



India's nutrition challenges

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India with 2.5% of the global land mass is home to 17% of the global population. When India became independent in 1947, the country faced major nutrition and health challenges. The memory of the Bengal famine which killed millions was still fresh in the mind; the threat of famine loomed in other parts of the country. Over 80% of the households were poor and had no food security. Under-nutrition and micronutrient deficiencies, especially in children and women, were very high. Poor environmental hygiene and lack of access to safe drinking water resulted in a high prevalence of infections. Lowered immunity due to undernutrition led to higher infection rates, resulting in further undernutrition. This vicious cycle could often not be interrupted, because health care facilities were absent except in some urban areas. As a result, mortality rates in both children and adults were high and life expectancy was a mere 33 years. Fertility rates were high; there were dire predictions that rapid population growth would "aggravate the situation and lead to dissolution of India as a viable nation".

India, however, considered its population as a major potential resource for national development, and recognized the importance of optimal nutrition and health for human resource development. Therefore, Article 47 of the Constitution of India stated "the State shall regard raising the level of nutrition and standard of living of its people and improvement in public health among its primary duties". India's first Prime Minister Jawaharlal Nehru believed that "It is only through research, science and technology that India can find solutions to the numerous massive problems that the country is facing", and therefore promoted investment in research and development. Research and Development institutions in agriculture, nutrition and health were set up to find solutions to the country's food, nutrition and health challenges.

India's Five Year Plans enunciated the policies, prioritised multi-pronged strategies and outlined multi-sectoral programmes to meet India's nutrition challenges through:

- improving food production, storage and distribution
- improving household food security through poverty alleviation programmes and access to subsidised food distribution through PDS
- providing nutrition and health care to reduce under-nutrition and its health consequences.
- providing needed funds to implement intervention programmes
- laying down goals to be achieved in a specified time frame and
- creating independent systems for assessing the impact of interventions

How has the country fared over the past seven decades in meeting the inter-related massive challenges of food production, distribution, poverty, food insecurity, hunger, population growth, widespread under-nutrition, micro-nutrient deficiencies and associated health problems? How is the country coping with the emerging challenges in the new millennium such as Green Revolution Fatigue, fragmentation of land holdings, low availability of pulses and vegetables, food price inflation posing a threat to household food security, persisting under-nutrition and micronutrient deficiencies and progressive increase in the prevalence of over-nutrition? Why does India rank so low in global food security and human development reports, and what can we do to shed this dubious distinction? Can India deploy its human resources and vast experience to turn these challenges into opportunities for promoting optimal nutrition and health of its citizens? This article will explore the answer to these questions.

Adequate food production is the first priority

Food security is the essential prerequisite for optimal nutrition; agriculture and allied sectors hold the key to the food security of the country. Right from 1950, India accorded very high priority to interventions to achieve self-sufficiency in food grain production. Priority was accorded for building dams and irrigation canals to expand the area under cultivation and reduce the impact of vagaries of the monsoon on food production. Land reforms enabled the farmers to invest their money, time and labour in improving the farm yield. In this enabling environment, the technology of high-yielding varieties of rice and wheat, and investment in lab-to-land agriculture extension education provided the necessary impetus for the Green Revolution. India became self-sufficient in food grain production in 1970s¹. This success was a happy beginning but a long arduous road lay ahead.

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Addressing challenges of household food insecurity

A review of the situation in the Seventies showed that attaining self-sufficiency in food grain production at the national level did not result in poverty reduction, household food insecurity, hunger, and under-nutrition rates. Seventy percent of Indian households remained poor and food insecure; the under-nutrition rate was over 70%.

The country, therefore, embarked on

- poverty alleviation programmes to improve purchasing power;
- providing subsidised food grains through PDS to improve household food security
- food supplementation programmes to bridge the gaps between requirement and actual intake in vulnerable groups
- health care to reduce nutrient loss due to infections, and family welfare services to prevent unplanned pregnancies.

India's holistic interventions to improve the household food security and nutritional status of its citizens preceded, by two decades, the redefinition of food security by the World Food Summit in 1996: "a situation in which all people, at all times, have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".

Newer challenges to food production

In the Nineties, the country faced the problems of fragmentation of land holdings, Green Revolution fatigue, and stagnation in the production rates of pulses and vegetables. Inappropriate use and overuse of water, fertilisers and pesticides, coupled with extensive mono cropping with rice and wheat, impaired soil nutrition and health and kept productivity low. Very little attention was being paid to achieve integrated farming systems that will ensure sustainable evergreen revolution and provide appropriate dietary diversification to achieve balanced dietary intake.

The Tenth Five Year Plan² advocated nutrition orientation of food production; it emphasised that producing balanced food for human nutrition and health, benefits soil health and soil nutrition and is economically rewarding to the farmers, especially those with small fragmented land holdings. During the Tenth Five Year Plan, the National Food Security Mission³ and National Horticultural Mission⁴ were set up to achieve increased production of food grains, pulses and vegetables. Again, these indigenous efforts preceded the FAO's advocacy for "nutrition sensitive agriculture" by a decade.

