

Mitigation of Malnutrition

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The free medical dictionary defines malnutrition as the condition that develops when the body does not get the right amount of vitamins, minerals and other nutrients it needs to maintain healthy tissues and organ function.

The World Health Organization (WHO) views it more broadly. In their view, malnutrition refers to deficiencies or excesses of nutrient intake, imbalance of essential nutrients or impaired nutrient utilization.

The double burden of malnutrition consists of both undernutrition and overweight and obesity as well as diet related non communicable diseases.

The life-cycle approach to nutrition clearly reveals that these conditions are interlinked.

This article, while giving priority to nutrition deficiency disorders, will also address problems related to overweight and obesity. While briefly referring to the global situation, it will focus primarily on Sri Lanka.

Mitigation is the act of making milder or less intense or severe. Mitigation of malnutrition at both personal level and at community (national) level will be discussed. You may wonder why we aim for mitigation rather than eradication. In diseases of a single pathogen etiology (causation), like malaria and poliomyelitis, we aim for eradication and with poliomyelitis we have achieved it. Malnutrition has a very complex etiology and is less amenable to eradication at community level. At a personal level one may strive for its eradication but that too is difficult.

Nutritional deficiency disorders of public health importance in Sri Lanka include: Energy Protein Malnutrition (EPM), iron deficiency anemia, vitamin A

deficiency, Iodine deficiency and zinc deficiency. Low birth weight is another nutrition related problem of public health significance.

Overweight and obesity are the main outcomes of over nutrition. There are several other Non-Communicable Diseases (NCD) such as diabetes, hypertension (high blood pressure), heart diseases, strokes and cancers which are the main causes of mortality (Death) in adults, directly related to overweight and obesity. They too come under the scope of our discussion.

Assessment of nutritional status of an individual can be done clinically (using externally visible physical features),



Figure 1: Non-Communicable Diseases (NCD)

anthropometrically or biochemically. Which of these methods are used depends on the disorder. EPM is usually assessed anthropometrically, though the severe forms like marasmus and kwashiorkor can be recognized clinically. Overweight and obesity are also assessed anthropometrically. Vitamin A deficiency and Iodine deficiency are assessed clinically using a gradation of eye signs for Vitamin A and goiter for iodine deficiency. However due to successful interventions, prevalence of both have come down dramatically and presently we assess their sub-clinical forms (not externally visible) biochemically. The same applies to Zinc deficiency. Iron deficiency anemia, though recognizable clinically when severe, has always being assessed by estimation of the Hemoglobin percentage in blood. Milder degrees of iron deficiency not severe enough to cause anemia, are assessed using other biochemical criteria.

Energy protein malnutrition which is due to a deficiency of the macronutrients, carbohydrate, fat and protein, is the most widely prevalent nutrition deficiency disorder in developing countries including Sri Lanka. It occurs in two forms, acute and chronic. Acute EPM causes wasting, while the chronic form causes stunting.

They are diagnosed using anthropometric criteria. Anthropometry refers to accurate measurement of various body features such as height, weight, head circumference, waist circumference, mid-arm



circumference and skin fold thickness. The individual measurements or indices based on these measurements are compared with population-based reference standards which are developed through large population studies. Currently in Sri Lanka, we use the WHO (World Health Organization) growth standards as our reference standard.

Weight for height -3SD (standard deviations) below median is considered severe wasting, also referred to as Sever Acute Malnutrition (SAM). Between -2SD and -3SD is considered to be Moderate Acute Malnutrition (MAM).

Height for age-3SD below median is severe stunting and between -2SD and -3SD is moderate stunting.

Weight for Age deficit is a combined measure which does not distinguish between acute and chronic forms, referred to as underweight it could be due to wasting or stunting or a combination of both.

Public health statistics about child malnutrition are based entirely on the above mentioned anthropometric diagnoses.

However, severe acute malnutrition can be distinguished clinically into three syndromes progressively worsening in severity, viz; marasmus, marasmic kwashiorkor and kwashiorkor.

