International Journal of Multidisciplinary Approach and Studies
ISSN NO:: 2348 – 537X

Anthropometric status of underprivileged children below six years of age residing in an urban slum of Delhi using various indicators

Gupta S* & Chadha R**
****Assistant Professor, Lady Irwin College,***
*****Associate Professor, Lady Irwin College***

ABSTRACT

Nutritional status of children determines the health and well-being of the population. Malnutrition impairs physical and cognitive growth of the child. Appropriate measurement of nutritional status is important for early identification and timely intervention. A cross-linked study was undertaken on 2305 children (0-71 months old) residing in the areas availing services from 6 Anganwadi Centres in Haiderpur slums, Northwest Delhi. A total of 6334 observations from twelve rounds at three monthly intervals (August 2006-April 2010) on these children were obtained for various anthropometric measurements (weight, length, height, MUAC, WC and HC) to assess the nutritional status of the children. Prevalence of stunting (55%, height-for-age), wasting (53%, MUAC-for-age) and underweight (44%, weight-for-age) was higher among the group as compared to wasting (18%, weight-for-height) and low BMI-for-age (13%) based on <-2SDWHO Child Growth Standards (2006) for all the indices. Among the children with normal BMI, 60 % were stunted indicating that though they had normal weight for their current height and age, their height for age is below normal. It is important to consider stunting rates for planning any intervention for preschoolers as it is associated with poor physical and cognitive performance with implications on economic productivity.

Key words: *Anthropometric status, BMI, stunting, undernutrition, underweight, wasting*

INTRODUCTION

Several of SDGs have implications for nutrition, including the goal to end all forms of malnutrition among the vulnerable groups. For the first time the focus of measuring nutritional status has shifted from underweight to stunting and wasting in children below five years of age (UN, 2016).

Data from various National Family Health Surveys have shown that in India nearly half of the preschool children are underweight or stunted and almost one sixth are wasted. There has been some reduction in underweight rates between NFHS-1 (1992-93) and 2 (1995-96) but not much change between NFHS-2 and 3 (2005-06). There were small but not consistent changes in the stunting and wasting rates between the three surveys. More recent NFHS-4 (2015-16) reported a 10% decline in stunting and 7 % decline in underweight among children below 5 years of age as compared to NFHS-3 (2005-06). However, 51 % of the children belonging to the lowest wealth quintile in NFHS-4 survey were still stunted and 49% were underweight.

Repeated infections and inadequate food intake result in milder forms of undernutrition of short duration (wasting- low weight-for-height), which can be corrected with timely referral and adequate dietary intake. More severe and prolonged undernutrition can result in stunting (low height-for-age) and wasting. Adequate dietary intake may reverse wasting but the child may not be able to catch up with the deficit in height. Adequate nutrition and health care of the child would help the child to continue to grow in a trajectory, lower but parallel to growth trajectory of child with normal weight and height for his age without making the stunted child short and thin or short and fat (NFI, 2005). Assessment of anthropometric status of children is needed to identify the magnitude and nature of malnutrition to plan appropriate programmes and strategies to combat malnutrition.

The present study was conducted to assess theanthropometric status of underprivileged children below 6 years of age residing in an urban slum of Delhi using various anthropometric indicators and to explore their appropriateness for assessment of malnutrition among them.

METHODOLOGY

A cross-linked study was carried out in Northwest Delhi on children below 6 years belonging to low socio-economic group availing services from Anganwadi centres (AWCs) of Integrated Child Development Scheme (ICDS).It is a serial study in which a group of children is followed such that some children leave the study and other join it as new entrants at some age points (Tanner, 1977) making total number of children covered at each round equal (Figure 1).This design was considered appropriate for the present study as it allowed enrolment of new subjects to make up for the sample loss at any requisite age points due to frequent migration of the vulnerable segment in the urban slums from one area to other in search of employment.

Figure 1: Illustration of crosslinked study design used in the present study

Age (in months)	Rnd 01	Rnd 02	Rnd 03	Rnd 04
0-2				
3-5				
6-8				
9-11				

White cells indicate new entrants in that age group in each round and coloured cells are children from the previous round (this is an illustration does not indicate actual numbers in the study)

The sample size was determined using 25 % morbidity in preschool children and prevalence of low BMI (9%) from the baseline survey of the present study. The minimum number of children required to be included in undernourished group with morbidity was 456,taking 95% level of significance and 80 % power precision. BMI-for-age identified the lowest number of children with undernutrition (9% in the baseline survey of the study). Therefore, to enroll 456 undernourished children (low BMI) it is required to enroll at least 5066 children. The sample size was estimated to be 5066 for the study.

