



Review Article

Healthy Nutrition to Build a Healthy Nation

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Abstract: ‘Health is wealth’, goes the saying. Health and nutrition are the most important contributory factors for human resource development in the country. Unhealthy eating and physical inactivity cause 1/3 of premature deaths. Nowadays nutrition related non communicable diseases have become a major threat to public health. Protein Energy Malnutrition (PEM), micronutrient deficiencies such as vitamin A deficiency, Iron Deficiency Anemia, Iodine Deficiency Disorders and vitamin B-complex deficiencies are the nutrition problems frequently encountered, particularly among the rural poor and urban slum communities and among children and women. These nutritional risk factors, are considered responsible for 3.9 million deaths (35% of total deaths) and 144 million disability-adjusted life years (DALYS) (33% of total DALYS) in children below 5 years of age [1]. The scenario clearly shows there is a need for reappraisal of nutrition intervention programmes for children and pregnant women in India for which an attempt was made by us through identification of some healthy recipes and introduction of these among a set of population which are presented in this paper.

Keywords: Health, Nutrition, Premature, Malnutrition, Anemia, Intervention Programmes

1. Introduction

Malnutrition remains a major health problem with consequences that are too grave to be ignored. Long-term malnutrition leads to stunting and wasting, non-communicable chronic diet related disorders, increased morbidity and mortality and reduced physical work output which causes great economic loss to the country and undermines development. Globally, it is estimated that 30% of deaths in children under 5 years of age are attributable to mild to moderate malnutrition. Malnutrition in women of reproductive age increases the maternal mortality ratio and the risk of low birth weight for their children. 186 million children in the world are estimated to be stunted and 20 million to suffer from the most deadly form of severe acute malnutrition each year. Persistent undernutrition throughout the growing phase of childhood leads to short stature in adults. About 33% of adult men and 36% of the women have a Body Mass Index (BMI) [Weight in kg/(Height in meter)²] below 18.5, which indicates Chronic Energy Deficiency or CED [2].

1.1. Micronutrient Deficiencies

Micronutrient deficiencies several micronutrient deficiencies are being reported particularly among vulnerable groups, including children and women of childbearing age.

1.1.1. Iron Deficiency Anemia

Iron deficiency anemia is a serious public health for many countries. Among children between the ages of 6 and 59 months, a majority (70%) [3] are anemic. Nearly three fourth (75%) of women in India are anemic, with the prevalence of moderate to severe anemia being highest (50%) among pregnant women [4]. It is estimated that nutritional anemia contributes to about 24% [5] of maternal deaths every year and is one of the important causes of low birth weight. It adversely affects work output among adults and learning ability in children.

1.1.2. Vitamin A deficiency

Vitamin A deficiency is considered a public health problem in several countries, affecting preschoolers, school-age children and women of reproductive age. Vitamin A deficiency is highly prevalent with 0.8 million preschool-age

children estimated to have night blindness, 0.8-1% of preschool children show the signs of Bitot's spots and night blindness and 13.2 million preschool-age children with serum retinol levels $<0.70 \mu\text{mol/l}$ [6]. Approximately one third of the world's preschool-age population is estimated to be vitamin A deficient; with highest prevalence (44-50%) being reported in regions of Africa and South-East Asia [7].

1.1.3. Iodine Deficiency

Iodine deficiency is recognized as a significant public health problem in 18 countries, and one third of the population is estimated to be at risk of developing iodine deficiency disorders, which have dramatic consequences for the fetal brain and for cognitive and functional development in early childhood [8]. The most important consequence of iodine deficiency in mothers is cretinism in which the children suffer from mental and growth retardation right from the birth. About 90,000 still-births and neonatal deaths occur every year due to maternal iodine deficiency. Around 54 million persons are estimated to have goiter, 2.2 million have cretinism and 6.6 million suffer from mild psycho-motor handicaps [9].

1.2. Food Insecurity

Food insecurity is the most pressing problem in the field of

nutrition, especially for vulnerable populations, such as children and women and people living with HIV, tuberculosis and other communicable diseases.

