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PREVALENCE OF ANEMIA IN PTC GIRLS FOLLOWED BY SUPPLEMENTATION OF DATE BALL

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ABSTRACT

Iron deficiency is defined as decreased total iron body concentration. Iron deficiency anemia is the most common form of anemia. The present study was planned to perform in three parts to fulfill the objectives like pilot study that is prevalence rate of anemia in PTC girls (n=92), product development and supplementation of iron rich Date ball to the anemic girls for find out the bioavailability of nutrients. The present study indicated that 76% girls were anemic due to iron deficiency. When they were fed with the iron rich product i.e., Date ball for 21 days their hemoglobin content had increased and urinary calcium and creatinine content were decreased. Thus the product indicates a product shows the positive effect in anemic girls. Therefore it may be concluded that for prevention of anemia it is very essential to modify the meal that it provides the maximum amount of bioavailable iron.

Key words: *Bioavailability, Hemoglobin, Iron deficiency anemia, Supplementation.*

INTRODUCTION

Nutritional status is the condition of health of an individual as influenced by nutrient intake and utilization in the body. In developing countries like India various forms of malnutrition affect a large segment of population and both macro and micronutrient deficiencies are of major concerns. In developing world, approximately 146 million children are underweight. Out of these, 57 million children live in India [1] and over 90% Indian women, adolescent girls and children are anemic [2-4], indicating that the health of children is dependent upon food intake that provides sufficient energy and nutrients to promote optimal physical, social, cognitive growth and development. Inadequate energy and nutrients have a variety of poor outcomes including growth retardation, iron deficiency anemia, poor academic performance and development of psychosocial difficulties. It was reported that, etiology of linear growth retardation is multi-factorial but has been explained by three major factors: poor nutrition, high levels of infection and problematic mother-infant interaction, which is closely related to the socio-economic status of the family [5].

Iron deficiency anemia is due to decrease in the number of red cells in the blood caused by too little iron. Iron deficiency anemia is the most prevalence micro nutrient deficiency in the world. In normal individuals there is a complementary relationship between the nutrient intake and the nutritional status. The amount of nutrient absorbed from the diet must be enough to overcome the need for that nutrient and it must play its metabolic role in the body.

This nutritional equation may be thrown off balance by insufficient intake or absorption of nutrient and by increased needs or losses. Any one or combinations of reasons result in reduced availability of the nutrient to the body. The body when faced with this situation initially uses its own reserves. After the exhaustation of its reserves, if the nutrient intake still remains inadequate the function in which the nutrient is active is affected. In case of iron, its deficiency results in lowered hemoglobin level and this condition is known as iron deficiency anemia. This is an actually the last stage of iron deficiency and it represent the end point of a long period of iron deprivation.

The objectives of the present study were (i) to carryout the study to know the prevalence of anemia in PTC Girls of Anand Peoples Medicare Society campus, Anand (ii) to develop an iron rich product and its nutritional assessment (iii) supplementation of experimental products (30 g date ball per day) to the anemic girls followed by clinical assessment. (iv) to assess the calcium and creatinine level in blood and urine samples of these girls.

MARERIALS AND METHODS

The experiment was divided into three parts including the pilot study, product development and supplementation of product to the anemic girls.

The first part deals with the prevalence rate of anemia in 92 PTC girls of Anand Peoples Medicare Society campus to assess the nutritional status of adolescent girls using clinical assessment such as blood and urine analysis. The hematological auto analyzer was used for blood analysis. Further factors such as general information, medical information, and dietary information were studied for their influence on nutritional status. Hemoglobin (Sahli's method), serum calcium (Arsenzo III Kit method) [6] urinary calcium (Arsenzo III Kit method) [6], serum creatinine [7] and urinary creatinine [8] level were estimated at the beginning and at the end of the feeding trial as an indicator of body iron and calcium status.

The second part of the study deals with the development of different proportion based product prepared with the objective of increasing available iron in the daily diet of adolescent girls. Recipe as "Date ball" was initially selected randomly by variation in ingredient levels. From these the experimental product was selected. The experimental product was analyzed for the nutritional parameters i.e. fat (Soxhlet method), protein (Kjeldhal method, 1965), Iron [9], Calcium [10] and phosphorus [11]. For standardization of experimental product, incorporation of different proportion of ingredients was used. Five different combinations were tried for Date ball preparation. All the experiment products were tested by the selected panel members. The final experimental Date ball was selected on the basis of its sensory score and also the product which has highest nutritive value.