The data were collected at three month intervals (total of 12 contact points) for a period of three years from August 2006 to April 2010. All Six AWCs from the slums of Haiderpur, Northwest Delhi formed the part of the study to ensure cooperation and to prevent loss of data as the families living on rent frequently shifted from one locale to another within the region. The sequence of AWCs covered was kept same in the subsequent rounds so that the time between the two successive measurements in each AWCs remained three months. A total of 2305 children availing services from these AWCs were enrolled during the study. On an average, number of children covered in each round was 527± 64 providing a total of 6334 set of independent observations in twelve rounds. Multiple observations were available for each individual at different intervals during the study, each observation was assumed to be an independent observation and was analyzed cross-sectionally (n=6334).

The data on socio-demographic profile of the families (n=2305) was collected at the first contact point during the period. The primary caregivers (mothers/grandmothers/fathers) were interviewed to collect information on socioeconomic -demographic profile viz., residence, caste, religion, education, and occupation of the parents, at the time of enrolment of the children in the study and were recorded in a pre-tested questionnaire. The information on birth dates of the children was obtained with the help of immunization cards if available or by asking at least one parent using a calendar of local events or from AWW's records. The WHO Anthro software was used to randomly assign a date in case of those children (18.2%) for whom information on only month and year of birth could be elicited.

Anthropometric measurements were undertaken using standardized techniques for weight, recumbent length, height, and mid-upper arm circumference and recorded on the assigned Child Card. The equipments were calibrated from time to time. Quality control was maintained in order to minimize intra-individual by taking duplicate reading on every 10th boy or girl every day in each round. Body weight of all children was recorded barefoot with minimal clothing while standing erect on the scale without any support (WHO, 1995) using Seca electronic balance sensitive to 100 g. Body weight of the infants and young children who couldn't stand erect was estimated by subtracting weight of the mother alone from weight of the mother with the child using the above mentioned electronic weighting scale. The extra layers of clothing were removed in winter months just before the measurements.

The crown heel length of infants was measured using an infantometer with an accuracy upto 0.1 cm. The infant was made to lie on the board (WHO, 1983). Length was taken for all the children from 0-2 years of age in all the rounds. Height was measured to the nearest mm by using a wall mounted microtoise (UNICEF, Copenhagen) nailed to flat wall with minimum or no skirting. Standing height was measured for all the children from 24 to 71 months of age in all the rounds.

Mid upper arm circumference (MUAC) was measured to the nearest mm on the left arm using a fibreglass tape with vernier attachment (Ramachandran, 1986). It was measured for all the children above 3 months of age and who willingly allowed the measurement to be taken without crying.

Data Analysis

The quantitative and qualitative data were organized and systematically tabulated in Microsoft Excel 2007 and SPSS 16.0 software was used for data analysis. Mean, median and Standard Deviation (SD) of all the anthropometric measurement was compared for each age group and sex. BMI was calculated for all the children in all the rounds. Z-scores (weight-for-age, height-for-age, weight-for-height, BMI-for-age and MUAC-for-age) for all the children were obtained using WHO Anthro software (2006). The prevalence of undernutrition and overnutrition was determined using all the indices (WAZ, HAZ, WFH, BAZ and MUACZ) based on WHO Child Growth (2006) standards. All results were tested at 5 % level of significance. The cut-off points in relation to reference median are given in Table 1

Table 1: Cut-off points in relation to reference median of WHO Child Growth Standards (2006) for anthropometric status measurement

Indices	Undernutrition	Z or SD	Overnutrition	Z or SD
Weight-for-height (WFH)	Wasting	<-2SD	Overnourished	>2SD
Height-for-age (HAZ)	Stunting	<-2SD	Tall	>2SD
Weight-for-age (WAZ)	Underweight	<-2SD	Overweight	>2SD
BMI-for-age (BAZ)	Undernourished	<-2SD	Overnourished	>2SD
MUAC-for-age (MUAZ)	Undernourished	<-2SD	Overnourished	>2SD

RESULTS AND DISCUSSION

Majority of the families (90%) of the children were living as nuclear families with mean family size of 4.9 ± 1.21 members. Nearly half of the fathers (52.6%) were educated upto secondary level whereas half of the mothers were illiterate. Nearly sixty percent of the fathers were employed as unskilled labourers, small vendors and rickshaw pullers. Majority of the mothers were housewives and only 12% of the mothers were gainfully employed.

