

Effect of Rice Flakes and Jaggery Mixture Consumption on Hemoglobin Level among Adolescent Girls

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Abstract: A pre experimental study was conducted to assess the effect of rice flakes and jaggery mixture consumption on hemoglobin level among adolescent girls in a selected area at Pandalam Panchayat. The objectives of the study were to compare the pre test and post test level of hemoglobin among adolescent girls and to find out the association between pre test level of hemoglobin and selected socio demographic variables. A quantitative research approach with one group pre test post test was adopted for the study. The study was conducted in the 8th ward of Pandalam Panchayat. Thirty adolescent girls with hemoglobin level less than 12 g/dl were selected by purposive sampling technique. Conceptual framework was developed based on King's goal attainment theory. Socio demographic data were collected by structured interview schedule, pre test was done by hemoglobin test using cyanmeth hemoglobin method by photoelectric colorimeter and hemoglobin chart and samples were subjected to administered 150 g of rice flakes and jaggery mixture in the form of a laddoo for a period of three weeks. Post test was done after three weeks using the same tool. Data were analyzed using descriptive and inferential statistics. The findings showed that average mean post test 11.42 with SD =0.44 were higher than the average mean pre test 11.33 with SD =0.45. The calculated t value (8.31) is greater than table value (2.05) at df 29 showed that there was significant improvement in the level of hemoglobin after the consumption of rice flakes and jaggery mixture ($p < 0.05^*$). The study found association with age, main source of information on anemia and history of menstrual irregularities in the last one year.

Keywords: Effect; Rice flakes and jaggery mixture; Hemoglobin level; Adolescent girls

1. Introduction

“Healthy eating is a journey not a destination”.^[1]

Good health is a secret of every happy man. There is an old saying “health is wealth”. According to World Health Organization, “Health is a state of complete physical, mental and social well being and not merely the absence of disease or infirmity”. Many people do not realize the importance of good health and even if they do, they may still disregard it. A person can be said to be healthy, when his or her body is healthy and the mind is clear and calm. Good health is a matter of great concern; to maintain it, healthy living and disciplined life is a must. One of the best ways is to have a well balanced and nutritious diet. Inadequate nutrition results in certain deficiency disorders. Among that, anemia remains as a major nutritional problem among children and adolescents in India.^[2,3]

Anemia is the world's second leading cause of disability and thus one of the most serious global public health problems. Adolescent girls are one of the risk groups of anemia. Anemia is said to be present when the hemoglobin level in the blood is below the lower extreme of the normal range for the age and sex of the individual. Staying healthy for children is vital for the proper growth and development of mind and body and to lead a productive life.^[3,4]

The District level Household Survey on reproductive and child health-2 reported that 90.4 % of adolescent girls are anemic in Kerala and 97.8% are in India. Report of working group on child rights for the 12th five year plan, states that about 56% of girls age group between 15-19 years are anemic.^[7]

Hence from the above literature review it is evident that anemia is a serious health concern which need to be treated at the earliest. In Kerala, recent health ministry survey reports prove that there are 22% of adolescent girls, out of majority are suffering from iron deficiency anemia. To deal with the problem of anaemia, government launched a Weekly Iron and Folic acid Supplementation (WIFS) programme. The programme is implemented in both rural and urban areas and it is covering school going adolescent girls and boys from 6th to 12th class enrolled in government/government aided/municipal schools through the platform of schools and out of school adolescent girls through the platform of aganwadi centers on every Monday in all districts.^[8,9]

The world's adolescent population is facing a series of serious nutritional challenges which are not only affecting their growth and development but also their livelihood as adults. In females, adolescence marks the beginning of the menstrual cycle or reproduction. Adolescents gain 30% of their adult weight and more than 20% of their adult height between 10-19 years, which we call as growth spurt. Because of this rapid growth, adolescents are especially vulnerable to anemia.^[10]

Adolescence is “coming of age”, as children grow in to young adults. These teen years are a period of intense growth, not only physically, but also mentally and socially. This means extra iron is required by the body for increase in weight, height and muscles. When this extra requirement of iron is not met through proper diet, it leads to anemia.^[10]

