

Dual nutrition burden in India: Challenges and opportunities

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Abstract

Dual nutrition burden, with persistent under-nutrition and emerging problem of over-nutrition is a phase in nutrition transition. Indian clinicians and epidemiologists have defined the magnitude of dual nutrition burden in India, shown that under-nutrition and over-nutrition occur in same family, the same individual at different periods of life or even at the same time . They have documented trans-generational impact of maternal nutritional status on the offspring.

Over the last five decades there has been a slow but steady decline in undernutrition rates. Poverty and lack of food are no longer major causes of under-nutrition. With increasing awareness among the population and improving access to and utilization of health and nutrition services, it is possible to accelerate the decline in undernutrition rates.

Currently overnutrition rates are relatively low; over-nutrition is mainly a problem in urban affluent segments of population. Steep reduction in physical activity is the major factor responsible for overnutrition and increase in risk of noncommunicable diseases (NCD). With improved awareness on need to increase discretionary physical activity and improved access to services for prevention, early detection and effective management of obesity, it might be possible to reduce the predicted increase in obesity and NCD over the next two decades .

Key words

Undernutrition, overnutrition, dual nutrition burden, stunting, underweight, wasting , BMI for age

Introduction

Most of the developing countries are currently undergoing economic, social, demographic, health and nutrition transitions. The term dual nutrition burden was coined in the nineties to denote the phase of ongoing nutrition transition in low and middle income countries, characterized by persistent under-nutrition mainly among poorer segments of population and emerging problem of over-nutrition seen mostly among the urban affluent segments. Concurrently these countries are also undergoing health transition and are facing dual disease burden with persistence of high morbidity due to communicable diseases and maternal and child health problems and simultaneous increase in the lifestyle and over-nutrition related non-communicable diseases.

In India over the last five decades, there has been steady if slow decline in poverty; poverty and lack of food are no longer the major factors responsible for undernutrition. Improved access to health care for infections and consequent reduction in the nutrition toll due to infections especially in children, has resulted in slow but steady decline in undernutrition¹. In the last decade the reduction in physical activity in occupational, domestic and transport domains have contributed to the bridging of energy gap in adults and contributed to reduction in undernutrition rates in adults. The emerging problem of overnutrition and increased risk of noncommunicable diseases (NCD) is mainly attributable to steep decline in physical activity and unchanging energy intake².

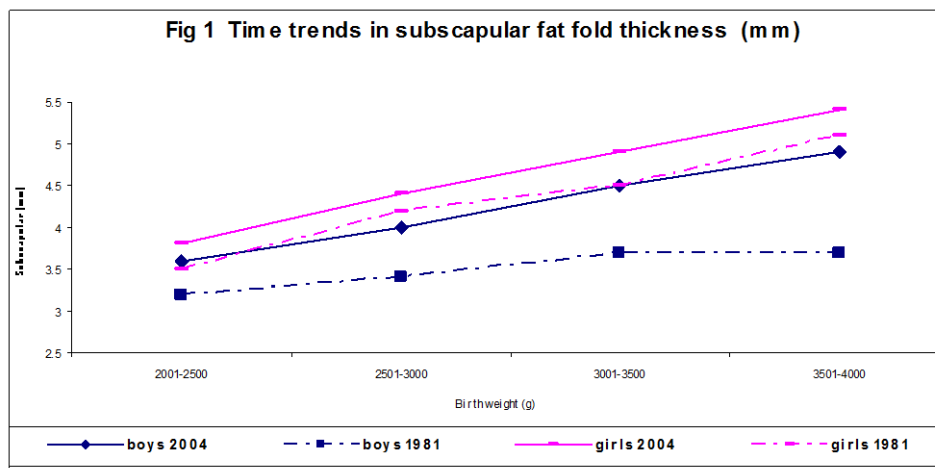
India is a vast and varied country. During last two decades, Indian clinicians and epidemiologists have defined the magnitude of dual nutrition burden and the rates of nutrition transition in different states of the country. There are substantial differences in under-nutrition and infections, obesity and non communicable diseases between urban and rural population and between different segments of the population living in the same region. Research studies from India have shown that under-nutrition and over-nutrition can be seen in same family, in the same individual at different periods of time and in the same individual at the same time. Trans-generational impact of maternal under and overnutrition on the offspring has also been documented.

