

## Evaluation of Physical Growth Status of Boys from Low Income Families of Slums of Kolkata

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**ABSTRACT** In the context of scanty nutritional data on urban slum children, the present study is conducted to assess the nutritional standard of 9 – 12 years boys from urban slums of Kolkata. Mean height varied between 123.9 for 9 years and 134.9 cm for 12 years with corresponding weights ranging between 22.2 to 29.4 kg. These are much lower as compared to urban children. Prevalence of stunting was higher than wasting ranging between 49 % in 9 years to 59.5 % in 12 years with an overall average of 53 % and showed an increasing trend through ages. Highest prevalence of wasting (48 %) was observed among the 9 year group which declined abruptly to 27 % in the 10 year group. The higher prevalence of wasting in the lower age group may be due to lack of parental care.

### INTRODUCTION

In the last few decades, there has been a radical change in the socio-cultural and economic scenario of India. Large scale migration to cities for a possible better opportunity of earning and living have ended up in expansion of urban population, sub-urbanization and urban decay characterized by rapid growth of slums. Dreams of many have confronted the vicissitudes of dismal quality of slum life characterized by insecurity, poor housing and overcrowding. Lack of basic amenities like safe drinking water and proper sewerage system make this population vulnerable to infections. A combined effect of all these factors takes a heavy toll on health and nutrition of the slum dwellers especially on the children. Malnutrition appears to be a plaguing factor for a large proportion of children in India living in slum areas owing to its negative impact on physical and cognitive development. Studies have indicated a complex etiology of child-

hood malnutrition that entails complex interactions of biological, cultural and socio-economic influences. It has been reported that poor maternal nutrition before and during pregnancy cause retarded intrauterine growth and low birth weight of the newborn which along with poor feeding practices and lack of nutritious food due to poverty leads to protein-energy malnutrition, micronutrient deficiency and early growth failure (Khor 2003).

While significant progress has been achieved in reducing the proportion of malnourished children in developing countries, nonetheless, malnutrition persists affecting large numbers of children. Systematic studies reporting countrywide data as well as individual studies focusing on the prevalence of malnutrition among preadolescent urban slum children is scanty. Majority of the studies conducted have focused on the nutritional status of preschool slum children below 5 years of age. Some early studies in this context had reported a very high prevalence of malnutrition of 92 % and 94 % among Kolkata and Jabalpur slum children (NFI 1988) and 82 % among preschool children from Delhi slum area (Kapil et al. 1989). In some other studies, 58 % of under five children from Delhi (Ray et al. 1990), 63 % of slum children from Bhopal (Dwivedi et al. 1992) and 51 % of children below 5 years from Kolkata slum (Sen 1994) were reported to be

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malnourished. Awasthi et al. (1997) reported a high prevalence of malnutrition, 68% underweight, 63 % stunting and 26 % wasting among children below 4 years of age from slums of Lucknow. Two other studies reported more than 60% prevalence of malnutrition of among under-five children and infants from urban slums of Chandigarh (Swami 2000) and Vadodara city (Bhalani 2002). A large scale study conducted on 15 Indian cities documented that 92 % of slum dwellers had chronic malnutrition and lower energy intake (NNMB 1994).

It is projected that more than half of the Indian population will live in urban areas by 2020 and nearly one- third of this urban population will be of slum dwellers (NFHS 2000; Gopalan 2003). In many of the studies conducted on urban slums it has been reported that the prevalence of malnutrition was much higher than the rural and urban areas (NFI 1988; Swami 2000).

The socio-economic cost of the malnutrition burden to the individual as well as to the country is high particularly in the context of a developing country. Therefore studies reporting childhood malnutrition are of great importance in order to focus on the magnitude of the problem to plan proper cost effective culture specific nutritional intervention program based on food beliefs and food habits and food availability.

Anthropometry is the single most universally applicable, inexpensive, and non-invasive method available to assess the size, proportion and composition of human body (WHO 1995). World Health Organization has recommended various indices based on anthropometry to evaluate the nutritional status of children.

The city of Kolkata in eastern part of India has demonstrated a conspicuous rise in its slum growth profile in the past few decades. Hitherto, studies on physical growth and nutritional status particularly on preadolescent slum dwellers are lacking. Therefore growth and nutritional studies among slum children are needed to carry to understand the malnutrition in relation to socio economic status.