Nearly two third of the families were living in one room rented houses. Most of the families in the present study had access to toilet facility (shared/sulabh/own flush). Only 10 % of the families owned motorized vehicle and 63% had a television set. Majority (98.4%) of the families had access to drinking water (including public tap, hand pump, submersible, and water tankers).Half of the families (56 %) had monthly per capita income ranging between Rs. 1000- Rs. 1500.

Anthropometric profile of children

The mean weight of boys and girls in the present study were 10.9± 3.05 kg and 10.4± 3.06 kg, repectively (Table 2). The mean height attained by boys (n=2929) and girls (n=3099) was 85.6±12.69 cms and 83.8±12.78 cms, respectively. There was a progressive increase in mean weights and heights of both boys and girls with increase in age. The mean weight of boys was significantly higher at all ages as compared to mean weight of girls (t:- 3.785, p<0.05). Similarly, a significant difference (p<0.05) was observed between mean lengths/heights of the boys and girls at all ages except in first three months. The mean weight and height of the children was comparable with mean weight and height observed by other authors in their studies on children living in slums of Delhi (Kapur et al, 2005) and other cities (Das et al, 2009; Rao et al, 2000).

Table 2: Weight (kg) profile of the children (0-71 months, n=6334) residing in an urban slum of Delhi

Age (months)	boys			girls			't'-value
	n@	Mean	SD	n@	Mean	SD	
0-2 m	73	4.2	0.93	90	3.9	0.88	2.166*
3-5 m	115	6.0	0.94	123	5.5	0.97	3.822*
6-8 m	145	7.1	0.96	135	6.5	1.02	4.851*
9-11 m	163	7.7	1.07	164	7.3	1.06	3.451*
12-17 m	304	8.4	1.05	305	8.0	1.28	4.274*
18-23 m	304	9.2	1.32	319	8.8	1.30	4.140*
24-29 m	284	10.3	1.35	310	9.6	1.42	5.447*
30-35 m	304	11.0	1.45	308	10.4	1.47	4.912*
36-47 m	529	12.2	1.53	646	11.7	1.54	5.016*
48-59 m	466	13.5	1.65	512	13.1	1.67	3.736*
60-71 m	386	14.7	1.78	335	14.4	1.64	2.917*
0-71 m	**3073**	**10.9**	**3.05**	**3261**	**10.4**	**3.06**	**3.785***

**, unpaired t-test between boys and girls, t-value significant at p<0.05; @, n in the cross-sectional analysis was total number of contact points with children*

Table 3: Height (cm) profile of the children (0-71 months, n=6028) residing in an urban slum of Delhi

Age (months)	boys			girls			't'-value
	n@	Mean	SD	n@	Mean	SD	
0-2 m	53	55.1	3.57	72	54.3	2.75	0.678
3-5 m	101	62.8	3.66	88	61.0	3.05	3.946*
6-8 m	113	67.0	2.66	105	65.4	2.87	5.085*
9-11 m	129	70.3	2.70	138	68.6	3.14	3.879*
12-17 m	267	73.4	3.20	265	71.9	3.90	4.868*
18-23 m	297	77.2	3.69	310	75.8	4.24	4.284*
24-29 m	279	81.6	4.74	299	79.5	5.23	4.271*
30-35 m	297	85.0	4.72	307	83.5	5.42	3.429*
36-47 m	529	90.1	5.03	656	89.0	5.69	3.319*
48-59 m	472	96.5	5.49	519	95.1	6.00	4.070*
60-71 m	392	102.0	5.66	340	101.0	6.18	2.869*
0-71 m	2929	85.2	12.69	3099	83.8	12.78	2.465*

**, unpaired t-test between boys and girls, t-value significant at p<0.05; @, n in the cross-sectional analysis was total number of contact points with children*

BMI (kg/m^2) values for boys (n=2929) and girls (n=3099) were obtained using WHO Anthro software. There was an increase in mean BMI of both boys and girls upto 6-8 months after that there was decrease in mean BMI. There was a gender difference in mean BMI with boys having significantly higher values at the age of 0-2 months and between the age of 1-4 years (Table 4). A recent study on 2-6 year old children utilizing ICDS services in West Bengal reported lower mean BMI values as compared to the present study(Mandal et al, 2009). However, the study also reported that mean BMI of children decreased with increase in age.

The mean Mid upper arm circumference (MUAC) of boys (n=2295) was 13.1±1.32 cm and for girls (n=2442) was 13.1±1.31cm in the present study. The mean MUAC of boys and girls increased with age. There was no significant gender difference in mean MUAC at all ages upto the age of 4 years except at 12-23 months of age. Other studies have also reported that the gender differences became evident at the age of 4 years. This could be due to the result of differential rate of fat deposition at this site between the two sexes (Mandal and Bose 2009, Kaur et al 2005).