India is facing the daunting task of combating dual nutrition and disease burden in a billion plus population. Integrated Child Development Services (ICDS) and National Rural Health Mission (NRHM) and its urban counterpart have attempted to provide universal access to essential nutrition and health services and appropriate interventions for prevention, early detection and effective management of undernutrition and infections as well as obesity and noncommunicable diseases. The magnitude and dimensions of the dual nutrition burden in the country and the ongoing interventions to combat it are reviewed in this manuscript.

Dual nutrition burden at birth

Global data on low birth weight (LBW) indicate that the prevalence of LBW is highest in the South Asian region³. India with one sixth of the global population accounts for nearly 40% of global LBW infants. Estimates based on available data from institutional deliveries and smaller community- based studies suggest that over the last six decades there has not been any reduction in LBW rate: nearly one-third of all Indian infants weigh less than 2.5 kg at birth¹. Low maternal pre-pregnancy weight, low pregnancy weight gain, anaemia have been the major factors responsible for low birth weight in India, clearly demonstrating trans- generational impact of maternal undernutrition. Maternal factors associated with LBW such as low maternal height and low pre-pregnancy weight cannot be modified during pregnancy. However early detection and effective management of low pregnancy weight gain, maternal anaemia, and pregnancy induced hypertension can lead to substantial reduction in LBW rates. Convergence of services for pregnant women under NRHM and ICDS at anganwadis during the Village Health and Nutrition Days, can bring rapid improvement in coverage, content and quality of antenatal care; early detection of problems and appropriate interventions in pregnancy can enable the country to bring about 5% reduction in LBW over the next five to ten years..

Maternal overnutrition and gestational diabetes with maternal overnutrition predisposes to large for date babies – trans-generational impact of maternal overnutrition. Pregnancy induced hypertension in overnourished women with or without diabetes is emerging as an important obstetric factor predisposing to LBW showing that maternal overnutrition can be associated with increased risk of low birth weight .



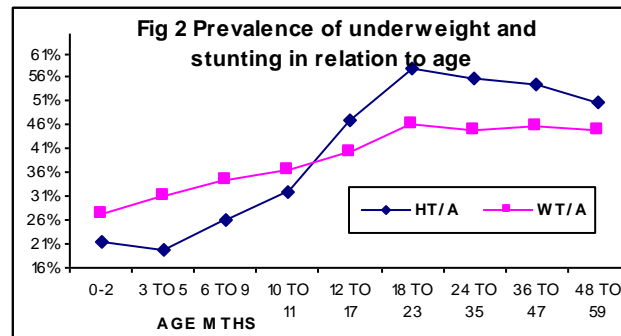
Data from hospital based studies in Delhi⁴ have shown that between 1981 and 2004, there has been an increase in fat fold thickness,

especially truncal fat folds in neonates even though there has not been any change in mean birthweight or incidence of low birthweight. These neonates simultaneously suffer from undernutrition (stunting and underweight) and overnutrition (high body fat) suggesting that dual nutrition burden begins in utero (Figure 1). Over these two decades the mean body weight in Delhi women had shown a 3-4 kg increase, though height and Hb levels remained unaltered. Increase in weight might be due to maternal fat deposition and this could have

been the factor associated greater adiposity in the neonate. Maternal adiposity may have adverse consequences for the mother child dyad. It is therefore essential to assess nutritional status of women using BMI, monitor weight gain and advise appropriate modification in diet and physical activity during pregnancy.

Dual nutrition burden in infancy and early childhood

Data from National Family Health Survey(NFHS)-3⁵ and District Level Household Survey (DLHS) 2⁶ show that during the first few months after birth, Indian infants are usually exclusively breast fed and are relatively free from infections. Computation of prevalence of underweight and stunting using the WHO growth standards(2006)⁷, shows that underweight and stunting rates



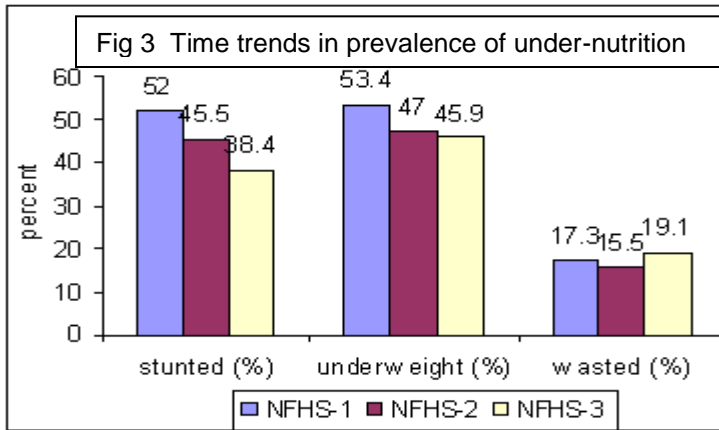
remain unaltered between birth and three months when most of the infants are exclusively breast fed (Figure 2). Introduction of animal milk between 3-5 months and increase in morbidity due to infections lead to an increase in underweight rates. Further rise in underweight and stunting rates occurs between 6-11 months due to late introduction, inadequate quantity and low calorie density of complementary feeds and increase in morbidity due to infections. Inadequate food intake because children are not fed often enough with the low calorie dense household diets in the first year is the cause of increase in the underweight and stunting rates between 12-23 months⁵.

