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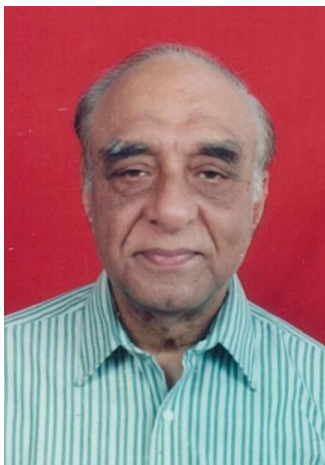
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Commentary

My life in nutrition



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Editor's introduction

Dr Colothur Gopalan is the first honorary life member of the World Public Health Nutrition Association. It is a pleasure and a privilege for the Association in this way to recognise his immense contribution to the health, welfare, strength and independence of his own country of India, and his influence in Asia, and globally. His member's profile is published on the Association's website. His life's work, which continues, attests to the fundamental contribution of nutrition to the health and to the fate of nations.

He is a distinguished and accomplished combination of physician, nutritionist, teacher, researcher, policy-shaper, executive and activist, committed to the well-being of all sectors of society now and in future, who has never been afraid to advocate inconvenient positions. He continues to be a guiding light to young professionals in India, South and South-East Asia, and globally. Any thoughtful list of the Indian citizens that have enabled the world's biggest democracy, one of the countries on which all our futures will increasingly depend, to survive and develop as a great nation, should include his name.

He has been unswervingly committed to the food-based approach to nutrition for over 60 years, in a professional career that began before India's independence. A fellow of the UK Royal Society, and director or president of a series of national institutions and organisations now part of the fabric of Indian public life, he has had special status within the UN system, as an Indian and South-East Asian leader (1). Readers of *WN* will know that for him, the food-based philosophy involves powerful and rational opposition to the current policy of universal vitamin A supplementation (2) which, among other things, he sees as a distraction from promotion of local wholesome foods and breastfeeding.

While by nature optimistic, he has for 30 years warned of the implications of the double burden of obesity superimposed on undernutrition in India and other lower-income countries. (3,4).

We invited him to give an informal account of the impact of the practice of public health nutrition on the health and welfare of the people of India, without shelter behind references, with some personal touches. This is what he has done here. Characteristically, his account is elegant, succinct, courteous, charming – and pointed. His main conclusions, beginning with the summary of his commentary that follows, are universal. His monument is all around him, in India, Asia, and elsewhere.

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Summary

In over sixty years spent in nutrition research and action, I have learned many lessons and gained many insights. The two lessons I would pick to head the list are as follows.

One. When we attempt to combat a nutrition deficiency disease, we must have a clear understanding of the local contribution to the disease. Approaches that do not address local issues, maybe involving importations of models and ideas from other countries, are likely not to work, and almost certainly will have no sustained benefit. Even though the disease is the same, the causes are likely to be different.

Two. The most holistic and the most sustainable, and therefore the best, physiological approach to ensuring the nutritional well-being of people is the food-based approach. This involves ensuring that every person in every home has access to adequate food, as regards both quantity and quality. This calls for a clear understanding of locally available foods and cooking practices, and the nutritive value of these foods. A nutrition atlas such as this enables better communication to local populations, and more practical solutions to local malnutrition problems.

We must look to our farms, not to our pharmacies, to solve our nutrition-related problems.

The road I have taken

In the early 1940s, I stood at a fork in the road of life. I had been an outstanding medical student and had already earned an MD from one of the most prestigious universities in India, Madras University. Now I had to decide where I wanted to go next.

One branch of the road, the well-trodden one, beckoned with the promise of a bustling clinical practice and the accompanying social prestige and material prosperity. But somehow I felt a pull towards quite another direction. It was around this time that India was rocked by one of the most devastating famines in human history... the Great Bengal Famine of 1943. Between 2.5 and 3 million lives were lost as a result of that famine – far more than all the US, UK, Commonwealth and Western European Allied troops who died during the entire course of World War II.