While the correlation between morbidity (ill health) and risk of mortality (death) of the anthropometric diagnostic categories is sufficient for public

health decisions, assessment of the degree of disturbance of bodily function, which is a prerequisite for correct management, is based on a clinical assessment. Routine use of relatively cost intensive interventions like ready to use therapeutic food (RUTF) based on an anthropometric diagnosis cannot be justified scientifically.

The prevalence and trends of wasting, stunting, and under weight in children under 5 years, based on national surveys conducted by the Medical Research Institute (MRI) over the last 50 years is summarized in the graph/table shown below. This is the key target age group affected and one in which the harmful effects are most severe.

It shows that while stunting and underweight has reduced significantly over this period, wasting has remained constant and even increased slightly during the last year. Even in stunting and underweight, the pace of reduction has slowed down since 2006. However there are marked differences in the prevalence of these conditions between urban, rural, and estate sectors and between different provinces and districts. The estate sector, which was the worst affected, has shown some progress during the last 20 years.

While children under five years are the most susceptible to the serious outcomes of malnutrition there are other categories who are also vulnerable. They include adolescents/school children, pregnant and lactating mothers and the elderly (>65 years).

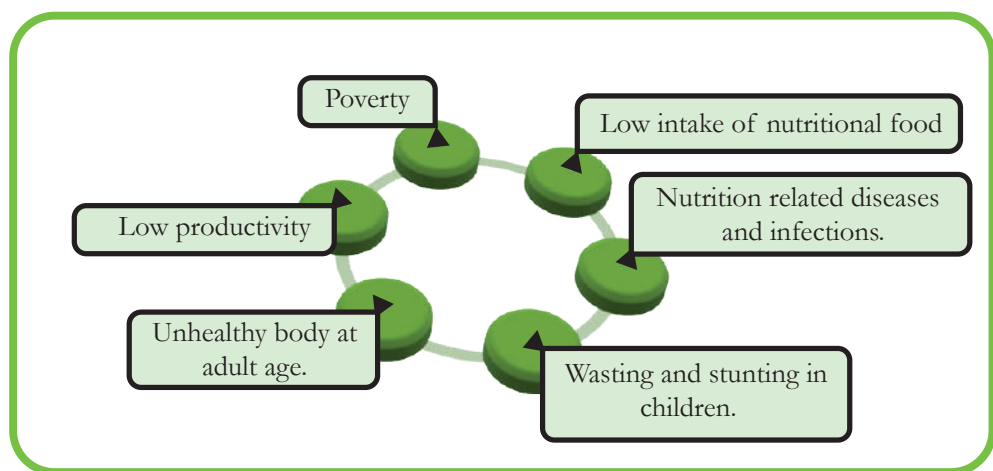
The prevalence of these disorders in these categories will not be discussed in this article.

There is an intergenerational vicious cycle which links these groups. The effects of malnutrition throughout the life cycle are depicted in the diagram below.

This diagram also depicts the harmful effects of malnutrition.

early life have greater chance of developing obesity and the non-communicable diseases in adulthood. The importance of directing our focus to this period i.e. the first thousand days, in mitigation/ prevention of malnutrition is well recognized. It is referred to as a window of opportunity.

The harmful effects of malnutrition accrue to the



Further study of the intergenerational nature of malnutrition reveals that malnutrition commences from conception and occurs during the intra uterine period i.e. the period within the mother's womb and continues most rapidly during the first two years after birth. Most of the growth retardation occurs during this period now referred to as the first thousand days. The consequences of malnutrition during this period are now recognized to extend to adulthood. "Fetal origins of adult disease hypothesis" first proposed by the British epidemiologist Barker is now supported by epidemiological evidence from both developing and industrialized countries. Low birth weight and stunted babies in