Food grain production

The National Food Security Mission³ (NFSM) was launched in August 2007 with the following objectives:

- increase production of rice and wheat in a sustainable manner
- restore soil fertility and productivity
- enhance farm level economy (i.e. farm profits) to restore confidence of farmers

The Mission has focussed on states / districts with high yield potential and large yield gaps. The yearly production goals have by and large been met; projections for 2030 indicate that, in spite of several constraints, India will remain self-sufficient in food grain production.

Pulse production

Pulses are the major source of protein in Indian diets. Pulse production had remained stagnant at 13 million tonnes for over three decades. The unmet demand for pulses led to their import and

rising costs, taking them out of the food basket of the poor. Under the NFSM, efforts were made to increase pulse production through increase in the area under cultivation and also by increasing productivity. Minimum support prices and farm-level procurement policies persuaded farmers to grow more pulses. The production has improved, and in 2012-13 the country produced 17 million tonnes of pulses⁵. The current estimates indicate that the country will achieve production of 24 million tonnes and will become self-sufficient by 2017; projections suggest that India will remain self-sufficient in pulse production till 2030.

Vegetable production

Fruits and vegetables provide essential micronutrients. Low vegetable consumption is the major factor responsible for widespread anaemia and micronutrient deficiencies. Currently, India is among the world leaders in the production of vegetables and fruits, and average per capita availability meets the requirement⁵. But diet surveys reveal that the average consumption of vegetables / fruits continues to be low and micronutrient deficiency rates continue to be high⁶. This is at least in part due to high prices; over the last few years food inflation rates for vegetables has been over 10% throughout the year. Nutrition education to promote vegetable consumption will succeed only when vegetables are available throughout the year at affordable cost. The National Horticultural Mission⁴ was set-up to facilitate crop diversification and make horticulture more profitable through efficient land use, optimum utilization of natural resources (soil, water and environment), creation of the necessary skills in the rural setting, and reduction of wastage. These efforts have the potential to increase vegetable intake and to improve the micronutrient status of the population.

Challenges in improving food access for the poor

Employment programmes for the poor

As early as the Fifties, poverty and lack of gainful employment had been identified as the factors responsible for persistent household insecurity and under-nutrition. Efforts were made to identify vulnerable households, provide them with essential foodstuffs, and improve their purchasing power through providing employment opportunities. This early investment in employment programmes went some way towards enabling poor rural populations to improve their household food security while also improving rural infrastructure.

In 2005, India enacted the National Rural Employment Guarantee Act (NREGA)⁷, providing paid jobs to unemployed rural persons as a legal entitlement. Despite infirmities in the implementation of the programme, the landless marginalised segments of rural households did benefit from the programme; distress employment at wages far below the minimum wages and seasonal migration especially, from drought-prone areas in many States to urban areas in search of employment have been reduced.

Access to subsidised food grains

India built up the Public Distribution System (PDS) to overcome regional and seasonal food grain shortages and provide access to food grains at heavily subsidised costs, especially, to those below poverty line. Despite the shortfalls in the system such as leakages, the policy has helped in keeping the cereal prices low, within the purchasing power of the vulnerable sections.

In recent years, several states have attempted to improve the functioning of PDS. Wherever there was involvement of the PRI and local population, there was substantial improvement. Chhattisgarh has extensively used mobile telephones to alert the PRI and local population about the arrival of grains in villages and ensured substantial improvement in access to subsidised grains in remote tribal areas. Overall improvement has been reported in many states; it is expected that a strong and accountable PDS will ensure effective

implementation of the National Food Security Act.

GDP growth, poverty reduction and energy consumption

Economic growth is one of the major drivers of poverty reduction. After a relatively slow growth for four decades, India became the second-fastest-growing economy in the first decade of this century, leading to a steep reduction in poverty and enabling India to achieve the Millennium Development Goal of 50 % reduction in poverty as early as 2012⁸.

In most developing countries, rapid economic growth is associated with increase in total energy intake, consumption of animal foods and sedentary lifestyles, leading to a spike in overnutrition rates. India appears to be an exception to this trend. Time trends in GDP growth at factor cost between 1972-73 and 2009-10, based on NSSO⁹ data showed that cereal and energy intake in the lowest expenditure tertile increased; this might be due partly due to the rise in per capita income and partly due to access to subsidised grains. In middle and high expenditure tertiles, there was a progressive reduction in per capita cereal and energy intake in both urban and rural areas. The voluntary reduction in energy intake may be the rational, aware population's response to lowered energy requirements due to rapid mechanisation of occupational, domestic and transport domains over this period and consequent reduction in physical activity.

Food price inflation and National Food Security Act

During the years between 2000 and 2008, GDP growth rates were higher than food price inflation rates¹⁰. The NSSO survey 2009-10 showed that even though food prices had nearly doubled during this decade, there was no reduction in per capita energy intake. The year 2008 witnessed a steep increase in food-grain prices globally. In India, inflation in cereal prices was relatively low, but there has been a sustained steep increase in prices of pulses, oils, vegetables and fruits. Since 2009, the GDP growth has been falling and from 2010, food price inflation has exceeded the GDP growth rates. The fall in GDP growth rates coupled with sustained high rates of food price inflation caused some distress among the poor and low middle income groups, threatening to affect household food security.

