

Whitepaper
Malnutrition
Balancing Malnutrition
Factors

Presented by Interlink Marketing Consultancy

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Foreword

Recent years have shown remarkable progress and drawbacks with respect to food and malnutrition. Although the world hunger index has reduced over the last couple of years, there is still a large number of population in the world suffering from undernourishment, which needs to be effectively addressed leading to its elimination. There has also been increased vulnerability in world leading to food crisis.

Various reports have indicated several factors affecting malnutrition but what we have come across are the various Interlinking factors such as Economic inequality (Gini coefficient), Sanitation, Urbanization, Food security etc. which need to be tackled holistically to eliminate malnutrition.

Timely review of government policies/programs and by filling in the existing gaps, the goal of eliminating malnutrition seems achievable in the near future.

Let me place on record my appreciation for the knowledge team of Interlink and Dr.Vaibhav Kulkarni, Honorary Treasurer & Chairman of Regulatory Affairs Committee- HADSA, FICCI Western Chapter Co-chairman, Consumer Complaint Counsel Member of ASCI in preparing this document and co-operation by administration of HADSA.

Your comments and suggestions are always welcomed.

With best regards,

A handwritten signature in black ink, appearing to read 'R. B. Smarta', written in a cursive style with a horizontal line underneath.

Dr. R. B. Smarta

Chapter 1

Vulnerability

Hunger

Hunger is a feeling of discomfort or weakness caused by lack of food, coupled with the desire to eat. The physical sensation of hunger is associated with contractions of stomach muscles, sometimes referred to as hunger pangs. These stomach muscle contractions can be severe and painful. Once these hunger pangs become severe they may trigger high concentrations of the hormone ghrelin. Hunger pangs may become worse due to irregular meals. People who can't afford to eat more than once a day sometimes refuse to have more than one meal because if they don't eat at around the same time on the next few days, they may suffer extra severe hunger pangs. Older people may feel comparatively lesser violent stomach contractions when they get hungry, but still suffer the secondary effects resulting from low food intake which include weakness, irritability and decreased concentration. Prolonged lack of adequate nutrition also causes increased susceptibility to diseases and reduced ability of the body to self-heal. Due to various reasons, today the world has become more vulnerable to hunger.

Vulnerability

Food crisis has affected the world due to various events leading to chronic vulnerability. One of the stated examples would be the Syrian Civil war which has sent shock waves throughout the region as well as its neighbouring countries. The war has resulted in Syrian economy to decline by around 40% with more than 4.9 million people in moderate need of food assistance. Also, the World Food Programme (WFP) briefly withdrew its assistance to the region in late 2014 because of funding crisis.

Another illustration would be the food crisis in West Africa which emerged from a different kind of shock altogether; the outbreak of Ebola. The epidemic caused severe destruction of food systems agricultural produce, harvest, transport, markets apart from destroying lives, leading to rise in food prices. These are just a few examples of rise in chronic vulnerability in the world.

Hunger and Nutrition

Whenever living organisms do not have enough energy to carry out daily activities they feel hungry. The hunger can be temporary i.e. not getting enough food to eat for a meal or a day, or it can be long lasting when a person does not get enough food to eat for a longer period of time over many days, weeks, months or years. When a person has hunger for a sustained period of time, faces the lack of essential nutrients which may either be mild or severe depending on his body's needs and food intake.

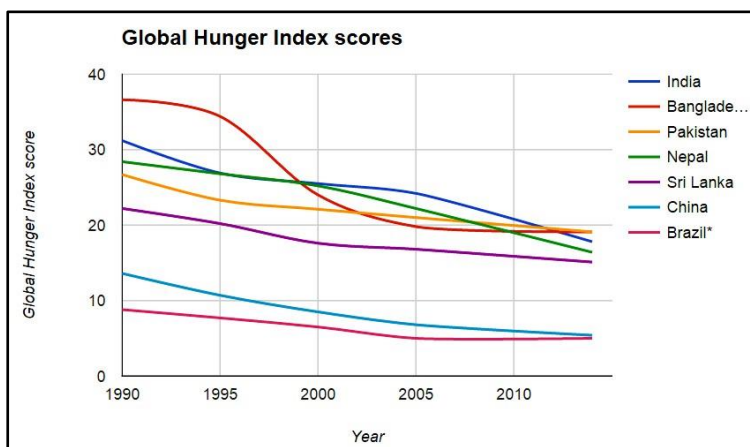
The hunger quotient of a nation can be measured or estimated by the Global Hunger Index (GHI). The GHI measures and tracks hunger globally and by region and country. The measurement of hunger is a combination of three equally weighted indicators (Undernourishment, Child underweight and Child Mortality) into one index.

This Index ranks countries on a 100 point scale, with 0 being the best score (no hunger) and 100 being the worst. Higher the score, worse is the hunger problem in the country.

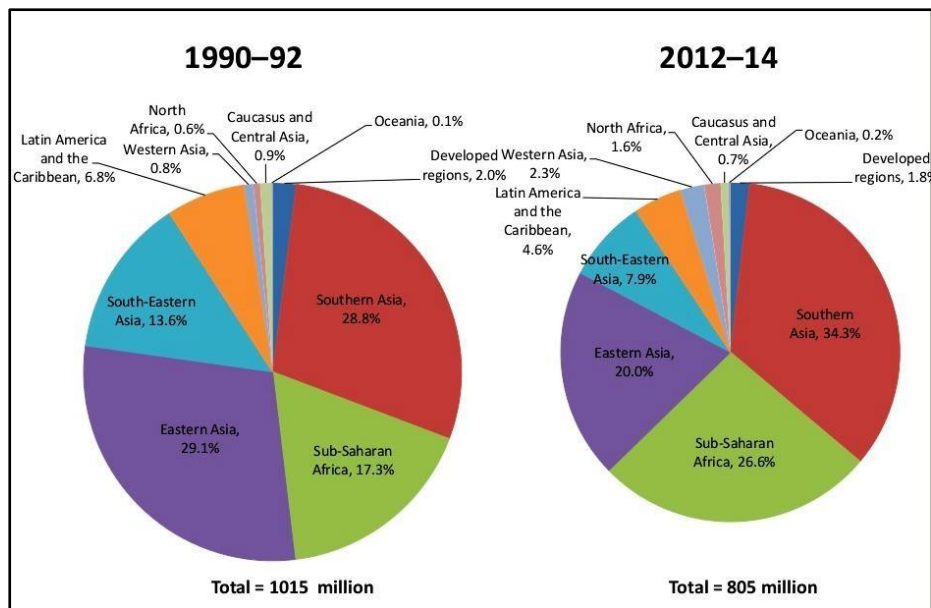
Hunger Index scores and their indications

