NFI BULLETIN
Bulletin of the Nutrition Foundation of India
Volume 18 Number 3 July 1997

Nutritional Status Of Children And Women In India: Recent Trends

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Over the past two decades, there has been a substantial and progressive decline in infant and child mortality rates in India[1]. There has also been a significant reduction in the prevalence of florid nutritional deficiency disorders. It is therefore important that increasing attention is now paid to the nutritional status of the survivors. The alarming reports of some international agencies[2] which have placed India at about the bottom-rung of an arbitrary world development scale, have raised apprehensions that the nutritional status of women and children in India shows no signs of improvement. Recent trends with respect to the nutritional status of women and children in India have been analysed and evaluated, so as to address this issue.

This paper is based partially on published information but more importantly on non-indexed publications and reports, culled from several institutions and individual scientists in the country. The information on changing trends gathered from these data is being presented here.

PROTEIN ENERGY NUTRITION

The most outstanding achievement on the national nutrition front during the last four decades has been the virtual 'banishment' of acute large scale famines, of the type that used to decimate sizable sections of the country's population with distressing regularity for centuries[3].

The personal experiences of paediatricians throughout the country indicate that in the past three decades there has been a significant decline in severe protein energy malnutrition (classical kwashiorkor and extreme forms of marasmus) in hospitalised children. The decline has been particularly dramatic in relation to classical kwashiorkor, which has virtually disappeared from numerous regions. This change in the spectrum has been occasionally quantified[4].

Reliable community-based data generated by the National Nutrition Monitoring Bureau (NNMB) from eight central and southern states (Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu) also confirm a decline in clinical deficiency signs in preschool children (one to five years old) from 1975-79 to 1988-90 in rural areas[5]. The overall prevalence of marasmus decreased from 1.3 to 0.6 per cent and kwashiorkor from 0.4 to 0.1 per cent. Amongst the 12,000 children evaluated in the 'repeat surveys', Gujarat showed the highest prevalence of both forms (1.1 per cent kwashiorkor and 4.9 per cent marasmus), while in the other states their prevalence was below 1 per cent. In the NNMB and National Council for Applied Economic Research (NCAER) linked survey conducted in 1994 in the same eight states but in different sampled areas[6], among 1,828 preschool children the overall prevalences of kwashiorkor and marasmus were 0.2 and 0.4 per cent, respectively. In fact, cases of kwashiorkor were seen only in Madhya Pradesh, where the prevalence was about 1.4 per cent. Fortunately, a similar declining trend was documented in the under-privileged urban slums[7] of these six states (cities included Ahmedabad, Bangalore, Bhubaneswar, Cuttack, Hyderabad, Nagpur and Trivandrum). The overall prevalence of marasmus diminished from 3.7 per cent in 1975-79 (n=519) to 0.2 per cent in 1993-94 (n=334). No case of kwashiorkor was observed.

LOW BIRTH WEIGHTS

It is generally believed that there have been no differences in the reported mean birth weights and the proportion of newborns with LBW (low birth weight[8]; <2,500 g) in the three decades between the late 1960s and the late 1980s[8,9]. These inferences were based on a comparison of data from disparate settings at various time points. Given the expected marginal magnitude of change in birth weight in two to three decades in a nation

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commencing epidemiologic transition, these inferences from such a research design are not surprising. It would, however, be more valid to analyse data from the same area at different time points.

In analyses of this nature (Table 1), a positive time trend for birth weight is evident in most hospital-based data and the solitary community study. The mean magnitude of improvement is marginal (52 to 126g). However, this has resulted in a greater reduction of LBW prevalence (by 8 to 12 per cent). These calculated mean improvements in birth weight are probably underestimates since concomitant changes in other important associates have been ignored. With time, the mean birth order has also decreased and correction for this factor alone[15] enhanced the magnitude of change in the community study (rural and urban areas combined) from 70g to 100g (first-borns have lower weights than later births). The absence of a time trend in the two Delhi hospitals may be related to the relatively short gap in one report[17] and the fact that these institutions primarily cater to the underprivileged population in whom the transition is expected to commence last of all. In one of these studies[11], the higher percentage of term births could be regarded as the beginning, since term new-borns have the best intrauterine growth as a group.