Diet is a risk factor for diseases like cardiovascular disease (coronary heart disease, stroke, high blood pressure, atherosclerosis); type 2 diabetes; some forms of cancer (stomach, colon, rectal, breast and endometrial); obesity; gall bladder disease; gastrointestinal diverticular disease and constipation; dental caries; renal diseases, Non alcoholic fatty liver disease, osteoarthritis.

India is passing through the phase of economic transition and while the problem of under nutrition continues to be a major problem, prevalence of over nutrition is emerging as a significant problem, especially in the urban areas.

1.2.1. Obesity and Overweight

Obesity and overweight Overweight and obesity are emerging problems in India. Thirteen percent of women and 9 percent of men are overweight or obese. The simultaneous occurrence of over nutrition and under nutrition indicates that population in India are suffering from a dual burden of malnutrition. The prevalence of obesity is higher among the women (10.9%) compared to men (7.8%) in rural areas [10].

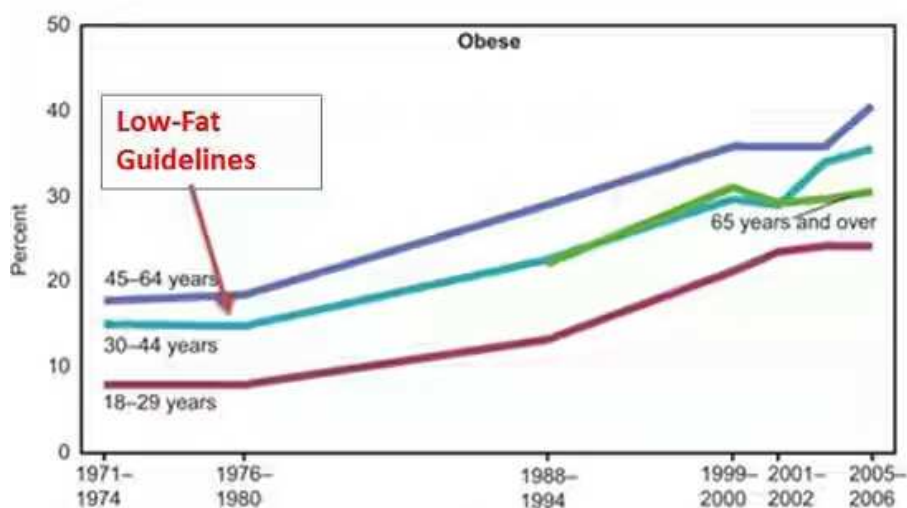


Figure 1. Most of people with obesity are under 65 years old.

1.2.2. Cardiovascular Disease

A study in South India showed that coronary heart disease [11] is associated with small size at birth (Stein et al 1996). A review by Barker et al (1993) concluded that babies who are small at birth or during infancy, due to under-nutrition, have increased risks of cardiovascular disease as adults. The underlying mechanisms are not understood, but may relate to early influences on the development of the vascular system itself. For each 2% of calories from *trans* fat was associated with a 23% higher risk of coronary heart disease.

1.2.3. Type 2 Diabetes

Diabetes is Obesity's Twin Epidemic. Diabetes [12] rates have risen along with obesity rates. The number of Americans

with diabetes more than quadrupled (from 5.8 million to 23 million) between 1980 and 2008. More than 60% of people with diabetes are under 65 years old. Among the population aged 20 years and older, the prevalence of diabetes is reported to be 11%, hypertension 26%, dyslipidemia 50%, overweight and obesity 65% and physical inactivity 77% [13].

1.2.4. Cancer

The incidence rate of cancer is comparatively higher among women (123) compared to men (113 for 100,000) [14].

1.2.5. Syndrome

X (or the insulin resistance syndrome) [15] occurs in all populations exposed to western lifestyle, but is particularly evident in indigenous populations exposed to rapid lifestyle

change in the 20th century. This syndrome becomes evident after the transition from a traditional to an 'urbanised' or 'westernised' lifestyle and includes high rates of obesity, Type

2 diabetes and cardiovascular and renal disease [16].

Some examples of change in traditional food pattern are represented below.