### **Objective**

The main purpose of this study is to assess the nutritional standard from physical growth status of boys in the age group of 9 – 12 years from slum areas of Kolkata by means of standard anthropometric techniques in relation to their socio- economic standards.

## **MATERIAL AND METHODS**

### **Subjects**

A total of 319 boys between 9 – 12 years were selected randomly from morning and day sections of two schools in Central Kolkata. Before start of the work, necessary permission was taken from the school authorities. The study was conducted during the period from March – July 2011.

### **Measurements**

**Age:** This was obtained from the register of the school.

**Height:** Height in centimeters was measured with an anthropometer with shoes removed and standing on a horizontal platform with heels close together stretching upward to the fullest extent with arms hanging on the sides and heels and buttocks touching against the rod. The head was aligned in Frankfurt plane. The horizontal scale of the anthropometer was brought down and held against the top of the head and the readings were taken to the nearest 1 cm.

**Weight:** Weight was measured in kg by using a weighing machine. It was calibrated against known weights regularly. Weight was taken with minimum clothing and without shoes and was recorded to the nearest 500 grams.

### **Assessment of Nutritional Status**

The main objective of the study was to assess the physical growth status of the children as the growth pattern of children is considered to be the most important criteria for recognizing their health and nutritional status. Physical growth of children is reflected mainly by simple anthropometric measurements like height and weight from which stunting and wasting status can be derived. These are widely accepted and adopted methodologies for the determination of nutritional status. In accordance, classification of nutritional status was made according to public health criteria recommended by a World Health Organization expert committee (WHO 1995).

For analytic purposes, the subjects were divided into 5 groups: 1) normal, 2) low height-for-age (stunted), 3) low weight-for-height (wasted), 4) low height-for-age and low weight-for-

height (stunted and wasted), and 5) overweight. For further comparison of the data, z scores were calculated for height – for – weight values. The criteria used for the classification of nutritional status in children are described in Table 1.

**Assessment of Socio-economic Status**

Socio-economic and demographic conditions were evaluated using a semi-structured questionnaire survey and personal interview with the parents during household survey. The questionnaire items were selected based on literature search and have been widely used in various studies. The questions include parental education and occupation, total number of family members and average monthly income of the family. The socio-economic status of the family was evaluated from parental education, parental occupation and monthly family income (Kumar et al. 2007). The socio- economic status is summarized in Table 6.

**RESULTS AND DISCUSSION**

**Mean Height and Weight**

The descriptive statistics for height and weight of the subjects is summarized in Table 2. The mean height in different age groups varied between 123.9 and 134.9 cm, with corresponding mean weight ranging between 22.2 to 29.4 kg. The height and weight of the boys in present study was compared with other Indian and overseas literatures (Table 3).

The mean height and weight of the of the Kolkata slum children representing lower – middle socio- economic class are almost equal to

**Table 2: Descriptive statistics for height, weight and body mass index (BMI) of the children by age<sup>1</sup>**

Age (y)	Height (cm)	Weight (kg)	BMI (kg/m <sup>2</sup> )
9 (n= 89)	123.9 ± 5.8	22.2 ± 3.7	14.3 ± 1.7
10 (n= 74)	127.1 ± 4.5	24.4 ± 3.5	15.2 ± 2.1
11 (n= 72)	130.1 ± 3.9	25.8 ± 3.5	15.2 ± 1.8
12 (n= 84)	134.9 ± 4.0	29.4 ± 3.6	16.2 ± 1.9

<sup>1</sup> mean ± SD

that of rural Indian children of similar age groups (ICMR 2009). The growth status is also comparable with North Bengal school children from lower socio- economic class (Manna et al. 2011) and children of Assam tea garden workers (Medhi et al. 2006). However, the mean height and weight of the boys are much lower as compared to middle class school children of Kolkata (Das and Ray 1990) and affluent Indian population (Agarwal et al. 1992). The present values are also lower compared to NCHS standards (Hamill et al. 1979) and a group of school children from Mozambique (Prista et al. 2003).

Two anthropometric indicators of nutritional status were used in the present study. Height-for-age (HAZ) was used to assess chronic malnutrition and eight-for-height (WHZ) was used to measure whether a child is having acute malnutrition. In accordance, the child was termed as ‘stunted’ or ‘wasted’, respectively.