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The third part of the study deals with the supplementation of experimental product to the selected anemic girls and then biochemical analysis of their blood and urine samples was performed.

Based on the pilot study data (part 1), 26 anemic girls (Hb<10g/dl) were selected as experimental subjects after obtaining their willing consent. They were requested to follow the general pattern of diet without much variation during the experiment feeding period. Subjects were then fed 15 gm of two Dates balls (which would be consumed in one serving as a snack) during day time for 21 days. Hemoglobin, serum calcium and urinary calcium, serum creatinine and urinary creatinine level were estimated at the beginning and at the end of the feeding trial as an indicator of bioavailability of iron and calcium status. The statistical analysis was performed using the SPSS software.

RESULTS AND DISCUSSION

In the first part of the blood and urine samples of study total 92 girls were clinically analyzed. The hemoglobin results indicated that around 70 (76%) girls were anemic and 22 (24%) girls were found normal. The average hemoglobin value of 70 girls was 10.079 g/dl which was indicating the anemic condition due to nutrient deficiency, while 22 girls had the normal range of hemoglobin value that was 12.650 g/dl. Thus there was a highly significant difference (**$p<0.01$) as compared to the normal girls. Serum calcium and creatinine values were slightly higher in the anemic girls compared to that of normal girls and there was no significant difference between the two groups. Urinary calcium values were slightly lower in the anemic girls compared to normal girls, while the urinary creatinine values were slightly higher in the anemic girls compared to normal girls. (Fig. 1)
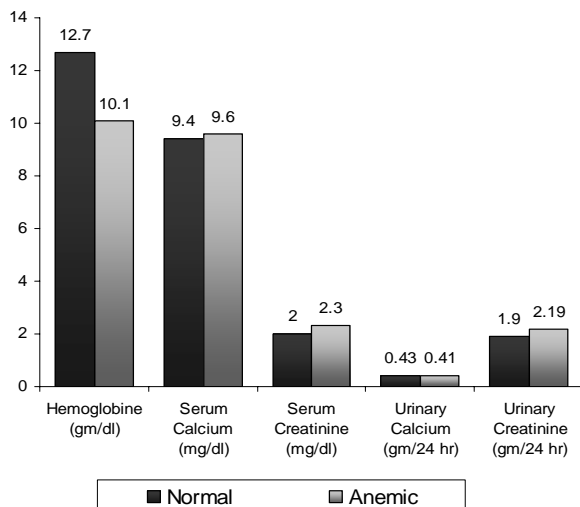
Fig. 1 Clinical parameters of normal and anemic PTC girls during pilot study

Out of 70 anemic girls, 15 girls had low RBC value which indicates that the subjects are suffering from iron deficiency anemia. The monocyte values were in the range of 7.7 to 10.7%. The anemic subjects 49 out of 70 shows the higher range i.e. more than 8% which was responsible for iron deficiency anemic condition. The haematocrit values were lower than the normal range in 54 anemic girls out of total 70 anemic subjects which may be due to the iron deficiency. The

mean cell volume (MCV) 50 out of 70, mean cell hemoglobin (MCH)   52 out of 70 and mean corpuscular hemoglobin concentration (MCHC) 48 out of 70 subjects shows the lower values compared to normal range. The clinical research suggests that the lower MCV value is responsible for the iron deficiency anemia. The blood red cell distribution width (RDW) values were higher in 67 anemic girls which indicate that the anemic condition is due to the iron deficiency. The mean platelet volume (MPV) and platelet (PLT) values were normal in both groups and it has no relation with the anemic condition. The plateletcrit (PCT) values were higher than the normal range in 67 anemic girls and it was responsible for the anemic condition. So the blood parameter and higher or lower values of hemoglobin were suggested that the anemic condition in most of the 70 girls may be due to the iron deficiency.

As a part of pilot study the questionnaire was also filled up by the subjects. The questionnaire contained the common questions collected to their food habit and suffering from any clinical symptoms. The hemoglobin value of anemic girls indicated that 47% of girls were suffering from headache, 67% of girls were suffering from fatigue and 9% of girls were suffering from anorexia.

Results of pilot study suggested that the anemic condition in 70 girls was due to iron deficiency. So the second part of the study was planned with the objective of developing the iron rich product. The date ball was selected as an iron rich product. Initially different combinations of all ingredients were tried theoretically with respect to nutrient content. The best combination which contained all the nutrients in the higher amount was selected as an experimental product. Table 1 gives the nutrient content of experimental Date ball. The analyzed value of fat, calcium, phosphorus, iron and protein were almost similar to the theoretical value. Slightly higher or lower values were due to the varietals difference in the ingredients. According to Recommended Dietary Allowances (RDA) requirement 30% of fat, 14.1% of calcium, 9% phosphorus, 7.5% of iron, 4.77% of protein requirement per day was fulfilled by the experimental product.