These data suggest that poor infant and young child feeding and caring practices are the major factors responsible for the steep increase in underweight and stunting between 0-23 months. It is essential to mount effective nutrition education campaign

- for exclusive breast feeding during the first six months
- on how appropriate complementary feeds can be prepared by modifying household food and fed 4-6 times a day for children between 6-11 months of age and
- on the need to feed 12-23 month old children 4-6 times a day with household food and continue breast feeding until the child is two years of age.

When this nutrition education is combined with health education on importance of accessing health care for early diagnosis and management of infections, it is possible to prevent the rise in undernutrition in preschool children.

Comparison of data from NFHS1^{8,29} and 3⁵ showed that stunting rates had declined; there had been a small reduction in underweight rates, and wasting rates had increased (Fig 3). The apparently inconsistent trends in undernutrition

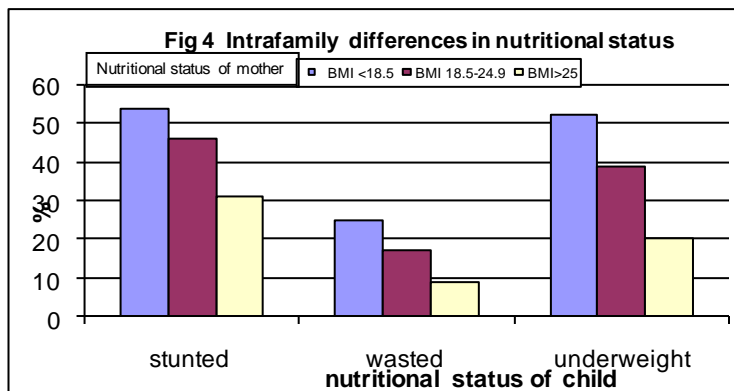


rates as assessed by the three commonly used indices has led to a lot of debate. Many economists and policy makers have expressed concern that increasing investment in nutrition programmes has not resulted in rapid decline in underweight rates; on the contrary there has been an increase in wasting rates. Nutrition

scientists point out that in children the three indices respond differently to chronic energy deficiency (CED). CED in children initially leads to wasting. Stunting is an adaptation to continued CED and stunted children have normal BMI. If energy intake is too low even to meet the requirements of stunted children, then there is further wasting; and the cycle continues. When progression from wasting to stunting has been prevented, there is a reduction in stunting rate underweight rates may not show much change and wasting rate will increase. Therefore progressive reduction in stunting observed between NFHS 1, 2 and 3 should be interpreted as decline in undernutrition rates. Convergence between health and ICDS programmes with focus on the first two years of life especially early detection and effective correction of wasting and infections could lead to acceleration of the decline in stunting and improvement in nutritional status of children .