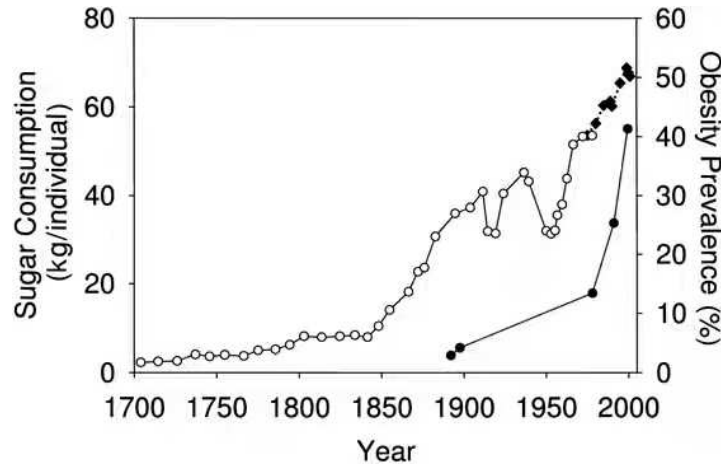


Figure 2. Total sugar intake has skyrocketed in the past few years.

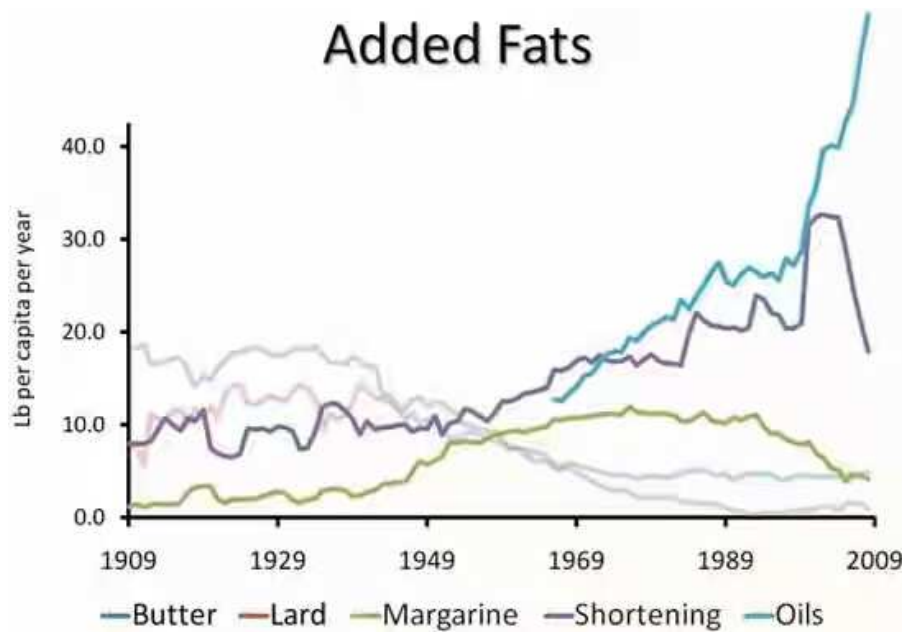


Figure 3. People have abandoned traditional fats in favour of processed vegetable oils.

1.3. Nutrition

Nutrition is a basic human need and a prerequisite to a healthy life. Nutrients that we obtain through food have vital effects on physical growth and development, maintenance of normal body function, physical activity and health. Our diet must provide all essential nutrients in the required amounts. Requirements of essential nutrients vary with age, gender, physiological status and physical activity. Dietary intakes lower or higher than the body requirements can lead to under nutrition (deficiency diseases) or over nutrition (diseases of affluence) respectively. Eating too little food during certain significant periods of life such as infancy, childhood, adolescence, pregnancy and lactation and eating too much at any age can lead to harmful consequences. An adequate diet, providing all nutrients, is needed throughout our lives. The

nutrients must be obtained through a judicious choice and combination of a variety of foodstuffs from different food groups.

