Effectiveness of gooseberry juice with honey and guava juice with honey compared with control on clinical signs and symptoms of nutritional deficiency among adolescent girls

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Abstract : The aim of this study is to Effectiveness of gooseberry juice with honey and guava juice with honey compared with control group on clinical parameters among adolescent girls studying in selected government schools at Dharmapuri, Tamilnadu. **Methods:** Pre test and post test design was used for this study. 255 iron deficiency anaemic adolescent girls were selected from schools at Dharmapuri district Tamilnadu. The samples were divided in to 3 groups by purposive sampling technique. Experimental group I (n = 85) were received 25 ml of gooseberry juice with honey, experimental group II (n = 85) were received guava juice with honey and control group (n = 85) were not received any intervention. Clinical signs and symptoms of nutritional deficiency like eyes, lips, tongue, skin, teeth, gums, nails, pallor were measured as pretest, intermittent(21 days) and post test(45 days). **Results:** There was a significant differences between control and experimental group I and II. Moreover experimental group I(gooseberry juice with honey) is more effective in improving clinical signs and symptoms of nutritional deficiency. **Conclusion:** Gooseberry juice is more effective than the guava juice which helps in iron absorption and reducing the anaemia.

Key words : Anaemia, Adolescent girls, Effectiveness, Honey mixed Gooseberry juice, Honey mixed Guava juice.

Introduction

Iron is one of the micronutrient and is of great importance in human nutrition. It is used for formation of hemoglobin, oxygen transportation, brain development, regulation of body temperature and muscle activity. When the iron is decreased in human body, it is called as iron deficiency. Iron deficiency is the most common etiological factor in anaemia. The decreased hemoglobin level is called as iron deficiency anaemia[1].

Iron deficiency anemia is also referred to as hypochromic anaemia. Hypochromic is a term whichmeans less than normal colour. In general, women need more iron in their diets than men, due to the regular loss of iron in the menstrual flow. Anaemiais a condition in which the haemoglobin concentration is lower than normal level. It is not a specific disease state but a sign of an underlying disorder and chronic iron deficiency will lead to iron deficiency anaemia. Iron deficiency anaemia can be the consequence of several factors, including chronic blood loss, insufficient iron in the diet, poor or impaired absorption of iron in the body, periods of rapid growth and infection[2].

Nutritional anaemia especially iron deficiency anaemia occurs at all stages of the life cycle, but is more prevalent in adolescents, .Iron deficiency anaemia (IDA) constitutes the major anaemia during adolescent

period. Nutritional Anemia is major public health problem worldwide particularly in developing countries among women of reproductive age. As per National Family Health survey, more than half of women in India (55%) have anemia, including 39% with mild anemia, 15% with moderate anemia and 2% with severe anemia. Nearly 50 – 80% of Indian mothers suffer from anemia due to iron – deficiency[3].

Adolescent girls are particularly susceptible to iron deficiency anemia because of the increased need for the dietary iron for hemoglobin and myoglobin synthesis, during this rapid period of growth, when blood volume and muscle mass are expanding and to replace menstrual losses in adolescent girl. As an individual adolescent girl need extra iron according to the stage of development.Anemia is the term that indicates a low red cell count and a below normal hemoglobin or hematocrit level. The prevalence of anemia in India is reported that in urban and rural is 50% and 60% respectively. The solution for combating anemia are both inexpensive and effective by providing iron rich diet increasing iron absorption by inclusion of ascorbic acid in diet[4].

According to D.C.Dutt[5]anaemia is an indirect cause of death. About 50% of pregnant women worldwide suffer from anaemia during pregnancy, commonly due to deficiency nutrition, iron,folic acid, iodine and other micronutrient. Anaemia is responsible for 20% of maternal deaths in the third world countries[6]. Women of child bearing age should be provided nutritional education regarding food source of iron, especially prior to becoming pregnant and taught how food choices can enhance or interfere with iron absorption[7].

