



REVIEW ARTICLE

FOOD FORTIFICATION- ENHANCEMENT FOR BETTER HEALTH

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ABSTRACT

Interest in micronutrient malnutrition has increased greatly over the last few years. One of the main reasons for the increased interest is the realization that micronutrient malnutrition contributes substantially to the global burden of disease. Unfortunately, ensuring the consumption of balanced diet is far from being achievable everywhere since it requires universal access to adequate food and appropriate dietary habits. From this standpoint, food fortification has the dual advantage of being able to deliver nutrients to large segments of the population without requiring radical changes in food consumption patterns. Our Acharyas have mentioned various processing and preparations so as to tackle the problem of malnutrition, through *samskara* and *samyoga*. Thus, resulting in enhancing or enriching the property of the *ahara* taken.

Key words: food, fortification, malnutrition, Ahara, Samskara, Samyoga

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INTRODUCTION

Nutrition is the intake of food, considered in relation to the body's dietary needs^[1]. The body requires different vitamins and minerals that are crucial for body development and disease prevention. It may involve calories, protein, carbohydrates, vitamins or minerals^[2]. These nutrients are not naturally produced in our body, therefore it should be made available through the food we take. Thus, when the body doesn't absorb or get sufficient amount of nutrients it leads to a condition known as malnutrition. Thus, Malnutrition is defined as a condition that results from eating a diet in which nutrients are either not enough or are too much such that the diet causes health problems. Not enough nutrients is called undernutrition or undernourishment while too much is called over nutrition^[3]. Micro nutrient Malnutrition is often used to specifically refer to undernutrition where an individual is not getting enough calories, protein, or micronutrients^[4].

Micronutrient malnutrition is a serious condition faced by the world. As per the global nutrition report 2016, Out of the world population of 7 billion, 2 billion suffers from micronutrient deficiencies^[5]. Worldwide as well as in India, the 3 major micronutrient deficiencies are Iron deficiency, Iodine deficiency and Vitamin deficiency, of which

Iron Deficiency Anaemia is the most prevalent one. It is estimated that at least 1.6 billion people around the world suffer from anaemia^[6] and growing children are more vulnerable to its consequences.

The World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) have identified four main strategies for improving micronutrient malnutrition, they are:

1. Nutrition education leading to diets that are more diverse and better quality
2. Food fortification and biofortification
3. Supplementation
4. Disease control measures^[7]

Each of these strategies has a place in eliminating micronutrient malnutrition. To achieve maximum impact, the appropriate mix of these strategies should be in place simultaneously to promote consumption and utilisation of an adequate diet for all people in the world^[8].

Food fortification is considered a sustainable public health strategy because it can reach wider at-risk populations through existing food delivery systems without requiring major changes in existing consumption patterns^[9]. Compared to other interventions, food fortification is likely to be more cost-effective, and – if fortified foods are regularly consumed – it has the advantage of maintaining steady body stores^[10].

Food fortification

As defined by the World Health Organization (WHO) and the Food and Agricultural Organization of the United Nations (FAO), fortification refers to "the practice of deliberately increasing the content of an essential micronutrient, ie. vitamins and minerals (including trace elements) in a food irrespective of whether the nutrients were originally in the food before processing or not, so as to improve the nutritional quality of the food supply and to provide a public health benefit with minimal risk to health", whereas enrichment is defined as "synonymous with fortification and refers to the addition of micronutrients to a food which are lost during processing"^[11].

Nutrients or food components may be added for a variety of reasons: 1. Restoration – this is where nutrients lost during food processing are replaced. For example, iron, thiamine and niacin must be added to brown and white flour, as they are removed with the bran during the milling of wheat to make flour. 2. Substitution – nutrients are sometimes added to produce a substitute product with similar nutritive value. For example, vitamin a and d is being added to margarine as a substitute for butter.

History

Food fortification has a long history of use in industrialized countries for the

successful control of deficiencies of vitamins A and D, several B vitamins (thiamine, riboflavin and niacin), iodine and iron. Salt iodization was introduced in the early 1920s in both Switzerland and the United States of America and has since expanded progressively all over the world to the extent that iodized salt is now used in most countries. From the early 1940s onwards, the fortification of cereal products with thiamine, riboflavin and niacin became common practice. Margarine was fortified with vitamin A in Denmark and milk with vitamin D in the United States. Foods for young children were fortified with iron, a practice which has substantially reduced the risk of iron-deficiency Anaemia in this age group. In more recent years, folic acid fortification of wheat has become widespread in the Americas, a strategy adopted by Canada and the United States and about 20 Latin American countries.