Table 4: BMI (kg/m^2) profile of childrenchildren (0-71 months, n=6028) residing in an urban slum of Delhi

Age (months)	boys			girls			't'-value
	n@	Mean	SD	n@	Mean	SD	
0-2 m	53	14.1	2.23	72	13.3	2.10	2.583*
3-5 m	101	15.2	1.77	88	14.9	2.03	0.410
6-8 m	113	15.8	1.88	105	15.4	2.02	1.598
9-11 m	129	15.7	1.59	138	15.3	1.97	1.530
12-17 m	267	15.5	1.53	265	15.1	1.99	2.125*
18-23 m	297	15.5	1.84	310	15.2	1.69	2.755*
24-29 m	279	15.4	1.59	299	15.2	1.46	2.470*
30-35 m	297	15.3	1.41	307	14.9	1.39	2.491*
36-47 m	529	15.0	1.31	656	14.8	1.40	2.496*
48-59 m	472	14.5	1.21	519	14.5	1.38	-0.379
60-71 m	392	14.1	1.16	340	14.1	1.20	0.100
0-71 m	2929	15.0	1.56	3099	14.8	1.63	0.658

**, unpaired t-test between boys and girls, t-value significant at p<0.05; @, n in the cross-sectional analysis was total number of contact points with children*

Nutritional status of children assessed using various anthropometric indicators

The nutritional status of underprivileged children in the present study was assessed using various anthropometric indices viz. weight-for-age, height-for-age, weight-for-height and BMI-for-agewas calculated using WHO Anthro software (2010) based on WHO Child Growth (2006) standards. The frequency distribution of weight-for-age z-scores of the children computed using WHO 2006 growth standards indicated that 99% of the boys were below 1SD of the population (Figure 2). The shift in curve towards left with increase in age in boys clearly showed deterioration in nutritional status with age.

Age wise distribution of height-for-age z-score for boys showed that 99% were below 1SD of the population. The maximum number of children were below -2SD. The percentage of boys (20.2%) and girls (15.6%) below -2SD were less in first year of life but after that in both boys and girls number of children falling below -2SD had increased tremendously indicating high stunting rates after 12 months of age (Figure 3). As a result, there was a shift towards right in the BMI-for-age distribution curves with increase in age (Figure 4). There was a steep increase in stunting rates during this period therefore, this should not be interpreted as improvement in nutritional status of children. This could be due to the fact that height is used a s a denominator in calculating BMI values. Similar observations were obtained for girls in the present study with the age wise distribution of z-scores indicating decline in their nutritional status with increase in age.