In Nagpur[18]a study was conducted on anemia among adolescent girls showed that the prevalence of anemia formal to be 35.1%. A Sample survey conducted among 93 girls in Tirusulam near Tambaram. The study concluded that 75 girls were found to have a hemoglobin count for less than 12 gram%[8].A cross sectional study was conducted to determine the prevalence of anemia among 100 adolescent south Indian girls age of 11 to 18 years were selected in an urban slum of Vellore.Their social economic, dietary and anthropometric information were collected, and blood hemoglobin was estimated, and the result showed that the prevalence of anemia (HB<12g %) was 29 %[9].

Eating a Gooseberry (Amla) everyday also helps in improving in blood and curing anemia and it is a good source of vitamin C. Also taking 3 spoons of Gooseberry juice for 21 days will definitely cures Anaemia[10].Taking Amla and Black Till (black sesame seeds) in equal quantity with honey or ghee cures mental and physical weaknesses.Taking milk in the morning after licking one teaspoon of ground Amla powder mixed with honey imparts freshness and strength to the body. Intellect gets sharpened if one takes the pulp of fresh Amla or Amla juice with honey or ghee every morning and evening. Taking Amla juice or powder with honey purifies blood[11].

Research Dcesign and Methods

Subjects

A total of 255 adolescent girls were screened for the inclusion in the study. Adolescent girls aged between 12 to 16 years, those who were diagnosed with iron deficiency anaemia and having Hb below 11 gms/dl was included. Adolescent girls with major or minor complications, associated illness, food allergy and learning difficulties, who cannot read and write the local language were excluded from the study. All the participants provided informed consent. The present study was approved by the human ethical committee of the Saveetha University, Chennai, Tamil Nadu, India.

Study design

We used pre test and post test design and cluster randomization followed by purposive sample technique was used to select the samples for the present study. Adolescent girls with iron deficiency anaemia were included. A total of 85 adolescent girls were assigned to control group who they did not received any supplementation, 85 adolescent girls were assigned as experimental group I who were received gooseberry juice 25ml with honey 5ml and 85 adolescent girls were assigned as experimental group II who were received guava juice 25ml with honey 5ml for 45 days. The gooseberry and guava juice was prepared under hygienic condition daily in the morning.The gooseberry juice contains 81.2% of water, 0.5% of protein, 0.1% of fat, 14.1% of carbohydrates, 3.4% of fibrous elements, 0.05% of calcium, 0.02% of phosphorus, 0.02% of iron, and

600 mg/100 gm of Vitamin 'C'[12]. The guava juice contains water 76.1%, protein 1.5 %, fat 0.2%, carbohydrates 14.5%, calcium 0.01%, phosphorus 0.04%, iron 1 mg and vitamin 'C' 300 mg/100 gm[13]. All three groups were instructed to maintain the regular activities.

Study measurements

Theclinical signs and symptoms of nutritional deficiency likeeyes, lips, tongue, skin, teeth, gums, nails, pallor[14] were assessed.After 21 and 45 days clinical parameters were checked.

Statistical analysis

The data were analyzed by means of descriptive and inferential statistics. Data were presented as mean and standard error. Pre test and post test were compared by paired 't' test. One way ANOVA was used to find the effectiveness of gooseberry juice with honey and guava juice with honey compared with control group. Chi-square was used to check the homogeneity of the samples. A probability of 0.05 level or less was taken as statistically significant. The analysis and graph plotting were carried out by using sigma plot 13. A probability of 0.05 or less than was taken as statistically significant[15].

Results

Frequency distribution of participants according to the scores obtained by them in clinical parameters

Participants were classified based in the scores obtained by them inclinical signs and symptoms of nutritional deficiency like eyes, lips,, nails, tongue, teeth, skin, gums and pallor. The frequency distribution was given in table 1.

Table No. 1. Frequency distribution of participants according to the scores obtained by them in clinical parameters.