Concerned over the potential adverse consequences of sustained food price inflation on the food security of the poorer segments of population, India enacted the National Food Security Act in 2013¹¹ aimed at improving household food security and nutrition by providing adequate quantities of good quality food grain at affordable prices as a legal entitlement. The combined coverage of Priority and Antyodaya households (called "eligible households") is up to 75% of the rural population and up to 50% of the urban population. However, it will never be possible to provide all the food stuffs for a balanced meal at subsidised cost to all the people who need them. There is an urgent need for a nutrition awareness campaign targeted to women (who are head of the household for the ration card) to persuade them to purchase other healthy foodstuffs such as pulses and vegetables to provide a balanced diet to their families. This should be possible because of the money saved on cereals (approximately Rs 15-20 per kg and amounting to about Rs 500 per month).

Challenges in implementing food supplementation programmes

It has long been recognised that preschool children and pregnant and lactating women are the most nutritionally vulnerable segments of the family. Data from the NNMB surveys have shown that there are large gaps between RDA and actual dietary intake in these segments. The Government of India initiated two major food supplementation programmes to address the energy gap in children, pregnant and lactating women.

Integrated child development services (ICDS) - a vehicle to improve child nutrition

The ICDS was initiated in 1975 as a programme in the Ministry of Social Welfare

- to provide food supplements to children, pregnant and lactating mothers in food-insecure households to improve their nutritional status, and
- to promote psycho-social development of children through early stimulation and education.

ICDS now operates through 14 lakh anganwadis across India and is the largest food supplementation programme for pregnant women and preschool children in the world. But the number of persons receiving adequate supplements on a continuous basis is low. Also, the food supplements often act as a substitute to home food (hot cooked meal in the anganwadi) or are shared with other members of the family (take home rations). Even though monthly weighing of children to identify growth faltering and undernutrition is an important component of ICDS, very few children in the critical 0-23 month age group are weighed. As children are not regularly weighed, under-weight children are not identified and given double rations. Nutrition education, which is a critical component of ICDS, has not got the attention that it deserves.

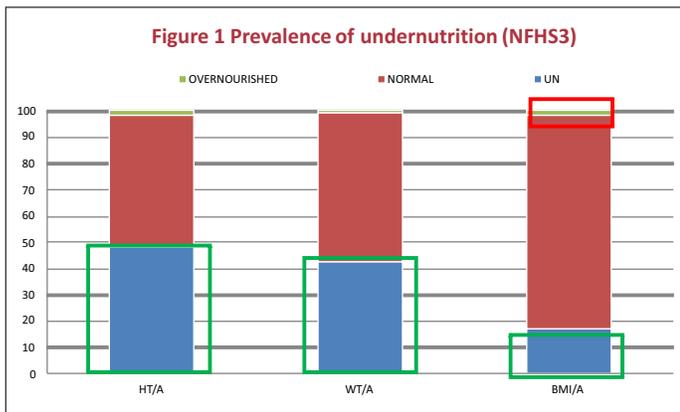
In 2007, India adopted the WHO MGRS growth standards. Applying MGRS standards to the NHFS 3 data brings out the fact that though nearly half the children are underweight and stunted, only about 17% are wasted (i.e., have low weight for age and height) (Figure 1). This is a very important finding in the Indian context. Whereas interventions to correct underweight and stunting will take longer to show results, a 50% reduction in wasting rates can be achieved within 3-6 months. This will assure the AWWs and the mothers that interventions do work. Rapid reversal of wasting will enable the child to grow along the normal trajectory and prevent further stunting.

ICDS can become a vehicle for rapid improvement in under-five under-nutrition by

- ensuring nutrition education on infant and young child feeding using Mother Child Protection Card
- ensuring weighing of all children and plotting trajectory of growth on the MCPC growth chart to detect growth faltering
- identifying under-nourished children, providing them with double rations (take home rations) and getting them checked for infections during the Village Health and Nutrition Days
- monitoring improvements in nutritional status.

Mid Day Meal (MDM) – an opportunity to improve the nutritional status of school children

Concerned about the lack of universal enrolment and high dropout rates in primary schools, the government initiated the Mid Day Meal programme (National Programme of Nutritional Support to Primary Education) in 1995. The programme was initially envisaged as a free wheat/rice take-home programme for every child studying in class I-V in all Government, local body and Government aided primary schools who had attended the school on more than 80% school days. However, two major concerns emerged: take-home rations given to the child were being shared by all members of the family and the problem of classroom hunger was not addressed. It is well known that the school-going years are a period of rapid growth, and that optimal nutrition during these years will promote accelerated linear growth and enable the children to attain a better adult height. Data from NNMB surveys indicate that the gap between energy requirements and intake in growing children is highest during adolescence (over 500 K cal)⁶. The school midday meal programmes is aimed at providing hot cooked meals to primary and upper primary school children in all government and government-aided primary schools. Currently the MDM programme is the world's