Figure 2: Distribution of z-scores using weight-for-age in boys

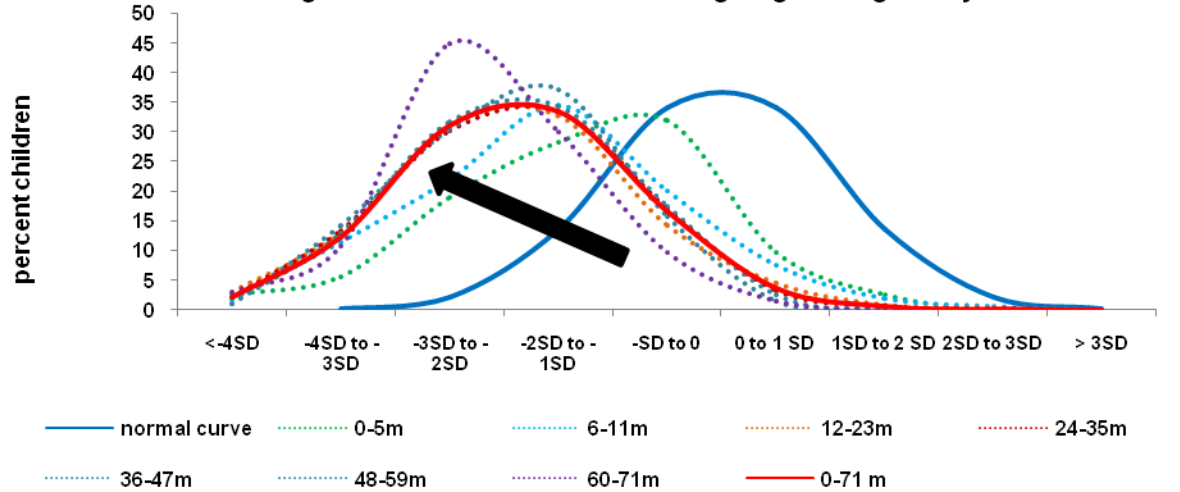
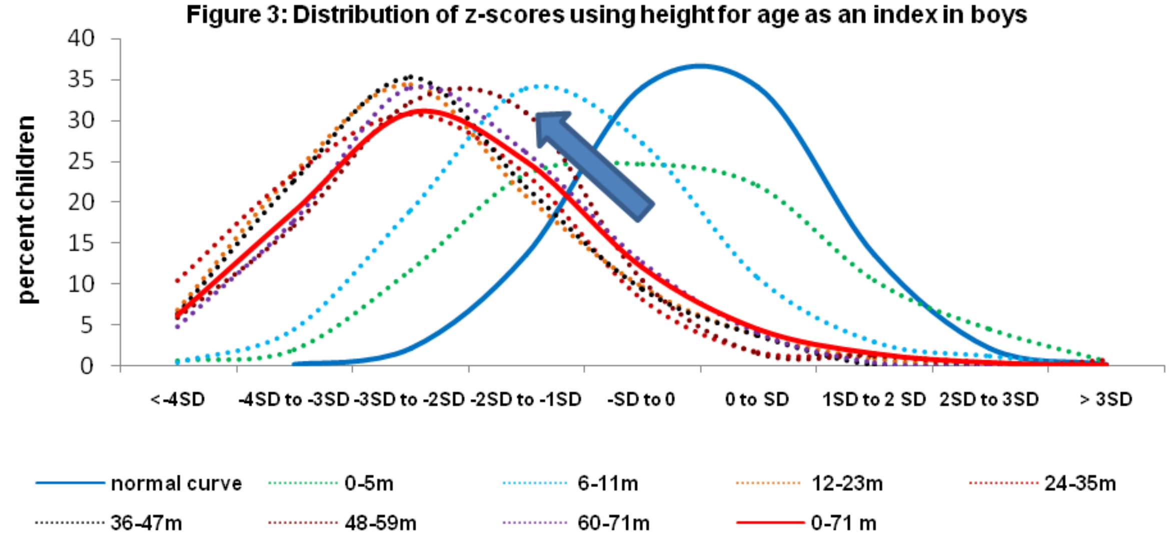


Figure 3: Distribution of z-scores using height for age as an index in boys



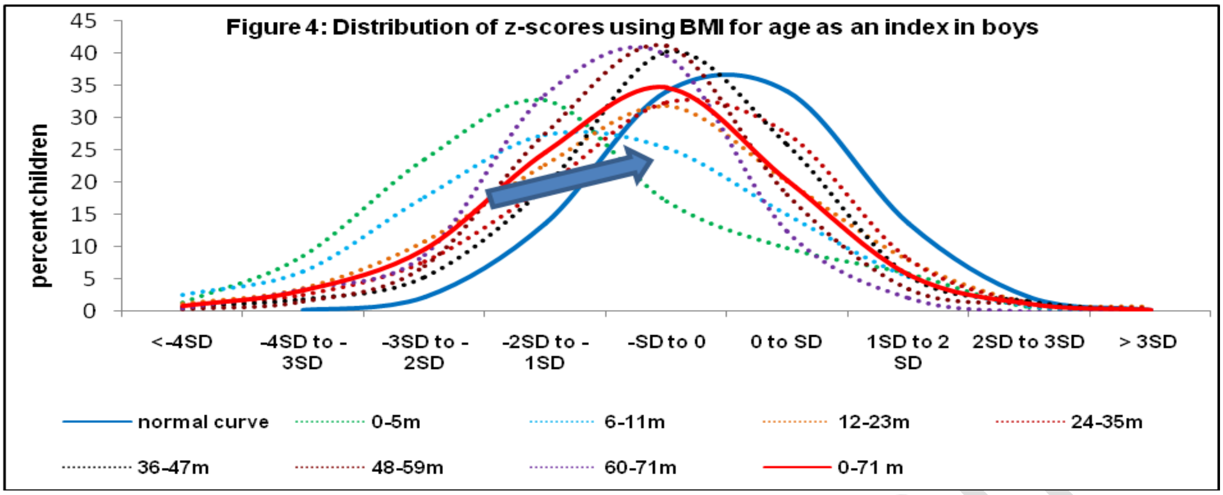
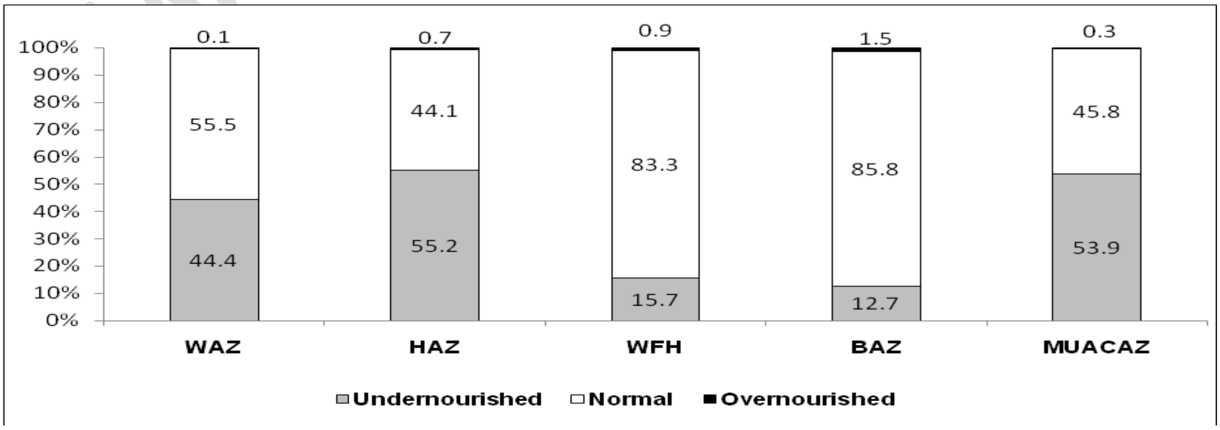


