

Impact of dietary intervention with a functional food supplement to combat anemia - the blood iron metabolic disorder among the coffee plantation laborers

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ABSTRACT

Objective: To assess the nutritional status and other nutrition related problems of the workers. To design, implement and evaluate the impact of dietary intervention for the nutritional metabolic disorder which is directly related to productivity.

Background: Indian economy greatly relies on agriculture. Agriculture is set to play a more dynamic role in the economy. The present study focuses on the nutritional status with special reference to the blood iron profile of manual coffee plantation laborers belonging to Kodaikannal, Tamil Nadu, India. The outcome of this study on the dietary intervention, based on nutritional picture of coffee plantation laborers, will have a nationwide application because of the simplified, stable coffee plantation operations throughout India.

Method: Experiments were carried out in three phases. In the first phase, the personal background of the laborers was assessed. In the second phase, the nutritional and health status of the laborers, through dietary survey comprising 24 Hour Food Recall record and weighment of cooked food consumed for three consecutive days, clinical and biochemical profile were studied. The serum iron was measured with the total iron binding capacity, from which the transferrin saturation was calculated. In the third phase, dietary intervention was implemented with a nutrient rich nutraceutical food supplement - *spirulina* incorporated soup. The supplementation was extended for a period of 120 days. The subjects were grouped into control and the experimental group. The control group was given plain soup and the experimental group was administered with soup incorporated with *spirulina*. The impact of intervention on the biochemical and nutritional profile of the laborers was reassessed in similar working conditions.

Results: A deficit of 0.1 mg to 0.3 mg of iron intake per kg body weight in the male and female laborers was observed when compared to their RDA. The clinical pictures reveal that

94 percent suffered from anemia, 56 percent showed anemic signs of spooning of nails (koilonychia), 36 percent of the subjects had glossitis (mouth ulcer), 16 percent suffered from bleeding gums, 4 percent had cheilosis (ulceration of tongue) and 28 percent had angular stomatitis. The average hemoglobin level was 8.6 ± 1.12 g/dl for men and 8.1 ± 1.01 g/dl for women which are 28 and 37 percent less than normal respectively. Dietary intervention of 5g of *spirulina* in 150 ml of soup had significantly improved the blood iron profile. Among the male laborers, 10 percent who suffered from *severe* anemia with $7.9 \text{ g}\cdot\text{dl}^{-1}$ hemoglobin before intervention were shifted to *moderate* levels of $9.4 \text{ g}\cdot\text{dl}^{-1}$, 30 percent who suffered from *mild* anemia were shifted to *normal* ones and among 60 percent of male laborers who were moderately anemic, 50 percent reverted to *normalcy*.

Conclusion: In the present study it was observed that the habitual dietary intake showed deficiency in consumption of iron rich foods and the clinical picture revealed the signs and symptoms of anemia. The blood iron profile - Hemoglobin (Hb), Serum Iron, Transferrin Saturation, Serum Ferritin, Total Iron Binding Capacity (TIBC) and Unsaturated Iron Binding Capacity (UIBC) were greatly influenced by dietary intervention with the functional food *Spirulina* incorporated soup. The blood hemoglobin content increased by 21 percent *i.e* from 10.9 to $13.3 \text{ g}\cdot\text{dl}^{-1}$. Serum iron, serum ferritin and transferrin levels showed a consistent and progressive rise while TIBC and UIBC reduced resulting in a positive iron balance.

Keywords: Dietary intervention, functional food, *Spirulina*, hemoglobin, anemia