1.3.1. Balanced Diet

Nutrients are classified chemically as macronutrients and micronutrients. Carbohydrates, fats and proteins along with water are macronutrients, which are needed in large amounts. Vitamins and minerals constitute the micronutrients and are required in small amounts. These nutrients are necessary for physiological and biochemical processes by which the human body acquires, assimilates and utilizes food to maintain health and activity. A balanced diet is one which provides all the nutrients in required amounts and proper proportions. A balanced diet should provide around 50-60% of total calories

from carbohydrates, preferably from complex carbohydrates, about 10-15% from proteins and 20-30% from both visible and invisible fat. In addition, a balanced diet should provide other non-nutrients such as dietary fibre, antioxidants and phytochemicals which bestow positive health benefits. Antioxidants such as vitamins C and E, beta-carotene, riboflavin and selenium protect the human body from free radical damage. Other phytochemicals such as polyphenols, flavones, etc., also afford protection against oxidant damage. Interactions between these compounds are likely to be complex, either causing or masking effects, or acting synergistically with other compounds [17].

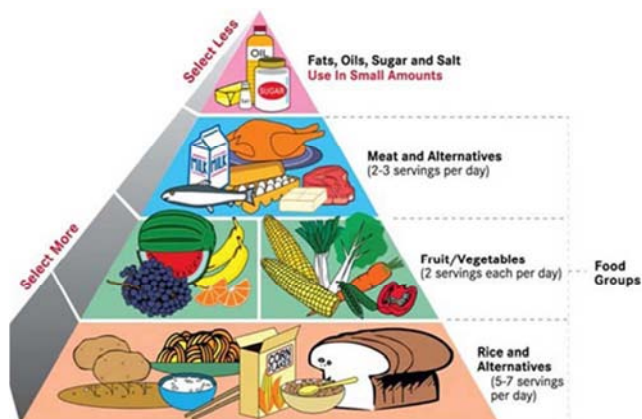


Figure 4. Balanced diet.

1.4. Recommended Dietary Allowance

Recommended dietary allowance suggested for physiological groups such as infants, pre-schoolers, children, adolescents, pregnant women, lactating mothers, and adult men and women, taking into account their physical activity. In

fact, RDAs are suggested averages/day.

A diet consisting of foods from several food groups provides all the required nutrients in proper amounts. Cereals, millets and pulses are major sources of most nutrients. Milk which provides good quality proteins and calcium must be an essential item of the diet, particularly for infants, children and women. Oils and nuts are calorie-rich foods, and are useful for increasing the energy density and quality of food. Inclusion of eggs, flesh foods and fish enhances the quality of diet. However, vegetarians can derive almost all the nutrients from diets consisting of cereals, pulses, vegetables, fruits and milk-based diets. Vegetables and fruits provide protective substances such as vitamins/minerals/ phytonutrients. Spices like turmeric, ginger, garlic, cumin and cloves are rich in antioxidants. Water is the major constituent of the human body. Some beverages provide nutrients while others act as stimulants. Milk is an excellent beverage for all age groups as it is a rich source of nutrients. Sodium plays an important role in nerve conduction and fluid balance in the body. Each daily serving of fruits or vegetables was associated with a 4% lower risk of CHD and a 5% lower risk of stroke. Greater whole grain intake (2.5 compared with 0.2 servings per day) was associated with a 21% lower risk of CVD events, with similar estimates for specific CVD outcomes such as heart disease, stroke and fatal CVD. Fish consumption was associated with significantly lower risk of CHD mortality. In contrast, each 50-g serving per day of processed meats (eg, sausage, bacon, hot dogs, deli meats) was associated with higher incidence of both coronary heart disease and diabetes mellitus. 0.8mg of folic acid per day reduces serum homocysteine by 3mmol, leading to a 16% reduction in CHD and a 24% reduction in stroke.

Table 1. Essential foods in our diet.

Energy rich foods	Carbohydrates & fats Whole grain cereals, millets Vegetable oils, ghee, butter Nuts and oilseeds	Protein, fibre, minerals, calcium, iron & B-complex vitamins Fat soluble vitamins, essential fattyacids Proteins, vitamins, minerals
Body building Foods	protein Pulses, nuts and oilseeds Milk and Milk products Meat, fish and poultry	B-complex vitamins, invisible fat, fibre Calcium, vitamin A, riboflavin, vitamin B12 B-complex vitamins, iron, iodine, fat
Protective foods	Vitamins and Minerals Green leafy vegetables Other vegetables and fruits Eggs, milk and milk products and flesh foods	Antioxidants, fibre and other Carotenoids Fibre, sugar and antioxidants Protein and fat

Table 2. Importance of diet during different stages of life.