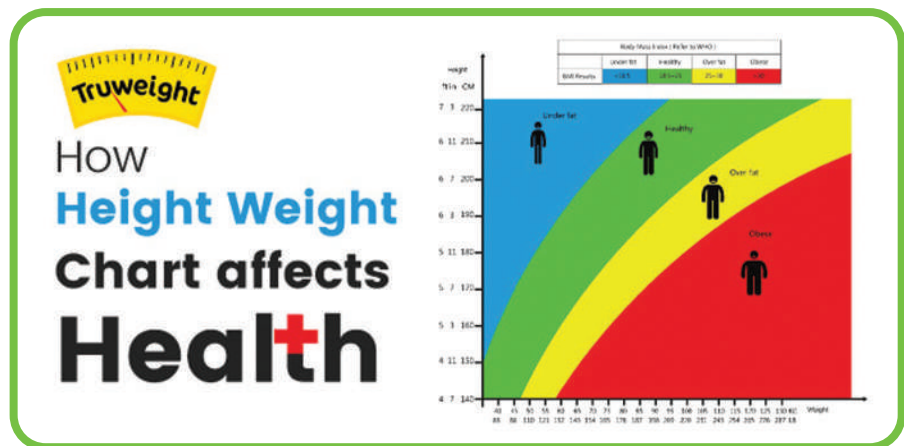
individual and the community. They include retardation of growth, impairment of cognitive (brain) development, susceptibility to infections due to lowering of immunity, increased risk of mortality due to infection, and reduction of the productivity both physically and mentally. It also leads to a greater prevalence of obesity and non-communicable diseases in adults. By sapping the human resources it has adverse impact on social and economic development. Increased morbidity and mortality adds greatly to health care costs.

The micronutrient deficiencies such iron, iodine, vitamin A and zinc are still considered to be public health problems in spite of the severe clinical forms being

rare. Existence of biochemical deficiency is a reason for concern, as if the conditions deteriorate these diseases can re-emerge at both individual and community level. Vitamin A deficiency and Zinc deficiency are recognized causes of secondary immune deficiency and contribute to greater morbidity due to respiratory and gastrointestinal infections. Iron and zinc deficiency in infancy are recognized causes of cognitive impairment in later life. Wasting (acute EPM) also predisposes to infection and makes the chance of dying from an infection much greater. UNICEF estimates that at least one third of child deaths in the world have malnutrition as an underlying cause. Both acute and chronic EPM are also recognized as a cause of impaired cognitive development. Stunting in the female child leads to stunted adults with heights less than 145 cm which is an important cause for low birth weight babies. That is how the vicious cycle starts.

Having discussed the serious sequelae of malnutrition and its intergenerational impact, it is opportune now to discuss its causation (etiology). As indicated earlier it is complex and multifactorial. UNICEF in 1998 developed a conceptual frame work for causes of child undernutrition. An adapted version of this frame work is depicted below as a diagram.

Although the diagram is self-explanatory, a further description is provided for clarity. The final outcome is malnutrition and all its harmful effects described above. The immediate causes are inadequacy of food intake and some disease, most often



in children, it is an infection. Sometimes it could be another disease like cancer or diabetes. The interaction between malnutrition and infection is well established. Malnutrition causes a weakening of the body's immunity. And predisposes it to infection.

Infection reduces the appetite and weakens the digestion, absorption and utilization of the nutrients for bodily growth and bodily functions. Other diseases also act in a similar manner.

At a household or family level, inadequate access to food due to poverty or food not being available for purchase, money being spent for other purposes like alcohol, smoking or addictive substances like cannabis, Incorrect practices related to nutrition and child care like not breast feeding the baby, inadequate complementary feeding, wrong choice of foods, not going for public health services like growth monitoring or immunization, or not seeking health care when needed, inadequate access to housing, sanitation, water and health services. are among a long list of intermediate causes.

The ultimate or basic causes in society determined by social, economic and political systems could be due to poverty or inequitable provision of these services. Referred to as the social determinants of health, it is the responsibility of the state and the community as a whole to make these available in a fair and equitable manner to every citizen irrespective of geographical location, class, religion or ethnicity. Countries which are able to do this well are rated highly in the human development index.

I will recount a case history to illustrate the causation, using this model.