Anemia is mainly caused due to iron deficiency. Low intake of meat, fish, poultry or iron fortified foods, frequent dieting or restricted eating, vegetarian eating styles, meal skipping, chronic or significant weight loss, heavy menstrual periods,

rapid growth, participation in endurance sports, intensive physical training are the major risk factors of anemia in teenagers. As anemia gradually gets worse, though, they may start to experience some noticeable symptoms, like tiredness, weakness, pale skin, rapid heartbeat, irritability, decreased appetite or dizziness.^[5]

Inadequate nutrition, inadequate iron intake, poor iron absorption, increased iron need or chronic blood loss, prolonged iron deficiency during adolescence can have serious consequences throughout the reproductive years of life and beyond.^[10]

Anemia is more common in girls because they have extra loss of iron in blood through menstrual bleeding. In teenagers, anemia is more common than just being pale and tired. It can affect the adolescent girls development and school performance. Studies have shown that adolescents with anemia have impaired verbal learning and memory, as well as lower standardized maths scores. There is evidence that, correcting the anemia may improve learning. Even before anemia might develop, iron deficiency can cause shortened attention span, alertness, and learning in adolescents.^[6]

The nutritional anemia in adolescent girls attributes to the high maternal mortality rate, high incidence of low birth weight babies, high peri natal mortality and the consequent high fertility rates.^[6]

According to Hippocrates, "Let food be thy medicine and medicine be thy food". A sensible way to prevent teenager from becoming iron deficient or anemic is to provide a diet naturally rich in iron. Proper nutrition, including adequate iron intake, plays an important part of teenager's growth and development. Girls especially, need to consume more nutritious and iron-rich food because they lose some iron when they go through their monthly cycles.^[11]

Setting of the study

The setting for the present study was the 8th ward of Pandalam Panchayat which was selected conveniently

Population

The population in this study consisted of adolescent girls who were having hemoglobin level <12 g/dl in the age group of 13-19 years.

Sample and sampling technique

The sample of the study consisted of 30 adolescent girls (13-19 years) having hemoglobin level <12 g/dl in the 8th ward of Pandalam Panchayat, who fulfilled both the inclusion and exclusion criteria, were selected.

In order to select the sample from the population, investigator adopted non probability purposive sampling technique.

Inclusion criteria: Adolescent girls who are

- In the age group of 13-19 years.
- Having hemoglobin level less than 12 g/dl.
- Residing in the selected study setting.
- Willing to participate in the study.

Rice flakes and jaggery are rich in iron. 1.49 mg of iron is present in 100 g of rice flakes and 3 mg of iron /100 g of jaggery. It is written in Sushruta Samhita that, the gud (jaggery) "purifies the blood, prevents rheumatic afflictions and disorders of bile & has nutritive properties of high order". Rice flakes and jaggery are easily available, accessible and affordable in Kerala. Rice flakes are also rich in vitamin C which facilitates iron absorption and also rice flakes and jaggery mixture is an attractive food for the adolescents, usually taken as evening snacks. Iron is an important building block for red blood cells. When the body doesn't have enough iron, it will make fewer red blood cells which is not sufficient. Iron is an important mineral that is essential for the normal functioning of the body and it is helpful in carrying oxygen around the body, ensures a healthy immune system and provides energy for the body and prevents anemia.^[6,12,13]

2. Materials and Methods

Research approach

A quantitative research approach has been adopted for this study.

Research design

Pre experimental one group pre test post test design was adopted for this study.

Table 1: Representation of Research Design

Group	Pre test	Intervention	Post test
Experimental Group	O ₁	X	O ₂

Key:

O₁ - Pre test for assessing the level of hemoglobin by hemoglobin test using cyanmeth hemoglobin method.

X - Intervention by administering rice flakes and jaggery mixture.

O₂ - Post test for assessing the level of hemoglobin by hemoglobin test using cyanmeth hemoglobin method.

- Present at the time of data collection.