- Low hunger – value < 4.9
- Moderate hunger - values between 5 and 9.9
- Serious - values between 10 and 19.9
- Alarming - values between 20 and 29.9
- Extreme - values exceeding 30

Represented below are some of the countries and their GHI Scores from the year 1990 to 2010.



The hunger index score of India was around 31.2 in the year 1990 and 17.8 in 2010. Also, India ranks 55th among the 76 emerging economies in the Global Hunger Index rankings. Similar to India, globally, the GHI score has improved by 39% i.e. from 20.6 to 12.5 between the years 1990 and 2014. Regardless of this progress, the number of undernourished/hungry people in world is quit high i.e. 805 million as per the IFPRI report. The representation below depicts the change in distribution of hunger in world.



Source: Food and Agricultural organisation of United Nations, The State of Food Insecurity in the World (SOFI) 2014

From the 1990's the overall hunger and undernourishment has reduced from 1015 million people in the world to 805 million people. It can be observed that hunger and undernourishment has reduced in the South-eastern Asia, Latin America and the Caribbean and Eastern Asia, while it has increased in Southern Asia, Sub-Saharan Africa and upto some extent even in North Africa and Western Asia. Thus, although the overall hunger has reduced across the world, there are certain regions which have a high percentage of undernourished and hungry people, who need to be addressed.

Hidden Hunger

Hidden hunger is a very different concept from the usual hunger. Hidden hunger arises from prolonged lack of essential nutrients, this may or may not show any visible warning signs, so that people who suffer from it may not even be aware of it. Hidden hunger results in consequences as severe as chronic hunger. The term hidden hunger is coined so because it invisibly affects the health of an individual. According to estimates, hidden hunger affects one in every three people. The most affected are women and people from the lower income groups in developing countries.

Hidden hunger arises due to poor diet, diseases, impaired absorption and increased micronutrient needs during certain life stages, such as pregnancy, lactation, and infancy. Also, adequate or even excessive consumption of dietary energy from macronutrients, such as fats and carbohydrates can give rise to hidden hunger and therefore can also coexist with overweight /obesity in a person.

Hidden hunger can thus, be tackled by food-based approaches: dietary diversification, which might involve growing more diverse crops, fortification of commercial foods; and bio-fortification, in which food crops are bred with increased micronutrient content. To make a lasting difference, these measures would require long-term, sustained, and coordinated efforts. Vulnerable populations can combat hidden hunger for short term with vitamin and mineral supplementation.

Chapter 2

Malnutrition Syndrome

As observed, vulnerability has increased food crisis, adding to the existing hunger problem, also the new concept of hidden hunger is emerging in developing and middle income countries. All these factors in turn affect the nutrition status and health of an individual.

Nutrition plays a significant role in our daily lives. For the smooth functioning of an organism's metabolic processes and growth, both macro and micronutrients are equally important. Every food item that we ingest has its own nutrition value and is essential for life. Thus the amount and type of nutrients consumed govern the health of an individual. Striking a balance between the amount, type and quality of nutrients is the key to healthy living.

Lack of good nutrition, unhealthy eating habits as well as lack of physical activities in general and exercise may lead to many lifestyle diseases or other health disorders. In recent years there has been an increase in the lifestyle diseases due to increase in irregular dietary habits and improper nutrition. Evidences show that the risk of adult chronic diseases, like hypertension, obesity, type 2 diabetes etc. increases due to unhealthy eating habits. Under normal conditions, healthy diet is directly proportional to adequate nutrients required for daily activities.

Malnutrition syndrome

Imbalance in the good nutrition or essential nutrients in body gives rise to various health conditions. Two of the major health conditions concerning nutrition imbalance are, **Under-nutrition** and **Over-nutrition**. **Malnutrition** is an umbrella term for under-nutrition and over-nutrition, basically it is the imbalance of nutrients in a person's body. Malnutrition can even be considered as a **syndrome**, which is associated with a set of medical signs and symptoms that are correlated with each other and often, with a specific condition.

Under-nutrition in an individual is characterized by less supply of food than the requisite amount of food and nutrition essential for sound health and growth. Under-nutrition occurs when a person consumes diet that does not meet the required amount of essential nutrients or calories required to maintain healthy state of body & mind. Whereas **over-nutrition** in an individual is characterized by excessive nourishment so much so that it hampers the sound functioning of the body. Over-nutrition occurs when a person consumes food that exceeds the required amount of essential nutrients, or the amount of calories a person requires to remain healthy.

Currently the world is facing problems of both Over-nutrition as well as Under-nutrition. Many developed as well as few developing countries face the problem of Over-nutrition, whereas most of the developing countries face the problem of Under-nutrition.

Measuring Malnutrition

Malnutrition can be quantified through anthropometric methods. These anthropometric methods include age, sex, length, height, weight and oedema. These tools help in classifying the nutritional status in children. Oedema is also a confounding factor for the measurement of malnutrition. Children with oedema are always considered of being suffering from severe acute malnutrition. Also, when oedema is present in both feet (bilateral pitting oedema) a child is considered severely malnourished, regardless of his weight-for-height Z-score. These measurements are based on cutoffs values.

The degree of severity of malnutrition in children on the basis of mid-upper arm circumference (MUAC) is given below.

