
UNIT 12 STRATEGIES TO COMBAT PUBLIC NUTRITION PROBLEMS-I

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12.1 INTRODUCTION

In Units 3 and 4, we learnt about the various public nutrition problems, their causes and consequences. In Unit 10 we have discussed the on going nutrition programmes of the country. In this and in the next unit we will learn about various strategies to combat these public nutrition problems. We already know that there are multiple causes of public nutrition problems. Therefore, we require multiple strategies to combat these problems. In most instances, for maximal effectiveness, desirable control programmes will include a variety of intervention strategies/approaches operating concurrently and attacking various facets of the causative factors at the same time so that the basic problems are being modified. What are these possible strategies? What is the basis of these strategies? These are a few aspects covered in Unit 12. This Unit will focus on the diet or the food-based and nutrient based strategies. The relationship between immunization and malnutrition, genetics and biotechnology as one of the strategies to combat malnutrition, role of clean water and sanitation to combat malnutrition is the focus of Unit 13.

Objectives

After going through this unit you will be able to:

- highlight the various strategies to prevent malnutrition,
- differentiate between food-based and nutrient based strategies,
- describe the various food-based strategies namely, diet diversification, food fortification, horticulture intervention, nutrition and health education, and
- discuss supplementation as a nutrient based strategy.

12.2 STRATEGIES TO COMBAT NUTRITION PROBLEMS

PEM and micronutrient malnutrition are problems of global proportion. Micronutrient malnutrition, as we have already studied earlier in Unit 3, is a term commonly used to

refer to vitamin and mineral deficiency diseases. Diets which lack adequate amounts of essential vitamins and minerals lead to such diseases. *Vitamin A deficiency, iron deficiency anaemia and iodine deficiency disorders* are among the most common forms of micronutrient malnutrition. Other micronutrients found in food, including vitamins such as thiamin, niacin, riboflavin, folate, vitamins C and D, and minerals such as calcium, selenium and zinc can also significantly affect health when dietary deficiencies exist. Micronutrient deficiency is “hidden hunger” in that most people who suffer from these deficiencies are not aware of that they are suffering from anything. It has not been until quite recently that the scientific and public health community has begun to understand the extent and impact of these public nutrition problems and develop programs to combat them.

The primary causes of most micronutrient malnutrition are inadequate intakes of micronutrient-rich foods and impaired absorption or utilization of nutrients in these foods due to partly infection and parasitic infestation, which also increase metabolic needs for many micronutrients. Poverty is often at the root of malnutrition and is also linked to inadequate access to food, sanitation and safe water and to lack of knowledge about safe food handling and feeding practices.

Recognizing this aspect, the Government of India’s Policy for control of public nutrition problems currently combines both short, as well as, long term measures and recommends a comprehensive strategy, addressing the following issues to achieve the goal of improving the nutritional status of the population:

- a) Diet/Food-based strategies viz. dietary diversification/modification, food fortification, horticulture intervention, nutrition/health education,
- b) Nutrient based strategy i.e. distribution of vitamin and mineral supplements.
- c) Immunization programme in the context of public nutrition programmes.
- d) Supplementary feeding programmes.
- e) Improving the quality of food produced by genetic approaches.
- f) Clean water and sanitation as a strategy to combat public nutrition problems.
- g) Improving Food and Nutrition Security.

The strategies are not exclusive of the other; rather they are complementary and may be of greater or lesser value according to present and changing circumstances. In fact we need to understand that the public nutrition problems usually do not exist in isolation, thus, a strategy for a given problem, area or a specific population would likely incorporate many interventions - supplementation, fortification, dietary diversification, as well as public health measures. The appropriate mix of interventions depends on the specific context. Remember, there is NO ‘ONE-SIZE-FITS-ALL’ STRATEGY.

A review of these strategies is presented in this and the following unit. Here, in this Unit the focus is on the food-based and nutrient based strategies. So let’s get started.

12.3 DIET OR FOOD-BASED STRATEGY

Malnutrition, particularly micronutrient deficiency, usually occurs when diets lack variety. Since the problem is mainly of dietary origin, it would perhaps be logical to presume that policies/strategies need to be developed and implemented which ensure year round access and consumption of an adequate variety and quantity of good quality, safe food. Foods provide several essential micronutrients, simultaneously addressing a combination of deficiency problems. Furthermore, physiological interaction, between vitamin and minerals can enhance the body’s ability to absorb essential micronutrients. It is in this context that diet or food-based approaches as preventive strategies to combat malnutrition are gaining momentum.

Food-based strategies are defined as a preventive and comprehensive strategy that uses food (i.e. whole, refined form, processed, fortified or a combination) as a tool to overcome micronutrient deficiency.

Diet and food-based approaches play an essential role in preventing micronutrient malnutrition by increasing the availability and consumption of micronutrient-rich foods. In the long-term, such approaches are more likely to be sustainable. However, you would realize that the benefit of such approaches is not immediate. If overt micronutrient malnutrition (such as xerophthalmia, goitre or cretinism, or severe iron deficiency anaemia) is present, short-term supplementation programmes already discussed in Unit 10 would need to be implemented in addition to starting food-based activities. We will look at the supplementation as a strategy to combat malnutrition later in this unit. Now let us look at the benefits of food-based strategies. The benefits of food-based strategies go beyond the prevention and control of micronutrient deficiencies. These are highlighted in Box 1.

Box 1	Benefits of Food-based Strategies
The benefits of food-based strategies include: - They are preventive, cost-effective and sustainable. - They can be adapted to different cultural and dietary traditions and locally feasible strategies. - Because they are broad-based, aiming to improve the overall quality of the diet of a population, they can address multiple nutrient deficiencies simultaneously. - Because the amounts of nutrients consumed are within normal physiological levels, the risk of toxicity is minimized. - Food-based strategies support the crucial role of breastfeeding and the special diet and care needs of infants and young children. - Food-based approaches foster the development of sustainable, environmentally sound food production systems. Agricultural planners are alerted to the need to protect the micronutrient content of soils and crops. - Food-based strategies build partnerships among governments, consumer groups, the food industry and other organizations to achieve the shared goal of overcoming micronutrient malnutrition.	

Food-based approaches, therefore, are preventive, cost-effective and sustainable long-term strategy to combat malnutrition, particularly the micronutrient deficiency. A comparison of the cost-effectiveness of food-based programmes versus supplementation has demonstrated that food-based approaches are preferable because they are generally less costly, more sustainable, better able to target vulnerable groups and have multiple nutritional benefits. Food-based strategies also promote sustainable improvement by encouraging long-term behaviour changes. The modification of behaviour leading to better selection or preparation of food so as to enhance intake or bioavailability of nutrients is the primary goal of the approach. Few important food-based approaches which can bring a qualitative improvement in the nutritional status include:

Dietary diversification/modification to promote year round availability, access to and utilization of foods which promote the increased intake and absorption of nutrients

Horticulture intervention including home gardening addressing issues of food production, preservation, processing, marketing and preparation

Food fortification to improve dietary intake of nutrients and their bioavailability

Nutrition and Health Education to promote food-based approaches.