Stunting is an indicator of past growth failure. It is associated with a number of long-term factors including chronic insufficient protein and energy intake, frequent infection, sustained inappropriate feeding practices and poverty (Cogill 2001). The present study demonstrated a high prevalence of stunting among the boys as

**Table 1: Criteria for classification of nutritional status**

Criteria	Anthropometric indicators	Cut off points
Normal	Height-for-age BMI- for -age	≥ -2 SD of height-for-age, ≥5th percentile of BMI-for-age and d”85th percentile of BMI-for-age
Stunted (low height-for-age)	Height- for-age	< - 2SD of Height- for-age
Wasted(low weight – for - height)	BMI- for- age	<5th percentile of BMI-for-age
Stunted and wasted (low height- for-age andlow weight – for – height)	Height- for-age andBMI- for- age	< -2 SD of height-for-age and<5th percentile of BMI-for-age
Overweight	BMI- for- age	≥85th percentile of BMI-for-age

**Table 3: Mean values of height and weight of Kolkata slum children compared with some other studies.**

Group / Population (Reference)	Height (cm)				Weight (kg)			
	9 yrs	10 yrs	11 yrs	12 yrs	9 yrs	10 yrs	11 yrs	12 yrs
Present study	123.9	127.1	130.1	134.9	22.2	24.4	25.8	29.4
Indian rural children (ICMR 2009)	123.8	128.2	132.7	137.4	22.2	24.3	26.4	29.2
NCHS (Hamill et al. 1979)	132.2	137.5	143.3	149.7	28.1	31.4	35.3	39.8
Middle class Kolkata school boys(Das and Ray 1990)	-	-	141.3	146.8	-	-	31.8	34.3
Affluent Indian children (Agarwal et al.1992)	128.2	133.6	139.6	145.8	24.4	27.0	30.6	34.8
Children of Assam tea garden worker(Medhi et al. 2006)	125.6	128.9	132.1	136.2	21.9	23.5	25.2	28.5
North Bengal school children from lower socioeconomic class (Manna et al. 2011)	122.1	125.3	130.3	132.1	22.5	22.7	25.7	27.1
Mozambique school children (Prista et al. 2003)	132.8	139.3	143.8	147.4	27.7	31.4	34.7	35.8

**Table 4: Prevalence of stunting, wasting and stunting and wasting among the subjects**

Age (y)	Stunting (low Ht- for Age) (%)	Wasting (low wt- for- ht) (%)	Stunting and wasting (%)
9 (n= 89)	49.4	48.3	34.8
10 (n= 74)	51.4	27.0	16.2
11 (n= 72)	52.8	33.3	18.1
12 (n= 84)	59.5	28.6	14.3
All group (n=319)	53.3	34.8	21.3

shown in Table 4. The prevalence of stunting ranged between 49 % in 9 years to 59.5 % in 12 years children with an overall average of 53 %. An increasing trend of stunting was also observed through ages.

The height - for - age values were converted in to corresponding z scores. Age wise z score values are presented in Table 5. The mean z score was calculated to be - 1.8. A total of 145 children (45.5 %) demonstrated a z score of less than -2 which indicated a high prevalence of malnutrition (WHO 1995).

**Table 5: Height for age Z scores for all age groups**

Age group	Z score
9	-1.5
10	-1.7
11	-2.0
12	-1.9
All group	-1.8

Although a number of literatures have reported a high prevalence of malnutrition in slum areas but majority of those studies were conducted among children below 9 years of age. In context of the age of the boys in present study, it will not be justifiable to compare the present findings directly with these literatures. However, irrespective of the methods and age groups, these literatures indicated a high prevalence of malnutrition of 52 – 94 % among under-5 children from both rural and urban areas of India (NFI 1988; Sen 1994; Awasthi and Pande 1997; Bhat et al. 1997; Aneja et al. 2001; Singh and Mishra 2001; Bhalani and Kotecha 2002).

Studies from other Asian countries also indicate similar trend (Fauveau et al. 1992; WHO 1997). The findings of the present study are in accordance with these previous literatures and indicated a deleterious effect slum life on the growth pattern of children.

Although no attempt has been taken in the present study to assess the dietary intake pattern of the subjects but it definitely points to the dietary deficiencies among the subjects. It has been specified that urban poor has least intake followed by rural and urban better off population respectively (Shah and Sachdev 2001). It was estimated that 81% of rural children and 92% of slum dwellers in Hyderabad suffered from current long duration malnutrition and that the dietary intake of pre-school children in urban slums was no better than those of rural pre-schoolers (NNMB 1984); a lower consumption

of energy and nutrients in urban slums was documented from 15 cities all over India which was comparable to rural landless poor (NNMB 1994).