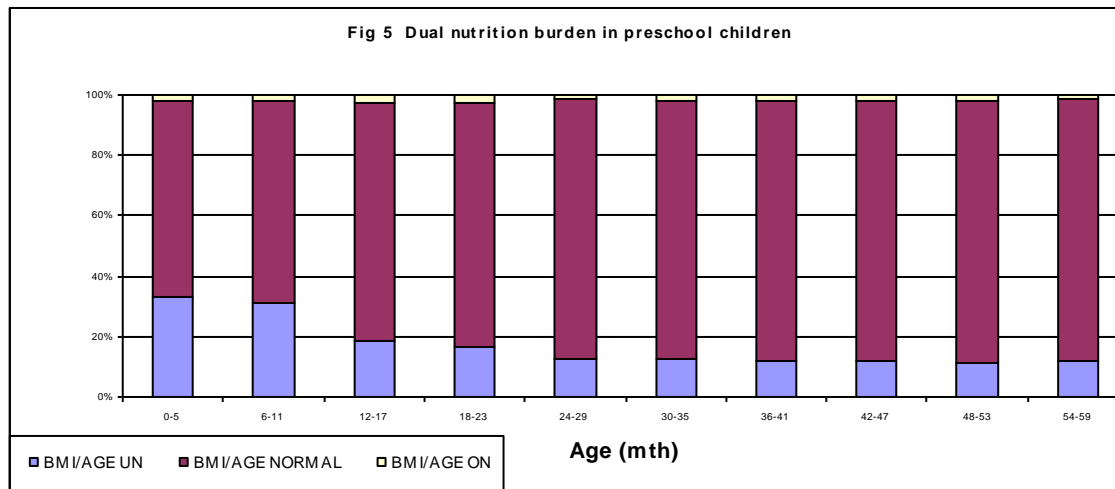
Over the last four decades surveys conducted by the National Sample Survey Organisation(NSSO)¹⁰ have shown that there has been a slow but steady decline in poverty. Surveys carried out by the National Nutrition Monitoring Bureau (NNMB)¹¹ have shown that there has been steady improvement in the household food security and decline in the proportion of households in which dietary intake of all members of the family were below their requirements. However in the last three decades there has been a two fold increase in the proportion of households in whom dietary intakes of adults were adequate but intakes of preschool children were inadequate suggesting that poor intra-family distribution of food is emerging as major factors associated with undernutrition in young children.

Analysis of data from NFHS 3 on nutritional status of women and children from the same family⁵ (Fig 4) showed that prevalence of stunting, wasting and underweight rates in children were higher



when the mother was undernourished (BMI was below 18.5). But even when the mother was overnourished (BMI>25) about a third of preschool children were stunted and one fifth were underweight (Fig 4). Data from NFHS -3 confirms that dual nutrition burden is now seen within the family and by implication poverty and household food security are no longer the major determinants of childhood undernutrition.

Analysis of data from NHFS 3⁵ using WHO growth standards (2006)⁷ for BMI for age indicate that right from birth about 2% of neonates have high BMI

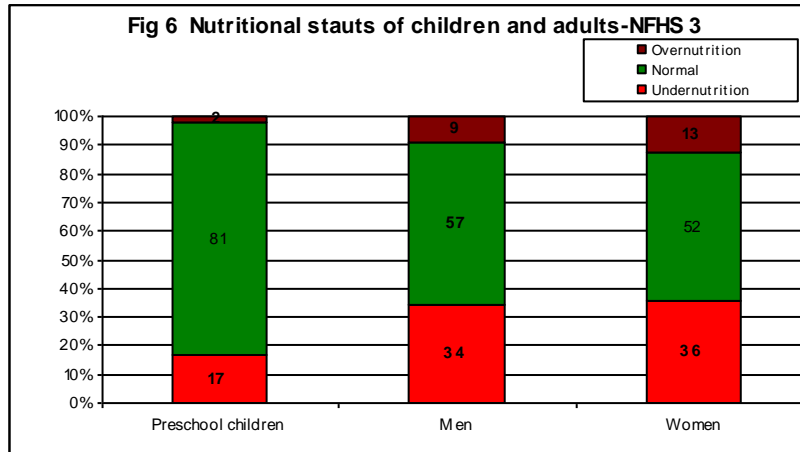


(>+2SD) and about 2 % of preschool children have high BMI for age (Fig 5). These data indicate that though undernutrition remains the major problem in preschool children, overnutrition is also present from preschool age. In view of the high stunting rates in India, it is essential that the clinicians measure length/height and weight in all preschool children, compute BMI for age for assessment of under and over nutrition and advise the parents regarding appropriate intervention .

Data from the follow up studies of Delhi¹² cohort have documented that underweight and stunting in infancy, childhood and adolescence may predispose to overnutrition in adults. This cohort from low middle income group had a low birthweight rate of 30%; half of them were underweight through infancy , childhood and adolescence. However at 30 years of age nearly half were overweight and had abdominal adiposity; this adiposity might have been the effect of sedentary life styles of urban Delhi population in the nineties. About one sixth of this cohort had developed hypertension or diabetes/impaired glucose tolerance test by 30 years of age. Children who had crossed the cohort mean BMI for age, were the ones who developed diabetes and hypertension in adult life. These data provide yet another rationale for using BMI for age for assessment of nutritional status in preschool and school children and undertaking energetic interventions to combat dual nutrition burden.