This was also the time when India was a veritable museum of frank and florid nutritional deficiency diseases. In the wards in which I had worked as a house surgeon, I saw many patients with nutrition-related diseases. But these represented just a microcosm of the depressing countrywide scenario.

Beri-beri, both wet and dry, was rampant along the eastern seaboard, accounting for much morbidity and mortality. Classical pellagra was common among the sorghum eaters in the south-central Deccan region. Kwashiorkor and keratomalacia in children were major public health problems, especially in the south and east of the country. Pendulous goitres and osteomalacia were common in the sub-Himalayan belt. Severe anaemia arising from iron deficiency, aggravated by malaria and hookworm infestation, was endemic virtually everywhere in the country.

As a young doctor still in his twenties, I was assigned supervision of an entire nutrition ward in the Government Stanley Hospital, in my home city of Madras (now Chennai). That experience further opened my eyes to the problems as well as the possibilities, and helped me to set priorities in research.

I realised that these were all treatable and avoidable hardships for the most vulnerable populations – the children and the poor. That is when I decided to devote my medical career to the investigation and mitigation of the nutrition-related problems of Indians, especially those of the disadvantaged sections.

So I took the road less travelled...and that has made all the difference. Like any other road, this one too had its signposts and milestones, rough patches and smooth rides.

Building capacity in South-East Asia

In 1947, I set sail on a slow steamer to London. I was the first Nuffield Foundation scholar from India, on my way to the UK to pursue nutrition research. When I first landed in London I met Dr John Waterlow who had just returned from the West Indies after completing his work on fatty liver disease. We struck up an instant friendship, further strengthened through periodic contacts at meetings and conferences where we had opportunities to interact and share our ideas.

London holds very fond memories for me, not least because of all the outstanding scientists I met there. These included Sir Edward Mellanby, Dr Robert McCance, Dr Elsie Widdowson, Dr Reg Passmore, Dr Kenneth Blaxter and Dr Albert Neuberger, to name just a few.

The Nutrition Research Laboratories



My career in nutrition research started at the Nutrition Research Laboratories, founded in the days of the British Empire by Sir Robert McCarrison. The laboratories were in Coonoor, Tamil Nadu, in a jam factory! They were housed in

the premises of the Pasteur Institute, in an old building previously used to make jam. Many old-timers continued to refer to this scientific institute as ‘the jam factory’ for years after it had been in operation.

Jawaharlal Nehru, the first Prime Minister of India, visited us in the jam factory in the 1950s. Here I am with him, in the picture above. He had always been deeply interested in children and concerned for their welfare. He was known to the children of India as ‘*Chacha* Nehru’ meaning ‘Uncle Nehru’.

He said he was impressed by the work we were carrying out, and wanted to know what I thought of the idea of starting a government programme of midday meals in schools. ‘At least a couple of biscuits for each child...that would be good’ he said. Then he asked me, ‘Do you have any ideas about this?’ I did, and I sent him a proposal, which he duly circulated to all the Chief Ministers. Nothing more was heard about it. Today, there is a universal school midday meal programme in government schools in India. Maybe, back then, it was an idea whose time had not yet come!

The National Institute of Nutrition

The laboratories moved to new premises in Hyderabad, Andhra Pradesh, in the late 1950s. At first we had just six scientists, two of whom were about to leave for assignments elsewhere. Despite the numerous difficulties in building up a government-funded research institute in India during that time, it grew and blossomed. Within a decade, I had succeeded in all the lofty goals I had set myself for the institution. There were excellent scientific staff and new, flourishing departments of endocrinology, pathology, biophysics and education extension.

The spacious campus gave us room to grow and spread our wings. Important research work was undertaken and published, and nutrition training and dissemination were ongoing. The institution became a landmark in Hyderabad, and rapidly won recognition nationally and internationally. When in 1969 it was renamed as the National Institute of Nutrition in recognition of its growth, development and contributions, the function was attended by India’s Health Minister and by Dr Marcolino Candau, the then Director-General of the World Health Organization. More than four decades later, NIN continues to flourish as the apical institution for nutrition research in India.

