

**ABSTRACT**

The present study was undertaken to quantitatively evaluate the nutritional status and knowledge, attitudes and practices of adolescent girls under recently launched NAGS of ICDS. Keeping in view the limitations in terms of both the interventions, namely dietary supplementation and NHHCC education, the interventions of ongoing scheme were improved upon in the improved module of NAGS. The impact of improved module of nutrition and health education along with modified and enhanced supplementation was also assessed in quantifiable terms. It was a pre-and post-design study conducted on 171 adolescent girls in the age group of 9-15 years belonging to periurban area of Panchkula city, who were selected purposively and served as EXPT group. For the purpose of evaluation of ongoing scheme, 60 adolescent girls from two blocks of Sirsa district of Haryana were enrolled, which served as ONG group.

Demographic profile of girls of both EXPT and ONG group revealed that girls of both groups had same low socio-economic conditions. The ecological background of girls of both groups also exhibited poor household and environmental conditions.

Dietary and nutrient intake of girls revealed that the meal pattern was similar in both groups and majority of the girls followed three-meal pattern daily. There was no significant difference in food intake of girls of both groups, except milk and milk products, pulses and tubers. Intake of milk and milk products was significantly higher by girls of ONG group, though inadequate as compared to RDA whereas intake of pulses and tubers was significantly higher by older girls of EXPT group. The intake of even staple foods i.e. cereals and pulses was deficient to the extent of 50 - 60% of RDA in all girls. In younger girls of both groups, the intake of nutrients was more or less similar, except for intake of vitamin C, calcium and potassium, which were found to be significantly higher in girls of ONG group. In the older girls (13 - 15 years age group), a significant
difference was observed in the intake of all nutrients, except carbohydrates, fat, vitamin A and niacin. All the nutrients in the diet of these girls were deficient to the extent of 50% or more, except thiamin and phosphorus, which were adequate.

All girls were shorter and lighter as compared to their respective NCHS standards. The percentile status of girls revealed that the deficit in height and weight increased with increasing age. Indices based on height and weight i.e. height-for-age and weight-for-age revealed the prevalence of stunting to the extent of 31% and 39% and underweight to the extent 64% and 68% in girls of EXPT and ONG group respectively. Among other linear and circumferential measurements, all measurements had lower values as compared to their respective standards and there was no significant difference between the two groups, except in case of calf circumference, which was found to be higher in girls of EXPT group.

The biochemical examination of blood/serum of girls of both groups revealed no significant difference in hematological profile, indicators of iron status and indicators of protein status. The girls of both groups had Hb level below the normal value (12gm /dl) in all age groups, majority of the girls being in Grade I & II of anaemia. Low values of indicators of iron and protein status as well as indices based on Hb, PCV and RBC i.e. MCV, MCH and MCHC indicated the prevalence of hypochromic microcytic anaemia in girls of both groups. Clinically, the incidence was higher (54.4%) in girls of EXPT group as compared to 33.3% in girls of ONG group.

The Physical Fitness Index (PFI) scores revealed no significant difference in girls of both groups in all age groups, except 10 and 13 years age groups, in which PFI scores of girls of ONG group were higher as compared to girls of EXPT group. The scores of girls of both groups were poor in all age groups to begin with.
After giving dietary supplementation of 125 gms comprising of puffed rice, roasted Bengal gram/groundnuts and gur to girls of EXPT group for 3 months, height and weight of girls increased significantly in all age groups, resulting in an improvement in their percentile status. Height and weight velocities accelerated and their acceleration was higher than NCHS standards in all age groups, it being higher in younger girls as compared to older girls. At this stage, the Hb level of girls increased marginally and majority of girls still continued in same grades of anaemia, except for the severely anaemic girls, who improved and shifted to better Hb status.

After supplementing the girls for 3 months, dietary supplementation was discontinued for 3 months to evaluate the effect on catch-up growth. During this period, height and weight gain, though marginal and insignificant, continued but there was no change in percentile status of girls. Height and weight velocities deescalated as compared to supplementation period and were below NCHS standards. Six monthly increments revealed higher height increments and comparable weight increments as compared to NCHS standards in all age groups. Prevalence of stunting was reduced by only 11% and under weight by 4% in these girls. However, there was no change in Hb level of girls in all age groups and girls continued in same grades of anaemia.