Nutritional status of school children

Weight for age is the most widely used parameter for assessment of undernutrition in children. By this parameter prevalence of undernutrition is highest among preschool children. Indian children are shorter as compared to their developed country counterparts and therefore they weigh less. They get classified as undernourished by weight for age index even though they have appropriate weight for their height. With the availability of BMI for age standards for children and adolescents (WHO 2006, 2007)^{7,13}, it is possible to compute under and over nutrition rates across age groups using BMI as the parameter. Prevalence of undernutrition and over nutrition in



preschool children and adults using BMI (WHO 2006) for assessment of under and overnutrition is shown in Figure 6. Prevalence of both under and over nutrition are higher in adults as compared to preschool children; the increase in both under and over nutrition must have occurred during school age.

Surveys carried out by the NNMB¹¹, and research studies in urban and rural school children have shown that undernutrition remains a major problem in school age children¹. This is mainly attributable to the fact that energy intake in these children is inadequate to meet the requirements of adolescent growth spurt. School mid day meal programme (MDM) was designed to bridge the energy gap but usually acts mainly as a substitute for lunch from home. Nutrition education on the importance of using MDM as an additional meal for the growing schoolchild has to be taken up energetically. As poverty is no longer the major determinant of low dietary intake, nutrition education to school children and their parents on the importance of increasing the dietary intake to meet the nutrient needs for adolescent growth spurt may pay good dividends. It is imperative that all school children are weighed and have their height measured at least once a year. From these measurements BMI for age can be computed and children with wasting can be identified. Undernourished wasted children can be provided an additional helping from MDM to bridge the energy gap and improvement in their weight monitored once in three months.

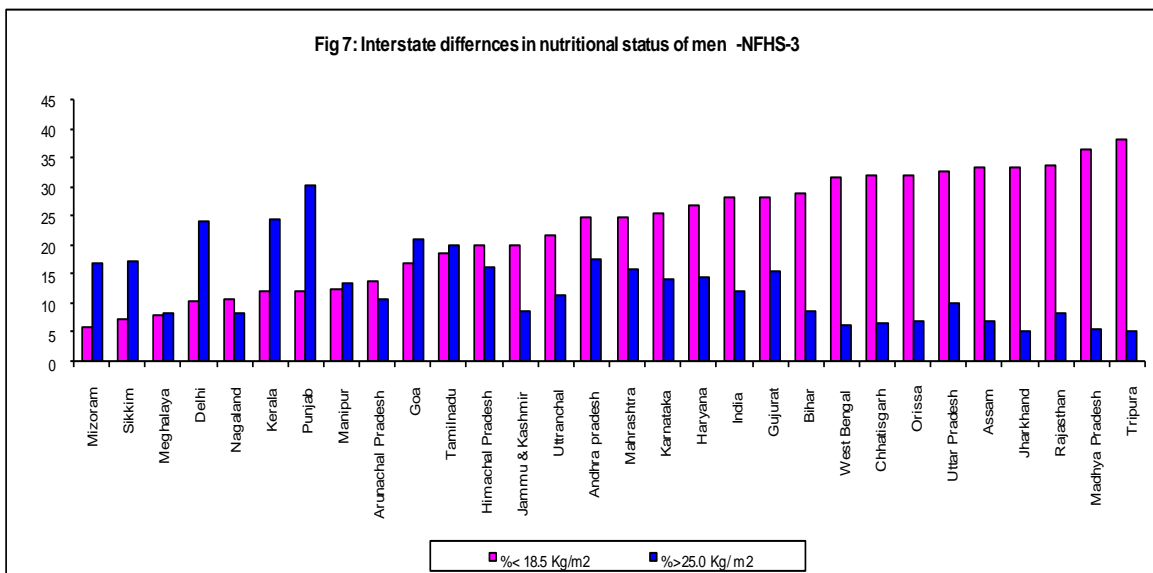
Overnutrition is emerging as a major public health problem in affluent school children especially in urban areas^{1,2}. Nutrition education on avoiding regular intake of energy dense junk food and soft drinks should form a part of the campaign to prevent overnutrition. The steep fall in physical activity in school and at home is an important factor responsible for overnutrition in school children. Increase in time devoted to games involving energetic physical activity in school and at home would reduce the prevalence of overnutrition in school

children. Such efforts to increase physical activity in school children will have long term health and nutrition benefits, as these children are likely to grow into physically active adults with healthy lifestyle.

