CHILD NUTRITION IN INDIA: PRIORITIES FOR THE COMING DECADE

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During the past few decades, India has made remarkable progress in several fields like agriculture, medicine, industry and technology. Food production has increased from 79 million tonnes in 1960 to a record level of 176 million tonnes in 1990. Health facilities have improved considerably in terms of health manpower, number of hospital beds and primary health centres. At present, more than 100,000 sub-centres and 17,000 PHCs are functioning. The community health centre covering a population of 100,000, provides specialist services to the rural masses. In addition, special health and nutrition programmes have been initiated for women of repoductive age and young preschool children who constitute the most vulnerable segments of the population. The Integrated Child Health Services (ICDS), which represents the largest MCH programme in the world, has been in operation for nearly two decades. What is the impact of these developments on the health and nutritional status of our children? This question acquires practical relevance, since children who constitute 40% of the total population, represent the most critical part of our human resources.

An attempt is made here to briefly review the current status of child nutrition in India and identify the priorities for the coming decade to attain the goals set for 2000 AD.

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Maternal Nutrition and Low Birth Weight

Maternal nutrition is a major determinant of intra-uterine development of the fetus, birth weight of the infant as well as the subsequent growth and development of the child. Earlier studies have shown that about a third of the infants born in India are of low birth weight (<2.5 kg), largely attributable to maternal undernutrition. Recent reports indicate that there is no significant change in the situation. A multicentric study conducted by the ICMR (1990) revealed that the prevalence of LBW ranged from 27-56% in urban slums and 33-41% in rural population(1). A significant proportion of these women were undernourished. The study identified a number of risk factors associated with low birth weight–age of the mother (below 19 years), maternal weight less than 40 kg, maternal height less than 145 cm, weight gain during pregnancy below 5 kg, pregnancy interval less than 24 months and hemoglobin below 8 g/dl. A study conducted by NIN showed a good correlation betweel birth weight of the infant and body

mass index (BMI = $Wt/Ht^2 \times 100$) of the mother(2). The mean birth weight in women with BMI less than 16, reflecting severe chronic energy deficiency (CED), was 2.5 kg and it showed a progressive increase with increase in BMI status of mothers.

Recent NNMB surveys (1989-90) show that the average weight and height of rural women are 42 kg and 152 cm(3). A comparison of these data with those obtained in mid-seventies shows that there is not much difference between the two periods. A significant proportion of women are still undernourished as their weights are below 40 kg, heights below 145 cm and BMI below 18.5.

There is evidence that the adult stature is influenced to a great extent by the nutritional status during childhood. Longitudinal studies conducted by NIN have shown that undernourished children continued to have stunted growth during the subsequent years(4). The deficit in height, observed at the age of 5 years persisted even up to 18 years. In addition, many girls in rural India, get married before they reach 18 years of age, and early motherhood prevents them from achieving full growth potential. Apart from the short stature arising from these factors, many women during pregnancy, subsist on inadequate dietaries and suffer from anemia, all of which contribute to LBW. Studies in rural women have shown that the dietary intake ranges between 1600-1900 kcal/day and their weight gain during pregnancy is around 6 kg, as against an intake of 2000-2500 kcal and weight gain of 11 kg in women of high income group(5). Anemia is widespread, particularly among women of reproductive age. Earlier studies have shown that 50-70% of pregnant women had hemoglobin levels below 11 g/dl(5). The recent studies indicate continued prevalence of anemia. A survey conducted by the ICMR covering a large number of women from different parts of the country revealed that 88% of the pregnant women are anemic(6). Thus, there has been no significant improvement in the maternal nutritional status over the last few decades.

Lactation Performance and Infant Growth

A vast majority of women in rural communities still continue to breast feed their infants for 12-18 months. Despite maternal undernutrition, the lactation performance is satisfactory and the infants grow well in the first 4-6 months(5). Breast milk output is not affected, unless the mothers suffer from severe undernutrition, and the composition of milk with respect to protein, fat and lactose is also well maintained. However, the concentration of vitamins, particularly vitamin A content in milk is lower in undernourished than in well nourished mothers. Although studies have failed to show any impact of food supplementation on lactation preformance, these women should be given nutrition supplements up to 6 months of lactation to maintain their own nutrition and provide adequate vitamins to infants through breast milk.