The small improvement in birth weight is probably contributed to by an increase in both the overall gestation period and an increase in birth weight at different gestation periods (intrauterine growth curves).

TABLE 1
Trends in Intrauterine Growth

Ref	Area	Setting	Comparison Period (Mean gap in yr)	Observed Changes		
				Weight	Gestation	IUGC
10	Rourkela (Orissa)	Industrial Hospital	1963 & 1986 (23)	MBW +74g LBW –34 vs 25%	NA	NA
11	Delhi	Hospital (Poor)	1969 & 1989 (20)	NA	Term +*	0
13	Delhi	Hospital (Better-off)	1973-74 & 1985-87 (12.5)	NA	NA	+
14	North Arcot (Tamil Nadu)	Rural	1969-73 & 1989-93 (20)	MBW+78g LBW –27 vs 16%	M+0.7W PT –21 vs 16%	+p
		Urban	1969-73 & 1989-93 (20)	MBW+52g LBW –19 vs 11%	M+0.8W PT –20 vs 15%	+p
15	Vellore	Hospital	1969 & 1994 (25)	MBW+126g LBW –27 vs 15%	Me+0.3W PT –14 vs 10%	NA
16	Mumbai	Hospital (Poor)	1988 & 1995 (8)	LBW –60 vs 38%	0	NA
17	Delhi	Hospital (Poor)	1986 & 1996 (11)	0	0	NA

*+: significant increase; + p: significant at some gestations; –: significant decline; 0: no significant change; IUGC: Intrauterine Growth Curves; M: Mean; Me: Median; MBW: Mean Birth Weight; NA: Not Available; Ref: Reference number; W: Gestation in weeks; * Calculated by comparison with earlier study values cited in reference 12.*

GROWTH OF CHILDREN

In developing countries, anthropometry, despite its inherent limitations, still remains the most practical tool for assessing the nutritional status of children in the community. In this context, there have been several small scale surveys but the data from these may not be representative of the country as a whole. The two major national surveys which provide data related to nutrition and cover large segments of India's population are:

- the periodic surveys carried out by the NNMB[5,7,18] of the National Institute of Nutrition, Hyderabad, and
- the recent National Family Health Survey (NFHS) initiated by the Ministry of Health and Family Welfare, Government of India[19].

It is important to be aware of several factors, notably the sampling framework, which can potentially influence the estimates of malnutrition prevalence from these surveys[20].

TABLE 2
Changes in Prevalence (%) of Malnutrition

Malnutrition Index	Survey			
	NNMB[5] 1975-79 (n=6,428)	NNMB[5] 1988-90 (n=13,422)	NNMB[6] 1994 (n=1,832)	NFHS[19] 1992-93 * (n=25,578)
Weight-for-age (underweight)				
<2 SD	77.5	68.6	63.6	53.4
<3 SD (severe)	38.0	26.6	24.7	20.6
Height-for-age (stunting)				
<2 SD	78.6	65.1	63.0	52.0
<3 SD (severe)	53.3	36.8	35.8	28.9
Weight-for-height (wasting)				
<2 SD	18.1	19.9	16.7	17.5
<3 SD (severe)	2.9	2.4	2.6	3.2

** For weight-for-age assessment only. The sample size for the other two indices was lower.*

Table 2 compares the estimated prevalence of various indices of malnutrition in these surveys as per the current international recommendation and nomenclature. A distinct improvement in the prevalence of underweight and stunting (including in the severe category, namely, below 3 SD) is evident from the NNMB data at an average rate of 1 per cent per annum. The NFHS[19] estimates were still lower than the NNMB-NCAER[6] prevalences at comparable time periods. This could be partly related to differences in sampling design, areas surveyed (whole

country versus eight states and urban plus rural versus rural) and the age groups analysed (zero to four years versus one to five years).