Exclusion criteria: Adolescent girls who are

- On treatment for anemia
- Having iron intolerance.
- Having history of juvenile diabetes.
- Having indigestion

Tool/ Instruments

The data from the sample was collected using

Tool 1: Socio demographic Proforma

Technique: Structured interview schedule

It included 18 items of socio demographic variables such as age, religion, educational qualification, type of family, family income per month, main source of information, dietary habits, dietary pattern, consumption of iron rich foods, consumption of vitamin C rich foods, habit of drinking coffee/tea immediately before or after or along the meal, frequency of having coffee/tea in a day, history of deworming in the last one year, history of excessive menstrual bleeding in the last one year, history of menstrual irregularities in the last one year, history of anemia in the

last one year, history of consumption of iron tablets in the last one year, levels of anemia.

Tool 2: Hemoglobin test using cyanmeth hemoglobin method by photoelectric colorimeter and hemoglobin chart.
Technique: Bio physiological method

The researcher was collected 0.5ml of blood from the samples and checked the hemoglobin level by hemoglobin test using cyanmeth hemoglobin method by photoelectric colorimeter and maintained the hemoglobin chart before and after the intervention.

The standard range of hemoglobin as per World Health Organization (WHO) were followed in the study,

≥12 g/dl - No anemia

11-11.9 g/dl - Mild anemia

8-10.9 g/dl - Moderate anemia

<8 g/dl - Severe anemia

Data collection process

Prior permission was obtained from the concerned authorities to conduct the study. The investigator familiarised herself with subjects and explained the purpose of the study to them. Confidentiality was assured to all subjects. An informed consent was taken from the parents and adolescent girls. Forty two adolescent girls were screened, among which thirty subjects were purposively selected from the population as per the inclusion criteria. Socio demographic data was collected by structured interview schedule and pre test was conducted for the subjects by hemoglobin test using cyanmeth hemoglobin method by photoelectric colorimeter in the laboratory. The samples were administered rice flakes and jaggery mixture which was made it in to a form of 150 g laddoo which contained 2.99 mg iron. This was provided for adolescent girls in the evening as snacks per day for a period of 3 weeks. It was prepared by the researcher herself from 3000 g of rice flakes and 1500 g of jaggery by mixing it well and divided 150 g of each portion in the common balance. After that prepared 150 g of 30 balls. The researcher closely monitored the samples for ensuring timely consumption of rice flakes and jaggery mixture on a daily basis and post test was done after 3 weeks of intervention by hemoglobin test using cyanmeth hemoglobin method by photoelectric colorimeter in the same laboratory.

3. Statistical Analysis

The data obtained was planned to be analysed by both descriptive and inferential statistics based on the objectives and hypothesis of the study. To compute the data a master sheet was prepared by the investigator.

The data would be analysed as shown below:

Part I: Frequency and percentage distribution would be used to analyse socio demographic variables.

Part II: Mean, standard deviation would be used to assess the pre test and post test level of hemoglobin level among adolescent girls.

Part III: Paired t- test would be used to compare the pre test and post test level of hemoglobin among adolescent girls.

Part V: Chi-square test would be used to find out the association between the pre test level of hemoglobin and selected socio demographic variables.

4. Results

The major findings of the study are presented below,

Demographic Variables

Among 30 adolescent girls, 36.7% of adolescent girls belonged to the age group between 15-17 years, 47.0% were hindus, 63.3% of samples were in high school students, 56.7% of subjects belonged to joint family, 70.0% had family income ranging between 20,001-25,000 per month, 33.33% of adolescent girls had a main source of information on anemia from journals/magazines, All the samples (100%) of adolescent girls were non vegetarian, All the samples (100%) of adolescent girls had 4 meal pattern, More than half (53.3%) of adolescent girls consume iron rich foods occasionally, Half (50.0%) of adolescent girls consume vitamin C rich foods weekly, Majority (86.6%) of samples had a habit of drinking coffee/tea immediately before or after or along the meal., Around three fourth (70%) of adolescent girls drink coffee/tea twice a day, 73.3% of adolescent girls had a history of de worming in the last one year, 80% of adolescent girls had no history of menstrual irregularities in the last one year, 100% of samples had no history of excessive menstrual bleeding in the last one year, 100% of adolescent girls were not knowing about history of anemia in the last one year, 66.7% of subjects had history of consumption of iron tablets in the last one year and 83.3% of adolescent girls had mild anemia