You may recall studying briefly about these food-based strategies earlier in Unit 3 under section 3.4 and 3.5 while studying about the nutritional deficiencies. A detailed discussion on these approaches is presented next in this unit.

12.3.1 Dietary Diversification/Modification

Dietary change or modification, as a food-based approach to improve nutritional status is important. With respect to improving vitamin A status or iron status, evidence suggests that dietary modification is the most cost-effective measure. Let us see how?

Green leafy vegetables, we know, are the predominant sources of micronutrients for all, particularly for the poor people. In India, for example, the prevailing vitamin A malnutrition reflects the inadequate intake of these beta-carotene rich foods. Efforts in combating vitamin A deficiency must therefore, be logically directed towards augmenting the availability and intake of these relatively inexpensive foods. Abundant sources of vitamin A exist. However, the contribution of such plants to alleviating micronutrient deficiencies is greatly underappreciated. Among the wide range of green leafy vegetables, drumstick leaves (*Moringa oleifera*) in particular provide a very rich and inexpensive source of pre-formed vitamin A, in addition to other important micronutrients. Native to India, the tree grows abundantly in all tropical countries where vitamin A deficiency is a problem. A glassful of fresh drumstick leaves contains the daily requirement of vitamin A for up to ten people, or small amounts of less than 10 gm of fresh leaves can meet the day's requirement of vitamin A of preschool children. Hence advocating and implementing such dietary modifications can go a long way in improving the vitamin A status of population groups.

Similarly, examples of relatively small modifications/changes in food behaviour/skills which can have a significant impact on iron status are highlighted in Box 2.

Box 2	Examples of Relatively Small Changes in Food Behaviour/ Skills which can have a Significant Impact on Iron Status
	<i>CHILD FEEDING (New Behaviour)</i> - Feeding colostrum instead of discarding it - Breastfeeding as long as possible, but not beyond the 2nd year - Introducing complementary foods rich in iron at six months - Providing small but frequent meals to the child - Adopting a 5-6 meal pattern for infants/children - Starting family food by one year of age - Cooking food in iron vessels - Introducing variety of food in the diet of infants - Feeding items which inhibit or compete with iron absorption in between meals rather than with meals: Milk with high calcium content may be given in between meals or/and at bed time <i>GENERAL EATING HABITS</i> - Consuming iron-rich food more frequently. Infact including atleast one source/serving of iron-rich food in each meal, if possible. - Eating new food combinations to enhance iron absorption. Including fruits (specially rich in vitamin C) with or directly after meals rather than only between meals.

Consuming leaves or other part of the food that are not traditionally consumed

Avoiding or reducing the consumption of tea and coffee with meals

Adopting practices such as fermentation/germination, where not practised to increase the bioavailability of foods.

NEW SKILLS

Preparation of recipes using higher proportion of iron-rich foods

Appropriate household-level preservation methods for fruits, vegetables, fish and meat

Food preparation methods that preserve micronutrients i.e. short cooking time, steaming, adding food to boiling water rather than cold water, adding just enough water to aid cooking rather than cooking in large amounts of water and draining excess water after cooking.

Mashing and, if necessary, straining fruits and vegetables so they can be eaten by infants.

* Adapted from FAO/IISSI 1997

The objective of dietary diversification is to ensure that individuals get essential nutrients in sufficient amounts through their daily diet. The modification of the behaviour leading to better selection or preparation of food so as to enhance intake or bioavailability of these nutrients is the primary goal of this approach.

Dietary diversification to include more micronutrient rich food is an ideal and sustainable long term solution. Improvements can be made, as you may have noticed in the examples above, through the introduction of new crops, better cooking or food at the home, better storage or preservation methods, improving food safety or the promotion of more varied diets through nutrition education.

In adopting dietary diversification as a food-based strategy to prevent micronutrient deficiency, certain steps have been suggested which are listed in Box 3.

Box 3	Steps in Adopting Diet Diversification/Modification as a Food-Based Approach
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The steps suggested in adopting diet diversification as a food-based approach include:

Assess what people are already eating, describing the daily meal pattern - the foods/meals consumed and the items/dishes included therein - and describing how dietary patterns are changing. Remember, food preparation methods are culturally and economically determined and should be approached with care and respect.

Determine/analyse the bioavailability of the nutrient say availability of iron, calcium etc. in the diet.

Assess what can be modified with respect to:

- composition of meals (given the local food availability, cost and cultural factors)
- food preparation

Implement such modifications. For example frying and fermentation decrease levels of beta-carotene in foods by about 25%; vitamin C is destroyed by

cooking. Losses of both beta-carotene and ascorbic acid are greatly reduced when vegetables are placed in boiling water and cooked for the minimum time necessary. Steaming in a covered pan preserves nutrients even more effectively.

Assess the impact of approach i.e. in case of iron deficiency anaemia reassess Hb levels (i.e. before and after improved practices)

Source: Adapted from WHO (1994)

Geared with the knowledge about how to adopt dietary diversification as a food-based strategy, we must further understand that dietary change programmes may be more sustainable at the family and community level when food sources are locally available and have the advantage of providing other nutrients and dietary factors to improve absorption and utilization of micronutrients. Dietary diversification, it must be noted, is cheaper than any form of supplementation or fortification. First and foremost, it requires a minimal amount of money, it promotes intakes of a whole range of micronutrients rather than singling out and tackling just one, it is sustainable, it fosters community and individual involvement, and can help stimulate local food economy. Furthermore, this approach does not “medicalise” food and nutrition, rather it enables individuals, families and communities to maintain their own health and nutrition. The key to this solution lies in bringing about a shift away from the growing of just staple crops, to a diversity of crops in the fields.

The “World Declaration and the Plan of Action on Nutrition”, adopted by 159 countries at the International Conference on Nutrition jointly organized by FAO and WHO in 1992 states that strategies to combat micronutrient malnutrition should:

“Ensure that sustainable food-based strategies are given first priority particularly for populations deficient in vitamin A and iron, favouring locally available foods and taking into account local food habits.”

Furthermore, it pleads forcefully in its Plan of Action for a policy of:

“...promoting the dissemination of nutrition information and giving priority to breast feeding and other sustainable food-based approaches that encourage dietary diversification through the production and consumption of micronutrient-rich foods, including appropriate traditional foods. Processing and preservation techniques allowing the conservation of micronutrients should be promoted at the community and other levels, particularly when micronutrient-rich foods are available only on a seasonal basis.”