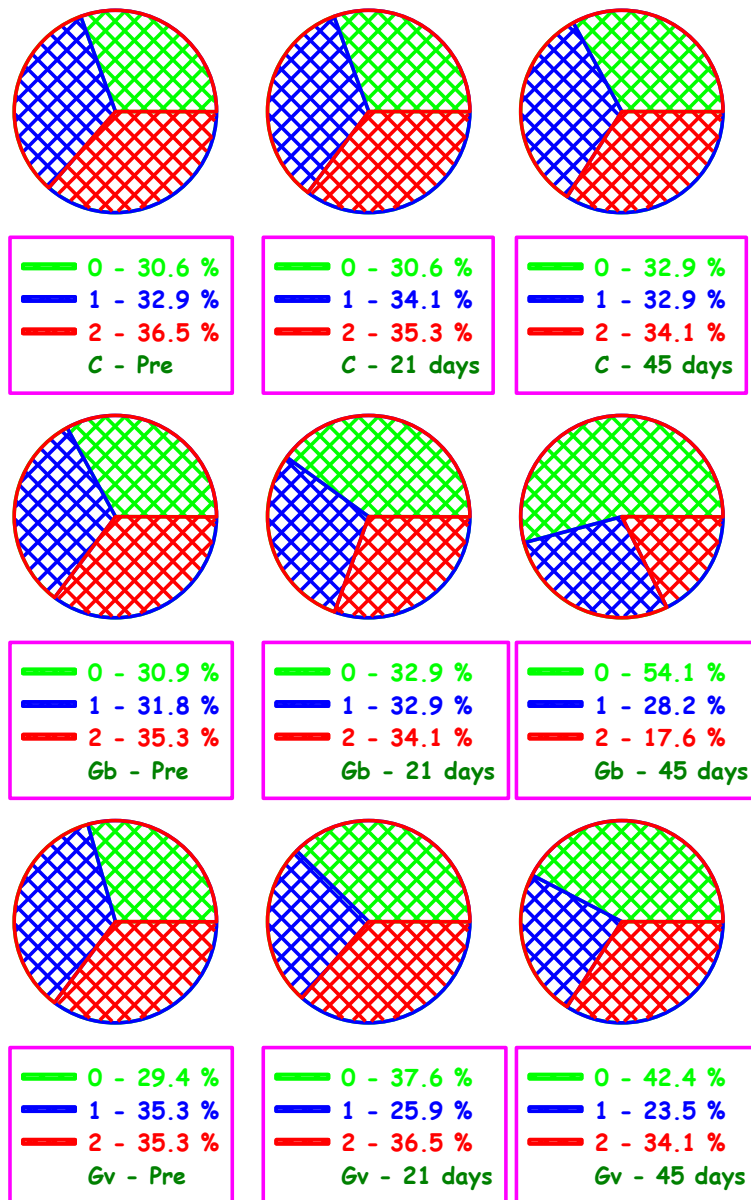| S.No	Sym/ Parameters	Category	Pre test			Intermittent			Post test		
			Con	Gb&H	Gv&H	Con	Gb&H	Gv&H	Con	Gb&H	Gv&H
1	Eyes	0 1 2	$X^2 = 0.364$ P= 0.985			$X^2 = 2.671$ P= 0.614			$X^2 = 11.140$ P= 0.025		
2	Lips	0 1 2	$X^2 = 0.273$ P= 0.991			$X^2 = 0.705$ P= 0.951			$X^2 = 2.688$ P= 0.611		
3	Tongue	0 1 2	$X^2 = 4.263$ P= 0.372			$X^2 = 4.074$ P= 0.396			$X^2 = 6.677$ P= 0.154		
4	Skin	0 1 2	$X^2 = 0.960$ P= 0.916			$X^2 = 0.942$ P= 0.918			$X^2 = 17.395$ P= 0.002		
5	Teeth	0 1 2	$X^2 = 2.410$ P= 0.661			$X^2 = 1.752$ P= 0.781			$X^2 = 11.190$ P= 0.025		
6	Gums	0 1	$X^2 = 0.915$ P= 0.633			$X^2 = 2.926$ P= 0.232			$X^2 = 8.777$ P= 0.012		
7	Nails	0 1	$X^2 = 0.053$ P= 0.974			$X^2 = 2.749$ P= 0.253			$X^2 = 11.181$ P= 0.004		
8	Pallor	0 1 2	$X^2 = 4382$ P= 0.357			$X^2 = 1.747$ P= 0.782			$X^2 = 4.942$ P= 0.293		