Child Mortality

Since infant mortality rate (IMR) and under-five mortality rate (U5MR) reflect the health and nutritional status of the community, mortality trends are useful indicators. Although India continues to be in the list of countries with very high IMR and U5MR, the mortality trends indicate a significant improvement during the past 3 decades. IMR has declined from 146 in 1960 to 96 in 1990 and U5MR from 282 to 145 during the same period(7). Some

States have done better than others in this respect. Kerala has the lowest IMR of 28. However, improvement in child survival does not necessarily mean better child nutrition. Many children continue to be in poor environment and are deprived of the right to healthy and normal development.

Major Nutritional Problems

Among the nutritional deficiencies in children, protein energy malnutrition (PEM), vitamin A deficiency, anemia and iodine deficiency disorders (IDD) are the major problems of public health significance.

Protein Energy Malnutrition

PEM is the most widespread disorder among children. Kwashiorkor and marasmus are the two clinical forms of severe PEM often seeking hospitalization for secondary complications. Apart from contributing to high mortality, malnutrition during childhood can lead to permanent sequale like stunted growth, poor mental development and reduced work capacity.

Community studies have shown that about 2-3% of preschool children suffer from clinical forms of malnutrition, while a great majority have milder grades which manifest as varying degrees of growth retardation(8). Although the quantum of malnutrition has not shown a significant change over the years, there is some improvement in the nutrition profile of children. According to Gomez classification, children with weights less than 60% of the standard are considered to have severe or Grade-3 malnutrition. The NNMB studies have shown a significant decline in the prevalence of Grade-3 malnutrition from 15% during 1975-79 to 8.7% in 1988-90, with a corresponding increase in the proportion of normal children(3) (>90% of the standard). Similar trends are noticed in case of 'stunting' (low height for age) and 'wasting' (low weight for height) profiles of children. The prevalence of overt cases of clinical malnutrition like kwashiorkor and marasmus are also reduced to less than 1% suggesting an improvement in child nutrition. However, there is only a marginal increase in the caloric intake of children. The reduction in severe grades of malnutrition may perhaps be due to greater attention paid to such children in the ongoing child care programmes and better control of infections, which serve to aggravate malnutrition and precipitate clinical signs.

Improvement in child nutrition is not reflected in the growth performance of children. Although the growth of children from affluent populations is close to NCHS standard, a vast majority in rural communities shows varying degree of growth retardation, attributable to environmental and dietary constraints. Such children are shown to suffer from functional handicaps in addition to poor physical stature, and hence should not be mistaken for normal children. Now that the florid forms of malnutrition are fast disappearing, attention must be paid to these children with growth failure. They must be freed from environmental constraints, so that their genetic potential for growth and development finds full expression.

Secular trends with better growth performance are observed in children of high income groups as seen in advanced countries(9). However, children of poor communities have not shown much improvement. When NNMB data obtained from 1988-90 survey are compared with that of earlier survey, there is not much difference in mean heights and weights of children(3). But there are significnt differences in the growth performance of children from dif-

ferent States. In Kerala, which is the most progressive State with respect to health and social development, secular trends are evident with better growth of children. Efforts must be made to ensure that these trends continue and children in other States also attain better nutrition and growth.

Vitamin A Deficiency

Although vitamin A deficiency affects many tissues in the body, the most significant lesion is corneal xerophthalmia leading to permanent blindness. Such severe lesions, often associated with severe PEM, are mostly confined to children under 3 years of age, while mild xerophthalmia like night blindness and Bitot spots is seen in older children. Apart from causing eye lesions, vitamin A deficiency has other important functional implications. Altered iron metabolism can lead to anemia while impaired immune functions lower resistance to infections. Recent studies in children have shown that vitamin A deficiency is associated with increased risk of morbidity and mortality.

ICMR surveys in different parts of the country have shown that about 4% of the preschool children have Bitot spots and 1 in 1000 develop corneal lesions(8). Severe cases of corneal xerophthalmia and blindness often seek hospitalization, and follow-up studies show that about 50% of the blind die within 6 months(10).

