C H A P T E R IV

S U M M A R Y

SUMMARY

It is well-known that a substantial segment of the population in developing countries is undernourished and malnourished because of poor economic capacity as well as ignorance about the possibility of using available foods to best advantage. Children and expectant and nursing mothers are more vulnerable to malnutrition both because of food-sharing practices and increased requirements.

At present, attempts are being made to organize school lunch programmes in primary schools. Most such programmes are dependent on supplies from CARE, UNICEF etc. However the needs of rural areas can sometimes be more conveniently met by using locally available foods.

The present studies were attempted in this context to assess the extent of undernutrition and malnutrition in school children in rural areas and to study the impact of school lunch programmes based on locally available foods on their nutritional studies. Apparently well-nourished children in the upper class were studied for comparison.

The children in rural areas were physically stunted as compared to upper class children. Their body weights and heights were 4.0 kg and 5 cm less

than the upper class children. Their diets were deficient in calories, protein, vitamin A, calcium and riboflavine. This was reflected in the greater prevalence of clinical deficiency symptoms.

A lunch based on wheat, legume (peas or bengalgram), leafy vegetables and buttermilk and providing 800-900 Calories, 24 to 28 g of protein 2630 i.u. of carotene were provided for a period of six months to forty children in the village. Wheat and legume were used in the proportion 4:1 or 8:1.

A similar lunch was given in the following year with minor modifications. The response of the children to the lunch was measured in terms of weight and height increments, disappearance of deficiency symptoms and the composition of blood and urine. Children not receiving the lunch were used as controls.

The 'fed' children were found to show superior increments of weight, height, serum protein, albumin and carotene as compared to controls. They also showed some suggestion of improvement in skeletal development as judged by radiological examination. However,

symptoms of vitamin A deficiency such as dryness of the conjunctiva were found to persist in some children. The response of blood hemoglobin levels was not as much as was expected.

Attempts were also made to assess the impact of the 'CARE' lunch programme in a tribal area of Gujarat. The difference between the 'fed' and control children in this area where the programme had been in operation for two years compared with that in the studies described. The beneficial effects of the programme were found to be much greater during adolescence as judged by weight gain and cortical thickness of the second metacarpal bone.

In view of persistence of clinical symptoms of vitamin A deficiency in some of the 'fed' children and low hemoglobin levels, additional investigations were made on the availability of β-carotene in leafy vegetables and the effects of vitamin B_{12} supplementation. Both these investigations were carried out in adults. Groups of subjects were given a basal lunch for a period of three months. One of them received in addition 2000 i.u. of vitamin A palmitate in oil.

Another group received 50-60 g of leafy vegetables in lieu of carotene. A third group served as a control. About 50-60 g of leafy vegetables were found to compare with 2000 i.u. of vitamin A with regard to increments in serum vitamin A levels which increased from 11 to 27 µg per 100 ml. The control groups showed no such increment. The group supplemented with leafy vegetables also showed an increase in serum carotene from 9 to 24 µg per 100 ml. The availability of β-carotene in the leafy vegetables was estimated to be of the order of 50%. In retrospect, it is felt that the school lunch could have included 50-60 g of leafy vegetables as against 30 g provided.

Vitamin B_{12} (5 µg per day) supplementation with or without the intrinsic factor for a period of 3 months was found to have no effect on either hemoglobin or serum protein and albumin.

It is concluded from these studies that a lunch providing cereal, legume and a liberal amount of leafy vegetables (50-60 g) can correct the basic deficiencies in the diet of school children. This lunch would compare well with processed foods reinforced with vitamins and minerals.

The results also suggest a more serious state of undernutrition during adolescence.

It is further concluded that the carotene in leafy vegetables is well-utilized and that although ordinary diets are apparently poor in vitamin B_{12} there is no deficiency with regard to this vitamin.