Dual nutrition burden in adults

NNMB¹¹ surveys has shown that over the last four decades there has been a slow but steady decline in undernutrition in both men and women. NNMB¹¹ and NFHS^{5,8,9} show that since nineties there has been an increase in overnutrition in women. Prevalence of both under and over nutrition are higher in women. Data from NFHS - 3 indicate that about third of men and women are undernourished; 13 % of women and 9% of men are overnourished. Prevalence of undernutrition is higher in rural low income group population with low literacy rates. Overnutrition rates are higher in urban, educated and affluent population. . The proportion of normally nourished are the similar in all segments of the population. Country has to strive to implement programmes for combating the dual nutrition burden, to ensure that high under nutrition rates are not replaced by high over nutrition rates and the proportion of the population with normal nutrition shows a progressive increase.

There are substantial inter-state differences in prevalence of under and



overnutrition(Fig 7); most states with high undernutrition rates, have relatively low overnutrition rates and vice versa. States with high overnutrition rates face the problem of rapid increase in non-communicable disease partly due to high overnutrition rates and partly due to higher longevity of the population in these states.

Globally improvement in socioeconomic conditions have been associated with increase in energy intake especially from fat and sugar. Data from NSSO¹⁰ surveys indicate that India is an exception to this rule. The steep rise in GDP in the last two decades has not been associated with any increase in energy intake; energy intake from fats is still less than 15%. NNMB¹¹ survey data on

dietary intake as assessed by 24 hour dietary recall confirm that there has not been any increase in energy intake.

Physical activity is one of the major determinants of energy requirement. In India, until two decades ago, physical activity in work, domestic and transport domains were very high. Because of the high physical activity level in daily chores, majority of the population were moderately active and they enjoyed the health benefits of moderate physical activity without any discretionary physical activity. The last two decades witnessed tremendous change in lifestyles. The availability of transport both personal and public has improved several fold and energy expenditure in reaching places of study/work has become a fraction of what it was two decades ago. Better access to water and fuel both in urban and rural areas have resulted in substantial reduction in physical activity levels in women. Unlike the developed countries Indians do not undertake energy intensive discretionary activities. Unchanged dietary intake and reduced energy requirement led to positive energy balance and overnutrition.

The focus of health education efforts should therefore be on importance of moderate physical activity for prevention of overnutrition and noncommunicable disease risk. Practical demonstration how physical activity can be increased at home, at work and during leisure period within the existing constraints of time, space and cost will go a long way to persuade people to embark on process of increasing physical activity. Periodic counseling and encouragement as well as obvious dividends such as improvement in fitness, reduction in over weight will help in sustaining the increase in physical activity.

Conclusion

Nutrition transition is a global phenomenon. India has entered the dual nutrition burden phase of nutrition transition. The country will have to work towards shortening the duration of the transition and minimizing the prevalence of both under and overnutrition and their adverse consequences. Taking these into consideration the Tenth Five Year Plan¹⁴ envisaged a paradigm shift from

- household food security and freedom from hunger to *nutrition security for the family and the individual;*
- untargeted food supplementation to *screening of all the persons from vulnerable groups, identification of those with various grades of under-nutrition and appropriate management;*
- lack of focused interventions on the prevention of over-nutrition to *the promotion of appropriate lifestyles and dietary intakes for the prevention and management of over-nutrition and obesity and*
- vertical programmes to *convergence of related sectors to provide integrated comprehensive services to improve nutrition and health status*

A beginning has been made in implementing the paradigm shift .

Poverty, lack of household food security and poor access to health care which were the major causes of undernutrition five decades ago are no longer the critical determinants of undernutrition especially in children. Poor infant and young child feeding (IYCF) and poor utilization of health care are emerging as important determinants of undernutrition in children. Nutrition education on appropriate IYCF/ how to prepare inexpensive balanced diet for the family and health education on how to access needed health care are the key interventions to reduce undernutrition.

Research studies in India are highlighting the possibility that under-nutrition in childhood might be one of the predisposing factors for over-nutrition and obesity and higher risk of noncommunicable disease risk in adult life. Both ICDS programme and National Rural Health Mission and its urban counterpart cover the entire country. Nutrition and health education and improved access to health and nutrition care can lead to substantial reduction in undernutrition in children over the next decade.

Prevalence of overnutrition in India except among urban high income group is still relatively low. Health hazards associated with overnutrition in children and adults are well understood especially by the urban high income population. Effective nutrition and health education on balanced diet and adequate physical activity might enable the country to prevent predicted escalation in overnutrition rates. The current phase of dual nutrition burden, where poverty is no longer the major determinant of undernutrition and low physical activity is the major factor responsible for overnutrition should be viewed as a opportunity window for health and nutrition sectors to mount programmes to effectively combat dual nutrition burden and ensure optimal nutrition and health status of the population .

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