ABSTRACT

Nutrition is a fundamental base of human life, health and development across the entire life span; from the earliest stages of foetal development, at birth, through infancy, childhood, adolescence and into adulthood and old age. Lack of the essential nutrients- vitamins and minerals- continue to be pervasive and they overlap considerably with problem of malnutrition. Iron and iodine deficiencies are most commonly prevalent among pregnant women, further extended to the developing fetuses in the womb affecting their mental and physical development. These deficiencies are also striking school aged children during their growth spurt and pubertal stages affecting their physical and mental productivity.

Combating these essential micronutrient deficiencies using a single, cost effective and a vehicle with stable formulation is the need of the hour to improve the status of the vulnerable population. Hence, National Institute of Nutrition (NIN) has developed a double fortification strategy with iodine and iron fortification in a same vehicle- Double fortified salt (DFS).

The present study was divided into three phases. Initial two phases were carried out to assess the efficacy of Double Fortified salt (NIN-DFS) supplementation towards combating iron and iodine deficiencies amongst vulnerable population- pregnant women and school children. The study subjects included, N=121 pregnant women (enrolled from a semi government hospital, Vadodara), N=947 school children (Rural villages of Vadodara). The pregnant women were divided into experimental and control groups based on the DFS as supplementation strategy/ non supplementation throughout gestation. However, school children were subdivided into four groups (E+DW, E, C+DW, C groups) including DFS and deworming as dual interventions for 9 months.

An estimation of iron and iodine content of the NIN-DFS revealed 40 ppm and 1050 ppm respectively which remained 37.5 ppm and 979 ppm indicating stability of DFS after one year.

Third phase of the study included medium and small salt producers were advocated and monitored towards technical salt iodization and three of them were further motivated to initiate DFS production at local level. There were N=38 producers enrolled from Anand, Kheda,
Nadiyad, Bharuch and Vadodara districts. Later N=3 producers were further included in the study phase towards assessing feasibility process for DFS production.

Efficacy of DFS supplementation was assessed using biochemical estimations (Hb, UIE, Thyroid hormones) and by cognitive tests (DMT, CT, VMT) of the subjects. Impact of salt advocacy was measured using salt iodine content estimation (Iodometric titration method).

The results at baseline for pregnant women on their nutritional status and biochemical parameters indicated 35% undernutrition, 90% iron deficiency (Hb estimation) and 16.79% iodine deficiency (UI estimation). Towards the end of the study, there was nominal improvement in proportion of non anemic subjects in experimental and reduction in control group. However, mean Hb (Baseline-9.44 g/dl to end-9.86 g/dl) improved significantly (p<0.001) among experimental group compared to non significant reduction (Baseline-9.35 g/dl to end- 9.15 g/dl) among control group. Median UIE was observed to be highest during second trimester among both the groups (333.2 µg/L) and it remained >150 µg/L for both the groups throughout gestation indicating sufficient dietary iodine through DFS and iodized salt consumed by experimental and control group respectively. Thyroid hormone analytes (TSH, FT4, TT4) remained in the normal ranges and no serious anomalies were observed on the neonatal outcomes. The results on the DFS supplementation or no supplementation including deworming as an additional strategy among school children (5-15 years) were availed. School children (N=947) were enrolled and subdivided into E+DW, E, C+DW and C groups randomly. Overall baseline data on anthropometry indices (CDC standards 2000) revealed 44.60% stunting, 70.78% underweight and 54.16% thinness amongst the children. However, 98% of the children were anemic and 30% were iodine insufficient. Towards the end, mean Hb improved (0.42 g/dl) significantly (p<0.001) compared to decrease (-0.54 g/dl) among control groups. Median UIE improved significantly (p<0.001) in both the groups and the prevalence of iodine deficiency decreased significantly (p<0.001). Thyroid hormones (TSH, FT4, TT4) were observed to be normal amongst majority of the children. IQ/cognition scores also improved significantly among experimental groups (p<0.01) compared to control groups. Visual memory test scores were observed sensitive towards IDA.

Nutrition health education (NHE) could play a vital role on KAP and dietary intake of the study population. Further, it helped to irradiate inappropriate food taboos and blind believes among
the study population related to food intake during pregnancy. However, NHE provided to the parents of the school children, helped to meet major proportion of RDA of the children. While data from salt iodization units (small scale and medium scale) revealed that, 20.6% producers iodizing at 30 ppm (recommended standards at production level) at baseline which improved significantly to 58.8% towards the end. Conceptualization of DFS has also achieved success, having N=3 producers being motivated to undergo training and production unit upgradation towards DFS production at local level.

Thus, our study concludes that, DFS could improve iron and iodine status of the experimental group compared to control group along with alternative strategies provided. Our NHE could benefit study population remarkably. It could also be stated that, production of DFS at local level could be achieved in nearing future. Further, it is recommended that, DFS shall be used as one of the crucial strategies for controlling iron and iodine deficiencies among all age groups.