These statements are a clear call for the action that is urgently needed to promote dietary diversification for the prevention and control of micronutrient deficiencies.

With a clear idea about the role of dietary diversification in combating public nutrition problem, we move on to the next food-based strategy i.e. horticulture interventions.

12.3.2 Horticulture Interventions

Let us begin our study on horticulture intervention as a strategy to combat malnutrition by considering the following case studies:

Case Study 1: Papaya saplings, drumstick trees and amaranth seeds were distributed to mothers of preschool children, up to 30% of whom were landless, living in South India. Local agricultural officers demonstrated how to plant and care for the trees and beds of amaranth. The gardening demonstration project raised the women’s awareness of the significance of vitamin A-rich foods in their children’s diets.

Case Study 2: Vegetable gardens (10 m plots) planted for a harvest sequence of spinach- fenugreek-safflower-dock-amaranth-dill-amaranth-spinach provided well over 100% of the recommended daily allowance for a family of five. Harvesting the leaves early in the day and eating the leaves within 3 hours after harvest provided the highest beta-carotene intake (Josh and Aralkar 1994).

Having gone through these case studies, what can you conclude? Yes, any programme/intervention that increases the production of micronutrient-rich foods is likely to have a beneficial effect on the awareness and the micronutrient status of a population.

Horticulture inputs including home gardening addressing issues of food production, preservation, processing, marketing and preparation are innovative measures targeted to meet the goal of reducing the incidence of malnutrition and deficiency disorders. Home gardening as a traditional family food production system is widely practised in many homes and societies. *FAO* states that “the home garden is an important land unit for households as it is often the center of family life; a well developed home garden is a complete farming system; the home garden is the most direct means of supplying families with most of the non-staple foods they need year-round. Home garden has also been defined as a small-scale, supplementary food production system by and for household members that mimics the natural, multi-layered ecosystem. Indigenous gardens have been a part of household production systems since the beginning of agriculture and remain important for food supply, nutrition and income in both industrialized and developing countries.

Studies indicate that initiation of home gardens is possible and, if implemented effectively, could have a comprehensive impact on community development, health, nutrition and household food security in target populations. But, the use/effectiveness of home gardening as a strategy to combat micronutrient deficiency in India is limited to vitamin A deficiency control programmes. The Departments of Agriculture and Social Forestry are making efforts in this direction. The Indian Council of Agricultural Research (ICAR) has established 695 *Krishi Vigyan Kendras* or Farm Science Centres so far in various parts of the country to impart training in agriculture technologies to farmers. In the past, the major thrust was on cereal and millet production. It is only in the recent years that horticulture production is receiving emphasis. Women Extension Workers are trained not only in agriculture technologies, but also in home gardening and preparation of recipes based on locally available nutritious foods.

In our discussion above so far we have focussed on home gardens. Besides home gardening, community and family vegetable and fruit gardens play a significant role in increasing small-scale production of micronutrient-rich foods. School-based gardening programmes can be an excellent means of introducing new ideas about gardening and a useful channel for reaching others in the community, as children tend to be more open than adults to the adoption of new ideas. School-based programmes can reduce micronutrient malnutrition by:

- promoting consumption of fruits and green leafy vegetables,
- teaching students how to establish and maintain home gardens,
- introducing students to food preparation and storage techniques,
- providing nutrition information and encouraging adolescent girls to adopt more healthful dietary habits before their first pregnancy, and
- enhancing the status of and students’ interest in agriculture and nutrition as future occupations.

A successful example of school gardening project is illustrated in Box 4

Box 4	Successful Gardening Promoted Through Schools - the Asian Vegetable Research and Development Centre Case Study
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A model school garden project in Taiwan developed a 10 × 18 m school garden that provided half a cup of vegetables per day for each of 142 children throughout the school year, using indigenous plants. Each garden consisted of 12 raised beds that over the course of the year contained four or five vegetables. Garden produce provided an estimated 58% of the daily vitamin A requirement and 285% of the daily vitamin C requirement for a 10-year-old child.

Having gone through the discussion above it must be evident that if planned and designed with a good understanding of local circumstances, gardening is an effective food-based approach to improving micronutrient status. A variety of micronutrient-rich crops can be grown by making use of available space, soil, water and microclimates. Gardening can be promoted at the household or community level or at schools.

Programmes that promote small-scale production of micronutrient-rich foods can mobilize communities by appealing to community members' perceived needs (e.g., to increase food supply or generate income) in addition to offering to improve nutritional quality of the local food supply. Women are often more interested than men in working in such community projects, and their involvement can improve their income and social status. Even more important, children's nutrition benefits the most when women retain control of income generated by community projects.

With this we end our study of horticulture intervention, we move to the next important food based strategy i.e. fortification. But first let us recall what we have learnt so far.

Check Your Progress Exercise 1

1. Enumerate the strategies, which can be adopted to achieve the goal of improving the nutritional status of the population.
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2. What are food-based strategies? What are their benefits?
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3. Discuss the role of dietary diversification in combating public nutrition problem.
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.....
4. 'Home gardening is an effective food-based approach to improving micronutrient status'. Comment on the statement giving appropriate examples.
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.....

Continuing with our study on food-based approached, we now move on to fortification as a strategy to combat malnutrition.

12.3.3 Food Fortification

The addition of nutrients to foods in order to maintain or improve the nutritional quality of individual foods or the total diet of a group, a community or a population is referred to as *food fortification*. As per the Food Safety and Standard Authority of India

notification (FSSAI, 2018), fortification means deliberately increasing the content of essential micronutrients in a food so as to improve the nutritional quality of food and to provide public health benefit with minimal risk to health. Fortification as defined by the Codex Alimentarius is *“the addition of one or more essential nutrients to a food, whether or not it is normally contained in the food, for the purpose of preventing or correcting a demonstrated deficiency of one or more nutrients in the population or specific population groups”*.

While studying about fortification, you may come across other terminologies such as fortificants, fortified food. What are these terms?

‘Fortificant’ means a substance added to food to provide micronutrients but does not include nutraceuticals or food for Specific Dietary Uses.

‘Fortified Food’ means a food, as specified under the Food Safety and Standard (Food Product Standards and Food Additives) Regulations (2011), that has undergone the process of fortification as per the provision of these regulations.

Having looked at these terms can you now illustrate one example of food fortification in our country. Yes, the iodization of salt is a classical example of food fortification. Extensive tests, using iodine fortified salt in the community, have demonstrated the effectiveness of the fortified salt in improving the iodine status and reducing the prevalence of iodine deficiency disorders.

