in adolescent girls, the nurse must help them to understand the medical problems that affect in future. The beetroot juice contributes to improve the haemoglobin in the blood. The cost of the beetroot is low when comparing with other iron rich vegetables and it can be stored easily. So, every adolescent girl should aware about benefit of beetroot. Many studies proved that beet root also contribute to improve the hemoglobin level in the blood. Hence a study was conducted to assess the effectiveness of beet root juice on hemoglobin among adolescent girls.

MATERIAL AND METHODS

Beetroot Juice required for the experiment is prepared as follows.

Beetroot juice was prepared by cutting 100gm of fresh beetroot into small piece and grind then add 50 ml of boiled cool water with 15gm of jaggery.

SAMPLING TECHNIQUE

Sampling is the process of selecting a representative part of the population**.**

The samples for this study were selected by adopting non probability purposive sampling technique. The investigator has chosen the sample by using the Inclusion and Exclusion criteria and identified 60 adolescent girls age between 18-20 years. The study limited to 6 weeks only. Those are having signs and symptoms of anemia (having less than 8 gms/dl of haemoglobin)[2]

INCLUSION CRITERIA

The study includes girls who are:

- Who are studying in selected colleges at Trichy.
- Who are willing to participate in the study.
- Who are having Haemoglobin levels less than 11 gm/dl.
- Who are available during the time of data collection period.

EXCLUSION CRITERIA

The study excludes girls:

- With any systemic disease/associated illness.(like asthma, diabetes, liver and kidney problems)
- Who are having aversion to the beetroot juice.
- Who are currently taking medication for anaemia.
- Who are having less than 8 gms/dl of haemoglobin.

In this study a quasi-experimental, non-randomized pretest –posttest design control group was adopted. Purposive sampling technique was used to select each 30 samples in experimental and control group who fulfilled the inclusive criteria. The freshly prepared beetroot juice was administered to the samples for 30days in mid-morning. Observational checklist was used for assessing the signs and symptoms of iron deficiency anaemia and Pre and Posttest level of haemoglobin is assessed by sahli's hemoglobinometer method. [3&4]

Experimental group Control group

	Experimental group	**Control group**
Place	RVS Arts and science college, Trichy	Christhuraj Arts and science college, Trichy
Intervention tool	100 ml of beetroot juice given to each girl for 30 days.	-------
Duration	30 days	--
Frequency	Once in a day during break time of the class	--
Time	11-11.15am	--
Administered by	Investigator	--

DISCRIPTION OF THE TOOL

The researcher has developed a tool after reviewing the literature to assess the level of haemoglobin. It has the following sections

Section - I Distribution of Demographic Variables : It consists of demographic data seeking information about age, religion, type of family, , diet pattern, does meal contain more vegetables, , pattern of menstrual cycle, do you have anemia before, height, weight, BMI. [5,6 &7]

Section – II Clinical Variables checklist: consists of ten items with a single answer. Scoring "2" is give when the clinical symptoms were always present, Scoring "1" is give when the clinical symptoms were occasionally present and Scoring "0" is give when the clinical symptoms is never present. Total score of the item is "20". Maximum score is 20 and minimum score is 0. And the score interpretation is

- Mild anemia -1 to 7
- Moderate anemia- 8 to 14
- Severe anemia- 15-20

CLINICAL VARIABLES ARE:

1. Feel tired or weak more often than usual.
2. Pale skin
3. Headache
4. Brittle nails
5. Very heavy menstrual flow
6. Sore tongue
7. Palpitation or fast heartbeat
8. Hair fall
9. Shortness of breath
10. Poor appetite

Section – III Sahli's Haemoglobinometer to determine the quantity of haemglobin in blood

Score Interpretation for Assessing Haemoglobin Level

According to WHO Classification the level of haemoglobin level was as below

10-10.9 gm/dl	Mild anemia
7.9-9 gm/dl	Moderate anemia
<7gm/dl	Severe anemia

Intervention protocol:

Intervention protocol for both experimental and control group

PROTECTION OF HUMAN RIGHTS

The investigator got the approval from the principals of selected art and science college of Trichy. Written permission was obtained from authorities and oral consent was obtained from the subjects after explaining the purpose of the study. The information obtained was kept confidential.

Then the investigator assessed the hemoglobin level (pretest) in experimental group and control group by using Sahli's hemoglobinometer . Then 100ml of beetroot juice was given to the experimental group for continuous 30 days. In posttest on 30th day, haemoglobin level was assessed for experimental and control group by using Sahli's hemoglobinometer [8,9&10].