Fortunately, a similar overall declining trend was also documented in the underprivileged urban slums[7] of six states between the periods 1975-79 and 1993-94 for weight-for-age (Gomez classification based on National Centre for Health Statistics reference).

It must be noted that there is virtually no change in the profile of wasting in this period and the NNMB and NFHS estimates are also identical (Table 2), indicating thereby that the improvement in the weight-for-age index is predominantly due to an increase in the height.

NUTRITION OF WOMEN

A few studies have attempted to quantify the secular trends in height by comparison of mothers and daughters[8,21-25]. No positive trend was discerned in women from poor socioeconomic strata[8,23-25] whereas a significant increase, even up to a mean value of 5 cm[18], was documented in well-to-do communities[21,22].

An analysis of the NNMB 'repeat survey[5]' aggregate data (pooled for all the states) on heights, weights and body mass index over the period shows a definite improvement. The average values of measurements, in general, for almost all the age groups in both sexes show an increase; height increments tended to be more in children, with weight increments more visible in adults and adolescents. Statewise data clearly indicate that the heights of children and adolescents, and weights of adults and adolescents in the state of Kerala and, to some extent, in Maharashtra and Gujarat were distinctly better as compared to the 1970s[9].

The time trends in NNMB data[5,6,18] for height, weight and triceps fat fold thickness in females between the ages of 12 to 47 years are depicted in Figures 1-3. The adolescent age group (12 to 18 years), of particular interest in the Indian setting, has also been analysed. A positive trend in all these anthropometric parameters is evident at virtually all the ages examined (statistically significant at most points) with each successive survey recording higher mean values than the preceding one. However, the differences in height (Figure 1) between the NNMB 1988-90 and NNMB 1994 surveys were negligible at several ages.

The positive time trends in height in the 'repeat surveys' (1988-90) were more marked in the age group 12 to 14 years (mean differences between 1.7 to 3.0 cm) than later (mean differences between 0.3 to 1.4 cm). The mean increase in adult stature between 1975-79 and 1988-90 was calculated to be 1.2 cm[26]. The quantum of difference (marginal) in height may be related to the relatively short inter-observation period (average 12 years) for documenting secular trends in this parameter. The usual differences in mean weight ranged from 0.7 to 2.2 kg between the 1975-79 to 1994 surveys and the corresponding figures for mean triceps fat fold thickness were 1.5 to 2.5 mm. These differences too were not striking for an average inter-observation period of 17 years, but they do represent the initiation of a positive nutritional trend

TABLE 3
Trends in Body Mass Index in Adult Women

Body Mass Index Definition	(value)	NNMB[5] 1975-79 (n=6,428)	NNMB[5] 1988-90 (n=13,422)	NNMB[6] 1994 (n=1,832)	NNMB[7] Slum 1993-94 (n=1,319)
		Survey (values in %)			
Chronic Energy Deficiency					
Third	(<16)	12.7	11.3	10.4	9.5
Second	(16-17)	13.2	12.9	11.2	9.2
First	(17-18.5)	25.9	25.1	25.5	18.0
All	(<18.5)	51.8	49.3	47.1	36.7
Normal	(18.5-25)	44.8	46.6	46.3	51.7
Obese	(>25)	3.4	4.1	6.6	11.6

** Body Mass Index (BMI) is defined as weight (kg) / height²(m).*
The percentages for NNMB surveys 1975-79 and 1988-90 for the various categories were taken from reference 26.
The percentages for different categories for BMI <18.5 for NNMB survey 1994 were recalculated from the total adult sample.