Figure No.1: Effectiveness of gooseberry with honey (Gb) and guava with honey (Gv)   compared with control (C) in pre-test (Pre), 21 days and 45 days post-test on eye symptoms. 0 = ; 1 = ; 2 = . Values are percentages (n = 85 each)

Control - χ2 = 0.190; P = 0.996.
Gooseberry with honey – χ2 = 9.971; P = 0.041.Guava with honey - χ2 = 4.400; P = 0.335.

The participants were classified based on eyes changes into three categories. Based on the scores obtained by them in the signs and symptoms of malnutrition scale, they are grouped in to normal, watery, and dry. Majority of them were in the dry category (35%) between three groups. There was a significant difference observed between three groups in the post test. Majority of the participants achieved normal eyes in the experimental group one(gooseberry juice with honey). The calculated χ^2 and 'p' values in the pre test were 0.364 and 0.985 respectively and post test were 11.140 and 0.025, it revealed that there was highly significant difference between the pre test and post test at p<0.001 level (figure 1).

The participants score on signs and symptoms of lips were grouped three categories. They are normal , mild angular stomatitis and moderate angular stomatitis. Majority (55%) of the participants were normal

category in the pre test among three groups. There was no significant difference noticed between the groups in the pre test. A similar pattern of distribution was noticed between three groups were in the normal category in post test. There was not much difference noticed in the three groups. The calculated χ^2 and 'p' values in the pre test were 0.273 and 0.991 respectively and post test were 2.688 and 0.611 it revealed there was mild significant difference noticed between the groups at p<0.001 level.

The score obtained by the participants in the signs and symptoms of tongue was categorized into three groups. They are normal, pale, red. In the pre test participants in the control group 20, experimental group on (gooseberry juice with honey) group 14, and experimental group two(guava juice with honey) group 23 were in normal category. The calculated χ^2 value in the pre test and intermittent test(21 days) revealed that there was no significant difference noticed between the groups at p<0.001 level.The calculated χ^2 and 'p' values in the pre test were 4.263 and 0.372 respectively and post test were 6.677 and 0.154 it revealed there was mild significant difference noticed between the groups at p<0.001 level.
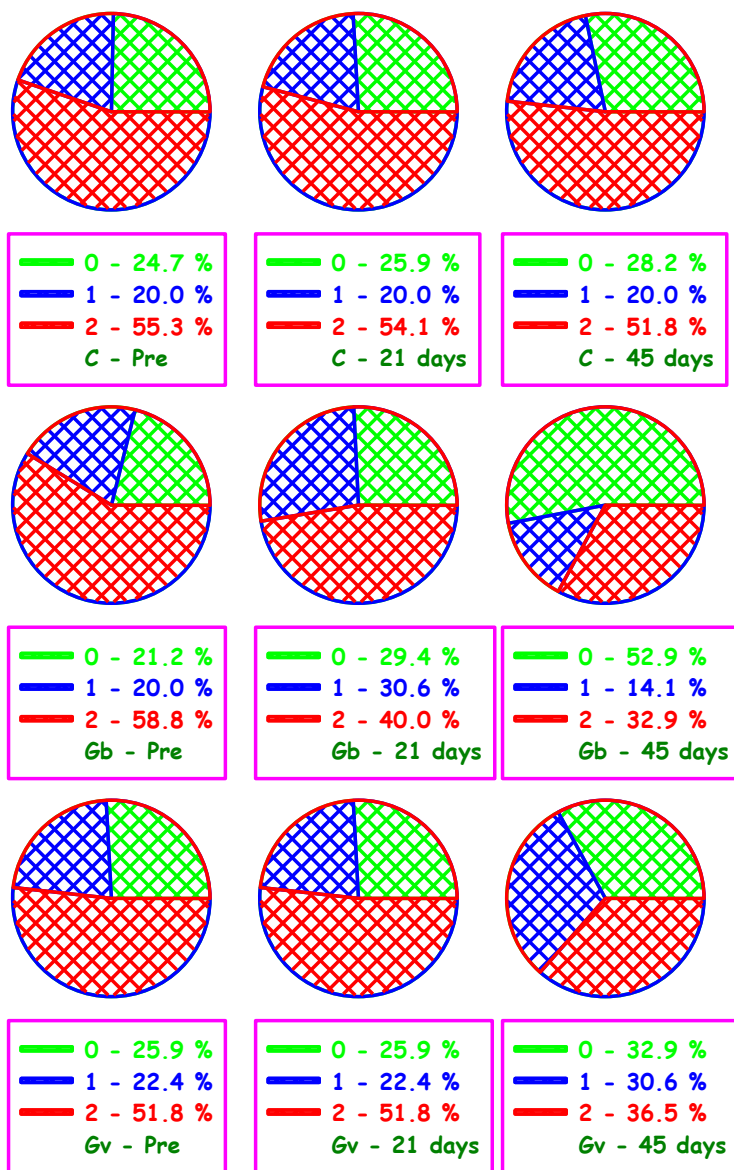