Specific benefits of food fortification include the following:

It can provide wide population coverage. Combined nutrient fortification can address multiple deficiencies.

It encourages industries to be socially concerned and to add nutritional value to their products. It provides opportunities for consumers to become involved in food quality issues and creates demand for safe, wholesome food.

In developing countries, fortification is increasingly recognized as an effective medium- and long-term approach for improving the micronutrient status of large populations. Fortification does not require changes in the dietary habits of the population, can often be implemented relatively quickly and can be sustainable over a long period of time. It is considered by World Bank, as one of the most cost-effective means of overcoming micronutrient malnutrition.

So, then what is the philosophy behind the addition of nutrients to food? Is it purely nutritional considerations or are other factors involved? Basically essential nutrients are added to foods for the purposes of contributing to any of the following:

- a. Preventing or reducing the risk of, or correcting, a demonstrated deficiency of one or more essential nutrients in the population or specific population group;
- b. meeting requirements or recommended intake of one or more essential nutrients;
- c. maintaining or improving health;
- d. maintaining or improving the nutritional quality of foods.

Harris has described six distinct philosophies of food fortification which are reviewed herewith:

1. *Fortification for restoration to normal level:* We have read above that nutrients can be removed or destroyed in food processing or storage. Under such circumstances, fortification may be undertaken for addition of nutrients to replace those removed or destroyed.

2. *Fortification above normal level:* Addition of nutrients to certain foods for special dietary uses is allowed. In special purpose foods i.e. foods for infants or geriatric food or foods for use in weight reducing diets, nutrients may be added in quantities well above the natural level with the intention of supplying the total nutrient requirements in the minimum amount of food consumed, perhaps in a normal daily portion of the particular food.
3. *Enrichment with public health objective:* Fortification of salt with iodine is in fact a classical example of enrichment with public health objective. Food or series of foods as a vehicle is used for distributing nutrient supplement linked to a demonstrable need for these nutrients in the population or in a particular segment of the population.
4. *Enrichment of 'substitute' foods to equivalent nutrient level:* With advancements in food science and technology, new products are being developed as alternates to natural products. A need has risen to ensure that these foods supply equivalent amount of important nutrients. This is where fortification assumes importance. The fortification of margarine with vitamin A is an example of this kind of fortification.
5. *Fortification to make a food complete in itself:* Under this philosophy, each food might contain adequate amount of the nutrient required for its metabolism. For example, suitable quantities of group B vitamins might be added to sugar or other heavily sweetened foods to provide for the demand of carbohydrate metabolism.
6. *Addition of nutrients for non-nutritional purposes:* You may recall studying about the use of carotene, riboflavin etc as natural colouring matter in foods. Similarly the addition of ascorbic acid, vitamin E etc. as antioxidants is prevalent. Addition of nutrients for technological reasons as mentioned above is the philosophy here.

With these philosophies in mind we can now appreciate the importance and scope of food fortification. However, for maximum effectiveness of this strategy certain basic criteria should be satisfied. These include:

There should be a demonstrated need for a nutrient in one or more population groups

Food selected as a vehicle for the nutrient(s) must reach the population at risk

The amount of nutrient added to food will supply adequate intake when the food is consumed in normal amounts by the population at risk

The amount of nutrient added will not be toxic or harmful to individuals with a high intake of the fortified food

The nutrient is biologically available in the form in which it is added and is stable in the food selected as a vehicle

The food selected does not seriously interfere with the utilization of the nutrient

Addition of the nutrient has no detrimental effect on flavour, shelf-life, colour, texture or cooking properties of the food

Fortification is technically feasible for the particular food

The cost of fortification does not result in a significant change in the cost of food

A method of controlling and/or enforcing the level of fortification is available

Selection of the carrier for fortification is a critical step and several required characteristics of the carrier have been noted. The identified vehicle must be consumed in roughly constant quantities throughout the year by the majority of the population. The food must pass through a centralized point to facilitate a rigidly controlled fortification process. The addition of fortificants at the required levels must not affect the organoleptic qualities of the food. Thus if a fortifiable food exists that is consumed by many people at risk of developing a deficiency/malnutrition, fortification is likely to be the most cost-effective component of any control programme.

Considering these aspects various carriers for fortification and standards for fortification of food products have been provided by FSSAI (Food Safety and Standard (Fortification of Foods) Regulations, 2017). These include:

1. Fortification of Salt with Iodine

Salt shall be fortified with iodine and may also be fortified with iron in combination with iodine, at the level given in the Table 12.1:

Table 12.1: Standards for Fortification of Salt with Iodine

S.No.	Components	Level of Nutrients
1.	(a) Manufacture level	Not less than 30 parts per million on dry weight basis
	(b) Distribution channel including retail level	Not less than 15 parts per million on dry weight basis
2.	Iron content (as Fe)	850-1100 parts per million

2. Fortification of Vegetable oil with Vitamin A or Vitamin D

Vegetable oil may be fortified with the following micronutrients, singly or in combination at the level given in the Table 12.2:

Table 12.2: Standards for Fortification of Vegetable oil with Vitamin A or Vitamin D

S.No.	Nutrients	Minimum Level of Nutrients	Source of Nutrients
1.	Vitamin A	25 IU per gm of oil	Retinyl acetate, Teinyl palmitate and Retinyl propionate
2.	Vitamin D	4.5 IU per gm of oil	Cholecalciferol and ergocalciferol

3. Fortification of Milk with Vitamin A or Vitamin D

Standardized, toned, double toned or skimmed milk may be fortified with the following micronutrients, singly or in combination, at the level given in Table 12.3.

Table 12.3: Standards for Fortification of Milk with Vitamin A or Vitamin D

S.No.	Nutrients	Minimum Level of Nutrients per liter of toned/double toned/skimmed milk	Source of Nutrients
1.	Vitamin A	770 IU	Retinyl acetate, Retinyl palmitate and Retinyl propionate
2.	Vitamin D	550 IU	Cholecalciferol and ergocalciferol

4. Fortification of Vanaspati

Vanaspati, shall be fortified with the following micronutrient at the level given in the Table 12.4.

Table 12.4: Standards for Fortification of Vanaspati

S. No	Nutrients	Level of Nutrients
1.	Synthetic Vitamin A	Not less than 25 IU per gm at the time of packing. Should be test positive when tested with Antimony Trichloride (Carr-Price Reagent) as per IS:5886-1970

5. Fortification of Atta

Atta, when fortified, shall contain added iron, folic acid and vitamin B₁₂ at the level given in the Table 12.5:

Table 12.5: Standards for Fortification of Atta

S. No.	Nutrients	Minimum Level of Fortification per Kg
1.	Iron-Sodium Iron (III) Ethylene diaminetetra acetate, Trihydrate (Sodium federate-Na Fe EDTA)	20 mg
2.	Folic acid	1300 µg
3.	Vitamin B ₁₂ - hydroxycobalamine;	10 µg

6. Fortification of Maida

Maida, when fortified, shall contain added iron, folic acid and vitamin B₁₂ at the level given in Table 12.6.