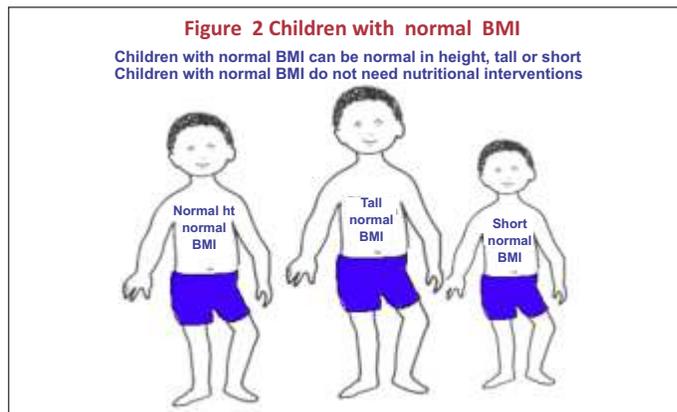
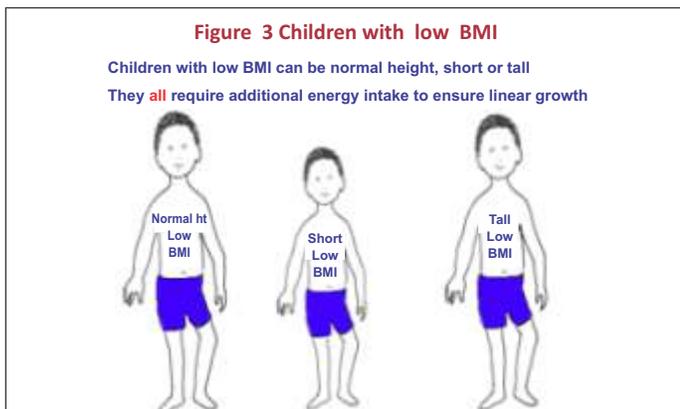


largest school feeding programme, reaching out to over 100 million children in 1.3 million schools in the country.

In 2007, WHO provided a growth chart with three indicators (height, weight and BMI for age) for 5-19-year-old children and recommended that, in the current dual nutrition burden era, BMI for age should be used as the indicator for assessment of both under- and over-nutrition, especially in countries with high stunting rates. It is simple to plot BMI for age from the chart and identify children as normal (Figure 2), thin (Figure 3), or overweight (high BMI) (Figure 4). The thin children should be given focused counselling to increase their food intake; if needed, they can be given an additional helping of MDM. Improvement in nutritional status can be monitored by recording weight once in three months. In collaboration with the school health programmes efforts can be made to identify children with chronic infections or other health problems, and provide treatment. Children who are found to be over-nourished can be encouraged to adopt healthier life-styles by playing outdoors and cutting down on energy-dense snacks. If these activities are undertaken in all schools, it will be possible to successfully meet the twin challenges of the rise in under- and over-nutrition during school age.

Challenges posed by micronutrient deficiencies

Micronutrient deficiencies, referred to as “hidden hunger”, are the most common nutritional problems in the world, affecting a third of the global population. While under-nutrition is due to insufficient quantity of food consumed, micronutrient deficiencies reflect the inadequate quality of food consumed. In India, the focus of public health interventions has been on three major micronutrient deficiencies: iodine deficiency disorders (IDD), iron deficiency anaemia (IDA), and vitamin A deficiency (VAD).

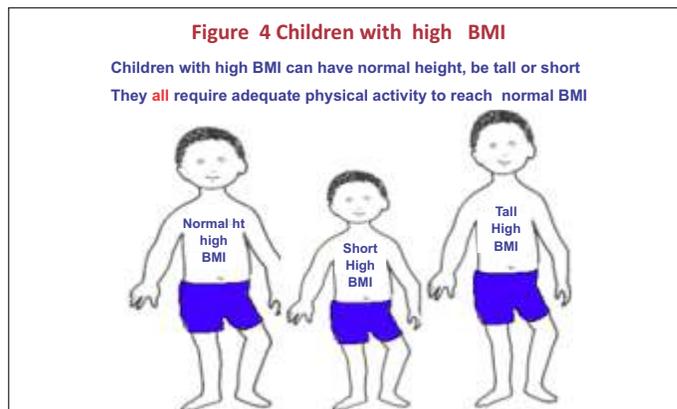


Iodine Deficiency Disorders

Salt fortification with iodine has been used worldwide for prevention of IDD for a century now. The National Goitre Control Programme (NGCP) initiated in India in 1962 was confined only to the sub-Himalayan ‘goitre belt’. In 1992, NGCP was renamed as National Iodine Deficiency Disorders Control Programme (NIDDCP) and it was decided to iodize the entire edible salt for human consumption in the country, promote universal access to this salt, and attempt to reduce the prevalence of IDD to below 5% in the country. The sale of non-iodised salt for human consumption was totally banned in 2007 and a campaign was mounted on the importance of using iodised salt. Available data from recent surveys indicate that the goal of universal access to iodised salt is likely to be achieved shortly. This shows that when the country decides, it can overcome challenges, rapidly scale up programme implementation and achieve the goals within a time frame.

Vitamin A deficiency

Diet surveys have shown that, in all segments of the population, the intake of Vitamin A-rich vegetables is very low as compared to the recommended dietary allowance. In the 1960s, a massive-dose vitamin A programme was launched to tackle the major public health problem of blindness due to vitamin A deficiency. Despite poor coverage under the programme and continued low vitamin A intake, there was a steep decline in blindness due to vitamin A deficiency in the 1980s. This may have been due to reduction in severe under-nutrition and measles infections, and improved access to health care. Over the years there has been a reduction in the prevalence of Bitot’s spots, but subclinical deficiency continues to be common. Studies from India do not suggest that massive dose vitamin A supplementation had any impact on morbidity or mortality in young children. In view of the elimination of blindness due to vitamin A deficiency, and the current low prevalence of clinical deficiency, it is essential to re-evaluate the need to continue the use of the massive-dose vitamin A supplementation programme.