From the 1950s my work was also international. In the 1950s and 1960s I was given the opportunity by the WHO South-East Asian Regional Office to visit South-East Asian countries and study their nutritional problems. These intensive visits resulted in the publication of three books on the nutrition scenario in South-East Asia. As Director of NIN I had the opportunity to interact with policy makers

and guide policy on nutrition. I also had the opportunity to interact with fellow scientists from the region who enrolled for the nutrition orientation courses at the Institute.

The Nutrition Society of India

In the 1960s I was very keen to launch a Nutrition Society in India. I had some support for the idea but there was scepticism too. 'There are already societies that nutritionists can join. Why do we need yet another society? You will never build up a membership. The whole thing will just fizzle out' it was said. Well, we went ahead. Today the Nutrition Society of India has over 1000 members.

The Asian Congress of Nutrition

At that time too, I was keen to bring the nutrition scientists of Asia together periodically to meet and exchange views. After all, here was a large continent with a great deal of malnutrition and therefore a great deal of important work in the field going on. I mooted the idea of an Asian Congress of Nutrition.

Again there was scepticism. Many thought it was too grandiose and impractical an idea to get scientists representing so many Asian countries to meet every four years by rotation in various countries. I had the pleasure of organising the first congress in Hyderabad in 1971, and also the ninth in New Delhi in 2002. By now ten congresses have been held, each better attended than the one before, with solid scientific presentations; and countries are now competing to host future Asian Nutrition Congresses that are still more than a decade away!

The Nutrition Society of India and the Asian Congress of Nutrition have become umbrella organisations for scientists in this field in this part of the world, and have given much-needed visibility and importance to nutrition as a science. These two creations of mine give me immense satisfaction. .

Indian Council of Medical Research

In the 1970s, as Director-General of the Indian Council of Medical Research (ICMR), I had even greater opportunities to guide health and nutrition policies, and learn more about the interaction between morbidity and undernutrition, while overseeing research activities in the national medical research institutions country-wide.

I also initiated a National Talent Search programme for young doctors who would be willing to opt for a career in medical research. I look back on these activities with great satisfaction even today, because I treasure my role as mentor, and as an

agent for change as far as the perception of medical research as a career was concerned. Many of the talent search scholars of those years went on to have successful and satisfying careers as medical research scientists. One of them is today the Director-General of the ICMR.

The Nutrition Foundation of India

When I retired as Director-General of the ICMR thirty years ago, I did not retire from nutrition. I decided to try to make another one of my dreams come true. I started a non-government organisation dedicated to nutrition research, the Nutrition Foundation of India (NFI), based in New Delhi.

I had long dreamed of building an institution for nutrition research in India from scratch, from the ground up, as a non-government organisation. I faced great challenges in building and nurturing the NFI and I worked at least as hard as any youngster starting out in his working life. During the initial phases, my garage at home was my office!

Fortunately, many well-wishers shared my vision, and the NFI is now a well established nutrition research centre. It is involved not with community-based research projects about the role of various nutrients. It is also deep into nutrition policy research, and nutrition education, dissemination and training. We are I believe making a significant contribution to ensuring that India is a nutrition-secure nation. I am proud of its growth, track record and contributions over the past three decades.

Reflections

When you build a good career, you contribute your knowledge and expertise for your lifetime. When you build an institution, you build several such careers for generations, and establish a valuable talent bank that is inexhaustible and will serve your country and perhaps others too, well into the future.

One day, at the dining table, my young great-grandson mentioned that his class was learning about the continents. 'I have been to every continent of the world except Antarctica' I told him. So then of course he wanted a list of the countries I had visited. When the list climbed to a few dozens, he stopped counting!