During the past few decades, there has been a significant change in the profile of vitamin A deficiency in Indian children. Hospital records show that the number of severe cases with corneal lesions are reduced considerably. Community studies also show similar trends. In the blindness survey conducted during 1971-74, vitamin A deficiency contributed to 2% of the total blindness(11). While in the recent survey (1989), it was only 0.04%(12). NNMB surveys show that mild xerophthalmia has also declined from 2% in 1975-79 to 0.7% in 1988-90. This may partly be due to the impact of vitamin A programme which has been in operation for the last two decades and partly due to the general improvement in the nutritional status, reflected in the reduction of severe grades of PEM.

Although xerophthalmia is showing a declining trend, sub-clinical deficiency of vitamin A is still widespread in poor communities. Clinical studies show that 20-30% of the apparently normal children have low levels of serum vitamin A (<20 μg/dl)(13). Since vitamin A deficiency has other important health implications, efforts should be continued to further improve vitamin A status of children.

Nutritional Anemia

Anemia is another problem of great public health significance. While no segment of the population is spared, the hazardous consequences of anemia are felt to a greater extent in pregnant women and preschool children. Apart from contributing to maternal morbidity and mortality, anemia in pregnancy is associated with premature delivery and low birth weight of infants. While severe anemia is treated as a medical problem, milder grades, which are more widespread, are often neglected. There is now evidence that even moderate reduction hemoglobin is associated with reduced work capacity and lowered resistance to infections. Anemia in early childhood is associated with poor cognitive development and behavioral changes.

A multicentric study carried out under the auspices of ICMR showed that as many as 62.8% of children below 1-3 years and 44% between 3-5 years had anemia(8).

Studies in pregnant women have shown that Hb levels below 11 g/dl in 50-70% during the third trimester(5). Although the national anemia prophylaxis programme has been in operation for the past two decades, there has been no significant dent in the problem. Recent surveys of ICMR (1989) in different parts of India have shown that more than 80% of pregnant women are still anemic(6). Other studies indicate that iron deficiency anemia is common even among other segments of the population(14) and emphasise the need to cover the entire population in the intervention programme designed to control anemia.

Iodine Deficiency Disorders (IDD)

Goitre, the most visible manifestation of iodine deficiency is largely of cosmetic significance. The real health problems are because of functional failure of thyroid gland at different stages of individual development. Iodine deficiency in the mother interferes with the development of the unborn child. In many cases, such deficiency produces abortion or stillbirth. The major effect of fetal iodine deficiency is endemic cretinism, characterized by growth failure, mental deficiency and deaf-mutism.

Goitre has been recognized as an endemic problem in the Himalayan and sub-Himalayan regions, since the past half century. Recent surveys of ICMR indicated the presence of goitre even in areas outside the conventional Himalayan belt(15). The prevalence of goitre ranged from 24% in hilly districts to 19% in coastal districts and 12% in plains. The prevalence of endemic cretinism is more alarming, with Manipur having the highest prevalence of 6.1%.

While the full syndrome of endemic cretinism is relatively rare, many children in endemic areas show varying degrees of thyroid deficiency and developmental defects. A recent study conducted by the AIIMS has revealed high prevalence of neonatal chemical hypothyroidism (NCH), defined by thyroxine levels less than 3 μg/dl and TSH levels above 50 μg/ml(16). The prevalence rate of NCH was as high as 15% in some districts of Uttar Pradesh. Another study on school children in the same districts of Uttar Pradesh. Another study on school children in the same districts showed deafness and mental subnormality in 20% of children(17). In addition, a high degree of apathy was observed in the general population. The reduced mental function resulting from iodine deficiency is thus a major handicap to social and economic development of the community.

Nutrition Goals for 2000 AD

The global declaration of the World Summit for Children (1990) gave a high priority to survival and development of children(7). The accompanying plan of action focussed on measures to eradicate hunger and malnutrition. Specific nutrition goals and targets to be achieved by 2000 AD are:

(*i*) Virtual elimination of severe malnutrition and a reduction of moderate malnutrition among the under-five children by half.
(*ii*) Growth promotion through regular monitoring.
(*iii*) A one-third reduction of iron deficiency anemia in women.
(*iv*) Virtual elimination of iodine deficiency disorders.
(*v*) Virtual elimination of vitamin A deficiency.
(*iv*) Reduction of low birth weight to less than 10%.
(*vii*) Empowerment of all women to

to improve the outreach of services and increase the coverage of younger children. Appropriate training of Anganwadi/ Health Workers is important, so that they know what steps should be taken when growth faltering is noted and precise advice to be given to mothers for improving the diets of children with the existing resources. Control of infections and feeding during illness should also receive adequate emphasis to prevent malnutrition.