- >14 cm: Normal
- 12.5-14.0 cm: Mild/Moderate wasting
- <12.5 cm: Severe wasting

These anthropometric methods cannot be used for adults as there is no internationally recognized anthropometry reference. Instead, malnourishment in adults is measured by Body Mass Index (BMI). Also, low-birth weight is an indicator of malnourishment in small babies. Low-birth weight as an indicator of malnourishment in small babies is widely used because it showcases not only the status of the new-born but also the nutritional wellbeing of the mother.

Types of Malnutrition

Severe Acute Malnutrition

Severe Acute Malnutrition (SAM) is defined by WHO and UNICEF as weight-for-height index less than -3 z-score or a mid-upper arm circumference (MUAC) less than 115 mm, or presence of oedema by visible severe wasting or by the presence of nutritional oedema. This is the reason why severe acute malnutrition is considered more of a disease.

The median under-five case-fatality rate for severe acute malnutrition typically ranges from 30% to 50%. These limits can be reduced to a great extent by taking care of physiological and metabolic changes. Management of severe acute malnutrition according to WHO guidelines reduced the case-fatality rate by 55% in hospital settings and recent studies suggest that communities such as ready-to-use therapeutic foods, can be used to manage severe acute malnutrition in community settings. In order to train health workers in applying this scheme WHO has created a course which, with the aid of institutional partners in Bangladesh, Chile, Gambia, Malawi and the UK, has been conducted in countries in the African, South-East Asia and Western Pacific Regions.

Since SAM is considered as a disease, it requires immediate treatment. Initially the children with SAM were referred to hospitals where they were administered with therapeutic foods. Nowadays,

ready to use therapeutic foods (RUTF) allows the management in the community of large numbers of children who are severely malnourished above the age of 6 months without medical complications. A meeting of experts was organized by the Department of Child and Adolescent Health and Development and the Department of Nutrition for Health and Development of the WHO, by UNICEF and the UN Standing committee on Nutrition in Geneva on 21-23rd November 2005 to review these recent developments and formulate recommendations. It is expected that implementation of these community-based interventions on a large scale along with a strengthening of referral facilities for severely malnourished children with complications could transform the lives of millions of these children.

Measuring incidence of SAM implies regular screening, ideally every month, of children fulfilling the above-mentioned definition of SAM. This cannot be done, except in research settings, using the WHZ-based definition. Some community-based management of severe malnutrition programmes measure MUAC of children every month and screen for the presence of oedema. These programmes, provided they have good coverage in their screening, are in a position to provide incidence data. Analysis of the data routinely collected by these programmes should soon provide more reliable estimates of the SAM burden in areas of high prevalence.

Moderate Malnutrition

Moderate malnutrition (MM) is defined as a weight-for-age between -3 and -2 z-scores below the median of the WHO child growth standards. It can be due to a low weight-for-height (wasting) or a low height-for-age (stunting) or to a combination of both. Similarly, moderate wasting and stunting are defined as a weight-for-height and height-for-age, respectively, between -3 and -2 z-scores.

MM affects many children in poor countries with a higher risk of mortality. It is also associated with a high number of nutrition-related deaths. Failure in receiving adequate support and treatment, moderately malnourished children could progress towards severe acute malnutrition (severe wasting and/or oedema) or severe stunting (height-for-age less than -3 z-scores), which are both life-threatening conditions. This calls for MM to be a public health priority.

For past several years, programmes and policies for tackling MM in children have remained virtually unchanged and thus, need timely review for improvement of their efficacy and effectiveness. The nutrient-dense foods are required for children of 6–59 months of age with moderate acute malnutrition to meet their extra needs for weight and height gain and functional recovery.

Chapter 3

Malnutrition: Primary Factors

Food provides living beings with the energy and nutrients required for healthy existence, growth and development. Daily supply of energy and nutrients is essential for normal functioning of organisms, and any interruption in this process may have negative impact on the normal functioning. Also any hindrance in the quality or quantity of food may result in imbalance of nutrients, lack of quality nutrients and even lack of adequate energy which results in malnutrition.

Several social, economic and medical factors may pose as a reason for malnutrition in humans. These factors either directly affect the quality or quantity of food leading to malnutrition. Some of these factors have been explained below.

Social factors

Population

Overpopulation is considered as one of the important determinants of malnutrition, other determinants being size of the family, spacing between the births of every child in the family. The availability of food per person in a district or a nation is determined by dividing the amount of food produced or purchased by the number of people who have access to that food. A family of eight that produces and purchases the same amount of food as a family of four has less food available per person. Population control and effective family planning can reduce the problems of hunger and malnutrition in families to some extent.

Agricultural Produce

Agriculture is the primary source of production of food. Not just the amount of agricultural produce but the nutritional status and profile of food is equally important. With the advancement of technology there have been not able developments in agriculture. High-yielding varieties of the important cereals (rice, wheat and maize) have been successfully developed, and much progress has been made in increasing crop yields per hectare of land. One of the main reasons affecting the quality and quantity of agricultural produce is natural calamities. They can lead to complete destruction of the agricultural produce or they may lead to non-facilitation of growth of foods or they may hamper the quality of produce. Other areas such as food safety, heavy food losses by pests and food storage influence the availability of food. Food demand and access has to be given equal importance as food production.

Food handling

In many developing countries accessibility of nearly half of the population to adequate food supply is low. One reason for this low accessibility is the amount of agricultural produce of the country and other notable reason is that a substantial part of the food produced is lost before it reaches to the consumer. The food produced may be lost because of improper post-harvest handling practices, bad storage conditions, spoilage due to pest infestation and loss during transportation. In case of processed foods, nutritional value is lost while processing and the quality of food may not remain the same as before the processing, if necessary actions are not taken to prevent the loss of nutrients. In many countries the loss of easily perishable fruits and vegetables has been estimated to be about half of what is grown. Also some percentage of the food and its nutrients are lost while cooking.

Thus, appropriate measures need to be taken in order to prevent food losses during harvesting, storage, processing and transportation. This factor needs to be considered while working on prevention of malnutrition and increasing accessibility of food.