Prê test level of hemoglobin and Post test level of haemoglobin

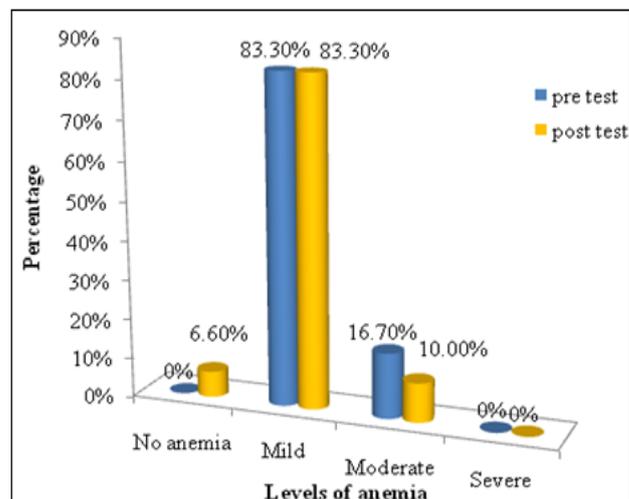


Figure 1: Cylinder diagram showing distribution of adolescent girls according to pre test and post test level of haemoglobin (N=30)

Data presented in figure 1 depicted that Majority (83.3%) of adolescent girls had mild anemia, less than one fifth (16.7%) of adolescent girls had moderate anemia. Where as in post test, majority (83.3%) of adolescent girls had mild anemia, one tenth (10.0%) of adolescent girls had moderate anemia and less than one tenth (6.6%) of adolescent girls had no anemia.

Comparison of the pre test and post test level of hemoglobin among adolescent girls

Table 2: Mean, S.D. and t value to compare the pre test and post test level of hemoglobin among adolescent girls, (N=30)

Test	Mean hemoglobin	SD	Std error	Difference between mean hemoglobin	Df	T
Pre test	11.33	0.45	0.01	0.09	29	8.31*
Post test	11.42	0.44				

*Significant at 0.05 level

The data presented in Table 2 shows that the mean pre test hemoglobin level was 11.33 with SD =0.45 and mean post test hemoglobin level was 11.42 with SD =0.44. The mean difference is 0.09 with standard error 0.01. The calculated t value (8.31) is greater than table value (2.05) at df 29 showed that there was significant improvement in the level of hemoglobin after the consumption of rice flakes and jaggery mixture ($p < 0.05$ *). Hence, null hypothesis (H_0) was rejected and research hypothesis (H_1) was accepted. Thus it can be concluded that the rice flakes and jaggery mixture consumption is effective in improving hemoglobin level among adolescent girls.

Table3: Association between pre test level of hemoglobin and selected socio demographic variables of adolescent girls (N=30)

Variable	χ^2 value	Df	P-value	Inference
Age	6.320*	2	0.042*	S*
Main source of information on anemia	14.314*	4	0.006*	S*
History of menstrual irregularities in the last one year	6.000*	1	0.014*	S*

Significant at 0.05 level

S=Significant

The data presented in Table 3 shows association of pre test level of hemoglobin with selected demographic variables such as age, main source of information on anemia and history of menstrual irregularities in the last one year had association. Hence, improvement in hemoglobin after consuming rice flakes and jaggery mixture is also influenced by age, main source of information on anemia and history of menstrual irregularities in the last one year.