Food vehicle and fortificant

One of the key processes in the development of a successful fortification program is selecting an appropriate food vehicle. The vehicle is the specific food to which the process of fortification is done. This requires specific knowledge of specific food patterns of who is eating what food among the groups at greatest risk of deficiency. The criteria for selection of the food vehicle are: it should be commonly consumed by the target

population, should have constant consumption pattern with a low risk of excess consumption, Good stability during storage and should be of Relatively low cost, should be Centrally processed with minimal stratification of the fortificant and there should not be any interactions between the fortificant and the carrier food. These vehicles commonly used can be grouped into three main categories: staples (wheat, rice, oils); condiments (salt, sugar, soy sauce); and processed commercial foods (noodles, infant complementary foods, dairy products). Overall, staples have been the primary choice as they are widely consumed by the population, whereas processed foods and cereals have been chosen when infants were the target population^[12].

Fortificant is the specific nutrient that is being added to the food vehicle. The criteria for selection of the fortificant are: the micronutrient added should have a good bioavailability, affordable cost, should have Acceptable colour, taste, solubility and particle size and it should be commercially available.

Levels of fortification

Food can be fortified at three levels – mass or universal; targeted; or household– and may be mandatory or voluntary. Mass fortification is the preferred approach when a majority of the population is at risk of a particular nutrient deficiency, whereas targeted fortification is designed for defined

population subgroups. Commercial or market-driven fortification is more common in developed countries, though its predicted rise in less-regulated low-income countries is causing concern due to the potential disruption to traditional dietary patterns. Home fortification and bio fortification are more recent approaches, with evaluations still underway as to their effectiveness

Ayurvedic perspective

Ahara is the food which is ingested, and includes all foods like eatables, lickable, drinkables etc. Our *Acharya's* have given prime importance to food and states that it is responsible for the growth, development and enhancement of *ojus*. *Acharya caraka*, emphasizes the importance of food and states that both the body and the diseases are formed by food, depending upon the *hita* and *ahita* portion in it^[13]. The state of health can be maintained or regained only if both *ahara* and *aushadha* are prepared in a proper way. *Ayurveda* has explained various food preparations and a large number of medicinal formulations along with their method of preparation to achieve the goal.

In *Ayurveda*, fortification can be related to the concept of *samskara* and *samyoga*. In *Ayurveda* word *samskara* has been used in various aspects with different meanings as per the context. *Samskara* is included under

paradi gunas. *Samskara* is also enumerated under the *ashta ahara vidhi vishesha ayatana*. *Acharya Charaka* has defined *samskara* as *karana*. *Karana* is the word used for that tool which is of special importance for *vaidya* who is trying to establish *dhatusamyā* (*swastha* state)^[14]. Thus *samsakara* includes, addition (placement) or imparting of newer *gunas* in between *gunas* which are already present. For example, Milk mixed with water in equal quantities boiled in an iron vessel reduced to the milk quantity, helps to cure *pandu*. *Samyoga* is defined as the combination of 2 or more substances resulting in the manifestation of specific qualities, which are not present singly. Thus, *samskara* and *samyoga* results in:

- Enhancement of properties
- Addition of new properties

Fortification in India

In India, salt, wheat, rice milk, and oil are identified as appropriate vehicles for fortification. Various programs undertaken by govt.:

- a) Fortification of ICDS supplementary cooked food
- b) Fortification of food for the Mid Day Meal
- c) Fortification of factory produced Ready-to-Eat (RTE) foods
- d) Fortification of wheat flour supplied through Targeted Public Distribution System (TPDS)

DISCUSSION AND CONCLUSION

Ayurveda has explained various food preparations and a large number of medicinal formulations along with their method of preparation to achieve the goal. The *samskara* is intended to meet the quality needs of a food or pharmaceutical preparation. The quality of an *ahara* as per Ayurvedic classics can be enhanced through *samskara* and *samyoga*. *Ahara* is mainly characterized based on its taste and nutritional aspects which is again attained by proper way of *samskara*.

Samskara causes transformation in *Swabhavika guna*, and here in this context it can be attributed especially to the *bhavana* and *bhajana samskara*, where the principle of fortification can be applied. *Acharya Susruta* have mentioned various utensils for storing and serving some of the food articles and medicinal preparation such as ghee should be stored in Iron vessel. This enhances makes the ghee useful in *pandu* and *kamala*, where the same principle of fortification is being applied. *Samyoga* imparts enhancement and addition of new properties when 2 or more substances are mixed and therefore, is necessary for bringing about changes in *dravyas* as and when needed.

Thus, Concept of *Samskara* and *Samyoga* clearly advocates that the food preparations need a proper handling not only by maintaining hygienic conditions during

preparation but also by selecting proper vessel, proper time, proper duration etc. in order to make the preparation efficacious and stable for long duration.

Food fortification is one of the most cost-effective nutrition interventions to tackle malnutrition on a large scale. In high-income countries, food fortification has been in place for almost a century, and has successfully eliminated deficiency diseases such as rickets and pellagra.

Food fortification is an attractive public health strategy and has the advantage of reaching wider at-risk population groups through existing food delivery systems, without requiring major changes in existing consumption patterns. Integration of fortification and supplementation strategies together with other prevention programs may be the answer to address the widespread global under-nutrition and to ensure sustainable benefits. Future programs also need to assess the direct impact of fortification on morbidity and mortality.

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