Table 12.6: Standard for Fortification of Maida

S. No.	Nutrients	Minimum Level of Fortification per Kg
1.	Iron –(a) Ferrous citrate, Ferrous lactate, Ferrous sulphate, ferrous pyrophosphate, electrolytic iron, ferrous fumarate (b)Sodium Iron (III) Ethylene diamine tetra acetate, Trihydrate (Sodium federate-Na Fe EDTA)	60 mg 20 mg
2.	Folic acid	1300 µg
3.	Vitamin B ₁₂ - hydroxycobalamine;	10 µg

7. Fortification of Rice

Rice, when fortified, shall contain added iron, folic acid and vitamin B₁₂ at the level given in Table 12.7.

Table 12.7: Standards for Fortification of Rice

S. No.	Nutrients	Minimum Level of Fortification per Kg
1.	Iron-(a) Ferric pyrophosphate(b)Sodium Iron (III) Ethylene diamine tetra acetate, Trihydrate (Sodium federate-Na Fe EDTA)	20 mg
2.	Folic acid	1300 µg
3.	Vitamin B ₁₂ - cynocobalamine, hydroxycobalamine;	10 µg

In addition, *Atta*, *Maida* and Rice may also be fortified with the following micronutrients, singly or in combination, at the level given in Table 12.8.

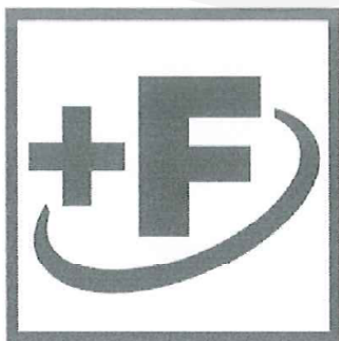
Table 12.8: Standards for Fortification of *Atta*, *Maida* and Rice with Micronutrients

S. No.	Nutrients	Minimum Level of Fortification
1.	Zinc- zinc sulphate	30 mg
2.	Vitamin A- Retinyl acetate, Retinyl palmitate and Retinyl propionate	1500 µg RE
3.	Thiamine (Vitamin B ₁)- Thiamine hydrochloride, Thiamine mononitrate;	3.5 mg
4.	Riboflavin (Vitamin B ₂)-Riboflavin, riboflavin 5'-phosphate sodium;	4 mg
5.	Niacin-Nicotinamide, Nicotinic acid;	42 mg
6.	Pyridoxin (Vitamin B ₆)-Pyridoxine hydrochloride;	5 mg

With respect to infants and young children, who are undoubtedly vulnerable, for a number of reasons, fortification of complementary foods is positively one important preventive strategy for iron deficiency. More recently, multiple fortifications - fortifying wheat flour and other selected food items with nutrients like iron and B-Complex vitamins has also been suggested for our country. Fortification with two micronutrients (e.g. iron and vitamin A or iron and vitamin C) would enhance the effect of fortification on micronutrient status. This is particularly important with respect to infants/young children, in whom the prevalence of multiple nutrient deficiencies is high.

Fortification is being promoted through both, the open markets and the government safety net programme, such as Integrated Child Development Scheme (ICDS), Mid-Day-Meal Scheme (MDM) and Public Distribution System (PDS). It is estimated that through the ICDS and MDM programme, benefit of food fortification could reach 18 crore beneficiaries. As the beneficiaries are provided with only one meal through the safety net programme, the consumption of these fortified products will ensure in meeting 30-50 percent of RDA along with dietary diversifications.

Although, fortification may be effective without consumer education, it is generally considered wise to include a consumer education component, only to avoid incorrect information. Education may also be required when the fortified product requires different handling during household storage and when certain cooking or product use practices result in loss of the fortificant. A logo for consumer in identifying fortified staples known as the “+F” logo.



Further, educational programmes may be required along with food fortification, particularly if (i) the fortification causes any change in the flavour, appearance, cooking properties, or cost of the food, (ii) there is a danger that the home treatment of the food may remove or destroy the added nutrient. For example, some people may be accustomed to washing impure salt before using it. If salt of this kind is iodized, consumers must be educated not to wash it because washing will remove all the iodine, or iii) the programme depend on the addition locally of a centrally prepared premix. iv) packaging and labeling requirements, under this following points are need to be taken into consideration while packaging the fortified food products: a) All fortified food shall be packaged in a manner that takes into consideration the nature of the fortificant added and its effect on the shelf life of such food. b) Every package of fortified food shall carry the words “Fortified with...(name of the fortificant)” and the logo, as specified above. c) Every package of food, fortified with Iron shall carry a statement “Not recommended for people with Thalassemia and people on low iron diet”.

With this we end our study on fortification. You would realize that the success of food-based strategies lies in effective nutrition communication. How nutrition communication can promote food-based strategies, is the focus of the next section.

12.3.4 Nutrition and Health Education

In our discussion above we have highlighted that diet diversification, agricultural production of micronutrient-rich foods and production of micronutrient-fortified processed foods enhance micronutrient availability. However, achieving increased consumption of these foods may require a change in food habits. This is not easy. Such a change requires a vigorous and concerted effort through a variety of communication channels, e.g., radio/television, print media and interpersonal communications. Nutrition communication, can be a powerful force in helping individuals make sound decisions about what they purchase, grow and eat. There is conclusive evidence that nutrition communication can convey information, help people develop necessary skills and motivate people to make lifestyle changes. Evidence from India indicate that nutrition communication alone without any other input can be a promising approach for bringing about improvement in dietary behaviour. Nutrition education can convey information, persuade individuals to consume food rich in micronutrients, choose fortified foods, and prepare food in new ways to protect their nutrient content and change patterns of feeding children.

So then what is nutrition communication or nutrition education? *Nutrition Education is that group of communication activities aimed at achieving a voluntary change in nutrition-related behaviour to improve the nutritional status of the population (FAO).*

The Government of India's policy for control of nutritional anaemia, for example, includes Nutrition /Health Education as one of the major long-term measures to prevent iron deficiency. The National Consultation on Control of Nutritional Anaemia (GOI 1998) recommended that the existing Nutritional Anaemia Control Programme should be comprehensive and incorporate Nutrition Education through school health and ICDS infrastructure to promote:

regular intake of iron/folic acid-rich foods by all age groups

consumption of foods that increase absorption of iron and vitamin C and avoid foods which inhibit iron absorption (tea/coffee), and

adequate availability of iron-rich foods by:

- increasing their production through development of kitchen gardens in homes, schools and the villages
- development of iron fortified foods and promoting their consumption.