I have indeed had the very great pleasure and privilege of visiting virtually every part of the world, either to give orations, chair seminars and meet with other nutrition scientists, or to spend time studying the specific malnutrition problems of those countries. I have met with government leaders, the cream of the scientific community, and the common people. It has been continuing education of the

richest kind. In turn, I have been able to invite some my peers to India to participate in conferences or seminars and visit our research facilities.

Food-based programmes work

I now turn from personal reflections to professional assessments and judgements.

Over 60 years after the beginning of my career, many of the worst manifestations of malnutrition in India have now disappeared, while some remain stubbornly endemic, and new ones have emerged to pose their own set of challenges. Some of the devils we know have gone, but devils we know less well are now visiting. Let me now touch upon some of the most worrisome problems that we as nutrition scientists in India have encountered over the decades.

Beri-beri

This is a disease that now belongs in a medical museum. It is not seen in India any more. But that was not so even up to the 1950s. Both the wet and dry variants of the disease were prevalent. It was known that beri-beri was caused by deficiency of vitamin B1, and that it was also seen in Thailand, the Philippines and elsewhere in the region. R.R. Williams had even mooted vitamin B1 supplementation.

However, a look at local conditions held the clue to the solution in India. The people living in the part of the country that is now Andhra Pradesh were rice-eaters. They were eating milled and highly polished rice, with the entire husk with its vitamin B1 content removed. The rice eaters further south did not have beri-beri because their rice was only partly milled and not polished. A policy decision was made that the rice being accessed by the low-income groups would not be milled and polished. Beri-beri soon died a natural death.

This is an example of how a home-grown solution was found for a localised problem. The solution was to adjust the form in which the food was eaten. This was a victory for the food-based approach.

Kwashiorkor

Kwashiorkor was widespread in India in the earlier half of the 20th century. Indian diets commonly consisted of rice or wheat, and a small quantity of pulses (legumes). The disease was also present in Africa among populations whose staple diet consisted of *matake* (plantain).

We demonstrated that, as far as India was concerned, kwashiorkor was a manifestation of what is commonly termed protein-energy malnutrition, and that the intake of sufficient calories in the form of the traditional diets of rice or wheat would automatically supply the required amounts of protein.

We nutrition scientists resisted attempts by commercial interests to promote a supplementation programme with fish concentrate, and also persuaded policy makers not to embark on a programme of fortification of wheat with lysine. These would have been poor substitutes for more simple measures, such as increased intake of pulses, and of food overall. Kwashiorkor disappeared over a decade or so, with better control of infections and better diets in households. The solution was to promote higher intake of food overall. Again, the food-based approach worked.

Pellagra

This nicotinic acid-deficiency disease was vying for hospital space along with other florid nutrition deficiency diseases in the early decades of the 20th century. Pellagra had been known and recognised elsewhere as a disease affecting maize (corn) eaters. In India it was widespread among populations that subsisted on *jowar* (sorghum). Research established that sorghum, like maize, is rich in leucine, which inhibits the absorption of nicotinic acid.

The solution was not distribution of nicotinic acid tablets, but a campaign to educate the people to add other cereals in their diets. By then, rice production had increased and, with the advent of the Green Revolution, it was affordable. Over time, pellagra too died a natural death. The solution lay in promoting a better mix of cereal foods. Again, the food-based approach worked.

Rational use of nutrients

While a food-based approach is the most desirable and feasible in the long term, there are situations that call for supplementation or fortification with nutrients to provide relief in the short and medium term. For three major deficiency diseases in India, the supplementation or fortification approach has been tried. The lessons from each of these are sharply different.

Keratomalacia

Keratomalacia caused by vitamin A deficiency was a major cause of blindness in young children in India till the 50s and 60s of the last century. Today, it is no

longer a public health problem. Initially, after field trials, a massive-dose vitamin A prophylaxis program was recommended by the National Institute of Nutrition, and a national programme of massive dose vitamin A supplementation was initiated. The implementation was patchy and the coverage was low.

Later assessments indicate that the gradual disappearance of keratomalacia over the next couple of decades cannot be attributed to this programme. Rather, it was due to better access to health facilities, the disappearance of kwashiorkor, and the introduction of measles immunisation.

