Research Article

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CORRELATION OF LEVEL OF HAEMOGLOBIN WITH IRON AND VITAMIN C AMONG ADOLESCENT GIRLS WITH IRON DEFICIENCY ANEMIA UNDERGOING NUTRITIONAL SUPPORT THERAPY

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ABSTRACT

The aim of the study is to find the correlation of haemoglobin with iron and vitamin c among adolescent girls with iron deficiency anemia undergoing nutritional support therapy at selected higher secondary school in Bangalore, Karnataka. Materials and Methods: An experimental design with pre test and post test control group was used for the study. The total sample consists of 120 adolescent girls between the age group of 14-17 years studying at selected higher secondary school using simple random sampling method. The sixty participants from Srigandhadakaval Public School was taken to control group and sixty participants from Gangothri Public School was taken to experimental group. Haemoglobin is estimated by using automated hematology analyser, iron by Ferene method and vitamin C by HPLC method. The Karl Pearson's correlation coefficient was carried out to correlate between level of haemoglobin vitamin c and iron. Results: Showed that the level of haemoglobin and vitamin C were highly correlated except in experimental pre test, the level of haemoglobin and iron were marginally correlated in control group as well as in the experimental group. Whereas the level of vitamin c and iron correlated in control group not in the experimental group. Conclusion: There was a positive correlation between level of haemoglobin with iron and vitamin C.

Keywords: Haemoglobin, vitamin c, iron deficiency anemia.

INTRODUCTION

Adolescence is a period of transition from childhood to adulthood, during which certain health problems and risk behaviours prevalent during this period influence their future health[1]. Iron deficiency anaemia is the most common nutritional anaemia affecting more than 2 billion people worldwide[2]. It can have profound negative impact on psychological and physical development, behaviour and learning performance, working capacities and reproductive health[3]. It can result from inadequate iron intake, reduced bioavailability of dietary iron, increased need for iron, chronic blood loss and parasitic infections[4].

Iron is very important in maintaining many body functions, including the production of haemoglobin that carries oxygen. Iron is also necessary to maintain healthy cells, skin, hair and nails. Iron from the ingested food is absorbed into the body by the cells that line the gastrointestinal tract. The body only absorbs a small fraction of iron. The iron is then released into the blood stream. There transferrin attached to it and delivers the iron to the liver. When red blood cells are no longer able to function (after 120 days), they are re-absorbed by the spleen. Iron from these old cells also is recycled by the body. Haemoglobin iron constitutes approximately 60-70% of the total body iron. The haemoglobin level is employed as the prime arbiter in the diagnosis of anaemia and its treatment. Approximately 1.0 g of iron stored as ferritin and haemosiderin. Iron is stored in the liver as ferritin and released as needed to make new red blood cells in the bone marrow. In normal subjects, the serum ferritin level is stable and its concentration is related to body iron stores. In iron deficiency, concentrations are less than 12 µg/L. Iron deficiencies is a systematic disorder involving multiple function rather than haematological condition[5].

Iron absorption is significantly increased by the presence of vitamin C, (ascorbic acid). Vitamin C, plays a vital role in the synthesis of red blood cells. Food iron is absorbed by the intestinal mucosa from two separate pools of haeme and nonhaeme iron. Haeme iron, derived from haemoglobin and myoglobin, is well absorbed and relatively little affected by other foods consumed in the same meal. On the other hand, the absorption of nonheme iron, the major dietary pool, is greatly influenced by meal composition[6].

MATERIALS AND METHODS

An experimental design with pre-test and post test control group was used for the study. This study was conducted among adolescent girls after getting Institutional Human Ethics Committee of Saveetha University, (011/01/2015/IEC/SU Dated 20/01/2015). Informed consent from parents and verbal consent was obtained from the adolescent girls for their participation in the study. The total sample consists of 120 adolescent girls between the age group of 14-17 years studying at selected higher secondary school using simple random sampling method. The sixty participants from Srigandhadakaval Public School was taken to control group and sixty participants from Gangothri Public School was taken to experimental group.

Inclusion and exclusion criteria: The study includes adolescent girls in the age group of 14-17 years, who were studying at selected higher secondary schools with hemoglobin level less than 12 gm/dL, attained menarche and willing to participate in the study. The study excludes adolescent girls with

hemogloin less than 7 gm/dL any systemic disease, with history of metrorrhagia/menorrhagia, reproductive disorders.