Table 5: Comparison of various anthropometric indicators in respect to BMI-for-age

BAZ	n	HAZ (<- 2SD)	WAZ (<- 2SD)	WFH (<- 2SD)
<-2SD	746	269 (36.1)	610 (81.8)	630 (94.5)
- 2 SD to +2 SD	5184	2996 (57.8)	2014 (39.4)	202 (4.3)
>+2SD	84	65 (77.4)	6 (7.1)	0 (0)
Parentheses denote percentages; percentages were calculated from n				

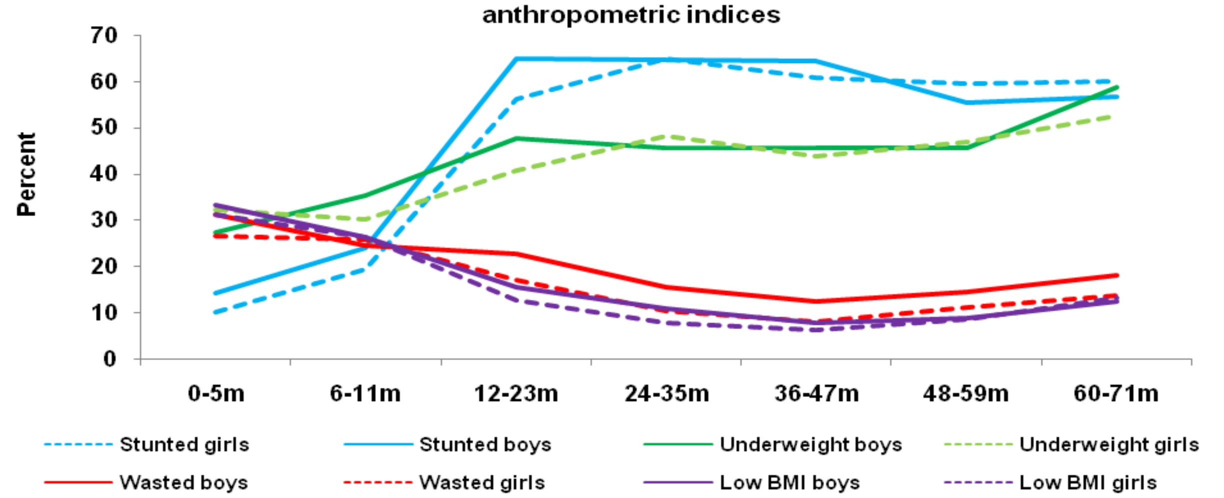
The prevalence of stunting (55%) was highest followed by underweight (44%), wasting (16%, weight-for-height) and low BMI-for-age (13%). BMI-for-age estimates undernutrition as well as overnutrition (1.5%) in preschool children (Figure 5). Of all these, BMI-for-age identified the maximum number of children as overnourished (1.5%). Table 5 indicated that 36 % of the undernourished children (<- 2SD BMI-for-age) were stunted (<-2 SD height-for-age) and about three-fourth of the overnourished children (> +2 SD BMI-for-age) were also stunted that means these children were 'short and fat'. Moreover, 60 % children with normal BMI were stunted suggesting that these children had already become stunted and they had normal weight for their current height and age.