Anaemia

Globally, anaemia is the most widespread of the micronutrient deficiencies. India has the highest anaemia prevalence rates and is home to the largest number of anaemic persons in the world. Anaemia, in India, is mainly due to low intake of vegetables that are rich in iron and folic acid, and poor absorption of iron from the traditional fibre- and phytate-rich diets. These diets protect Indians from cardiovascular diseases and colon malignancies, and, therefore, dietary modifications to reduce fibre and phytate in the diet should not be advocated. The coverage under the National Anaemia Prophylaxis Programme initiated in 1973 has been suboptimal in pregnant women and very low in children. Over the decades, there has not been any substantial reduction in the prevalence of anaemia; but there has been a reduction in the severity of anaemia and some of the adverse consequences associated with it. In 2013, Govt of India has started implementing the Iron Plus initiative to combat anaemia. The major long-term sustainable strategies for improving iron intake of 1.3 billion Indians are

- health and nutrition education to promote consumption of iron and folate-rich foodstuffs
- food fortification, especially introduction of iron- and iodine-fortified salt

In addition, the initiative envisages

- IFA supplementation in vulnerable groups
- detection and treatment of anaemia in pregnant women
- appropriate steps for detection of anaemia in other groups and
- management of anaemia depending upon its severity, chronicity, and physiological status of the individual

If effectively implemented at scale, it might be possible to achieve significant reduction in anaemia and its adverse consequences within a decade.

Nutrition and Infection

In India, morbidity due to infections in young children is common. Morbidity, especially severe, untreated or repeated, can lead to deterioration in nutritional status. Access to health care can play an important role in preventing or reducing the nutrition toll of infections. In India, there was a steep fall in the prevalence of under-nutrition in under-fives in the period between the 1970s and 1990s. During this period there was massive expansion of health infrastructure and improved access to primary health care; however, coverage under ICDS food supplementation remained quite low. It is, therefore, likely that the fall in under-nutrition rates was mainly due to health care reducing the nutrition toll of infection. Currently, both health services and ICDS cover the entire country. The Village Health and Nutrition Day (VHND) provides an opportunity to detect and treat both infection and under-nutrition; if this convergence is fully utilised, the country can achieve a more rapid decline in child under-nutrition.

Challenges posed by HIV infections: a success story

In the last three decades, HIV infection has been one of the major factors responsible for both mortality and under-nutrition in under-five children, especially, in Sub-Saharan Africa. It has also been a major factor responsible for high under-nutrition rates and high mortality rates in adults in Africa. In India, HIV infection was first detected in 1986. Extrapolating from Africa's experience, where the disease started taking a severe toll on the life and nutritional status of both children and adults, there were dire predictions that it would overwhelm the existing health care system in India and have a severe adverse impact on under-nutrition rates and mortality rates in all age groups. On the contrary, data from the National AIDS Control Organisation clearly indicate that the country was able to provide

the needed care for Persons Living with HIV infection without any adverse impact on other health services. India's low-cost generic anti-retro-viral drugs have improved ART coverage across the globe and prolonged the lives of millions of Indians, Africans and citizens of many developed countries. There has been a near-elimination of blood-borne and mother-to-child transmission of HIV infection and a steep reduction in the prevalence HIV infection in the population. The HIV/AIDS epidemic did not have any adverse impact on the rate of reduction in under-nutrition or mortality in India. This is a remarkable achievement and shows that India's health care system and a responsive population can cope with emerging health challenges through rational use of the available resources and achieve optimal results.

Overnutrition

While persistent under-nutrition in children and adults (BMI below 18.5) remains a public health problem in India, there has been a slow but steady increase in over-nutrition in the past 20 years¹². Unlike the situation in other developing countries undergoing similar socioeconomic and nutrition transition, the rise in over-nutrition rates in India is not due to an increase in energy intake. Over the last two decades there has been a steep reduction in physical activity in all segments of urban and rural population due to increased mechanization of transport, occupational and household activity domains¹³. This has led to a small but sustained positive energy balance; this is the major factor responsible for rising over-nutrition in all segments of population in India^{13,14}. In some urban affluent segments of the population, there has been an increase in intake of energy-rich foodstuffs and a steep fall in physical activity. The rise in over-nutrition in these segments has been steep.

Over-nutrition rates in children and adults are shown in Figures 5 and 6. The over-nutrition rate in India is among the lowest in the world but because of the large population size, this translates into a large number of individuals. There is persuasive evidence to show that stunted children who gain more weight (and BMI) than appropriate for their height during childhood are at higher risk of becoming over-nourished adults, with a higher risk of developing non-communicable diseases. Nutrition surveys have shown that within the same family there are under- and over-nourished individuals. It is, therefore, essential to screen individuals, identify those who are over-nourished, and provide them with appropriate nutrition counselling. Indians are prone to adiposity. A substantial proportion of over-nourished Indians have micronutrient deficiencies, and require treatment for these also.