The findings of the study were grouped and analyzed under the following

Section I: Data on the description of the demographic variables (Shown in Table 1).

Section II: Data on the assessment of pretest and posttest level of haemoglobin among girls in the age group of 18 – 20 years in experimental and control group(Shown in Table 2,3&4).

Section III: Data on the effectiveness of beetroot juice on anemia among girls in the age group of 18 – 20 years within and between the experimental and control group(Shown in Table 5,6 &7).

Section IV: Data on the association of pretest level of haemoglobin among girls in the age group of 18 – 20 years with their selected demographic variables in the experimental and control group (Shown in 8 & 9).

RESULTS

Table 1: Frequency and percentage distribution of demographic variables of girls in the age group of 18 – 20 years in the experimental and control group **N = 60(30+30)**

Demographic Variables	Experimental Group		Control Group	
	No.	%	No.	%
Age				
17 - 18 years	0	0.00	7	23.33
18 - 19 years	7	23.33	16	53.33
19 - 20 years	10	33.33	6	20.00
20 years and above	13	43.33	1	3.33
Religion				
Hindu	23	76.67	20	66.67
Christian	6	20.00	9	30.00

Muslim	1	3.33	1	3.33
Type of family				
Joint	8	26.67	8	26.67
Nuclear	22	73.33	22	73.33
Diet pattern				
Vegetarian	20	66.7	11	36.67
Non vegetarian	10	33.3	19	63.33
Does meal contain more vegetables?				
Yes	21	70.0	22	73.33
No	9	30.0	8	26.67
Do you have anemia before?				
Yes	0	0.00	0	0.00
No	30	100.00	30	100.00

Demographic variables	**Experimental Group**		**Control Group**	
	No.	**%**	**NO.**	**%**
History of Menstrual cycle				
Regular	16	53.33	14	46.67
Irregular	14	46.67	16	53.33

Table 2: Frequency and percentage distribution of level of anaemia (clinical variables) among girls in the age group of 18 – 20 years in the experimental and control group **N = 60(30+30)**

Clinical Variables	**Severe Anaemia <7 gm/dl**		**Moderate Anaemia (7 – 9.9) gm/dl**		**Mild Anaemia (10 – 10.9) gm/dl**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Experimental Group	0	0	21	70.0	9	30.0
Control Group	0	0	19	63.33	11	36.67

Table 3: Frequency and percentage distribution of level of anaemia (haemoglobin level) among girls in the age group of 18 – 20 years in the experimental group **n = 30**

Anaemia	**Severe Anaemia <7 gm/dl**		**Moderate Anaemia (7 – 9.9) gm/dl**		**Mild Anaemia (10 – 10.9) gm/dl**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Pretest	0	0	30	100.0	0	0
Post test	0	0	0	0	30	100.0

Table 4: Frequency and percentage distribution of level of anaemia among girls in the age group of 18 – 20 years in the control group **n = 30**

Anaemia	**Severe Anaemia <7 gm/dl**		**Moderate Anaemia (7 – 9.9) gm/dl**		**Mild Anaemia (10 – 10.9) gm/dl**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Pretest	0	0	30	100.0	0	0
Post test	0	0	30	100.0	0	0

Table 5: Effectiveness of beetroot juice on iron deficiency anemia among girls in the age group 18 – 20 years in the experimental group **n =30**

Anaemia	**Mean**	**S.D**	**Mean Difference**	**Paired 't' Value**
Pretest	8.71	0.43	3.71	**t = 40.442**
Post Test	12.42	0.34		**p = 0.0001, S*** **

***p<0.001, S – Significant

Table 6: Comparison of pretest and posttest level of haemoglobin among age group 18 – 20 year girls in the control group **n =30**

Anaemia	Mean	S.D	Mean Difference	Paired 't' Value
Pretest	8.79	0.42	`0.04	t = 1.649 p = 0.110, N.S
Post Test	8.75	0.42		

N.S – Not Significant

Table 7: Comparison of pretest and posttest level of haemoglobin among age group 18 – 20 year girls between the experimental and control group **n =30**

Anaemia	Group	Mean	S.D	Mean Difference	Student Independent 't' Value
Pretest	Experimental	8.71	0.43	0.08	t = 0.722 p = 0.473, N.S
	Control	8.79	0.42		
Post Test	Experimental	12.42	0.34	3.67	**t = 36.812** **p = 0.0001, S*****
	Control	8.75	0.42		