Economic factors

Poverty & social isolation

The economic status of the population now-a-days defines the type of malnutrition faced. The poor and lower income class people especially children usually suffer from undernutrition while the issue of overnutrition is on the rise in upper income class people. Poverty has often been considered as the root cause of malnutrition. Poverty may result in non-affordability of adequate food (both quality and quantity wise). In case of older population poverty and/or social isolation may be the cause of malnutrition. Affordability of food due to lesser income, reduced mobility, physical disability, lack of desire to eat or due to certain clinical conditions the older population find it hard to meet their nutritional demands, leading to malnutrition.

Medical factors

Diseases

Apart from the external factors such as discussed above, the social & economic factors, some of the internal factors may also lead to malnutrition. Disease related malnutrition may arise due to reduced dietary intake, increase in loss of nutrients, improper absorption of nutrients, transformed metabolic demands. Such type of malnutrition is mostly associated with adults rather than children. Some of the diseases that can cause malnutrition include oncological diseases such as cancer, pulmonary diseases as Chronic Obstructive Pulmonary Disease (COPD) or Cystic Fibrosis (CF) and gastrointestinal diseases, Inflammatory Bowel Disease (IBD) etc. Gastrointestinal diseases impair the functioning of stomach and/or intestine such that the efficiency of digestion and absorption of nutrients is reduced. The treatment methods (chemotherapy, radiation therapy) of oncological diseases can also have a negative impact on nutrition. Apart from these, diseases like the Parkinson's disease physically limit the intake of food in patients thus leading to inadequate nutrient intake.

Disease related malnutrition can be treated by treating the disease or implementing special diets designed for the patients to suffice their need for nutrients.

Food and Nutrition insecurity

The food safety issues are complex as well as diverse. The possibilities of the problems related to food safety are different at different stages of economic development. While many developing countries face the issue of food insecurity, many of the developed countries face the issue of nutrient insecurity. Both these aspects need to be taken into consideration while tackling the problem of malnutrition. Nutrition insecurity means over-nutrition or lack of quality nutrition. In case of middle income countries both food and nutrition insecurity exists. Countries like India, Brazil, China etc. are tackling both the issues of undernutrition as well as obesity and related problems. There are several factors that influence the scale and nature of food and nutrition security.

Key factors characterizing food security

Some of the major factors that characterize the security of food and nutrition in middle income countries are **increased urbanization, changing consumer's preferences, rising inequality and lack of focus on nutrition** and its quality. There has been a shift in the consumer's perception, preference of food and persistent neglect on nutrition. The consumer's preference has shifted from the traditional food to junk food. This adds to the burden of hidden hunger.

Although in many countries a lot of emphasis is given to the issue of accessibility of food, it would be great if this is linked to the adoption of healthy diets. Economic growth and poverty reduction can co-exist with the burden of malnutrition. The losses brought about by malnutrition in human capital development may be accentuated by lack of equal access to quality education and by gender gaps. Urbanization in the middle income countries have resulted in the shift of consumer's food and lifestyle related preferences. From the traditional nutrient rich, wholesome food the consumers have shifted to nutrient deficient, processed foods. Although to some extent the access to food has increased through various social policies, people need to adopt healthy diets.

Chapter 4

Malnutrition: Secondary Factors

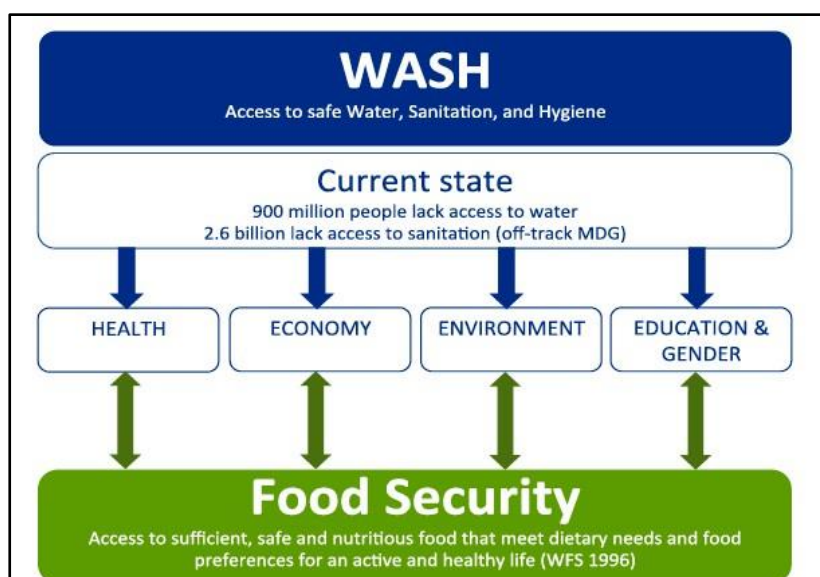
Sanitation and Nutrition

Along with hunger, sanitation also plays an important role in nutrition. Sanitation is necessary to reduce the incidence and spread of diseases, which may in turn hamper the absorption of nutrients in body and lack of sanitation, may also affect the nutrition value of food.

Recently a link has been established between Food security, Sanitation and Nutrition. This link has been elaborated in the Global Food Policy Report IFPRI. Up till now whenever food security has been addressed this link has been overlooked or not taken into consideration at all. But with increasing research & evidence, strengthening this link, it has become inevitable to ignore it.

WASH (net nutrition)

The concept of WASH involves Water, Sanitation and Hygiene. These three aspects have been linked to food security / hygiene. The representation below illustrates this link:



Source: Bonn 2011 Nexus Conference, Topic Session 7, Issue Paper

Around 900 million people even today lack the access to water, whereas 2.6 billion people lack access to sanitation (off-track the Millennium Development Goals). Water related diseases affect food and nutrient absorption in humans. WHO estimates that approximately 2.4 million deaths and 7% of the total disease burden can be prevented annually with the help of safe WASH. WASH is essential for reducing the risk of contaminants hazardous for the health and nutritional status of individuals, this will also help in achieving a higher level of food security. Safe WASH means hygienic

handling of food by the use of potable water during its preparation and promotion of hygiene through proper sanitation in order to avoid food contamination.