Table 3: Association between pre test level of hemoglobin and selected socio demographic variables of adolescent girls (N=30)

Variable	χ^2 value	Df	P value	Inference
Religion	0.429	2	0.807	NS
Educational Qualification	5.179	2	.075	NS
Type of family	1.407	1	.236	NS
Family income per month	0.926	2	.629	NS
Consumption of vitamin C rich foods	.240	1	.624	NS
Habit of drinking coffee/tea immediately before or after or along the meal	.231	1	.631	NS
Frequency of having coffee/tea in a day	1.886	2	.390	NS
History of de worming in the last one year	3.409	1	.065	NS
History of consumption of iron tablets in the last one year	3.409	1	.065	NS

NS=Not significant

The data presented in Table3 shows the association of pre test level of hemoglobin with selected socio demographic variables such as religion, educational qualification, type of family, family income per month, consumption of vitamin C rich foods, habit of drinking coffee/tea immediately before or after or along the meal, frequency of having coffee/tea in a day, history of de worming in the last one year, history of consumption of iron tablets in the last one year had no association. Hence, improvement in hemoglobin is not influenced by the selected socio demographic variables.

Since all the samples belonged to single category in dietary habits, dietary pattern, history of excessive menstrual bleeding in the last one year, history of anemia in the last one year variable, it becomes a constant and no chi square is calculated.

5. Discussion

Objective 1: To assess the pre test and the post test level of hemoglobin among adolescent girls.

The present study revealed that majority (83.3%) of adolescent girls had mild anemia, less than one fifth (16.7%) of adolescent girls had moderate anemia where as in post test, majority (83.3%) of adolescent girls had mild anemia, one tenth (10.0%) had moderate anemia and less than one tenth (6.6%) of adolescent girls had no anemia.

The present study was supported with a randomized, controlled double-blind trial to evaluate the effect of jaggery mixed with ascorbic acid in preventing or treating anemia among adolescent girls aged 12-17 years at a state-run school in Sobral, Brazil and the results revealed that there was a significant improvement in mean hemoglobin level in experimental group than the control group. During pre test the result showed that 62% of adolescent girls were mild anemic and 38% were moderately anemic while in post test, 72% of adolescent girls were mild anemic, 20% were moderately anemic and 8% of girls having no anemia.^[14]

Objective 2: To compare the pre test and post test level of hemoglobin among adolescent girls.

The present study showed that the mean post test hemoglobin level 11.42 was higher than the mean pre test hemoglobin level 11.33. The t value is (8.31) is greater than table value (2.05) at 0.05 level of significance with df 29 showed that there was significant improvement in the level of hemoglobin after the consumption of rice flakes and jaggery mixture. Hence, null hypothesis (H_0) was rejected and research hypothesis (H_1) was accepted. It can be concluded that the rice flakes and jaggery mixture consumption is effective in improving hemoglobin level among adolescent girls.

The present study was consistent with the findings of a quasi experimental study to develop an iron rich supplement with locally available foods and to test its feasibility in adolescent girls (13-17 years) belonging to low income families in Rajendra Nagar, Chennai and the results showed that there

was a significant increase in hemoglobin levels in girls after 30 days of supplementation. ^[15]

Objective 3: To find out the association between pre test level of hemoglobin and selected socio demographic variables of adolescent girls.

The present study depicted that the association of pre test level of hemoglobin with selected socio demographic variables such as age, religion, education qualification, type of family, family income per month, main source of information on anemia, consumption of iron rich foods, consumption of vitamin C rich foods, habit of drinking coffee/tea immediately before or after or along the meal, frequency of having coffee/tea in a day and levels of anemia. Among this, age, main source of information on anemia and history of menstrual irregularities in the last one year had significant association while others had no association.

Since all the samples belonged to single category in dietary habits, dietary pattern, history of excessive menstrual bleeding in the last one year, history of anemia in the last one year, history of consumption of iron tablets in the last one year variable, it becomes a constant and no chi square is calculated.

The present study are in agreement with a cross sectional study which was conducted to determine the prevalence of anemia and socio demographic factors in adolescent Nepalese girls in a semi urban setting and the results revealed that the overall prevalence of anemia was found to be 68.8% and among the socio demographic variables girls' age, body mass index, menarcheal status, parental education and occupation had a significant association. ^[16]

6. Conclusion

The present study revealed that rice flakes and jaggery mixture was effective in improving hemoglobin level. There was an association between pre test level of haemoglobin and subject's age, main source of information on anemia and history of menstrual irregularities in the last one year. Findings of the study suggested that rice flakes and jaggery mixture can be used as an effective nutritional intervention programme in improving hemoglobin level.

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