Figure No..2 : Effectiveness of gooseberry with honey (Gb) and guava with honey (Gv) compared with control (C) in pre-test (Pre), 21 days and 45 days post-test on skin symptoms. 0 = ; 1 = ; 2 = . Values are percentages (n = 85 each)
Control - χ^2 = 0.311; P = 0.989.
Gooseberry with honey – χ^2 = 25.121; P < 0.001. Guava with honey - χ^2 = 5.372; P = 0.251

The skin changes was assessed in terms of three categories. They were normal, pale and dry & rough. The participants were grouped in three categories. In pre test majority of the participants between three group were in the dry& rough category. The calculated χ^2 value revealed that there was no significant difference noticed between the groups in the pre test and intermittent test. The calculated χ^2 and 'p' values in the pre test were 0.960 and 0.916 respectively and post test were 17.395 and 0.002 it revealed there was highly significant difference noticed between the groups at p<0.001 level. The result of the frequency distribution revealed that that the gooseberry juice with honey was effective in improving the iron absorption and it had a positive effect on dry & rough to normal colour.

The score obtained by the participants in the signs and symptoms of teeth was categorized into three groups. They are normal, discolored, dental flurosis. In the pre test, 17 participants from the control group,13 from experimental group on (gooseberry juice with honey), and 19 from experimental group two(guava juice with honey) were in normal category. The calculated χ^2 value in the pre test and intermittent test(21 days) revealed that there was no significant difference noticed between the groups at p<0.001 level.The calculated χ^2 and 'p' values in the pre test were 2.410 and 0.661 respectively and post test were 11.190 and 0.025 it revealed there was highly significant difference noticed between the groups at p<0.001 level.

The next clinical parameters was signs and symptoms of gums. In control group there was no changes between the pre test and post test. In the experimental group one(gooseberry juice with honey pre test score was 62, which increased to 74 in the intermittent test (21 days) and it was further increased to 79 in the post test (45 days). There was a significant difference noticed between the pre test, intermittent test and post test in the experimental group one gooseberry juice with honey).The calculated χ^2 and 'p' values in the pre test were 0.915 and 0.633 respectively and post test were 8.777 and 0.012 it revealed there was significant difference noticed between the groups at p<0.001 level.