The evidence regarding consequences of sanitation has been strong, especially for open defecation without using a toilet or latrine. The health impacts of WASH is to control diseases like diarrhoea, acute respiratory infections, soil-transmitted intestinal helminth infection, diseases associated with chemically burdened water such as arsenicosis and fluorosis etc.

Apart from these diseases there is growing base of evidence linking sanitation, child height and child well-being. In case of children their height is important as it reflects their health and nutrition status in their initial years of development, right from the time of gestation. Height is a marker of physical and mental development, which is in turn influenced by the overall health and nutrition. Due to establishment of the link between WASH and food security the issue of sanitation and nutrition has moved to the top in developing countries.

Food Borne Diseases and Nutrition

Similar to water, food sanitation and hygiene is equally important. Various events that took place in recent years have severely threatened food security. To combat food security, new ways of genetically modified foods are also being studied.

Chemical burden of foods

Apart from the food borne diseases, the chemical burden of foods may also be one of the causes for malnutrition or act as support to malnutrition. In modern agriculture pesticides have been widely used for the protection of plants. Although pesticides protect plants from insects, weeds, rodents, fungus etc. it has many harmful effects on the environment.

The pesticides are usually sprayed on the vegetable plants and even after washing some traces of the chemical residues remain on the leaves and fruits. When we eat such vegetables these residues are transferred in our body. The effects of pesticide exposure in small amounts have not yet been defined however there are researches that link exposure of pesticides to elevated risk of chronic diseases. Also in already malnourished individuals or children these effects may be heightened as malnutrition and dehydration increase the sensitivity to pesticides and children face a higher risk from pesticides as they are more susceptible than adults. Pesticide related illness is a problem in children and it disproportionately affects infants & children.

When pesticide exposure is higher that it causes severe adverse effects to individuals, it is termed as 'Pesticide Poisoning'. Pesticide poisoning may occur due to breathing, drinking or eating, or through the skin or mucous membranes. The symptoms resulting from acute poisoning may range from fatigue, dizziness, nausea and vomiting, to respiratory and neurological effects that may be life-threatening. Chronic, and even low-level exposure to pesticides has been linked to cancer, birth defects, and damage the nervous and the functioning of the endocrine system.

When a child bearing mother is exposed to pesticides, the, to be born child is also directly or indirectly exposed to pesticides. The small children may also become persistently exposed to bio-accumulative pesticides present in the mother's body through breast milk. Protecting pregnant women and lactating mothers from exposure to toxic contaminants is therefore crucial.

Sanitation and Food related diseases are the secondary factors for malnutrition. Although the hunger index of world has reduced, there is still a large population of the world that suffers from under nutrition. These secondary factors also need to be taken into consideration in order to tackle malnutrition at large. Certain programs can be designed to improve sanitation for better nutrition. Study conducted with the support of UNICEF in Mali, Bangladesh and Zimbabwe has shown that Sanitation and Hygiene the program caused children under five years of age to be taller and less likely to be stunted. Improved sanitation has a detectible effect on child height, which can be correlated to malnutrition. As for the food safety, the use of pesticides in agriculture needs to be reduced as well as farmers need to be trained on how to cautiously use pesticides and prevent their exposure. Also Integrated Pest Management can be implemented to reduce the use of pesticides or herbal pesticides can be used as an alternative for the chemical pesticides.

Chapter 5

Indian Scenario

Over the last 25 years, the percentage of undernourished and hungry people has reduced upto some extent. But still around 30.7% of the Indian children are still underweight. In India, malnutrition is widespread in rural, tribal and urban slum areas and it is a significant public health problem described as an invisible enemy. The improved ranking of India in the Global Hunger Index rankings can be attributed to the efforts of government in dealing with underweight and undernourishment in children. Between 2005 and 2014, the prevalence of underweight children under the age of five years has fallen from 43.5% to 30.7%. This has helped improve the hunger situation of India from severity of the hunger situation in India from alarming to serious.

Represented below is the health and economic status of India.

Country	GDP growth (2003–2013)	Gini coefficient ^t	Years in middle-income status	Total population (millions)	Population undernourished (millions)	Population overweight and obese (millions)
China	9.6	42.1	15	1,368	150.8	341.9
India	6.1	33.9	7	1,260	190.7	141.1
Indonesia	4.3	35.6	11	251	21.6	52.1
Brazil	2.5	52.7	>27	200	ns	105.6
Mexico	1.3	48.1	>27	120	ns	82.6
Subtotal				3,198	363.1	723.3
World	2.7	38.5		7,125	805.3	2,458.0

Sources: Data on GDP growth, Gini coefficients, years in middle income, and population are from the *World Development Indicators 2014* (Washington, DC: World Bank, 2013), <http://databank.worldbank.org/data/views/variableSelection/selectvariables.aspx?source=world-development-indicators>. Data on undernourishment are from the Food and Agriculture Organization of the United Nations, *The State of Food Insecurity in the World—2014* (Rome: 2014), <http://www.fao.org/publications/sofi/2014/en/>. Data on obesity are estimated by multiplying population by prevalence of obesity, found in the Food and Agriculture Organization of the United Nations, *The State of Food and Agriculture in the World—2013* (Rome: 2013), <http://www.fao.org/publications/sofa/2013/en/>.

As we can see around **331.8 million** people in India are **Malnourished**, of which **190.7million** being **undernourished** and **141.1 million** being **overnourished**. Thus in India both types of malnutrition prevail. This situation is attributed to various factors such as demographic shifts, lifestyle and dietary changes related to increased income, lack of good nutrition, urbanization etc. As poverty may lead to Malnutrition, malnutrition in turn imposes high economic costs on the nation. India's GDP growth for the years 2003-2013 was around 6.1. According to the Global Food Policy Report, in India micronutrient deficiencies cost up to 3 percent of the annual GDP.