Adult	For being physically active and healthy	Nutrient- dense low fat foods.
Pregnant women and lactating mother	For maintaining health, productivity and prevention of diet-related disease and to support pregnancy/lactation.	Nutritionally adequate diet with extra food for child bearing/rearing rich in folic acid, calcium, vitamin A, iodine, vitamin B12, vitamin C.
Adolescent age	For growth spurt, maturation and bone development.	Body building and protective foods.
School children	For growth, development and to fight infections.	Energy-rich, body building and protective foods (milk, vegetables and fruits).
Less than 1 year of age	For growth and appropriate milestones.	Breastmilk, energy-rich foods (fats, Sugar).

2. Methodology

Being inspired by the women in the past who returned home few hours past delivery without vulnerability to illness which was possible only through the good diet they ate, some recipes were collected from good, great grandma's [18] and implemented in the present day diet to stress the importance of traditional diet in the modern world which could alleviate many diseases and aid in healthy living. The treatment of malnutrition, as well as its prevention, among under five children requires consumption of nutritious food, including exclusive breastfeeding for the first 6 months of life and in combination with complementary foods thereafter till at least 24 months of age, an hygienic environment (clean drinking water, sanitary facilities), access to preventive (immunization, vitamin A supplementation etc) as well as curative health services [19], and good (prenatal) care.

Low-cost food supplements can be prepared at home from commonly used ingredients such as cereals (wheat, rice, ragi, jowar, bajra, etc.); pulses (grams/ dhals), nuts and oilseeds (groundnut, sesame, etc.), oils (groundnut oil, sesame oil etc.) and sugar and jaggery. Such supplements are easily digested by all infants, including those with severe malnutrition. Healthy recipes can be planned at homes which can provide food of good quality and quantity.

Weaning foods based on cereal-pulse-nut and sugar/jaggery combinations will provide good quality protein, adequate calories and other protective nutrients.

Amylase rich foods Flours of germinated cereals, which are rich in the enzyme alpha-amylase, constitute ARFs which help in increasing the energy density of weaning gruels and in reducing its bulk as well. Preparation of ARF is very simple and can be done by mothers at home.

For school children, the recommended recipes that would be attractive, tasty as well as healthy include,

Malted Ragi Porridge

Malted Ragi... 30 g

Roasted Groundnut... 15 g

Jaggery... 20 g

Method: Malted ragi, roasted groundnuts and jaggery are powdered. Sufficient water is added and cooked.

Kichidi

Rice... 35 g

Green gram dhal... 10 g

Leafy vegetables... 2 t. sp

Fat... 2 t. sp

Cumin (jeera)

Method: Clean rice and dhal and cook them in water with salt till the grains are soft and water is absorbed. Leafy vegetables can be added when the cereal/pulse is 3/4th done. Cumin is fried in fat and added towards the end. Pulses are an important source of protein in Indian diets, particularly for vegetarians.

Wheat Payasam

Wheat... 30 g

Roasted Bengal gram flour... 15 g

Roasted & crushed Groundnut... 5g

Sugar... 15g

Method: Roast whole wheat and powder. Add roasted Bengal gram flour, groundnut and sugar. Cook with sufficient water.

Jaggery kheer

Vermicelli/Rice... 30 g

Milk... 100 ml.

Water... As required

Jaggery... 20 g

Method: Boil rice/vermicelli in water till half done. Add milk and bring to boil. Add jaggery and cook well.

Pohipogu (Milk, curds and nuts are rich sources of bio-available calcium), Vegetable rice (Eat foods rich in alpha-linolenic (ALA) acid such as legumes, greenleafy vegetables, fenugreek and mustard seeds), *Soya curry* (soyabean and wheat to prevent undernourishment in mothers and children) form an excellent, nutritious and delicious party meal at times.