In order to treat anaemia, promote physical growth and improve physical work capacity of girls, nutrient supplementation (containing 20 mg of elemental iron and 0.1 mg of folic acid) was given along with dietary supplementation for 4.5 months. During this period, there was again significant gain in height and weight of girls resulting in improvement in their percentile status. Height and weight velocities again accelerated but the acceleration was less as compared to first three months of supplementation period. Stunting was further reduced by 3% but the prevalence of under weight remained more or less the same. All
circumferential measurements, except MUAC and calf circumference, linear measurements and skinfold thicknesses increased significantly in all age groups. Hb, PCV and RBC level of girls increased significantly in all age groups and majority of the girls shifted to normal and grade 1 of anemia. Normal MCV, MCH and MCHC values indicated improvement in hematological status and correction of hypochromic microcytic anaemia. Indicators of iron and protein status improved significantly, indicating better availability and utilization of iron for Hb synthesis. This improvement manifested clinically in terms of significant reduction in incidence of iron deficiency anaemia.

With a decline in incidence of iron deficiency anaemia, PFI scores of girls improved significantly in all age groups, though most of the girls were at the threshold of being average.

An improvement in nutritional status of these girls occurred as a result of dietary and nutrient supplementation, which increased the total food intake and consequently nutrient intake of girls. Besides this, another intervention i.e. NHHCC education given to these girls through improved module of NHHCC increased the quality and quantity of home diet.

The girls of ONG group, who visited the Anganwadi centers of their villages only once a while and received the dietary supplementation on an average of not more than twice a week for six months. There was a significant gain in height and weight of girls but the percentile status remained the same in all age groups, as it was to begin with. Height and weight velocities accelerated but the acceleration was less than NCHS standards upto 11 years in case of height and 13 years in case of weight and higher thereafter. Prevalence of stunting reduced by 9% and under-weight by 3% at this stage. All the circumferential measurements, except MUAC revealed a significant increase in girls of this group.
Biochemical profile of girls revealed no significant change in Hb, PCV and RBC level of girls in all age groups. However, severely anaemic girls improved, whereas older girls who had attained menarche, deteriorated in their Hb status. There was no significant improvement in indicators of iron and protein status, indicating poor availability and utilization of iron for haemopoietic activity. The improved Hb status of severely anaemic girls manifested clinically in terms of reduction in clinical signs of iron deficiency anaemia in girls of this group.

The PFI scores of girls of ONG group also increased significantly in all age groups, except 10 and 13 years age group, girls being categorized as average in 10 – 13 years and poor in 14 – 15 years age group.

The marginal improvement in nutritional status of girls of this group occurred as a result of dietary supplementation, increasing the total food intake and hence the nutrient intake. Besides this, marginal increase in food intake and consequent nutrient intake occurred in girls of this group which could be an indirect impact of NHHCC education given to these girls for six months or an impact of seasonal variations after six months.

The direct impact of NHHCC education was assessed on knowledge, attitudes and practices of girls after giving NHHCC education through improved module of one year to girls of EXPT group and through educational package of NAGS of six months to girls of ONG group.

The results of pre-test scores revealed no significant difference in scores of attitudes between the two groups but a highly significant difference in scores of knowledge and practices, the scores being significantly higher in girls of ONG group. It was found that older girls had better pre-test scores in most aspects of knowledge, attitudes and practices as compared to younger girls in both groups.
After the educational intervention, the post-test scores of girls of EXPT group revealed a significant increase in all aspects of knowledge, attitudes and practices, the highest increase being in the area of knowledge (41 – 47%) followed by practices (39 – 45%) and least in attitudes (26 – 31%) in both age groups.

In ONG group, the overall increase in post-test scores was significant in case of knowledge (11 – 13%) but insignificant in case of attitudes and practices in both age groups.

A significant correlation between knowledge and practices followed by knowledge and attitudes was observed but the correlation between attitudes and practices was not significant. Another interesting finding was that improvement in scores of knowledge, attitudes and practices was higher in younger girls as compared to older girls.

Thus, a combination of dietary and nutrient supplementation for longer duration especially if given before menarche along with NHHCC education to younger adolescent girls would improve their nutritional status and knowledge, attitudes and practices vis-à-vis NHHCC as well as the nutritional status of their future generations too.