FIGURE 1: Secular Trend in Heights of Women

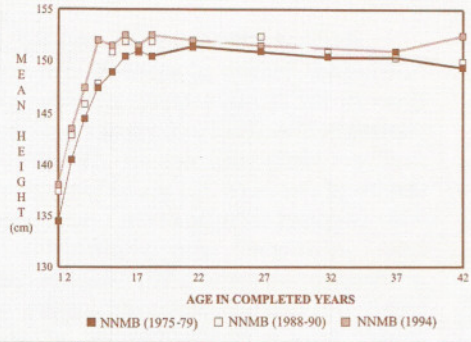


FIGURE 2: Secular Trend in Weights of Women

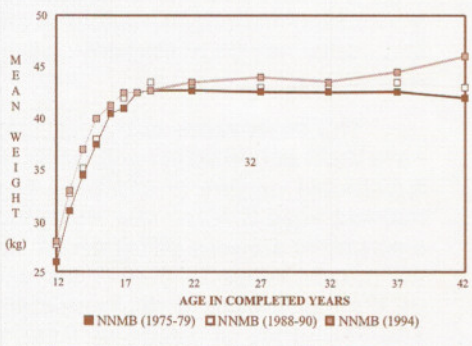
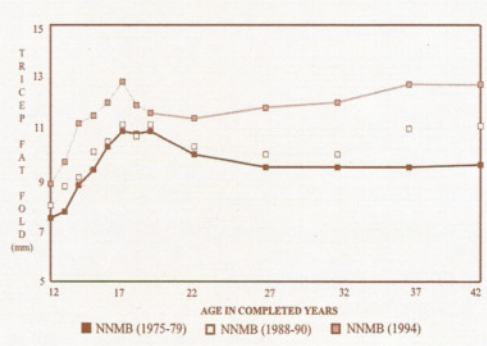


FIGURE 3: Trend in Fat Fold of Women



in the relatively poor rural population. A similar analysis was not feasible for the urban poor as the published report[7] did not provide comparative figures for this purpose.

Body Mass Index (BMI): BMI is being increasingly used as a measure of nutritional adequacy in adults and is considered to be a better indicator of chronic energy deficiency (CED)[9]. The time trends in BMI of adult women from the NNMB data are summarised in Table 3. A distinct shift of the distribution to the right is evident in the rural population. Interestingly, the underprivileged urban slum population had the best values. However, even now CED is prevalent in 37-47 per cent of the women with the severe variety being documented in 10 per cent. Obesity is also now beginning to emerge (7 to 12 per cent).

MICRONUTRIENTS

Vitamin A: Since preschool children bear the brunt of the deficiency, nationally representative surveys have primarily focussed on this age group. A nationwide survey conducted by the ICMR during 1971-74 showed that 2 per cent cases of blindness were attributable to corneal disease caused by vitamin A deficiency[9]. In the subsequent (1985) national survey of blindness, carried out under the auspices of the Government of India and the World Health Organization (WHO), this figure declined to 0.04 per cent[9,27]. Data from the School of Tropical Medicine, Calcutta, once the hot-bed of keratomalacia, and from the Christian Medical College, Vellore[27] are also suggestive of a sharp reduction in the documentation of keratomalacia (0 to 0.008 per cent in the late 1980s). A careful scrutiny of the hospital data from Calcutta in fact suggests that the decline in the incidence of keratomalacia had started even before the massive dosage prophylaxis programme had been instituted[27].

The changes in estimated prevalence of Bitot spots in preschool children from macro surveys are summarised in Table 4. A marked decline is evident, especially in the NNMB 'repeat survey[5]'. The slight apparent increase in later surveys[29] is probably related to the different sampling areas which included the relatively poorly performing states of Uttar Pradesh and West Bengal. Interestingly and paradoxically, the overall prevalence of night blindness (1.1 per cent) in this survey was lower than that of Bitot spots (1.9 per cent) in one to five year-old children[29]. Wide regional variations are apparent in some areas. A noteworthy observation was the absence of Bitot spots in infants and children, even in the slums, in the surveys conducted in the 1990s.