Fruit and vegetable salads

Vegetables/fruits are rich sources of micronutrients. Fruits and vegetables also provide phytonutrients and fibre which are of vital health significance. They help in prevention of micronutrient malnutrition and certain chronic diseases such as cardiovascular diseases, cataract and cancer. There is evidence suggesting that consumption of vegetables is associated with a reduced risk of weight gain [20-23] and reduced risk of obesity and weight gain [24-28].

Multi grain payasam Milk and milk products provide good source of protein [29, 30]. There is evidence of a probable association between consumption of three to five serves per day of grain (cereal) foods (mainly wholegrain) and a reduced risk of weight gain [31].

3. Results

The results clearly show that a healthy diet includes enough food from each of the food groups every day. Eating a wide variety of foods has a very positive effect on health. A healthy diet includes:

- plenty of water;
- plenty of plant foods (bread, cereal, rice, pasta, noodles, vegetables and fruit);
- moderate amounts of animal foods (milk, yogurt, cheese, meat, fish, poultry, eggs);
- small amounts of oils and fats (including margarine) and extra foods (ie snacks, soft drinks, lollies).

The above recipes when tried with children of different age groups for a period of time would be enjoyed by children and eaten happily without any hesitation. The menu planning in one's life should aim at maintenance of a state of positive health and optimal performance in populations at large by maintaining ideal body weight, ensuring adequate nutritional status for pregnant women and lactating mothers, improvement of birth weights and promotion of growth of infants, children and adolescents to achieve their full genetic

potential, achievement of adequacy in all nutrients, prevention of deficiency diseases and increasing the life expectancy.

4. Conclusion

The present scenario shows there is a need for reappraisal of nutrition intervention programmes for children and pregnant women in India. The study concludes that if the above recipes are included while planning menu in one's diet it would help in the maintenance of a state of positive health and ideal body weight. It would also ensure adequate nutritional status for pregnant women and lactating mothers. It would improve birth weight and promote growth of infants, children and adolescents to achieve their full genetic potential. If the diet is adequate in all nutrients, it would prevent deficiency diseases and increase the life expectancy.

5. Discussion

The strategy focuses on reappraisal of nutrition intervention programmes [32] for improving the nutritional status of the population, particularly in early life, by preventing and treating malnutrition among pregnant women and children aged up to 2 years, promoting adequate micronutrient intake, integrating actions to address the determinants of obesity and non communicable diseases, promoting safe and healthy food choices, providing comprehensive nutrition information and education to consumers, improving nutrition services in the health sector, monitoring and evaluating progress and outcomes using the WHO child growth standards. The Department of Health (England) recognises food poverty as "the inability to afford, or to have access to, food to make up a healthy diet." We should be inspired and follow "*Eat less*" campaigns actions to discourage the consumption of a specific product or nutrient around the world like the anti-sugar campaign in Thailand; and the campaign against sugar-sweetened beverages in New York City, some other parts of the US and Mexico. Community kitchens are community-focused and initiated cooking programmes often involving low-income groups which aim to develop food skills and empower individuals in addition to basic nutrition education and cooking skills. The fact that the associations of these food groups with birth size were observed at different weeks of gestation is of significance in view of varying requirements of fetal growth at different stages. This is because it is known that fetal growth in early gestation is mainly muscle growth while that in late pregnancy mainly consists of deposition of fat tissue [33]. One third of babies born in India are of low birth weight (LBW) (< 2.5 kg) and this continues to be a major public health problem. In addition to short term consequences, such as high infant mortality and childhood growth failure among survivors [34], LBW carries long term risk in the form of high rates of adult coronary heart disease and type II diabetes [35]. Known as the hypothesis of 'fetal origins of adult diseases' it states that fetal under nutrition at critical periods of development and during infancy leads to

permanent metabolic and structural changes that increase risks for adult diseases. In India, poor fetal growth has been attributed to widespread maternal undernutrition [36]. Reallocation of priorities for covering children in this critical age window will not only result in optimum utilization of limited resources but more importantly ensure better adolescent growth and better adult size as well.

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