Based on these guidelines the key messages to promote good iron status among children through diet diversification/modification have been identified and highlighted in Box 5.

Box 5	Key Nutrition Messages to Improve Iron Status
	Breast feed the child exclusively for 0-6 months Introduce complementary food at 6 months of age Ensure adequate inclusion of iron and vitamin A/C-rich food or foods fortified with iron in the household diet Provide lots of green leafy vegetables such as mustard, fenugreek, bathua, spinach and coriander etc.

Avoid serving tea/coffee along with meals (atleast 2-3 hours before or after a meal)

Serve a glass of fresh lemon juice along with meals rather than tea/coffee.

Add a few drops of lemon juice in dal/vegetable preparations.

Cook food in iron pots/kadhai. This will provide the much needed iron to keep the body healthy

Include flesh foods (meat, poultry, liver, fish) in the diet, whenever possible

Use fermented and sprouted foods such as sprouted pulses

Wash raw foods thoroughly before eating or serving to children

Remove milk from the meal and serve it between meals or at bed time.

Adapted from GOI (1996), WHO (1994)

Experiences have shown that the most successful behaviour-change nutrition education projects are based on systematic planning. A theoretical framework for planning nutrition education interventions has been proposed by *Adrien and co-workers*. The framework highlights four phases - conceptualization, formulation, implementation and evaluation - as its components which are described later in Unit 15 in this course booklet. Planning a nutrition education intervention to prevent micronutrient deficiency, would require consideration on the following issues:

What are the factors contributing to the micronutrient deficiency?

Which food or food-related behaviour to promote or change?

Who does the message need to reach?

How should the message be presented?

What communication channels should be used for maximum impact?

A detailed discussion on these aspects and other issues related to nutrition and health education is presented later in Units 15-18. Hence, we shall not go into the details here in this unit.

What we must emphasize here is that any nutrition communication programme should aim to reach the wider population. For example, a communication campaign that aims to improve micronutrient intake in young children must be directed at the children's care-givers. Besides the mothers, caretakers, or those who prepare families' food and supervise the feeding of children it is also important that those who make decisions and shape opinions about food consumption patterns in the household are included in the campaign. In any community, religious, traditional and cultural leaders can influence shifts in food behaviour and sanction new customs. In certain regions, fathers do the shopping and control the money used to buy food. In many cultures, the father decides what food is served in the household and how it is apportioned. For these reasons, targeting messages only at mothers, caregivers may be ineffective. It is also important to provide nutrition education for school children, girls out of school and adolescents, as they are future parents and need to be aware of how to maintain or improve their dietary habits.

From our discussion above you may now be able to appreciate the role of nutrition and health education in improving the nutritional status of community groups. But, it must be emphasized here that for any nutrition communication programme to be effective and to bring about a lasting change it must focus on exposing the target population to the messages and on the retention of the message on the part of the

audience. A long term carefully sequenced communication effort is necessary to achieve permanent change in food behaviour. Repeated exposure to the message is extremely crucial for long lasting effects. Specialists in public health communication have noted the phenomenon of behaviour decay, or reversion to an original behaviour pattern in the absence of periodic reinforcing messages. Experiences from the Expanded Food and Nutrition Education Programme (EFNEP) in USA indicate that it may take years for the desired changes in behaviour to become sustained. Hence nutrition and health education is a long term strategy, but can be an effective strategy to combat the public health problems.

Check Your Progress Exercise 2

1. What is food fortification? Explain giving appropriate examples.
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2. Enumerate the philosophy behind using fortification as a strategy to combat public nutrition problems.
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3. List the basic points one should keep in mind for ensuring maximum effectiveness of fortification as a strategy to combat malnutrition.
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4. 'Nutrition communication, can be a powerful force in helping individuals make sound decisions about what they purchase, grow and eat'. Justify the statement using appropriate examples.
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Having studied about the food-based strategies, let us move on to the nutrient based strategy, i.e. supplementation as a strategy to prevent malnutrition.

12.4 NUTRIENT-BASED APPROACH: THE MEDICINAL APPROACH TO COMBAT PUBLIC NUTRITION PROBLEMS

As compared to the food-based approaches, the medicinal approach - is a drug-based approach to combat public health problems. Nutrient supplements are effective. The medicinal approach, which is cheap in terms of cost of the pills, but expensive in terms of the support devoted to repetitive use of scarce health-manpower, has been successful in reducing clinical deficiency signs. To illustrate, countries like Indonesia, as well as, Vietnam have declared themselves to be free of clinical vitamin A deficiency (Xerophthalmia) in part because of the successful broad coverage

achieved through periodic delivery of high-dose vitamin A supplements. In the previous unit we have learnt about supplementation as a strategy to combat public nutrition problems. In this section however, we will recapitulate these strategies. What is the strategy? What are its potentials and drawbacks? Under what circumstances, the strategy is likely to be beneficial? These are a few issues highlighted in this section. So let us get started.

12.4.1 Supplementation - A Short Term Preventive Strategy

Supplementation as a short term strategy to prevent micronutrient deficiency particularly, iron and vitamin A deficiency, is most common in many countries. The oldest intervention route has been the provision of daily oral iron supplement. At the time of its introduction, supplementation was thought of as a short term emergency measure. But most of the current strategies worldwide still rely heavily on health interventions - usually the administration, at periodic intervals, of oral dosages of synthetic vitamin/mineral supplements to children under three years of age. This was pioneered in India in the late 1960's. What was originally envisaged as a temporary and short-term measure, and an adjunct to dietary improvement of communities in India, became the default model for current programs to eliminate some of the common public health problems like VAD.

Single-nutrient supplementation targeted at specific population groups has become an increasingly popular strategy to combat micronutrient malnutrition. You may recall studying about supplementation as a strategy to combat iron deficiency anaemia, vitamin A deficiency etc. earlier in Unit 10. The Government of India, you learnt, has launched the vitamin A supplementation programme on a national scale and the 'National Nutritional Anaemia Control Programme' to prevent and control nutritional anaemia. Under these programme, the schedule of supplementation recommended for preventive/therapeutic supplementation for population groups is highlighted in Table 12.9. This population-based approach is a pragmatic response to limited resources and assumes that, within a targeted group, the diagnosis of the nutrient deficiency is secure, its prevalence is clinically significant, and the benefits of supplementation outweigh the risks.