Phase I: A prior permission was taken from the school authorities. Informed consent from parents and assent was obtained from adolescent girls. The purpose of the study was explained to adolescent girls and their parents. The screening test was conducted in two steps. Check list was used to assess the signs and symptoms of anemia with the score of 1-26. The second screening test adopted was Sahlis method of measuring the level of haemoglobin as a confirmatory diagnostic investigation. These adolescent girls with mild and moderate anemia (Hb is 7-11.9 gm/dl) were selected as samples for the study.

Phase II: The structured interview schedule was used to collect demographic and clinical profoma including height, weight and BMI. The blood withdrawal procedure was explained in detail.

Blood Test: The participants who were identified by the checklist and Sahlis method were subjected to blood test analysis. The procedure of the blood test was explained to the participant. Helped the participant to assume comfortable position. The tourniquet was wrapped around the upper arm. The needle site was cleaned with spirit. The needle was inserted into the vein. 5 ml of blood was drawn. Removed the tourniquet from the hand. A gauze pad or cotton ball put over the needle site. Pressure was applied to the site and the bandage was applied.

Hemoglobin: Total 5 mL of blood collected in which 2 mL of blood was transfer to EDTA (ethlene diamino tetra acetic acid, anticoagulant) vacuitainer. The blood hemoglobin estimation was conducted in scan point diagnostic centre (NABL accredited laboratory) at Bengaluru. The level of hemoglobin was interpreted as normal (≥12gm/dL), mild (9-11.9g /dL), Moderate (7.1-8.9g/dL), and severe (<7g/dL).

Iron: The remaining 3 mL of blood was transferred to the clot activator tube for the estimation of serum iron and vitamin C. The iron estimation was done using Ferene method. The level of iron is interpreted as <50mg /dL (deficiency) 50-170mg/dL (normal).

Vitamin C: Estimation of serum vitamin C was done by HPLC method (high performance liquid chromatography). The level of vitamin C was interpreted as deficiency (<2mg/L) and normal (2-14mg/L).

Phase V: Nutritional support therapy was prepared from amla, jaggery and pumpkin leaves. The freshly prepared nutritional support therapy was given to the adolescent girls in the experimental group. It was administered to the adolescent girls in a quantity of 30 ml per day for duration of 90 days the with the help of an ounce glass. It was administered during the short break between 10.30- 10.45 am for the duration of 90 days from Monday to Saturday.

Phase VI: After 90 days, post-test was carried out with the same procedure.

Statistics: Karl Pearson correlation coefficient was carried out correlate level of haemoglobin, vitamin c and iron. The analysis and plotting of graphs were carried out using sigmaplot 12 (Systat software Inc., USA).