A 10 month old boy from an urban shanty in Colombo presented with high fever, cough and breathing difficulty. He was the first born of a 21 year old mother educated up to grade five who worked as a part-time domestic helper. The father was a 30 years old sanitary laborer who had dropped out of school in grade three. He consumed alcohol and smoked cannabis and used most of his earnings for this. The mother was very short and thin and had not

attended the ante natal clinic conducted by the municipality on a regular basis. Although she had received Thriposha from the clinic off and on, her weight gain during pregnancy was only 7 kg. At 38 weeks of gestation she was admitted with labor pains to the maternity hospital where she delivered this boy whose birthweight was 2.0 kg. There were no complications in the newborn period. Mother and baby were discharged home on the second day after baby was given the BCG vaccination. The mother breast-fed the baby in spite of some initial problems. As her parents lived far away there was no one to help her with the care of the baby. However an older lady from a neighboring shanty was helpful. The public health mid wife (PHM) visited once on the seventh day and advised her regarding breast feeding and invited her to the local clinic at four weeks. As the father's contribution to the household income was insufficient the mother was compelled to resume working when the baby was six weeks old. Baby was commenced on formula using the cheapest available infant formula.

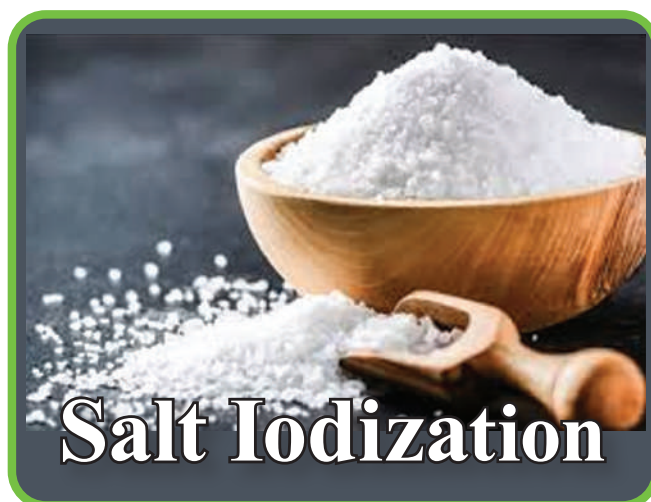
With her limited income she could afford only one pack per month. The neighbor agreed to look after baby during the mother's absence for a nominal fee. She prepared the formula at her house. Due to lack of water and fuel the sanitary aspects were not optimal. Breast feeding was done only at night. Although the baby was taken to the local child welfare clinic (CWC) off and on, growth monitoring and immunization had not been done in a systematic manner. The baby had required hospital admission on two occasions at three months and six months respectively, on both occasions with a gastro enteritis and dehydration needing intravenous fluids. The mother had been advised at the clinic to commence complementary feeding using a homemade multimix of rice, dhal and vegetables and powdered sprats but was unable to do it on a regular basis due to lack of both finances and time. She had also been given some packets of thriposha to feed the child but not on a regular basis. On admission on this occasion the growth chart of the baby showed marked flattening of weight away from the median, with several sharp dips

associated with infections. On examination the baby was severely wasted with the weight for height being in the red zone. He also had clinical evidence of a pneumonia. The admission diagnosis was Marasmus (SAM) with pneumonia.

If you analyze this case history you will be able to identify the causation of malnutrition in this child at the three levels. Using the conceptual frame work given above I suggest that you do it as an exercise. It will also enable you to understand the principles of mitigation and prevention. My analysis of causation is given as annexure one.

It is now opportune to look at the national level interventions that Sri Lanka has adopted in order to mitigate malnutrition.

Interventions can be classified as direct (nutrition-specific) or indirect (nutrition-sensitive). Direct interventions address the immediate causes of malnutrition such as improving household food security or prevention of disease, while the indirect interventions address the background issues such as



alleviating poverty, improving agricultural production or improvement in access to water and sanitation. Direct interventions could be targeted to specific groups or to the whole population.

The thriposha supplementation program, health education programs promoting breast feeding and correct complementary feeding, and the growth monitoring program using the child health development record are examples of direct interventions. The thriposha program, the school meal program, and the poshana malla for pregnant mothers program are examples of direct intervention targeted to specific categories, while the universal salt iodization program is a direct intervention to the whole population.

Indirect interventions include poverty alleviation programs such as Divineguma or Samurdhi, water supply schemes and agricultural subsidies.

While a critical in-depth analysis of these interventions are clearly outside the scope of this article, we can identify some which have achieved a measure of success.