State-wise Status of Malnutrition

Name of the state/UT	Data as per NFHS – 3 (Status for 2005-06)		Data provided by the Ministry (status as on)			
	Malnourished	Severely malnourished	31-March-2007		31-March-2011	
			Malnourished	Severely malnourished	Malnourished	Severely malnourished
Andhra Pradesh	32.5	9.9	53.23	0.13	48.72	0.08
Arunachal Pradesh	32.5	11.1	9.13	0.01	2.00	0.00
Assam	36.4	11.4	40.12	1.40	31.32	0.46
Bihar	55.9	24.1	NA	NA	82.12	25.94
Chhattisgarh	47.1	16.4	54.14	1.18	38.47	1.97
Goa	25.0	6.7	41.41	0.15	34.11	0.04
Gujarat	44.6	16.3	70.69	0.85	38.77	4.56
Haryana	39.6	14.2	45.34	0.11	42.95	0.05
Himachal Pradesh	36.5	11.4	38.86	0.15	34.24	0.06
Jammu & Kashmir	25.6	8.2	32.61	0.78	31.12	0.06
Jharkhand	56.5	26.1	47.36	1.74	40.00	0.70
Karnataka	37.6	12.8	53.39	0.31	39.50	2.84
Kerala	22.9	4.7	38.80	0.07	36.92	0.08
Madhya Pradesh	60.0	27.3	49.61	0.75	28.49	1.88
Maharashtra	37.0	11.9	45.47	0.21	23.32	2.61
Manipur	22.1	4.7	10.06	0.19	13.83	0.24
Meghalaya	48.8	27.7	36.74	0.14	29.13	0.18
Mizoram	19.9	5.4	22.67	0.48	23.26	0.20
Nagaland	25.2	7.1	13.79	0.31	8.36	0.07
Odisha	40.7	13.4	56.54	0.82	50.43	0.72
Punjab	24.9	8.0	35.36	0.37	33.63	0.05
Rajasthan	39.9	15.3	54.09	0.27	43.13	0.33
Sikkim	19.7	4.9	27.17	0.08	10.72	0.86
Tamil Nadu	29.8	6.4	39.10	0.04	35.22	0.02
Tripura	39.6	15.7	14.83	0.19	36.89	0.35
Uttar Pradesh	42.4	16.4	53.36	1.09	40.93	0.21
Uttarakhand	38.0	15.7	45.71	0.23	24.93	1.19
West Bengal	38.7	11.1	52.75	0.68	36.92	4.08
Delhi	26.1	8.7	54.36	0.07	49.91	0.03
All India	42.5	15.8	50.10	0.55	41.16	3.33

[Percentage of malnourished children covers all malnourished children including severely malnourished]

In studies conducted in an urban slum of Delhi and Jabalpur and evaluating the prevalence of underweight, stunting and severe underweight, it was observed that the prevalence stunting was more than that of wasting and severe wasting.

Changing Food Habits

India's agriculture has been focused on inputs for making it more viable and successful. Food calories and portions for individuals depending on age, gender and work have been specified by National Institute of Nutrition. It also specifies the food source from which these calories should come from.

Thus, the country's annual food quantity requirements can be determined from the NIN-recommended portions of food and also from census and NSSO data. The peak recommended calorie for Indian men and women are almost 15% more than what it is in the US.

Hence, these calorie requirements quantify the amount and type of food our farmers need to produce. India still strives to be self-sufficient in agriculture. Also, a well noted fact is that India produces more of cereals, fruits and sugar and less of milk and vegetables. In order to curb hunger and prevent the loss of essential nutrients, it is important to prevent wastage of food in the supply chain. Also, most of the times harvests that never reach the people due to poor quality of storage and transportation. There have been changes in occupation structure in the recent years as more people have started moving out of agriculture towards other prosperous occupations.

Producing less of nutritional items (in million tonnes)			
Indian produces a lot more of cereals and a lot less milk and vegetables.			
Food requirement over various age, gender and work categories and their production, March fiscal year-end, 2011			
	Requirement	Production	Excess/(deficit)
Cereal and millets	153.7	283.0	129.3
Pulses	32.8	18.0	(14.8)
Milk and milk products*	166.3	121.8	(44.5)
Roots and tubers	72.9	146.6	(45.1)
Green leafy vegetables	41.0		
Other vegetables	77.8		
Fruits	44.2	74.9	30.7
Sugar	13.2	24.5	11.3
Fat	13.6	NA	NA
			* in million litres

Source: The Business line, commodity times, 30th April 2015, Akhilesh Tilotia

India now is facing the burden of hidden hunger which is seen to be prevalent in the developing world. Along with hidden hunger, micronutrient deficiency, particularly iron and iodine deficiency, is also widespread. Approximately 62% Indian population is suffering from vitamin A deficiency and 25% from iodine deficiency.