Iron: Anaemia has been the most common parameter employed to determine iron deficiency. Personal experiences of several paediatricians and obstetricians all over the country indicate a dramatic decline of severe anaemia with oedema in children and women (pregnant and non-pregnant). A limited comparison of studies conducted in similar areas on comparable age and physiological groups at different time periods yielded two such series[30-32]. In Vadodra, there was a significant ($p=0.014$) decline in the prevalence of anaemia (haemoglobin <11 g/dl) from 71 per cent ($n=500$) to 65 per cent ($n=610$) between 1982-84 and 1993-94 in urban low income preschool children[32]. In pregnant women from Hyderabad, possibly from different settings[30,31] the prevalence of anaemia (haemoglobin <11 g/dl) significantly declined from 48.5 per cent to 33.2 per cent. Estimates based on ICMR evaluation in 1984-85 of the National Nutritional Anaemia Prophylaxis Programme indicated that 88 per cent of pregnant women were anaemic with 47 per cent having haemoglobin values below 9 g/dl[33]. The latest estimates pertaining to the ICMR multicentric field supplementation trial (published in 1992) on 1,968 pregnant women lowered these estimates to 62 per cent and 17 per cent, respectively[31].

Iodine: In Delhi, the goitre prevalence rate in school children declined from 55.2 in 1980[34] to 8.6 per cent in 1996[35]; the salt iodisation programme was implemented in 1989. The routine surveys conducted by the Directorate General of Health Services[36] indicate a significant decline in total goitre prevalence rate in 17 out of 21 districts from different states in which repeat information was available. The magnitude of decline ranged from 6 to 35 per cent (general values above 30 per cent in the Himalayan region and Uttar Pradesh) for repeat surveys performed six to 40 years later. Time series data revealed a marked reduction in the incidence of neonatal chemical hypothyroidism (NCH) in the highly endemic areas of Uttar Pradesh following salt iodisation[37-38].

TABLE 4
Changes in Prevalence of Bitot Spots in Preschoolers

Survey	Period	Prevalence (%)
ICMR 1977 (28)	1965-69	4.2
NNMB 1975-79 (5)	1975-79	1.8
NNMB 1988-90 (5)	1988-90	0.7
NNMB 1992-93 (29)	1992-93	1.9#
NNMB 1994 (6)	1994	1.1
NNMB Slum (7)	1993-94	0.9 to 2.5%*

 # This rural survey included two additional states (Uttar Pradesh and West Bengal) than earlier NNMB surveys.
** Bitot spots documented in only three of six cities surveyed.*
Figures within parentheses are references.

CONCLUDING COMMENTS

Recent trends with regard to nutritional status of women and children in India have been positive but modest. The improvement has been marked with respect to the prevalence of 'severe malnutrition'. Even with respect to moderate undernutrition modest improvements in anthropometry and birth weights have been noticeable even amongst the poor. These observations in poor women and children, despite a steep increase in population and continuing social and economic inequalities, are heartening indications that, at long last, India may be at the turning point with respect to nutrition.

The improvements though small have been achieved in the context of a substantial decline in mortality. Most malnourished children who would have died earlier are now being saved; and this may be expected to swell the ranks of the 'moderate undernourished'. The fact that in spite of this, an

improvement in the overall averages has been registered is heartening.

Reviewing the latest NNMB data in 1992, Gopalan[39] had pointed out that these data which revealed a favourable secular trend with regard to growth of women and children provide a glimmer of 'light at the end of the tunnel' and had suggested that future survey results will be awaited with interest in order to decide if indeed, Indian children were now on the march towards better nutrition. The present analysis shows that this march might well have begun. Though the beginnings are still small, they provide hope for the future of Indian women and children. The challenge now is to accelerate the pace of improvement.

There is yet another message that emerges from this analysis. The near total disappearance, within the last four decades, of florid nutritional deficiency diseases which were once major public health problems and the initiation of a positive trend with respect to less severe forms of undernutrition have important practical implications. With the possible exception of iodine deficiency disorders, none of these changes can be credited to specific 'nutritional intervention programmes', but to all-round improvement in the economic, health and dietary status of poor communities.

Thus, no specific drug or vitamin was used to combat beri-beri or pellagra which were once rampant but which have now disappeared. Nor was the present near disappearance of kwashiorkor achieved through the supply of 'protein-concentrates', strongly advocated by international agencies (before the 'protein fiasco').

This irrefutably argues for the concept of an all-round, integrated, rather than a narrow (drug-based) approach towards combating undernutrition.

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