***p<0.001, S – Significant, N.S – Not Significant

Table 8: Association of pretest level of anemia among age group 18 – 20 year girls with the selected demographic variables in the experimental group **n=30**

Demographic Variables	<Mean		>Mean		χ^2 value
	No.	%	No.	%	
Age					χ^2=0.220 d.f=2 p=0.896 N.S
17 - 18 years	-	-	-	-	
18 - 19 years	3	10.0	4	13.3	
19 - 20 years	5	16.7	5	16.7	
20 years and above	7	23.3	6	20.0	
Religion					χ^2=1.710 d.f=2 p=0.425 N.S
Hindu	12	40.0	11	36.7	
Christian	2	6.7	4	13.3	
Muslim	1	3.3	0	0	
Type of family					χ^2=0.000 d.f=1 p=1.000 N.S
Joint	4	13.3	4	13.3	
Nuclear	11	36.7	11	36.7	
Diet pattern					**χ^2=5.400** **d.f=1** **p=0.020** **S***
Vegetarian	13	43.3	7	23.3	
Non vegetarian	2	6.7	8	26.7	
Does meal contain more vegetables?					**χ^2=7.778** **d.f=1** **p=0.005** **S****
Yes	14	46.7	7	23.3	
No	1	3.3	8	26.7	
Do you have anemia before?					-
Yes	-	-	-	-	
No	15	50.0	15	50.0	

Demographic Variables	<Mean		>Mean		χ^2 value
	No.	%	No.	%	
History of menstrual cycle					χ^2=0.536 d.f=1 p=0.464, N.S
Regular	7	23.3	9	30.0	
Irregular	8	26.7	6	20.0	

N.S- Not Significant

Table 9: Association of pretest level of anemia among age group 18 – 20 year girls with the selected demographic variables in the control group **n = 30**

Demographic Variables	<Mean		>Mean		χ^2 value
	No.	%	No.	%	
Age	3	10.0	4	13.3	χ^2=3.590 d.f=3 p=0.309 N.S
17 - 18 years	5	16.7	11	36.7	
18 - 19 years	4	13.3	2	6.7	
19 - 20 years	1	3.3	0	0	
20 years and above					
Religion	9	30.0	11	36.7	χ^2=0.792 d.f=2 p=0.673 N.S
Hindu	4	13.3	5	16.7	
Christian					
Muslim					
Type of family	3	10.0	5	16.7	χ^2=0.151 d.f=1 p=0.697 N.S
Joint	10	33.3	12	40.0	
Nuclear					
Diet pattern	4	13.3	7	23.3	χ^2=0.344 d.f=1 p=0.558 N.S
Vegetarian	9	30.0	10	33.3	
Non vegetarian					
Does meal contain more vegetables?					**χ^2=4.224 d.f=1 p=0.040 S***
Yes	12	40.0	10	33.3	
No	1	3.3	7	23.4	
Do you have anemia before?					-
Yes	-	-	-	-	
No	13	43.3	17	56.7	

Demographic Variables	<Mean		>Mean		χ^2 value
	No.	%	No.	%	
History of menstrual cycle					χ^2=0.002 d.f=1 p=0.961 N.S
Regular	6	20.0	8	26.7	
Irregular	7	23.3	9	30.0	

N.S- Not Significant

DISCUSSION

The table 1 shows that in the experimental group, most of them 13(43.33%) were in the age group of 20 years and above, 23(76.676%) were Hindus, 22(73.33%) belonged to nuclear family, 20(66.7%) were vegetarian, 21(70%) contains more vegetables in meal, all 30(100%) had no anemia before and 16(53.33%) had history of regular menstrual cycle [11]. Whereas in the control group, 16(53.33%) were in the age group of 18 – 19 years, 20(66.67%) were Hindus, 22(73.33%) belonged to nuclear family, 19(63.33%) were non-vegetarian, 22(73.33%) contain vegetables in meal, all 30(100%) had no anemia before and 16(53.33%) had history of irregular menstrual cycle [12]. The analysis of clinical variables in the table 2 depicts that in the experimental group, 21(70%) had moderate anaemia and 9(30%) had mild anaemia whereas in the control group, 19(63.33%) had mild anaemia and 11(36.67%) had moderate anaemia.[13]