Supplementary feeding is an important component of most nutrition related programmes like ICDS, TINP and mid-day meal programmes. In some programmes, food supplements are given to all children in the community, while others are targeted to severely malnourished children. However, this approach has been criticised as it is likely to create dependence rather than self-reliance. Supplementary feeding is an effective means to improve the nutritional status of the vulnerable groups, particularly in the areas of abject poverty. But, it is only a temporary measure to mitigate malnutrition and will not have a significant impact, unless efforts are made simultaneously to address the basic problems of po-verty.

Prevention of Vitamin A Deficiency

Since inadequate dietary intake of vitamin A is the main cause of xerophthalmia, the most rational approach to prevent this condition would be to improve the diets and increase the intake of vitamin A. As a short term measure however, six monthly administrations of massive dose of vitamin A were recommended to reduce nutritional blindness in children. This strategy, based on extensive studies carried out by NIN, was envisaged as an interim measure till such time that dietary improvement is achieved(19). The Vitamin A Supplementation Programme has been in operation all over India for the last two decades, however, the coverage is far from satisfatory. The reasons for poor coverage include inadequate supplies of vitamin A, irregular distribution of the dose and poor coordination between the various health functionaries. Recently, the programme was reviewed by the Health Ministry and the strategy is revised to improve the outreach of the target population, by linking with other programmes like ICDS and EPI. Vitamin A supplementation is now confined to children between 1-3 years, instead of 1-5 years. An additional dose is being given to children between 9-12 months along with measles vaccine. International organizations have suggested introduction of vitamin A supplementation in early infancy along with DPT immunization. It is unwise to adopt this policy as the need for early supplementation or safety of this approach has not been established. This will unnecessarily increase the cost and add to the burden of the existing health care system.

Based on recent studies reported from Indonesia and Nepal, large dose vitamin A supplementation has been recommended as a measure to improve child survival(2). Although improvement in vitamin A status will certainly have a beneficial effect on child health, the claims made by these studies that child mortality can be reduced by 30-40% by vitamin A supplementation alone is highly exaggerated. The studies carried out by NIN in Andhra Pradesh, India(21) and by the Harvard Group in Sudan(22) failed to show any difference in mortality rates of children who received vitamin A and those who did not. There are several other factors like severe PEM, high infection rate and poor access to health care, which contribute to child

mortality. Vitamin A supplementation is only one of the several measures needed to improve child health.

Although vitamin A supplementation is a simple and effective short term approach to control vitamin A deficiency, the ultimate solution to the problem lies in the improvement of the diet. There is an urgent need to develop long term strategies to increase production and consumption of vitamin A rich foods through horticulture and education interventions. Green leafy vegetables like amaranth and palak, and fruits like papaya and mango are rich sources of β-carotene. Recent studies of NIN have shown that besides the conventional green leafy vegetables grown in kitchen gardens, leaves of a wide variety of plants which grow wild in the countryside are good source of β-carotene(23). Usage of other unconventional and inexpensive sources of β-carotene like red palm oil(23) and spirulina(24), a blue green algae, in the diets of children has also been demonstrated. Vitamin A status of the population can be improved by encouraging the production and consumption of such foods. The main advantage of this food-based strategy is that it will not only increase vitamin A intake, but also provides other micronutrients, contributing to better nutrition.

Control of Anemia

Since poor bioavailability of iron from cereal-based diets is the main cause of IDA, the only solution to the problem is supplementation of iron. In addition, folate deficiency also contributes to anemia in pregnancy. Although the national programme of folifer tablet distribution among pregnant women has been in operation for the last two decades, there is no significant impact on the problem(6). The evaluation study has revealed that the poor impact is due to inadequate supplies of tablets, irregular distribution and poor compliance by the beneficiaries. A revised strategy of the Health Ministry envisages linking of folifer distribution with TT immunization for better implementation of the programme. Efforts are needed to streamline the logistics of supplies and distribution of tablets and improve the compliance among the beneficiaries through a comprehensive strategy of information, communication and education on anemia.