The major concern regarding rising obesity rates in India is the association between obesity and the risk of non-communicable diseases. For any given BMI, Indians belonging to all age groups have higher body fat as compared to Caucasians, and, therefore, face a risk of cardiovascular diseases at lower BMI. Rising obesity is an important factor for increase in NCDs. NCDs are asymptomatic in early stages and their detection by repeated universal screening of asymptomatic persons is not possible. NCDs occur at an earlier age in Indians and require lifelong, often expensive, treatment.

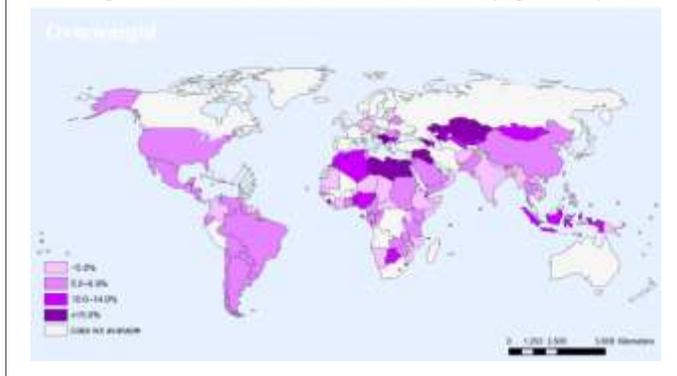
In India, the obesity trend has been identified early. Intervention programs to combat over-nutrition in India include nutrition and health education through all available modes of communication, emphasising the need for:

- eating balanced diets with plenty of vegetables;
- adopting healthy lifestyles with at least moderate physical activity

Health interventions should include

- screening persons for over-nutrition whenever they access

Figure 5 Global child over nutrition rates (high BMI)



- health care
- using of BMI for adults and BMI-for-age in children and adolescents for early detection of over-nutrition
- personalised advice regarding modification of dietary intake and life style;
- screening for NCDs followed up with appropriate care
- monitoring improvement in lifestyles, dietary intake, nutrition and health status.

India can and should strive to scale up these simple cost-effective interventions to slow down the epidemic of obesity and stave off the threat of rising NCDs.

Challenges in improving India's ranking in food security

Definition of food security

In the 1970s, FAO defined food security as a country's ability to achieve self-sufficiency in food grain production to ward off famine and to meet the needs of the growing population. By this yardstick, India was already food-secure. But soon, Indian and global data showed that food grain security at national level does not translate into food security at household level or reduction in under-nutrition. Taking these into account, the World Food Summit in 1996 re-defined food security as a situation in which "all people, at all times, have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". The revised definition has been accepted by all the member countries.

Food insecurity monitoring

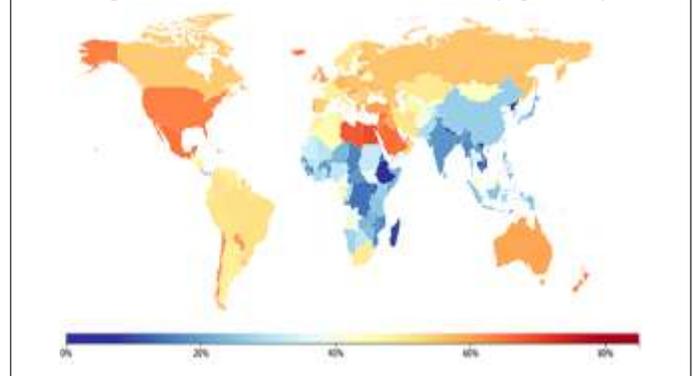
FAO uses a set of process and outcome indicators for monitoring food security. The major process indicators used are self-sufficiency in food production, economic growth, poverty alleviation and freedom from hunger. FAO uses infant and under-five mortality and under-nutrition in all age groups, especially in pre-school children, as food insecurity outcome indicators.

Food insecurity: process indicators

Globally and nationally, there is a direct inter-relationship between food availability, affordable access to food, and hunger. Food production and the proportion of population who are hungry are relatively easy to measure and have been regularly reported by most countries. The FAO has compiled the data and reported food insecurity across the globe. In India, there has been

- self-sufficiency in food production since the 1970s;
- slow but steady economic growth till 2000; in the new millennium India has become the second-fastest-growing economy in the world;
- steady improvement in per capita income and reduction in poverty;

Figure 6 Global adult over nutrition rates (high BMI)



- near-universal access to the public distribution system (PDS), providing subsidized food grains to the poor
- massive food supplementation programmes to bridge the nutrient gaps in the vulnerable groups such as children, pregnant and lactating mothers.

Food insecurity, mostly seasonal, was confined to poorer segments of the population living in remote areas. India's global position regarding food insecurity as assessed by hunger rates is comparable to other developing countries. It is obvious that India has fared well in terms of process indicators for food security.

Food insecurity: outcome indicators

In the 1960s and 1970s, epidemiological data indicated that within each country / community, food insecurity, under-nutrition and under-five mortality rates were higher among the poorer segments of population as compared to the middle and higher income groups. It was, therefore, logical to use available data on infant and under-five mortality and under-nutrition in pre-school children as food insecurity outcome indicators to monitor progress over time.