Socio-demographic status of the parents of the children is presented in Table 6. Socio-economic survey revealed that in majority of the families (77%) men are only earning members. They were engaged in various unorganised sectors and their daily wage varied between Rs.50 to Rs.80. The average family size was 4.6 (range 3-7). The poor earning status coupled with moderate to big family size might have contributed to a gross inadequacy of recommended dietary intake pattern.

**Table 6: Parental socio demographic profile**

<i>Demographic characteristics</i>	<i>N (%)</i>
<i>Fathers Education</i>	
Illiterate	45 (14.1)
Primary	226 (70.8)
Secondary	32 (10.0)
HS +	16 (5.0)
<i>Mothers Education</i>	
Illiterate	41 (12.9)
Primary	263 (82.4)
Secondary	15 (4.7)
HS +	0 (0)
<i>Family Income (per month)</i>	
<1000	69 (21.6)
>1000 - d" 1500	196 (61.4)
>1500 - d" 2000	42 (13.2)
> 2000 - d" 2500	12 (3.8)
<i>Family Size</i>	
<5	29 (9.1)
5 - 8	211 (66.1)
>8	79 (24.8)
<i>Mother's Occupation</i>	
Housewife	247 (77.4)
Other	72 (22.6)
<i>Father's Occupation</i>	
Daily wage worker	274 (85.9)
Salaried	45 (14.1)

In addition, it can also be mentioned that the subjects belongs to privatised schools that were not supported by any mid-day meal program which might have aggravated the mal-nutritional situation of the children.

Height-for-age reflects achieved linear growth, and its deficits (stunting) indicate long-term cumulative inadequacies of health and nutrition (WHO 1995). Stunting of older children is a sign of nutritional deprivation during early childhood. Thus, considering the findings from previous literatures and the present findings, the present level of prevalence of stunting among urban slum children was not unexpected

considering a high prevalence nutritional assaults during early childhood.

Wasting is the result of a weight falling significantly below the weight expected of a child of the same length or height. It indicates current or acute malnutrition resulting from failure to gain weight or actual weight loss. Causes include inadequate food intake, incorrect feeding practices, disease, and infection or, more frequently, a combination of these factors. Wasting in individual children and population groups can change rapidly and shows marked seasonal patterns associated with changes in food availability or disease prevalence to which it is very sensitive (Cogill 2001).

The prevalence of recent malnutrition or wasting is comparatively lower as compared to stunting among the children (Table 4). The overall average wasting was 33 %. Highest prevalence of 48 % was observed among the 9 year group which declined abruptly to 27 % in the 10 year group. The age group of 11 and 12 years showed lower prevalence of 33 and 28 % respectively. The lower prevalence of malnutrition was observed in the higher age groups. It may be assumed that the older children can pick up food without much parental care in comparison to younger children.

Different studies have focused on the determinants of child health showing that social and economic variables had significant influence on the degree of malnutrition (Pal 1999; Zere and McIntyre 2003; Rajaram et al. 2003; Rao et al. 2004). The effect of mother's education has been demonstrated as one of the most significant socio-demographic factors influencing nutritional status of children (Behrman and Wolfe 1984; Frongillo et al. 1997; Owor et al. 2000; Reyes et al. 2004; Som et al. 2006). In the present study the maximum educational status of the mothers of all stunted children were either having no formal education (23%) or having primary level of education (77%). The present study revealed that prevalence of wasting was especially prominent among the 9 year group. It was also observed that a major percentage of these children lack maternal care as their mothers were working. It has been reported that in lower socio-economic group competition for food is likely to be greater in households with more children (Hong 2007). Therefore it may be possible that in a larger family with poor socio economic status where the food competition is likely to be

higher, lack of parental care coupled lower maternal education, might have made the youngest children more vulnerable to malnutrition.

### CONCLUSION

The present study concludes that the children belonging to the low income group families, fighting to survive in an expensive urban environment have been suffering from both acute and chronic under nutrition.

The prevalence rate is high and the physical growth standard is dismal as compared to urban standard. The authors therefore suggest an in depth clinical study to confirm the extent of the children affected. Parental awareness programme should also be undertaken for betterment of maternal care to the younger children suffering from both acute and chronic malnutrition.

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