For many years now, and most recently in my contribution to the June 2010 issue of this journal, I have been vociferously advocating an end to the universal massive-dose vitamin A prophylaxis programme, which is now likely to do more harm than good.

Anaemia

This is a 'known devil' that has not gone away, and indeed seems to be becoming entrenched in India and in some other parts of South-East Asia. Based on studies at the National Institute of Nutrition showing that iron and folic acid supplementation may prevent further deterioration in haemoglobin status in pregnancy and perhaps bring about some improvement in birth weights, a national anaemia prophylaxis programme was initiated.

Currently, with more access to antenatal care, there should be screening of every pregnant woman for anaemia, and appropriate treatment given on an individual basis, instead of universal iron and folic acid supplementation. Indeed, recent data suggest that supplementation by itself does not entirely solve the problem of anaemia in pregnancy. This continues to be a rich area of research for us at the Nutrition Foundation of India. Anaemia impacts the quality of life of millions of Indians, particularly mothers and their new-born babies.

Goitre

Fortification of food can also be a rational approach, used where there is clear evidence of benefit with no risk. Goitre is a thyroid disease caused by iodine deficiency. It is a 'known devil' that once seemed to have gone away, but is still seen, and has been widely prevalent in sub-Himalayan regions where the water is deficient in iodine. However, surveys have now shown that there are pockets of iodine deficiency in most districts of India.

One of the factors responsible for iodine deficiency diseases might be the changes in soil chemistry caused by intensive cultivation of high-yielding varieties of food

grains which have depleted the soil of iodine. Considering that the requirement for iodine is small, and that iodine fortification in these amounts would be absolutely safe even for those who had no deficiency of iodine, it was decided to go in for universal iodisation of salt. The safety and efficacy of iodised salt has been demonstrated in community-based trials and the product is approved for use.

Some years ago, there was a move to make iodisation optional for salt manufacturers. Nutrition scientists throughout the country successfully opposed this proposal, and since 2007 all common salt sold in India is required to be iodised. Unfortunately, data from the third National Family Health Survey indicate that even today only around 50 per cent of Indian households consume adequately iodised salt. Of the other 50 per cent around half of households use salt with inadequate iodine content, and the other half consume non-iodised salt. This is an example of a disease that can be permanently prevented by the simple expedient of supplementing a common food item with a missing micronutrient.

The double burden

Towards the end of the 20th century, when undernutrition was becoming clearer and possibly more manageable in India, and indeed in the whole South-East Asian region, there has arisen a new nutritional problem that echoes the problem of the West, but with its own unique characteristics. This is overnutrition, leading to overweight, obesity and related morbidities that are so familiar to nutritionists in high-income countries.

The twist to the tale, as far as South and South-East Asia are concerned, is that this sharp rise in obesity largely represents a 'nutritional transition'. Many overweight people in India today were born in poverty, and experienced calorie deprivation in early childhood and consequent faltering growth. Then subsequently, with relative affluence and reduction in physical activity, these previously undernourished children have become overweight, fat adults.

This combination of childhood undernutrition followed by obesity in early adult life, leads to a whole host of chronic diseases, including hypertension and, most importantly, diabetes mellitus. India has been recording a very sharp and worrisome rise in the incidence of diabetes, which requires lifelong management, and so which is a long-term drain on public health resources.

The double nutrition burden of co-existing undernutrition and overnutrition poses altogether new challenges. Supplementations and handouts are irrelevant here.

Here is a battle for minds, to persuade a whole generation of young people to adopt healthy diets and ways of life from childhood.

The key to preventing much of the overweight seen in South and South-East Asia may be to prevent underweight at birth. This leads back to the nutritional status of mothers, who are anaemic and frail because they experienced nutritional deprivation in their own adolescence. In other words, nutrition scientists need to adopt a life-cycle approach to the whole question of good nutrition. Early deprivation throws a long shadow.