RESULT

Correlation of level of haemoglobin with vitamin C

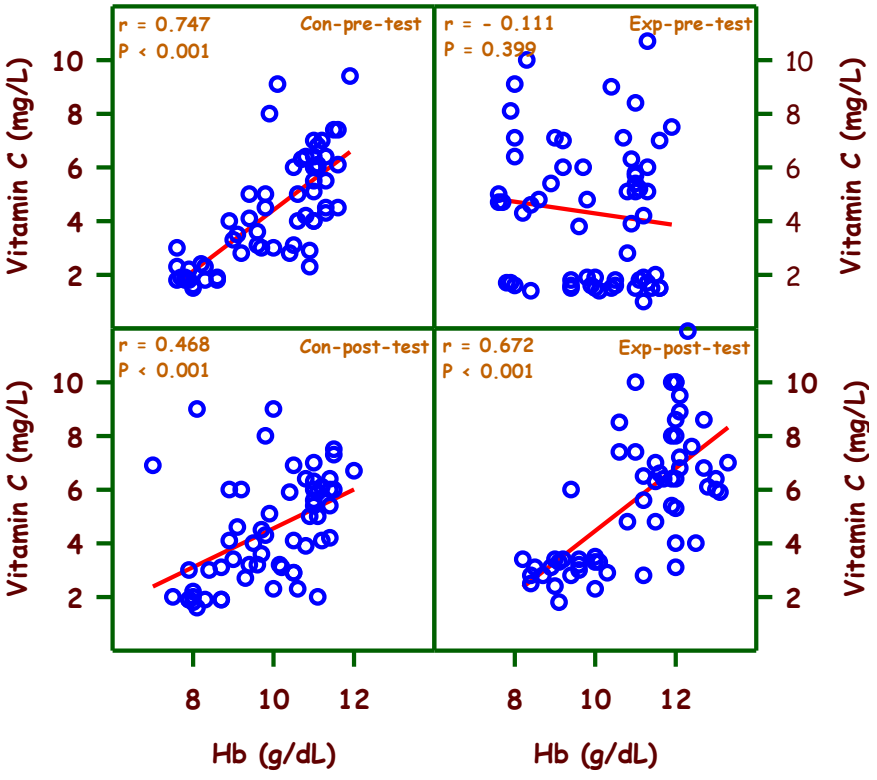

Figure 1

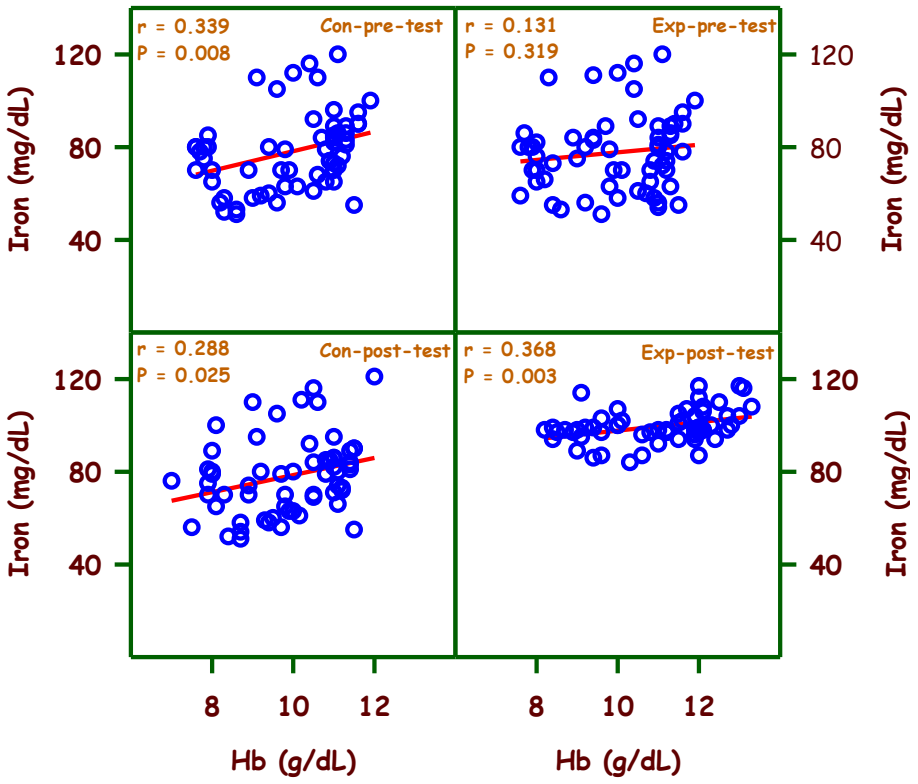

Figure 2

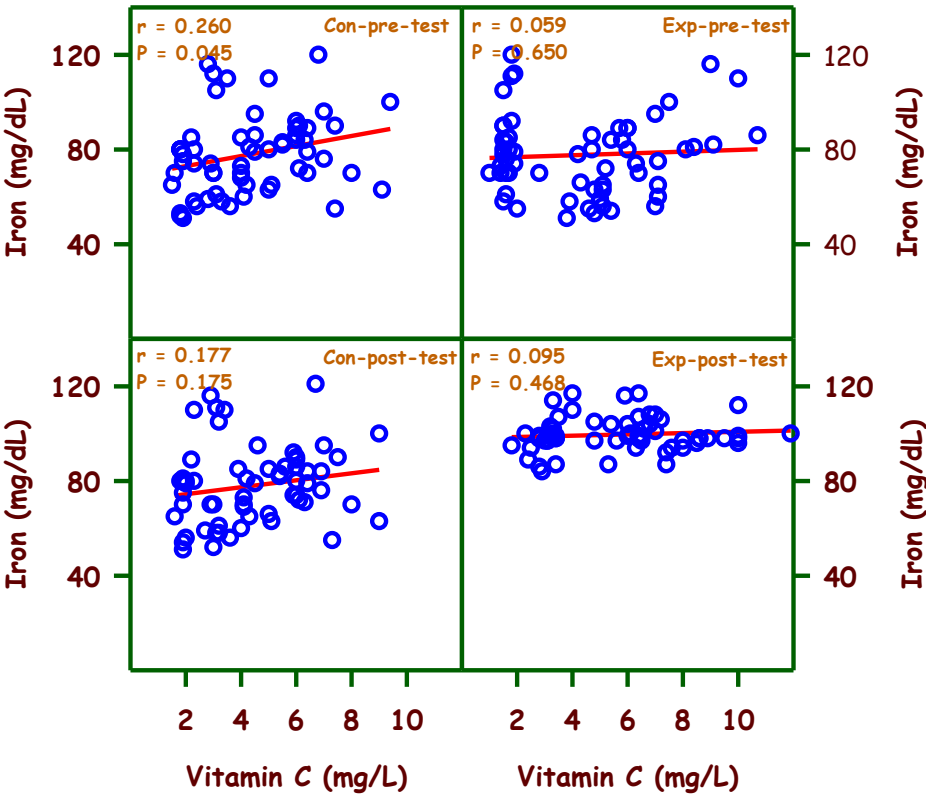

Figure 3

The figure 1 scatter plot represent the correlation between the level of haemoglobin with vitamin C among adolescent girls with iron deficiency anemia. It was found to be highly correlated in control group pre test ($r=0.747$, $p<0.001$) post test ($r=0.468$, $p<0.001$) and experimental post test ($r=0.672$, $p<0.001$) but in experimental pre test it was negatively correlated ($r=-0.111$, $p=0.399$).

Correlation of level of haemoglobin with iron

The figure 2 scatter plot shows that the correlation of level of haemoglobin with iron among adolescent girls with iron deficiency anemia. It was marginally correlated in control group pretest ($r=0.399$ $p=0.008$) and post test ($r=0.288$ $p=0.025$) as well as experimental pretest ($r=0.131$ $p=0.319$) and post test ($r=0.368$ $p=0.003$). This shows that the level of haemoglobin increases the iron level also increases.

Correlation of level of vitamin C with iron

The figure 3 scatter plot represents the correlation of level of vitamin C with iron among adolescent girls with iron deficiency anemia. It was found to be marginally correlated in control group pretest ($r=0.260$ $p=0.045$) and post test ($r=0.177$ $p=0.175$) but not correlated in experimental pretest ($r=0.059$ $p=0.0650$) and post test ($r=0.095$ $p=0.468$)

DISCUSSION

Iron deficiency anemia is the most common micronutrient deficiency in the world, bringing serious economic consequences and obstacles to national development. Accelerated growth during adolescence makes it a period during which earlier growth deficiencies might at least partially compensated. Therefore, adolescence is an opportune time for interventions to address anemia and improve their nutritional status, thus reducing reproductive risk and increasing productive capacity[7].

Vitamin C plays a number of important roles in the body, including enhancing the absorption of iron. Iron helps make hemoglobin, the part of the red blood cell that carries oxygen. Vitamin C also aids in red blood cell production. In the present study, the level of haemoglobin and vitamin c were highly correlated except in experimental pre test. It is supported by the study conducted among peritoneal dialysis patient to determine the vitamin c status in relation to haemoglobin level. The data indicated that vitamin c was positively associated with haemoglobin level[8].