Figure 5: Nutritional status of children as assessed by various anthropometric indicators



There was a steep increase in stunting rates of boys and girls in the present study from 20 % at 6 months to 65 % at 24 months. Stunting rates plateaued after 24 months of age. Nearly 30 % of the children were underweight in 0-5 months of age increasing upto 45 % by 24 months which is less steep as compared to increase in stunting rates. About a third of the infant had low BMI in the first six months; there is a decline in low BMI between 6-23 months.This may be due to steep increase in stunting during this period and should not be interpreted as improvement in nutritional status (Figure 6).

Figure 6: Agewise comparison of undernourished boys and girls using various anthropometric indices



A study conducted on children residing in rural areas of Punjab had reported that with WHO standards there was higher rate of underweight in infancy which correlates with the 26% rate of low-birth-weight infants in their study (Prinja et al, 2009). Low BMI-for-age and wasting rates were highest at birth reflected the adverse impact of intrauterine undernutrition and the steady decline in the wasting and low BMI rates between 6 to 23 months could be attributed to poor linear growth and steep increase in stunting rates during this period. Similar observations were reported by Ramachandran et al (2011) on reanalyzing the NFHS-3 data. It is obvious that weight for age overestimated the prevalence of undernutrition because most of the children are short (low height-for-age) as compared to BMI-for-age. Unlike wasting, stunting is not readily reversible. BMI-for-age which takes into account current height identifies wasted children who are in need of nutritional inputs to achieve optimal weight for current heights, it is likely that these children will grow along the trajectory appropriate for their current height.

CONCLUSION

The children living in an urban slum of Delhi had lower mean body weight, height, BMI and MUAC as compared to WHO 2006 standards. Nearly 30 % of the children were underweight, wasted and had low BMI and 10 % of the children were stunted in the age group of 0-5 months reflecting intrauterine undernutrition. There was a steep increase in stunting rates after 6 months of age which plateaued after two years of age but wasting and low BMI rates decreased after 6 months of age. This should not be interpreted as improvement in nutritional status of children. It was observed that 60 % of the children with normal BMI-for-age were stunted revealing that these children had normal weight for their current height and age. BMI-for-age identified 1.5 % children with overnutrition. About three-fourth of these children were stunted i.e. short and fat. Weight-for-age failed to make this distinction.

In India, where stunting rates are high, there has been a growing concern about appropriateness of using weight-for-age for assessment of undernutrition. Weight-for-age is a cumulative indicator for weight-for-height and height-for-age and doesn't distinguish between the two. It has been argued that when poor socio-economic conditions prevail overweight is not expressed, but with a rapid shift from nutritional scarcity to abundance, overweight emerges to co-exist with childhood stunting (Popkin, 1996). With the growing evidence in the last decade that children who are undernourished in-utero or during infancy are at more risk of overnutrition and non-communicable degenerative diseases in the adult life (Sachdev et al, 2005, Yagnik et al, 2004, Gupta et al, 2003). This further strengthens the need for interventions to reduce undernutrition in childhood. Stunting is associated with chronic undernutrition and is irreversible in nature. Unlike stunting, wasting is readily reversible. BMI-for-age can be used for early identification and timely intervention to prevent further deterioration in their nutritional status.

ACKNOWLEDGEMENT

All participating subjects, Anganwadi workers and block authorities are gratefully acknowledged for their cooperation. We would like to thank Lady Irwin College, University of Delhi, for giving UGC/CAS scholarship for the study.

REFERENCES

i. Das, S., Bose, K. (2011).Prevalence of Thinness among Santal Preschool Children Using New Body Mass Index Cut-Off Points.Journal of Anthropology Volume 2011, http://dx.doi.org/10.1155/2011/602782.

ii. Gupta, R., Yadav, K.K., Gupta, A., Gupta, M. (2003). Insulin levels in low birth weight neonates. Indian J Med Res, 118: 197-203.

iii. Kapur, D., Sharma, S., Agarwal, K.N. (2005). Dietary intake and growth pattern of children 9-36 months of age in an urban slum in Delhi. Indian Pediatr, 42:351-6.

iv. Kaur, G., Kang, H.S., Singal, P., Singh, S.P. (2005). Nutritional status: Anthropometric perspective of pre-school children. Anthropologist, 7(2): 99-103.