The ethics of nutrition policy

In a country in economic transition, such as India, policy-making is never easy. Nutrition scientists and policy-makers constantly have to balance many ethical and practical issues.

Like all branches of public health, nutrition has a political aspect, and this involves engaging with politicians at the highest level possible. I recall an occasion in the early 1980s. I was delivering the Jawaharlal Nehru Memorial Oration. Seated on the dais, among others, was Nehru's daughter Indira Gandhi. At that time, the Emergency she had declared earlier had been lifted, and she had announced and lost a general election. Her subsequent electoral victory, her second stint as Prime Minister, and her assassination, still lay in the future.

In the course of my speech, I pointed out that malnutrition and hunger were still public health problems for children in India, and made an impassioned plea for Mahatma Gandhi's and Jawaharlal Nehru's visions for Indian children to be made a reality. When Mrs Gandhi got up to speak, she showed her annoyance in no small measure. She wondered why we scientists had to paint such gloomy pictures. Turning to me, she said, 'Everywhere I go, I see only healthy, happy, smiling children. I don't see this malnutrition you speak about'.

I suppose I looked suitably abashed. Being a politician and a national leader, she would see only what was shown to her on her travels! However, after she was returned to office as Prime Minister, she was always supportive and willing to consider proposals that we brought to her attention.

School feeding – handouts or empowerment?

A good example of a practical issue which is also ethical is, should the government maintain a universal feeding programme in schools? If yes, for how long? Some say

that mere handouts will only prolong the problem, because people will become dependent and less willing to take responsibility for their own families and livelihood. They would prefer programmes of empowerment instead.

India has a massive universal school midday meal programme in place. Coverage has been satisfactory, but the content and quality of meals are suboptimal in many states. Also, the children do not have the benefit of the meal during school vacations. Despite the less-than-perfect functioning of the programme, it is generally accepted that it has been very beneficial as regards school enrolment and attendance, especially in districts with hitherto low enrolment and retention rates. However, the impact of the programme on nutritional status has not been evaluated.

Nutritionists should use the programme as a channel to educate the children, the families and their communities, that balanced diets can be prepared from locally available food, taking into account local culinary practices, and at an affordable cost. Once people stop seeing themselves as mere beneficiaries but as participants in development programmes, it will signal the beginning of empowerment.

Supplementation – or exploitation?

There is often a thin line between fulfilling a felt need, and exploiting that need for extraneous, often commercial, purposes. Thus, policy makers in low-income countries often have to make difficult ethical decisions regarding nutritional supplementation.

The Indian experience poses questions that policy makers need to face, in addition to the obvious ones regarding efficacy and safety. For example, is the supplementation necessary at all, or is there a simpler way, depending on what is causing the deficiency? Is the supplement synthetic or food-based? Is it for a targeted, local short-term need, or for long-term universal application? Is it in line with local preferences and traditions, and therefore acceptable – thus, fish concentrates would be shunned by vegetarians? Is it cost-effective and sustainable, and can the local authorities or government continue with it after an international or foreign or commercial enterprise ceases its operations?

Specific nutrient supplementation is not *per se* bad at all times and in all circumstances. But it cannot be the solution of first choice. For one thing, where there is deficiency of one nutrient, there is a good likelihood of other co-existing deficiencies. Supplementation cannot deliver the same result as an overall improvement in the diet. It is at best a fall-back option. In any case, it can very rarely be justified as a long-term universal programme to combat malnutrition, especially in a resource-starved country with a growing population.

Too often, supplementation programmes seem to take on a life of their own and keep running even after the initial problems they were meant to solve have disappeared. Supplementation morphs into prophylaxis and becomes entrenched. There is a big ethical issue here. All concerned should be sensitised to it.

Nutrients – or foods?

This brings me back to my favourite theme. Food-based approaches are best in tackling nutrition-related conditions of all kinds, in conjunction with nutrition education and appropriate changes in ways of life.