The score obtained by the participants in the signs and symptoms of nails was categorized into three groups. They are normal, pale, spoon shaped nails. In the pre test16 participants from control group,15 from the experimental group one (gooseberry juice with honey), and 15 from the experimental group two(guava juice with honey) were in normal category. The calculated χ^2 value in the pre test and intermittent test(21 days) revealed that there was mild significant difference noticed between the groups at p<0.001 level.The calculated χ^2 and 'p' values in the pre test were 0.053 and 0.974 respectively and post test were 11.181 and 0.004 it revealed there was highly significant difference noticed between the groups at p<0.001 level. It was concluded that gooseberry juice with honey is very effective to increase the iron absorption.

Participants were classified based on the scores obtained by them in pallor category. They are mild (pallor of conjunctiva and or mucous membrane), moderate (pallor of conjunctiva and or mucous membrane and pallor of skin) and severe (pallor of conjunctiva and or mucous membrane and pallor of skin and pallor of palmar creases). Majority of the participants (55%) were in the moderate category in the pre test . The calculated χ^2 values revealed that there was no significant difference noticed between the groups at p<0.001 level.

Discussion

Adolescent are more vulnerable to get iron deficiency anaemia and the reasons are, increase in physical growth and development, changes in the food habits and life style modifications and other activities like sports. A possible sign of early iron deficiency is reduced immune competence, particularly defects in cell mediated immunity and phagocytic activity of neutrophils which may lead to an increased risk for infection. As iron deficiency anaemia becomes more severe, defects arise in the structure and function of the epithelial tissue, especially the tongue, nails, mouth and stomach. The skin may appear pale and the inside of the lower eyelid may be light pink instead of red. Fingernails can become thin and flat and eventually spoon shaped nails (koilonychias) may be noted. Mouth changes include atrophy of the lingual papillae, burning, redness and in severe cases a completely smooth, waxy, and glistening appearance to the tongue. Angular stomatitis may also occur, as may a form of difficulty in swallowing.

A cross sectional study was conducted in 173 married adolescent girls between the age group of 15-19 years from urban slums near Pune city, India. The diet was assessed by two random 24-h recall. The age, weight, height, education, family size, income, physical work, and number of dayso menstrual loss were

recorded and also fasting blood was analysed for hemoglobin. The intake of micro- nutrients were 40 -75% less than the recommended dietary intakes for Indian adolescent girls. The high intake of phytates (171+/- 6 mg/ day) and low intake of vitamin 'C (25+/-lmg/day) resulted in low bio available iron intakes. The bioavailable iron intake was 0.76 +/- 0.3 mg/day for the adolescent girls. The prevalence of iron deficiency (hemoglobin<12gm%) was seen in 46.6% of Married Adolescent Girls[16].

A Study was conducted on anemia of Agakhan University. The results showed that out of 318 adolescent girls 104 (32.7%) were anemic with Hb level less than 10gms%. Iron deficiency anemia predominated among 63.5% women.A study was conducted on 'Food and nutrient intake among 12-15 years of 30 girls in rural Tamil nadu, South India. The study recommended improvement in standards of living of girls[17]. A study was conducted on Socio- demographic determinants of anemia in urban and rural areas of Oya State, Nigeria. The sample size was 597, simple random technique were used to select the adolescent girls from school. The result showed 32.8% of adolescent girls were anemic[18].

A study was conducted to evaluate the effects of iron deficiency on intelligence of 11-17 years students. This study was conducted on the 540 students (11-17 yrs). Data were analysedusing SPSS 13 and Chi2 and t-tests. Results showed that 78 (14.4%) students had iron deficiency, iron deficiency anemia was significantly higher in girls as compared with boys[19].

Conclusion

In summary, these data showed that 45 days of gooseberry juice reduces the clinical signs and symptoms of nutritional deficiency likeeyes, lips, tongue, skin, teeth, gums, nails, pallor.It gives relief also in the weakness of the nerves and the heart. Gooseberry juice is more effective than the guava juice which helps in iron absorption and reducing anaemia.

Acknowledgements

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