Table 12.9: Supplementary doses of nutrients recommended for preventive/therapeutic supplementation

Nutrient	Target Group	Schedule of Supplementation
Iron	Infants (6-60 months)	1 ml of IFA Syrup containing 20 mg of elemental iron and 100 mcg of folic acid.
	Children (5-10 years)	- 45 mg of elemental iron and 400 mcg of folic acid
	Old Children (10-19 years)	- 100 mg of elemental iron and 500 mcg of folic acid
	Pregnant Women and Lactating Mothers	- 100 mg of elemental iron and 500 mcg of folic acid
	Women in Reproductive Age (WRA) group	- 100 mg of elemental iron and 500 mcg of folic acid
Vitamin A	Infants 6-11 months of age Children between the age 1-5 years (currently only)	- 100,000 IU of vitamin A 200,000 IU of vitamin A given once every 6 months
Iodine	Women and children in hyper-endemic areas (Children between 1-3 yrs. old)	- Iodized oil injection - Single dose of 1 ml

The evidence is indisputable that supplements can substantially reduce the micronutrient deficiency. However, it is to be noted that supplementation, as a strategy, cannot correct a basic inadequacy in the quantity of food. The circumstances in which supplements may, therefore, be useful are limited and these are outlined herewith:

Supplementation as a therapy of specific deficiency and other diseases:

As discussed above, supplementation may be needed to treat nutritional deficiency diseases prevalent in an area. For example providing folifer tablets to all pregnant women for prevention of anaemia. Further, diseases causing malabsorption or excessive loss of nutrients may lead to secondary malnutrition; the classic example is the role of hookworm infections in causing iron deficiency anaemia. Under such circumstances, the administration of appropriate therapeutic levels of iron would be a necessary part of therapy.

Part of a broad preventive programme in the face of demonstrated need:

If it is apparent that a particular deficiency disease is prevalent in a population, provision of suitable supplement is indicated as a measure to effect rapid improvement. Under such circumstances waiting for a broader programme of nutrition/health education and food supply may not be very appropriate. However, it must be realized that supplementation should be used in conjunction with, but not as a replacement for, improvement in food selection.

Complement to feeding programmes: Certain situations indicate a need for nutrient supplement. For example, you may recall studying that under many circumstances, the government resorts to provision of food supplements. However, in areas where it is apparent that a particular deficiency disease is prevalent, it may be strongly recommended that in these areas the food source may be fortified with the particular nutrient. However, if a suitable fortified source is not available, then it is clearly expedient to supply the nutrient supplement along with the food source. This is how supplementation complements the feeding programme.

Supplementation as a short term strategy, therefore, can be effective. However, long experience with this intervention shows that it does not always work. The reasons identified, contributing to its ineffectiveness include: lack of compliance, economic constraints, poor efficiency of health services, dose-related undesirable gastrointestinal side effects, poor coverage, lack of awareness by local health workers, poor quality of supplement tablets etc. This 'drug-based approach' to synthetic vitamin A distribution has received wide criticism, even from the very individuals who have pioneered the work. Some of the limitations cited based on the 30-year experience of India are: ineffectiveness in correcting VAD (especially in populations where milder signs of deficiency are widespread), the limited shelf-life of vitamin A, and logistical problems in ensuring supply.

Supplementation programs are often expensive and unsystematic, and coverage may be poor. Frequently, the key target groups are different for each micronutrient, and operational constraints are severe. Further, the ease of supplementation has meant neglect of research into and promotion of better use of inexpensive food sources and diet diversification as a lasting long term strategy to prevent public nutrition problems.

With our discussion above we end our study of different strategies. Next, we shall learn how to implement an intervention strategy.

12.5 SELECTING/IMPLEMENTING AN INTERVENTION STRATEGY

Having read about the different food and nutrient based strategies, the crucial question that need to be addressed next is which of these strategies, is the most appropriate. Well, this is a difficult question to answer. As mentioned earlier, there is really NO

ONE-SIZE-FITS-ALL STRATEGY. *Several approaches exist, as we now know, and also highlighted in Table 12.10, to prevent and treat malnutrition, each with its own strengths and limitations (refer to Table 12.11), but which are highly effective if applied in complementary ways. The appropriate mix of interventions will depend on the specific context.*

Table 12.10: Approaches to prevent micronutrient deficiencies

	Dietary diversification	Food Fortification	Supplementation	Public Health Measures
Iodine deficiency disorders	Sea foods reduce goitrogens	Salt Water Baby foods Condiments Flour Milk	Iodized oil, Potassium iodide tablets	Legislation Enforcement Salt monitoring Primary health care
Vitamin A deficiency	Green leafy Vegetables Orange Fruits/vegetables Red palm oil Animal foods Breast milk	Sugar Salt Milk powder Baby foods Condiments	Capsules (oil) in massive or small doses	Prevention of infections: – immunization – antiparasitics – environmental health
Anaemia	Green leafy Vegetables Pulses Fruits/vegetables (vitamin C) liver, red meat Avoid tea/coffee with meals	Salt or Cereals Flour Condiments	Iron/folate tablets Parenteral iron	Prevention of infections – Immunization – Antiparasitics – Environmental health

There are several points to consider in selecting/implementing an intervention strategy. These are illustrated next:

Epidemiologic considerations:

- prevalence of the specific micronutrient deficiency
- severity of the specific micronutrient deficiency
- geographic extent/clustering of the micronutrient deficiency
- whether specific groups or subgroups are affected
- cause of the deficiency (single, multiple)

Level of country development: This aspect for example will influence the selection of strategies like food fortification which entails that food processing facilities, preferably centralized, must exist.

Capacity of country to implement and sustain the intervention

Cultural considerations

- typical diet
- symbolic, ceremonial meaning of food/meals

Circumstances in which the various interventions may be appropriate in conjunction with advantages and disadvantages of the main interventions are presented in Table 12.11.

Table 12.11: Interventions - appropriateness, advantages and disadvantages

Intervention	Appropriate for:	Advantages	Disadvantages/ Challenges
Supplementation	Therapeutic treatment Prevention programmes (target groups)	Timely Sustainability	More costly than other measures Narrow scope of coverage
Fortification	Prevention (Universal)	Highly cost effective Wide coverage sustainable	Requires participation of food industry Does not lead to awareness building and changes in wider dietary habits
Dietary Diversification	Prevention (Universal)	Highly cost effective Wide Coverage sustainable	Requires changes in eating behaviour Requires economic development to be feasible Require change in agricultural policies

An important advantage of food-based strategies is that foods provide many micronutrients simultaneously. Food-based approaches (i.e. fortification and dietary diversification) have the additional benefit of integrating micronutrient control programmes. And, interactions are avoided between potential concentrated-dose supplements. *The long-term goal of intervention should be to shift away from supplementation* (which may be appropriate in the short-term for dealing with severe deficiency) *toward a combination of food fortification and dietary diversification*. In other words, as the population prevalence and level of severity for a given deficiency decreases, the intervention mix should favour food-based approaches.