True, sometimes changes in environments have caused micronutrient deficiencies in the foods themselves, or in the soil in which they are grown. Iodine depletion, leading to the requirement for fortification of common salt with iodine, is an example. Keen observation, anticipation of events and a flexibility of approach, can ward off major nutritional problems before they can become full-blown.

Micronutrients may be compared to instruments in an orchestra that is playing an intricate classical composition. They are not merely a set of separate solo performances. Deficiencies of one or another micronutrient may become evident, but the solution does not lie in merely providing micronutrients alone, singly or in combination. No artificially concocted cocktail of these micronutrients works anywhere near as well to assuage 'hidden hunger', as diets rich in a variety of fruits and vegetables. Nature's cocktail cannot be replicated, if only because we do not know all the ingredients, and we do not know their individual bioavailability.

Phytonutrients have now set off quite a buzz in nutrition science circles, because of their role in a diverse range of functions, for example as antioxidants that bolster the immune system. These too are available in adequate quantities in reasonably balanced diets. I predict a very exciting time ahead for nutrition scientists, working in tandem with biologists, biochemists and others in the life sciences, in unravelling the mysteries of these so-called 'non-nutrients'.

The public health context

Nutrition properly understood is a vital aspect of public health and indeed overall public policies. This is a lesson we have learned in India, which applies to other countries, and universally.

Food and nutrition security

The definition of food security made by the Food and Agriculture Organization in 1996 reads: 'All people at all times have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life'. Food security is a necessary but not sufficient prerequisite for nutrition security. In order for a population (or a family) to be nutritionally secure, all the 'three As' must be in place. These are availability, accessibility and absorbability.

Absorbability depends on the general health of the individual and the absence or presence of morbidity conditions. This points to the importance of sanitation, access to clean water, sufficient ventilation, immunisation, and ready access to health care. These all impact on the absorbability of the nutrients delivered to the system through food. In India and many other countries, with road access still often poor, and potable water unavailable nearby, these criteria for nutrition security are not yet met in many rural areas. When the metabolism is disrupted or dysregulated, mere delivery of food is like trying to fill a leaky pot.

In India and in other countries in South-East Asia, we have always stressed the need to package sanitation and hygiene messages along with nutrition messages. The poor growth of many Indian children is due to a combination of undernutrition and recurring morbidity, mostly from diarrhoeal and respiratory diseases. In the under-5 age group, especially, improvements in nutritional inputs have to go in tandem with control of morbidity. Either one or the other in isolation would not solve the problem. Our public health nutrition messages to the community need to include the importance of environmental sanitation and immunisation.

The role of technology

A recent example of the use of new technology to enhance food and nutrition security in India has been the production of high-yielding varieties of food grains. In the middle of the 20th century, Malthusian predictions of catastrophe and famine were being voiced. Those threats faded, because the Green Revolution filled the granaries. Of course, nothing is gained without paying a price. The Green Revolution virtually replaced millets and other coarse grains with rice and wheat in people's diets, and probably also altered soil chemistry. It also has resulted in a shrinkage in the land used for growing pulses (legumes), primary source of proteins for vegetarians.

Genetic modification is the latest tool in the technological armamentarium of food scientists, although not yet with the specific aim of enhancing the nutritive value of foods. Reactions to this technology so far range from scepticism and distrust to enthusiastic acclamation. The truth, as often, probably lies somewhere in between. The wait and watch attitude may be wise, considering that apprehensions regarding long-term safety are involved.

The Millennium Development Goals:

The World Health Organization has recently stated that in India in 2015, extreme poverty will be one-half of what it was in 1990, in line with one of the UN Millennium Development Goals. But malnutrition is not the exclusive preserve of the poor. It afflicts many affluent households, largely because of ignorance.

It is good to have goals, but they should be more than just idealistic lines in the air, or pious wishes. Gross undernutrition and deprivation, verging on starvation, are still hallmarks of poverty. Logically, therefore, the mitigation of poverty should also result in lower rates of malnutrition. We must hope that this logic holds true to a great extent. But with food inflation riding high, and households aspiring to other symbols of the good life, household expenditure on food may not necessarily ensure adequate nutrition for all the members.