The table 3 portrays that in the experimental group, all 30(100%) had moderate anaemia whereas in the post test, all 30(100%) had mild anaemia. The table 4 portrays that in the control group, all 30(100%) had moderate anaemia whereas in the post test, all 30(100%) had moderate anaemia [14]. The table 5 shows that in the pretest, the mean score was 8.71 ± 0.43 and the posttest mean score was 12.42 ± 0.34. The mean difference was 3.71. The calculated paired‘t’ test value of t = 40.442 was found to be statistically highly significant at p<0.001

level. This clearly indicates that administration of beetroot juice on iron deficiency anemia had significant increase in the level of haemoglobin among girls in the age group of 18 – 20 years in the experimental group. The table 6 shows that in the pretest, the mean score was 8.79 ± 0.42 and the posttest mean score was 8.75 ± 0.42. The mean difference was 0.04. The calculated paired't' test value of t = 1.649 was not found to be statistically significant. This clearly indicates that there was no improvement in the level of haemoglobin among girls in the age group of 18 – 20 years in the control group [15]. The table 7 shows that in the pretest, the mean score of haemoglobin in the experimental group was 8.71 ± 0.43 and the mean score in the control group was 8.79 ± 0.42. The mean difference was 0.08. The calculated student independent't' test value of t = 0.722 was not found to be statistically significant. This clearly indicates that there was no significant difference in the level of haemoglobin among girls in the age group of 18 – 20 years between the experimental and control group.

The table 7 also depicts that in the post test, the mean score of haemoglobin in the experimental group was 12.42 ± 0.34 and the mean score in the control group was 8.75 ± 0.42. The mean difference was 3.67. The calculated student independent't' test value of t = 36.812 was found to be statistically highly significant at p<0.001 level. This clearly indicates that there was significant difference in the post test level of haemoglobin among girls in the age group of 18 – 20 year girls between the experimental and control group. This clearly infers that beetroot juice had significant effect and the level of haemoglobin had considerably increased among 18-20 year girls in the experimental group than the control group. The table 8 shows that the demographic variables of Diet pattern and Does meal contain more vegetables had shown statistically significant association with level of anemia at p<0.05 and p<0.01 level respectively and the other demographic variables had not shown statistically significant association with pretest level of haemoglobin among girls in the age group of 18 – 20 years in the experimental group.

The table 9 shows that the demographic variable Does meal contain more vegetables had shown statistically significant association with level of anemia at p<0.05 level and the other demographic variables had not shown statistically significant association with pretest level of haemoglobin among girls in the age group of 18 – 20 years in the control group.

The data analysis was done by using descriptive and inferential statistics. The results shows that majority of the adolescent girls in the experimental group 13(43.33%) were aged 20 years and in the control group 16(53.33%) were aged 18-19 years.In relation to religion, majority of girls in the experimental group 23(76.67%) were Hindus and in control group 20(66.67%).With regard to type of family, 22(73.33%) in experimental group and 22(73.33%) in control group were from nuclear family. Regarding type of food, experimental group 10(33.3%) and control group 19(63.33%) were non vegetarian. With regard to history of anaemia, girls in the experimental group 30(100%) and control group 30(100%) had no history of anemia. In relation to menstrual cycle, majority of girls in the experimental group 14(46.67%) had irregular menstrual cycle and in control group 16(53.33%) had irregular menstrual cycle. In the experimental group, overall pretest mean score of haemoglobin was 8.71 with SD of 0.43 and the overall posttest mean score of haemoglobin was 12.42 with SD of 0.34.It proved that after the administration of beetroot juice , there was a significant improvement in the haemoglobin level of adolescent girls with a 't' value of 40.442 at p<0.0001.Where as in control group overall pretest mean score of haemoglobin was 8.79 with SD of 0.42 and the overall posttest mean score haemoglobin was 8.75 with SD of 0.42. It showed that, there was no significant improvement in the haemoglobin level of adolescent girls. Association revealed that the demographic variable (diet pattern, does meal contain more vegetables) had statistically significant association with the pretest haemoglobin level at p<0.0001.in experimental group.

CONCLUSION

The study identified that the level of hemoglobin was increased after giving the beetroot juice. It was found that there was a significant improvement in the level of hemoglobin after giving the beetroot juice. The effectiveness of beetroot juice was found to be t=36.812, p<0.0001.The conclusion of the study illustrated that beetroot juice found to be an effective alternative therapy in increasing hemoglobin level for anemic adolescent girls.

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