Having gone through the strengths and limitations, you would agree that an appropriate mix of interventions depending on the specific context should be considered. Although the three major micronutrient deficiencies have many different causes and potential solutions, opportunities exist to coordinate micronutrient deficiency control programmes.

The advantages of programme coordination include:

- reductions in costly duplication,
- avoidance of unconstructive competition for funding (for example, joint grant applications may increase the likelihood of obtaining funding for all programmes),
- opportunity for combined information, education and communication efforts.
- opportunity for holding joint training sessions, and
- an increased likelihood of reaching policy makers with effective messages.

However, to be efficient and effective, strategies must incorporate a means of programme monitoring such that ongoing feedback occurs and programmes are improved in response to feedback.

Check Your Progress Exercise 3

1. Supplementation as a short term strategy is effective to combat malnutrition. Comment on the statement giving appropriate justifications.

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2. Enumerate the limitations of adopting supplementation as a strategy to combat malnutrition.

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3. What points would you consider in selecting/implementing an intervention strategy?

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12.6 LET US SUM UP

Various strategies can be adopted for the prevention of public nutrition problems prevalent in our country. In this unit we studied about the food-based and the nutrient based strategies to prevent malnutrition. Among the food-based strategies, diet diversification, fortification, horticulture intervention and nutrition and health education were covered. We studied that these food-based strategies are the most cost effective means to tackle the public health problems and are in fact the long term measures. As compared to the food-based strategies, supplementation is the medicinal approach, to combat the public nutrition problems. Supplementation as a short term strategy to prevent micronutrient deficiency particularly, iron and vitamin A deficiency, is most common in many countries. But, it has various limitations. Therefore when we talk about strategies, an appropriate mix of interventions, namely diet diversification, fortification, horticulture intervention, nutrition and health education, supplementation may be considered, depending on the specific context.

12.7 GLOSSARY

Intramuscular Injection : Injection of medicines into muscle for treatment of disease.

Malnutrition : Condition occurring due to deficiency or excessive intake of nutrients.

12.8 ANSWERS TO CHECK YOUR PROGRESS EXERCISES**Check Your Progress Exercise 1**

1. The strategies which can be adopted to achieve the goal of improving nutritional status are:

Diet/ Food-based strategies viz. Dietary diversification/ modification, food fortification, horticulture intervention, nutrition., health education.

Nutrient based strategy i.e. distribution of vitamin and mineral supplements.

Immunization programme in the context of prevention of public nutrition programmes.

Supplementary feeding programmes.

Improving the quality of food produced by genetic approaches.

Clean water and sanitation as a strategy to combat public nutrition problems.

Improving food and nutrition security.

2. Food-based strategies are preventive and comprehensive strategy that uses food (i.e. whole, refined form, processed, fortified or a combination) as a tool to overcome micronutrient deficiency,

The benefits of food-based strategies include

- They are preventive, cost effective and sustainable.
 - They can be adapted to different cultural and dietary traditions and locally feasible.
 - As they are broad based, aiming to improve overall quality of the diet of a population, they can address multiple nutrient deficiencies simultaneously.
 - Since the amounts of nutrients consumed are within normal physiological levels, the risk of toxicity is minimized.
 - Food-based strategies support the crucial role of breastfeeding and the special diet and care needs of infants and young children.
 - Food -based approaches foster the development of sustainable, environmentally sound food production systems. Agricultural planners are alerted to the need to protect the micronutrient content of soils and crops.
 - Food-based strategies build partnerships among government, consumer groups, the food industry and other organization to achieve the shared goal of overcoming micronutrient malnutrition.
3. The role of dietary diversification is to ensure that individuals get essential nutrition in sufficient amounts through their daily diet. Better selection or preparation of food so as to enhance intake or broad availability of these nutrients is the primary goals of this approach.
 4. Home gardening is an effective food-based strategy if implemented effectively, could have an impact on community development in Health and Nutrition. Home gardening as a strategy is limited to combat vitamin A deficiency as vitamin A/ carotene rich green-leafy vegetables cultivation can be promoted through this method.

Check Your Progress Exercise 2

1. Food fortification is defined as the addition of one or more essential nutrients to a food, whether or not it is normally contained in the food for the purpose of preventing or correcting or demonstrated deficiency of one or more nutrients in the population or specific population groups e.g. addition of iron to fortify cornflakes.
2. According to Harris six distinct philosophies of food fortification are:
 1. Fortification for restorations to normal level.
 2. Fortification above normal level.
 3. Enrichment with public health objective.
 4. Enrichment of 'substitute' foods to equivalent nutrient level.

5. Fortification to make a food complete in itself.
6. Addition of nutrient for non-nutritional purposes.
3. The basic points one needs to keep in mind are:
 - a. There should be a demonstrated need for a nutrient in one or more population groups.
 - b. Food selected as a vehicle for the nutrients must reach the population at risk.
 - c. The amount of nutrient added to food, will supply adequate intake when the food is consumed in normal amounts by population at risk.
 - d. The amount of nutrient added will not be toxic or harmful to individuals with a high intake of the fortified foods.
 - e. The nutrient is biologically available in the form in which it is added and is stable in the food selected as vehicle.
 - f. The food selected does not seriously interfere with the utilization of the nutrient.
 - g. Addition of the nutrient has no detrimental effect on flavour, shelf life, colour texture or cooking properties of the food.
 - h. Fortification is technically feasible for the particular food.
 - i. The cost of fortification does not result in a significant change in the cost of food. A method of controlling and/or enforcing the level of fortification available.
4. Nutrition communication convey information, persuade individuals to consume food rich in micronutrients, choose fortified foods, and prepare food in new ways to protect their nutrient content. Nutrition communication further can help develop necessary skills and motivate people to make lifestyle changes.

Check Your Progress Exercise 3

1. Supplementation especially short-term is beneficial in combating malnutrition. This is aptly justified as short term supplementation show compliance from the community, foregoing or economic constraints and impact that is maximum during a short-term strategy. e.g. Administration of folifer tables during the course of pregnancy has seen a marked improvement in Haemoglobin levels. However, long term use has seen lack of compliance, GI disturbances and hence discontinuation of its use.
2. The limitations of adopting supplement as a strategy to combat malnutrition are:
 - It is an expensive strategy compared with other interventions
 - It has a narrow scope of coverage in a population
 - Long-term intervention is not effective and impactful leading to non-compliance.
3. The points one would consider in selecting implementing an intervention strategy are:
 - Epidemiological considerations
 - Level of country development
 - Capacity of country to implement and sustain intervention
 - Cultural considerations