Table - 1 Ash, fat, calcium, phosphorus, iron and protein content of experimental product.

No.	Parameter	Theoretical	analytical	30 g/day	RDA/day
1.	Ash (gm %)	-	5.667 ±0.981	-	-
2.	Fat (gm %)	19.890	19.568 ±1.006	4.467	15-20
3.	Calcium (mg %)	281.800	277.500 ±3.118	84.54	600
4.	Phosphorus (mg %)	204.250	185.000 ±2.357	61.275	700
5.	Iron (mg %)	4.217	4.000 ±0.128	1.275	17
6.	Protein (gm %)	9.545	11.550 ±1.189	2.863	60

Mean of 3 replications ± SEM

After product development study the developed date ball was supplemented to the selected anemic girls. The hemoglobin value of after supplementation was increased in 80% girls compared to the before supplementation and it shows highly significant difference. Serum calcium values did not show much difference either before or after supplementation. The clinical research also suggests that the iron rich supplementation did not change the normal Serum calcium level. Serum creatinine values were found to get decreased after

supplementation, and it shows highly significant difference compared to initial value. The clinical research was also in support that when the calcium absorption is increased the serum creatinine level decreases. Urinary calcium and creatinine values were lowered after supplementation and it indicated that the calcium absorption was increased and excretion was decreased (Fig. 2).
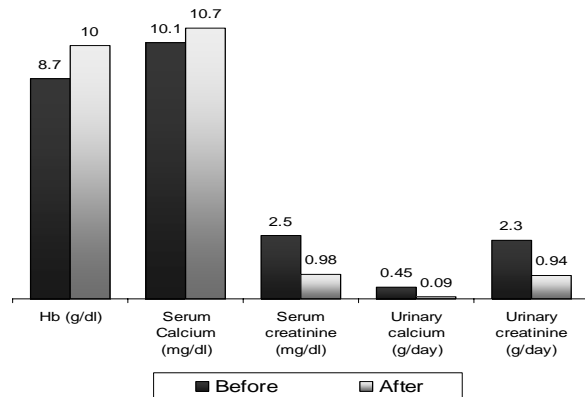
Fig. 2 Comparison of clinical parameters of anemic girls with respect to before and after supplementation

SUMMARY AND CONCLUSION

Iron deficiency anemia is the most prevalent micro nutrient deficiency in the world. The present study was planned to perform in three parts to fulfill the objectives like pilot study for find out the prevalence rate of anemia in PTC girls, product development and supplementation of iron rich Date ball to the anemic girls for finding the bioavailability of nutrients. The hemoglobin value of all subjects were categorized for the anemic (Hb<12 g/ dl) and non-anemic girls (Hb>12 g/dl). The blood parameter of anemic and non-anemic groups was analyzed and the RBC (red blood cell) WBC (white blood cell) and lymphocyte range were normal in both groups. Monocyte value in anemic group was higher. HCT (hematocrit), MCV (mean cell volume), MCH (mean cell hemoglobin), MCHC (Mean corpuscular haemoglobin concentration) values was lower in anemic group and RDW (Red cell distribution width) and PCT (Plateletcrit) values in anemic group was higher than the normal range.

Part 1 study indicated that 76% girls were anemic due to iron deficiency so the second part of the study was dealt with the product development. Dates ball which contain all the nutrients in higher amount were selected as an experimental product.

The third part of the study was carried out for the supplementation of iron rich product to the 26 selected anemic girls (Hb<10g/dl). The experimental subjects were fed two Dates ball (30 gm) per day for 21 days and after supplementation the clinical analysis of blood and urine were estimated.

The hemoglobin values after supplementation was increased in 80% girls which indicated that the iron bioavailability was increased by the anemic girls. In serum calcium values there was not much more difference after supplementation and serum creatinine values were decreased after supplementation. The urinary calcium and creatinine values were decreased after supplementation which indicated that the calcium absorption has increased.

Recent studies indicate that the intervention lead to decrease in the severity of anemia but incidence of anemia still remains very high. Therefore it is now very essential that a basic change in the dietary pattern be made in the meal is so modified that it provides the maximum amount of bioavailable iron.

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