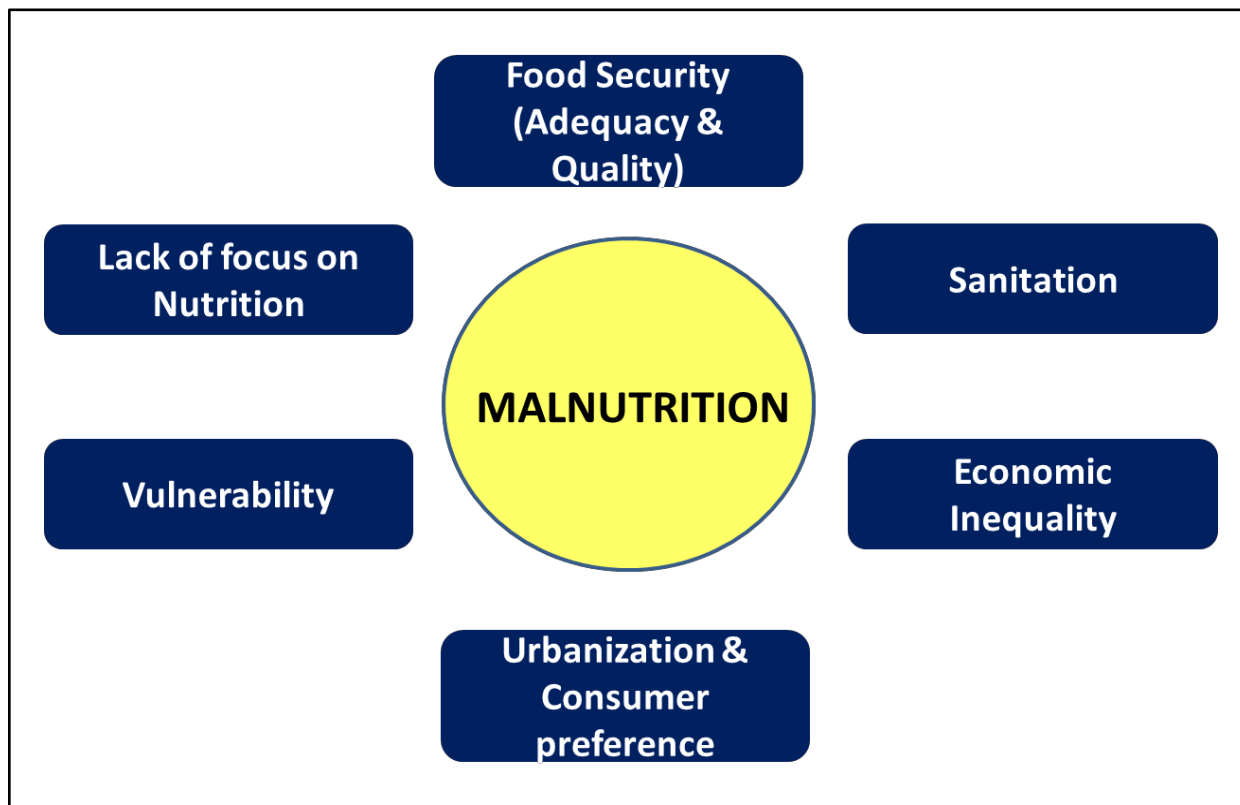
The concept of malnutrition in India is turning complex with shifts of people's diets from being traditional to more processed, energy dense & micronutrient poor foods, leading to obesity and diet-related chronic diseases.

This shows that India today faces the problems of micronutrient deficiency and obesity along with undernourishment.

Chapter 6

Interlinking Factors of Malnutrition

The representation below depicts the various factors affecting malnutrition as well as determinants of malnutrition. Although all these factors and determinants are broadly linked to malnutrition, they are interlinked with each other as well.



The above depicted determinants can be grouped together into three main categories, viz. **Security**, **Vulnerability** and **Socio-economic**.

Malnutrition as discussed does not have a single cause but there are several interlinking factors that may lead to malnutrition either directly or indirectly. Food security in terms of adequacy of quality food to the entire population of the nation or in broader view to the population of world is of utmost importance as this is interlinked with two of the major concerns of malnutrition, which are Hunger and Lack of nutrition. Vulnerability is another aspect which directly or indirectly affects food adequacy and or quality of food. Another factor connecting with the quality of food is the level of sanitation maintained with respect to the environment as well while handling food. The economic

inequality in any nation is the breeding ground for many maladies, malnutrition being one of them. As even though food is adequate in a nation, if majority of the people in that nation are poor and are unable to access this food, hunger and in turn malnutrition will still prevail. Hence, the need for measures, to reduce the economic inequality and/or ensure access of quality food to every individual in the nation. One of the recent links in the factors of malnutrition is urbanization and its resulting change in consumer's preference towards less healthy or nutrient deficient food from the traditional nutrient rich food.

So for, any measures or actions to be taken in order to effectively control, manage and ultimately eliminate malnutrition, it is essential to consider these factors along with their interconnection and effect on one another.

Chapter 7

How to create balance?

Indian Government Initiatives

The Government of India has given high priority to the issue of malnutrition in the country and is implementing several schemes, programmes under different Ministries and Departments through State Governments/Union Territories Administrations. The various schemes and programmes undertaken by government are:

Multi-sectoral approach for accelerated action on the determinants of malnutrition in targeting nutrition in schemes/programmes of all the sectors. The schemes/programmes include the Integrated Child Development Services (**ICDS**), National Health Mission (**NHM**), Mid-Day Meal Scheme, Rajiv Gandhi Schemes for Empowerment of Adolescent Girls (**RGSEAG**) namely SABLA, Indira Gandhi Matritva Sahyog Yojna (**IGMSY**) as direct targeted interventions. Besides, indirect Multi- sectoral interventions include Targeted Public Distribution System (**TPDS**), National Horticulture Mission, National Food Security Mission, Mahatma Gandhi National Rural Employment Guarantee Scheme (**MGNREGS**), Swachh Bharat Abhiyan, National Rural Drinking Water Programme etc. All these schemes address some or other aspect of nutrition. Management of malnutrition and common neonatal and childhood illnesses is addressed at community and facility level by training service providers in **IMNCI** (Integrated Management of Neonatal and Childhood Illnesses) training.

The government has set up **Nutrition Rehabilitation Centres (NRCs)**, which are special units for treatment of children with severe acute malnutrition at public health facilities. Presently 875 such centres are functional all over the country.

National Food Security Act

Under this act highly subsidized food grains would be provided to two-thirds of the country's population. This Act was fully implemented by 5 of India's 29 states and partly implemented by 6 other states. To ensure the success of this act, all states need to implement the act.

Private sector Initiatives

Combating Malnutrition through CSR (Corporate Social Responsibility)

Addressing malnutrition with the help of CSR is one of the innovative ways towards combating Malnutrition. Several drug manufacturers and fast-moving consumer goods (FMCG) companies have identified malnutrition as one of the areas to work on. While FMCG players such as Nestle and Danone, already present in the nutrition segment, are keen to spread awareness and campaign about the issue, pharmaceutical companies such as Glenmark and Biocon, which currently do not have products in the segment, are working in the area as part of their CSR initiative.

Glenmark, which recently joined hands with the FICCI Aditya Birla CSR Centre for Excellence to combat child malnutrition, feels there is a need for innovative solution to counter the crisis. “We need to introduce innovative ways to disseminate information on right and healthy practices among rural masses. Time has now come to employ practical solutions rather than theoretical ones to ensure that our children remain healthy,” says Cheryl Pinto, director corporate affairs, Glenmark. While the company has no plans to foray into nutraceutical segment, it says it is committed to work towards the social cause.