Iron is an essential element for blood production. The iron stored in the body in the form of ferritin that circulate in the blood. Deficiency of iron can lower the haemoglobin level causing reduced oxygen support to the body tissues. In the present study level of haemoglobin and iron were marginally correlated in control group as well as in experimental group. Whereas the level of vitamin c and iron correlated in control group not in experimental group. This result is in consistent with study undertaken to investigate the correlation between haematological and cognitive profile of anemic and nonanemic school age girls. It was found that serum iron level was significantly lower in anemic girls compared to non anemics[9]. A study was conducted on correlation of haemoglobin and red cell indices with serum ferritin in Indian women in second and third trimester of pregnancy. This study was undertaken to document haematological profile of Indian pregnant women. The haemoglobin showed significant correlation with serum ferittin in iron deficiency anemia caes[10]. An iron supplementation intervention was conducted among 104 unmarried adolescent girls. It showed increment in level of haemoglobin in the group receiving iron supplements whereas haemoglobin decreased slightly in girls in the control group[11]. The effect of vitamin c supplementations on iron status in Chinese children indicated that vitamin c supplement was effective in correcting iron deficiency[12].

CONCLUSION

We found positive correlation between level of haemoglobin with iron and vitamin c. Iron deficiency anemia in India is a major health problem seen him late adolescent and young female population. Comprehensive intervention strategies are essential to combat the problems of iron deficiency anemia among adolescent girls such as in paired physical growth, poor cognitive development, reduced physical fitness, and work performance and lower concentration on daily tasks. There was statistically significant changes observed after the intervention between control and experimental group in changing the values of haemoglobin vitamin C and iron.

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