v. Mandal, G.C., Bose, S.K., Bisai, S. (2009). Thinness among rural children in Bengal. Indian Pediatr, 76(8): 817-9.

vi. Mandal, G.C., Bose, S.K. (2009). Assessment of undernutrition by mid-upper arm circumference among Pre-school children of Arambag, Hooghly District, West Bengal, India: An observational study. The Internet J PediatrNeonatol2009;11 (1). DOI 10.5580/940.

vii. International Institute Population of Science. IIPS. (1992-93). National Family Health Survey-1 (NFHS-1),1992-93: India. Indian Institute Population of Science. Mumbai, India.

viii. International Institute Population of Science. IIPS. (1998-99). National Family Health Survey-2 (NFHS-2), 1998-99: India. Indian Institute Population of Science. Mumbai, India.

ix. International Institute Population of Science. IIPS. (2007). National Family Health Survey-3 (NFHS-3), 2005-06: India. Indian Institute Population of Science. Mumbai, India. Available from: http://www.nfhsindia.org/anfhs3.html

x. International Institute Population of Science. IIPS. (2016). National Family Health Survey-4 (NFHS-4) India: Factsheet. 2016: India. Indian Institute Population of Science. Mumbai, India. Available from: http://rchiips.org/NFHS/pdf/NFHS4/India.pdf

xi. Nutrition Foundation of India. NFI. (2005). Growth and Development during childhood and adolescence. In Twenty FiveYears report 1980-2005, 27-48. Nutrition Foundation of India. New Delhi, India.

xii. Popkin, B.M., Richards, M.K., Monteiro, C.A. (1996). Stunting is associated with overweight in children of four nations that are undergoing the nutrition transition. J. Nutr, 126: 3009-16.

xiii. Prinja, S., Thakur, J.S., Bhatia, S.S. (2009). Pilot testing of WHO Child Growth Standards in Chandigarh: implications for India's child health programmes. Bull World Health Organ, 87: 116-122.

xiv. Ramachandran C.R. (1986). Vernier tape for circumferential measurements. J Trop Pediatr, 32: 30-5.

xv. Ramachandran, P., Gopalan, H. (2009). Undernutrition and risk of infections in preschool children. Indian J Med Res, 130: 579-83.

xvi. Ramachandran, P., Gopalan, H.S. (2011). Assessment of nutritional status in Indian preschool children using WHO 2006 Growth Standards. Indian J Med Res, 134: 47-53.

xvii. Rao, S., Joshi, S.B., Kelkar, R.S. (2000). Changes in nutritional status and morbidity over time among pre-school children from slums in Pune, India. Indian Pediatr, 37: 1060-71.

xviii. Sachdev, H.P.S., Fall, H.D., Osmond, C., Lakshmy, R., Dey, K.S., Leary, S.D., Bhargava, S.K. (2005). Anthropometric indicators of body composition in young adults:relation to size at birth and serial measurements of body mass index in childhood in the New Delhi birth cohort. Am J ClinNutr, 82: 456–66

xix. Planning Commission. Tenth Five year Plan. (1997). Food and Nutrition Security: Nutrition 1997-2002. Planning Commission, Government of India; Vol 2 p. 315-360.

xx. Tanner, J.M., Whitehouse, R.H., Takaishi, M. (1966). Standards from birth to maturity for height, weight, height velocity and weight velocity: British Children 1965. Arch Dis Child, 41: 454-71.

xxi. United Nations. UN. (2016). The Sustainable Development Goals Report 2016. United Nations. NewYork. USA. Available from http://www.un.org.lb/Library/Assets/The-Sustainable-Development-Goals-Report-2016-Global.pdf

xxii. World Health Organization. WHO.(2006). WHO Multicentre Growth Reference Study Group. WHO Child Growth Standards based on length/height, weight and age. Acta Paediatr, (Suppl.) 450:76-85.

xxiii. World Health Organization. WHO. (2010). WHO Anthro for personal computers, version 3.1, 2010: Software for assessing growth and development of the world's children. Geneva: WHO. Available from: http://www.who.int/childgrowth/software/en/

xxiv. World Health Organization. WHO. (1983). Measuring change in nutritional status. Geneva: World Health Organization.

xxv. World Health Organization. WHO. (1995). Physical status: The use and interpretation of anthropometry. Report of a WHO Expert Committee. WHO Tech Rep Ser, 854: 1-452.

xxvi. Yajnik, C.S. (2004). Obesity epidemic in India: intrauterine origins? Proc NutrSoc, 63: 1–10.