There were, however, two major problems in this approach. The stature of children (and adults) varies across countries; therefore cross-country comparisons based on height and weight may not be appropriate for assessing food insecurity status of countries. There are substantial inter-country variations in the availability, access and utilisation of health services. As health care is a major determinant of mortality in under-five children, cross-country comparisons of under-five mortality rates may not be an accurate indicator for inter-country ranking on food insecurity. This is especially true for India and other South Asian countries where food insecurity is relatively rare but stunting and underweight rates are high.

Underweight and stunting in under-five children

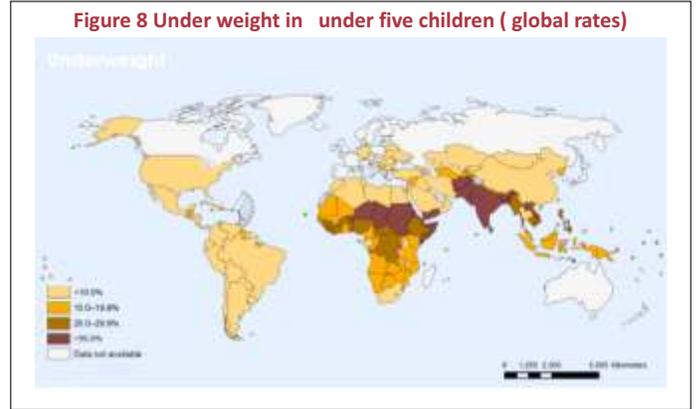
The second food insecurity outcome indicator used by FAO is under-nutrition, especially in children. Underweight, stunting and wasting rates are used as indicators for assessing under-nutrition. By these criteria, under-nutrition rates in India are comparable to those in Sub-Saharan Africa (Figures 7, 8, and 9). FAO process indicators show high rates of food insecurity in Sub-Saharan Africa; therefore, the high underweight and stunting rates in those countries could be attributable to food insecurity. However, these same indicators show low levels of food insecurity in India; so the persistent high rates of stunting and underweight in India cannot be due to food insecurity.

In India, one-third of infants are born with LBW (weight <math>< 2.5\text{kg}</math>) and wasting (<math>< 2\text{SD}</math> of the BMI for age) and 1/5th are stunted at birth. Size at birth is a major determinant of growth in childhood and adolescence. High stunting and underweight rates in LBW infants who are growing along their trajectory are not attributable to food insecurity. Also, poor infant and young child feeding practices are

Figure 7 Stunting in under five children (global rates)



Figure 8 Under weight in under five children (global rates)



common causes of stunting and underweight; under-nutrition in these children is not due to current household food insecurity. National surveys in India have shown that, within the same family, there are undernourished children and over-nourished adults. This suggests that, in India, poverty and household food insecurity are no longer the most important determinants of stunting and underweight in children.

FAO’s ‘State of World Food Insecurity 2013’¹⁵ acknowledges “food security is a complex condition. Its dimensions - availability, access, utilization and stability - are better understood when presented through a suite of indicators. The prevalence of undernourishment is a measure of dietary energy deprivation; as a stand alone indicator it cannot capture the complexity and multidimensionality of food security. Undernourishment and under-nutrition can coexist. However, in some countries, under-nutrition rates, as indicated by the proportion of stunted children, are considerably higher than the prevalence of undernourishment, as indicated by inadequacy of dietary energy supply.”

Taking all these into account, while developing indicators for food insecurity in Sustainable Development goals under- five mortality has been put under health indicators and underweight has been omitted; stunting and wasting in under-five children, underweight in adults (low BMI) have been included as food insecurity indicators. Wasting is readily and rapidly reversible and can, therefore, be a useful indicator to assess improvement in short and medium term. Reduction in stunting could be used to assess the long term impact of interventions. The use of these indicators will also enable better inter-country comparisons and help in evolving intervention strategies to improve food security and nutritional status of the population.

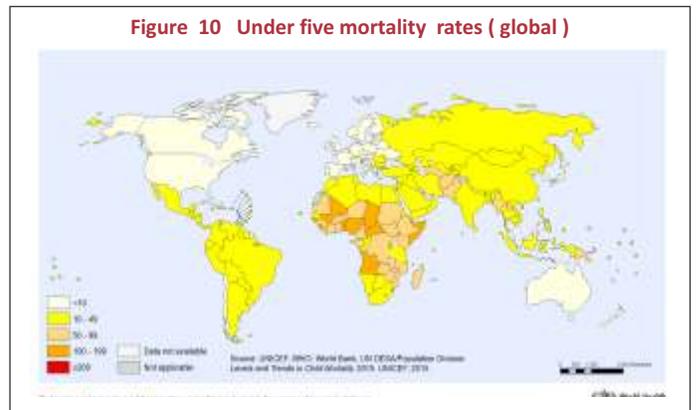
Infant and under-five mortality in India – functional implications of stature

Data on under-five mortality rates in different regions of the world

Figure 9 Wasting in under five children (global rates)



Figure 10 Under five mortality rates (global)



clearly indicate that, despite comparable under-nutrition rates in preschool children in Sub-Saharan Africa and South Asia, under-five mortality rates are substantially lower in South Asian countries. South Asian children are mature and the small size of the child was not associated with functional impairment leading to IMR and under-five mortality; by providing essential health care to small but mature neonates, and ensuring universal breast feeding and access to essential primary health care for management of common illnesses in childhood, South Asian countries have achieved relatively low IMR and U5 MR (Figure 10). It is, therefore, clear that infant and under-five mortality rates are not good indicators of food insecurity in these countries.