Personal and national partnerships

The basic personal nutrition message applies to India and is also, I believe, universal. It sounds simple:

- Eat adequate amounts (and no more) of a variety of locally available foods from each of the food classes.
- Breastfeed babies exclusively for the first six months.
- Observe good sanitation.
- Get children immunised.
- Access health facilities when necessary.
- Lead a physically active life.

In practice it is not quite as simple and straightforward as it sounds.

There are local food taboos and traditional prejudices that stand firm against change. In India and many countries the elders of the family often have a big say in

matters of diets, especially during pregnancy and after delivery, and in what is fed to the toddler. For example, in India there is a traditional belief that a child with diarrhoea should be totally starved, and not given even water, till the problem stops. During illnesses, home remedies suggested by the elders of the household or other villagers are often preferred to making a trip to the health centre.

Things are changing, but changing slowly. I have always advocated using school children as agents of change. The midday meal is a convenient entry point for nutritional education. I have repeatedly recommended a national health scout movement, with school children in secondary grades being trained to carry simple messages to their homes and their communities. The expertise available at home science colleges and the departments of community medicine in medical colleges all over the country also can be harnessed for nutrition extension work in their local areas. Apparently simple messages need to be reinforced in as many ways as possible.

Working together for nutrition security

Whose responsibility is it to ensure that every Indian household is nutrition-secure? Primarily, of course, this is the responsibility of the Indian government, at all levels. But every sector of society must be engaged. Non-government organisations can be agents of change, because of their focus and flexibility, and their grass-roots reach. In India, the private sector industries have always been aware of their responsibility towards the community. Recently more of them have been coming forward in newer and bigger ways to help with accelerating change, mainly in school education. Public-private partnerships, formal and informal, can work well in a country as heterogeneous as India, with its wide inter-regional variations in diets, culture, customs and traditions.

My conclusion

It is now more than sixty years down the road from my decision to devote my professional life to nutrition, in the hope of serving the people of India and South-East Asia in particular, Much has been accomplished, but much more still remains to be done.

Large-scale famines that used to devastate vast areas of the country with distressing frequency have now been eliminated. The great Bengal famine of the mid 1940s was the last of these major disasters. The Green Revolution has ensured that increase in food production has stayed ahead of population growth. The creation

of adequate buffer stocks of food, and its efficient distribution at subsidised cost to the poor, has improved the food security of households. But pockets of seasonal food insecurity still exist.

The infant mortality rate stood at 146 per 1,000 live births in 1951. In 2009 it was 53 per 1,000. Crude death rates have declined from 25.1 per 1,000 every year in 1951, to 7.4 in 2009. Life expectancy at birth was 34 years in 1951. In 2009 it was 65 years. Florid forms of nutritional deficiency diseases, which used to occur in epidemic proportions, have been controlled or eliminated.

But in India anaemia is still widespread. Around 30 per cent of babies are of low birth weight, and the growth performance of children in the low socio-economic groups is suboptimal. Overweight and obesity, with their attendant morbidities of hypertension and diabetes, are placing additional burdens on already stretched public health resources.

The government of India has increased its allocations of public funds for poverty alleviation and nutrition programmes, and has made the right to food one of the main pillars of its policy for improving the quality of life of its citizens.

Convergence between health and nutrition programmes, improvement in the content, quality and coverage of these services, and good use of available services by an increasingly aware population, should enable sustained improvement in the nutrition and health of all Indians.

As I write these final words, I am sitting at my desk at the Nutrition Foundation of India in New Delhi. I am not retired from my life in nutrition!

Request

Readers are invited please to respond. Please go to www.wphna.org and go to this commentary there, and use the response facility at the end of the commentary. Readers may make use of the material in this commentary, provided acknowledgement is given to the authors and the Association, and WPN is cited.

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