Another company Biocon, who is currently largely focused on oncology and preventive care-related CSR, is now exploring new areas such as child malnourishment. According to the head of the Biocon foundation, child malnourishment is a major problematic area in our country and it needs to be addressed.

Way Forward for India- Balancing Malnutrition Factors

Food security

Everyone has the right to adequate food in terms of quantity and quality, sufficient to satisfy their dietary needs. The Government plays a major role in controlling as well as elimination of malnutrition and hunger. The governments of the malnutrition affected countries need to create a regulatory environment that values good nutrition. This can be done by creating incentives for agriculture to produce enough crops with better nutrition profile that will suffice the hunger needs of the population of the country. Also incentives can be given to private sector companies to develop more nutritious seeds or foods. Apart from this increasing investments and actions in nutrition services for communities, in regions where poverty is predominant is essential.

Once there incentive and investment plans are in place, transparent accountability systems need to be established, in order to ensure that investments contribute to public health, while standardized data collection on micronutrient deficiencies can build the evidence base on the efficacy and cost effectiveness of food-based solutions. The effective implementation of the policies can be measured by the drop in hunger index of the country.

Poverty

Also ensuring that the economic growth and poverty reduction policies reach the poor will further help in reduction of malnutrition. Governments of developing countries should take necessary measures and draft policies or schemes that would help better the economic status of their countries. Along with this they should promote growth inclusive strategies. Similarly India can work towards reducing its Gini co-efficient from its current co-efficient of 33.9, in order to even out the distribution of income within the country. With the help of this the poverty index of country can also improve.

Combating Malnutrition

The government can take a step for creating programs for delivering immediate treatment to people suffering from severe acute malnutrition, by the use of medical foods or ready to eat therapeutic foods, although this may be the short term treatment of malnutrition. Also government can play a role in reviewing the policies & programs drafted for moderate malnutrition for its efficacy and ensure its implementation. The policies should be drafted keeping long term goal of eliminating malnutrition in mind.

Addressing hidden hunger

Another challenge is the increase in hidden hunger in world. Hidden hunger and micro-nutrient deficiency even after people have sufficed their hunger is a critical aspect that is often overlooked, mainly because of consumption of unhealthy or nutrient deficient foods. Great emphasis should be given to the nutritional content of food, apart from the quantity of food produced. If required, for this purpose the government can also make reforms in the existing health and nutritional policies.

Awareness and Education

Educating and creating awareness among consumers regarding the importance of healthy diet or nutrient rich diet is very important for tackling hidden hunger, also it is important to orient the mindset of people towards healthy diet and its benefits. The population of developing countries need to be educated on the importance of quality of food and nutrition, also programs focusing specially on girls and women health and nutrition. If we all become aware of the nutritional value of the foods then we can better address hidden hunger issues prevalent in both developing and developed countries.

These five balancing malnutrition factors need to be accepted by all stakeholders right from government to food consumer inclusive of corporates. Only after acceptance ways to balance these five different factors need further probe like mapping malnutrition zones of India, agricultural zones of India, poverty zones of India would provide ways to create specific programmes to improve nutrition and create balance of nutrition in the Indian population.

Glossary

Nutrition

As the definition goes, Nutrition is the science which interprets the interaction of nutrients and other components of food in relation to maintenance, growth, reproduction, health and disease of an organism. Study of nutrition involves all aspects of food intake, absorption, assimilation, biosynthesis, catabolism and excretion.

Nutrients

Nutrients are the nutritional components present in food that an organism utilizes to survive and grow. Based on the amount in which they are required nutrients are divided into two types: Macronutrients and Micronutrients.

Macronutrients are nutrients that provide the energy (calories) needed for the functioning of an organism's metabolic system, these nutrients are required in large amounts. Micronutrients are nutrients that provide the necessary cofactors for metabolism to be carried out and are required in relatively small amounts.

Malnutrition

Malnutrition is a pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients.

Gini Co-efficient

Gini coefficient is a commonly used measure for representing a nation's income, its distribution and inequality prevailing in the nation. The Gini coefficient measures the inequality among values of a frequency distribution (for example, levels of income). A Gini coefficient of zero expresses perfect equality, where all values are the same (for example, where everyone has the same income). A Gini coefficient of one (or 100%) expresses maximal inequality among values (for example, where only one person has all the income or consumption, and all others have none).[3][4] However, a value greater than one may occur if some persons represent negative contribution to the total (for example, having negative income or wealth). For larger groups, values close to or above 1 are very unlikely in practice.

Junk food

Prepared or packaged food that is high in calories but low in nutritional content.

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About HADSA

The Health Foods and Dietary Supplements Association (HADSA), was founded in April 2002, keeping the consumer benefits in mind, and represents the interests of manufacturers and suppliers of healthcare products including vitamin, mineral and botanical (including organic, GMO, non-GMO), Health Food, Natural Ingredient, Cosmeceuticals, Sports Nutrition Products, herbs and other Dietary Supplements

HADSA is a National, non-profit trade association committed to providing consumers with safe and effective products made to quality standards. Further, the association supports a science-based environment for responsible marketing of Nutritional Supplements and ensures that consumers are provided with accurate information required to make informed choice.

HADSA's commitment includes compliance to applicable laws and regulations consistent with International guidelines and standards, but to seek to change or question those laws or regulations that are inconsistent with the best interest of the public. HADSA unites a diverse membership, from retailers to the largest natural product supplier. We champion consumer's freedom of choice in our marketplace. We strengthen and safeguard a free market economy. We build strong markets to fuel industry growth. We act together with uncompromising integrity, and we encourage all to reach ever-higher standards of quality.

HADSA is a member of IADSA. IADSA has developed into an alliance of more than 60 dietary supplement associations spread over 6 continents. There are at present more than 8,500 companies who are part of the IADSA member associations. Its task is to represent the views of the industry in the shaping of global policies and regulations that affect dietary supplements. IADSA is the single coordinated voice speaking on behalf of over 8,500 companies and their 38 trade associations across six continents and these numbers are growing.

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