Conclusion

Over the last six decades, India has faced numerous challenges in its quest to improve the food security and nutritional status of its citizens. Despite numerous constraints, the gains have been substantial:

- the country has remained self-sufficient in food production
- there has been steady improvement in per capita income and reduction in poverty
- MGNREGA provides employment as a legal entitlement to rural poor thereby improving purchasing power of the poor and building rural infrastructure
- subsidized food grains are provided to 2/3rd of the population under the NFSA
- ICDS and MDM provide food supplementation to children and mothers
- access to primary health care is universal.

India’s performance in terms of process indicators for improving national, household and individual’s food security has been good and can be expected to improve over the next fifteen years. Wasting and over-nutrition rates are relatively low and majority of Indians

are normally nourished. The country has achieved relatively low US MR despite high low birthweight, and undernutrition rates.

India's major strengths in coping with challenges stem from:

- stable growing agriculture and economy
- excellent research and survey data base on ongoing changes
- track record for well conceptualised, holistic interventions to combat persistent and emerging challenges
- nationwide agriculture, nutrition and health infrastructure and human resources to implement intervention programmes
- perceptive, rational, responsive, responsible population who in the long run will make optimal use of the available facilities for providing needed care.

The country should build on these strengths, correct weaknesses such as delays in scaling up and poor implementation of interventions, and avoid complacency.

Using the experience gained over decades, the country can turn future challenges into opportunities for progress. Under-nutrition rates are steadily decreasing; over-nutrition rates are still quite low, and the majority of Indians are normally nourished. The new generation, with its improved awareness and literacy, will hopefully strive to remain normally nourished and healthy, access available services optimally, and enjoy long and healthy life.

The author is Director, Nutrition Foundation of India. This article is based on 39th Gopalan Oration delivered at the 47th Annual Conference of Nutrition Society of India on 9.10.2015.

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FOUNDATION NEWS

Annual Foundation Day: The Annual Foundation Day of NFI was celebrated on 26th November 2015. On this occasion Dr S Ramji delivered the C Ramachandran Memorial Lecture. The topic of the lecture was "Vitamin D and Neonatal Health" NAMS-NFI symposium on "MDG: lessons learnt and way forwards to SDG" was held on 27th November 2015.

Dr Soumya Swaminathan, Secretary, Deptt. of Health Research and DG, ICMR delivered the inaugural address.

The other speakers and their topics are given below:

Dr. C. Chandramouli, Registrar General of India

Maternal and child mortality: 1990-2015 and projections 2030

Dr. Pronob Sen, Former Chief Statistician of India

GDP growth and poverty alleviation: 1990-2015 and onward to 2030

Dr. Vinod Paul, Prof and HOD Pediatrics AIIMS

Child Health progress 1990-2015; universal health coverage by 2030

Dr. K. Kalaivani, Consultant, Nutrition Foundation of India

Maternal Health progress 1990-2015 and onwards to 2030

Dr. R. Sankar, Senior Advisor, Tata Trusts

Tackling micronutrient deficiencies 1990-2015 and onward to 2030

Dr. Yujwal Raj, Epidemiologist & Public Health Management Specialist

India's Journey in the Prevention and Control of HIV Infection: 1990-2015 and onward to 2030

Dr. Prema Ramachandran, Director, Nutrition Foundation of India

Transition from MDG to SDG: India's challenges and opportunities

The symposium was well attended. The faculty and students from AIIMS, New Delhi and AIIMS Jodhpur participated in the symposium through video linkage. The symposium was viewed by participants from several medical colleges in India and abroad.

The power point presentations made by the speakers have been uploaded both in the NFI web site and the NAMS web site and have been accessed widely.

NUTRITION NEWS

The 47th Annual Conference of the Nutrition Society of India was held on 9th - 10th October, 2015, at National Institute of Nutrition, Hyderabad. The theme of the conference was 'Agriculture and Nutrition – the connect and the disconnect'.

The Thirty Ninth Gopalan Oration was delivered by Dr Prema Ramachandran (Director, NFI, New Delhi) on the topic "India's nutrition challenges".

Dr Srikantia Memorial Lecture was delivered by Dr Vinod Paul, (Prof and HOD Deptt of Paediatrics AIIMS, New Delhi) on the topic "International foetal growth charts after MGRS".

The Sixth Rajammal Devadas Memorial Lecture was delivered by Dr Satyavati Rana on the topic "Nutrition and disease: an interaction"

Dr K Satyanarayana, former Director RMRC Bhubaneswar received the second B K Anand Award.

There were three scientific sessions during the conference:

Session-1: Debate on "Food and Agriculture Policies are Responsible for the Current Nutritional Status in India".

Session-2: Symposium on "Bridging the Gap between Agriculture and Nutrition".

Session-3: Symposium on "Geriatric Nutrition".

Two pre-conference workshops were held on 8th October 2015. One workshop was on "Infant and young child feeding" and the other was on "Food labelling and health claims – what a nutritionist should know?"