Since a high proportion of adolescent girls are anemic even before they become pregnant, it has been suggested that folifer tablets should be given to all newly married girls of low income group and their intake should be promoted through an intensive education programme. Feasibility of this approach needs to be evaluated.

Since anemia is widespread even in other segments of the population, fortification of common salt with iron, for which technology is available, has been suggested as an alternate strategy to improve iron status of the population(14). Iron fortified salt is currently being produced on a commercial scale by a few private manufacturers and recently the Tamil Nadu Salt Corporation has started large scale production of the fortified salt. If the fortification programme is introduced on a country-wide scale to improve iron balance in the total population, the anemia control programme among pregnant women through distribution of folifer tablets will have better success. Iron fortification of salt is suggested as an adjunct and not as an alternative to the current anemia prophylaxis programme.

Control of IDD

Iodized salt has been shown to be the

most effective approach to control goitre and other forms of IDD. Althouth goitre control programme has been in operation in India for the last three decades, it has gained momentum only recently. The National Policy of universal iodisation of salt is being implemented in a phased manner, and the Government has liberalised the production of iodised salt by including private sector, in addition to public sector, hoping to meet the requirements of the entire population by the end of 1992. However, several problems are encountered in the implementation of this strategy, mainly due to lack of coordination between the various sectors involved in the programme. This must be set right, if we have to achieve the goal of virtual elimination of IDD by the end of this century.

Iodised oil injection is the other approach suggested for tackling goitre and cretinism in hyperendemic areas. Although the injection programme has been successfully implemented in some countries, desirability of such an approach in the Indian context has been questioned. Studies carried out by AIIMS showed that injection of iodised oil to pregnant women in the last trimester of pregnancy did not help to reduce the incidence of neonatal chemical hypothroidism(16). On the other hand, it has been argued that the high levels of iodine following the injection could result in a feed-back suppression of thyroid function. Apart from this, the high cost and increased risk of AIDS and hepatitis associated with injection makes this approach undesirable. Oral administration of iodised oil has been suggested, but this may be even more costlier, since the amout of oil required is twice that given by intramuscular route. Iodisation of salt is the most appropriate strategy for the control of IDD. What is needed is an effective implementation of the programme.

Double Fortification of Salt

Since iron deficiency anemia and iodine deficiency disorders often coexist, the most cost effective approach to control these public health problems would be simultaneous fortification of salt with iron and iodine. A technology for double fortification of salt has been successfully developed by NIN(25). Large scale field trials have confirmed the community acceptance of the fortified salt. Implementation of this programme on a national scale will help in reducing the twin problems of iron and iodine deficiencies in the population.

Conclusion

Relatively inexpensive, time tested and well proven technologies are available to tackle the existing nutritional problems. What is needed is effective implementation of these measures. It is possible to achieve the nutrition goals set for the year 2000, by revising the current strategies and shifting the focus from severe to milder forms of malnutrition, with more emphasis on long term sustainable actions.

Only specific interventions to overcome the pressing problems of nutrition are discussed here. But the efforts to improve child nutrition and development are not confined to pediatrics or, for that matter, health sector alone. Improvement in education and social status of women, better health care facilities, environmental sanitation and overall community development are important for the upliftment of the nutritional status of children.

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NOTES AND NEWS

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The Department of Biostatistics, CMC, Vellore, jointly with the Epidemiology and Health Management Network of India (EPIDMAN), will be organizing 5 intensive, application-oriented 3-week courses from June 14 to July 2 1993: (*a*) Introduction to Biostatistics and Hospital Statistics: to develop skills in proper collection, use and interpretation of vital, health and hospital statistics; (*b*) Epidemiological Methods and Analysis: to describe disease frequencies, design and analysis of cohort, cross-sectional, and case-control studies as well as clinical trials; (*c*) PC-based Statistical Software in Health Care: both advanced level and introductory; (*d*) Applied Multivariate Techniques, to better use of statistical procedures, in different multivariate contexts; (*e*) Demographic analysis and their biostatistical application, dealing with formal and practical demography. All courses include laboratory and computer time.

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