Universal salt iodization program implemented in 1986 has achieved a significant reduction in endemic goiter and endemic cretinism. However no universally targeted program is without some negative effect. During this period there has been a slight increase of autoimmune thyroid disease in some segments of the population. While this needs close monitoring by the medical services, the advantages of the program far outweigh its negative aspects. The technical aspects of salt

iodization too need to be closely monitored.

The growth monitoring program, breast feeding and complementary feeding using Infant and Young Child Feeding (IYCF) guidelines has achieved some success in improving Exclusive Breast Feeding (EBF) rates and reducing the more severe forms of SAM like marasmus and kwashiorkor. But we have a long way to go in this respect.

Mega dose vitamin A program coupled with nutrition education on increased consumption of beta carotene containing fruits and vegetables has achieved a significant reduction in eye disease due to Vitamin A deficiency, but sub-clinical Vitamin A deficiency is still prevalent.

The WHO has prepared a list of nutrition interventions for the mitigation of malnutrition using the lifecycle approach. These are depicted in the following diagram which is self-explanatory.

Many of these interventions are already being implemented in Sri Lanka with varying levels of success. Greater technical efficiency and more accurate targeting are likely to improve the outcome. Inadequate allocation of funds, lack of public awareness of these programs, and inadequate human resources for implementation have hindered their progress. Improving the general public's understanding of the causation of malnutrition and how it can be mitigated is likely to have a positive impact on the success of these interventions.



Mitigation/prevention of obesity/ overweight and NCDs like diabetes, hypertension, heart attacks, strokes and certain types of cancer which are diet-related need relatively greater individual/personal initiative. However state/community interventions are required to provide preventive and curative services in an equitable and affordable manner and in regulation of industries/ organizations which deal in products which are clearly conducive to development of obesity, and non-communicable diseases, such as sweetened beverages, fast food, tobacco, alcohol and other addictive substances.

The causation(etiology) of obesity and non-communicable diseases is also complex but is now fairly well understood. The intergenerational effect through low birth weight and stunting in early child hood is important. There is a clear familial contribution to obesity which is partly genetic and partly environmental. The two most important risk factors for obesity are excessive consumption of energy dense food and lack of physical exercise. The other risk factors for NCDs are excessive salt and saturated fat consumption, smoking and other forms of tobacco use, and consumption of alcohol.

Prevalence of overweight and obesity are increasing rapidly in Sri Lanka. Surprisingly it is not confined to the wealthy but affects the poor too. The prevalence of childhood obesity is also increasing. Obese children usually end up as obese adults. NCDs are already the most important cause of disability and death in adults. The dietary and life style changes which contribute to these have not occurred spontaneously but due to active promotion of these unhealthy practices and products through mass media, social media and other social interactions. While the state and society have an obligation to regulate these through legislation and other measures, the most important way to combat these is the creation of enlightened and empowered citizens who are knowledgeable about causation and prevention of malnutrition including obesity.

Some of the initiatives taken by the state to address these issue include.

- Establishing healthy life centers in all primary medical care units (PMCU) which

provide medical and laboratory services for early detection and management of obesity and NCDs.

- Establishing medical nutrition clinics in all base/ provincial hospitals for management and follow-up of obesity and diet related NCDS. These are staffed by doctors specially trained in nutrition.
- Publishing national food-based dietary guidelines and disease specific food-based dietary guidelines for the public.
- Strengthening food regulations and food labelling and advertising guidelines to enforce a traffic light system of labelling for certain food categories, and to prohibit food advertising to children through mass/social media.
- Encouraging the creation of Consumer Protection Societies addressing specific categories, under the authority of the Consumer Protection Agency (CPA)

- Creation of the National Alcohol and Tobacco Agency (NATA) to strictly implement the global frameworks for control of tobacco and alcohol.

In this article we have learned that malnutrition is a widely prevalent problem in Sri Lanka. Though its causation is complex., the main underlying factors are clearly understood. Root causes are poverty and ignorance. We can mitigate these factors at an individual/community level and for both, awareness and full participation of an enlightened citizenry is the key.



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