Nutritional status of *under-five* children in urban slums of Pune

Abstract

Background: The nutritional status of under five children in urban slums is an important health indicator for assessing the health status of entire population and one of the major predictors of child survival. Objective: A nutritional survey was carried out in September- October 2012 in the field practice area of a medical college in Pimpri, Pune area with an objective to assess the nutritional status of *under-five* children. **Materials and Methods:** All the under five students in the field practice area of the medical college were examined. A total of 658 children were examined. **Results and Conclusion:** It was observed that the prevalence of under weight 34.3% (226/654) (30.7 to 38.0 C.I.), stunting 58.7% (386/654) (54.9 to 62.4 C.I.) and wasting was 16.9%(109/654) (14.0 to 19.7 95% C.I.). The prevalence of under weight 37.6% (114/303) and stunting 61.4% (186/303) was more in girls whereas wasting was more in boys 18%.(64/355)

Key words: Malnutrition, under-five, urban slums

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INTRODUCTION

Nutritional status of under five children is a matter of concern worldwide and malnutrition is a one of the most important public health problems. Globally, one quarter of under five children are stunted (estimated 162 million). South Asia particularly has a high prevalence of stunting (38%), underweight (32%) and alarmingly high percentage of wasting (16%) as compared to other regions in the world.[1] As per National Family Health Survey III, 48% children in India are stunted, 43% wasted and nearly 20% are under weight. Maharashtra state is performing better in terms of stunting (46.3%) and wasting (16.5%), but the percentage of under weight children is higher (37%) as compared to national level statistics.[2]

The Pimpri Chinchwad Municipal Corporation is one of the rich municipal corporations in South East Asia due to large number of automobile and software industry located in the nearby area.[3] This industrialisation of the Pimpri Chinchwad Municipal Corporation has also led to rapid development of slums due to the workers who get employed in these industries. The nutritional status of under-five children in these slums is very important because this is a vulnerable group which may fall prey to different types of communicable diseases that can spread easily due to high population density, poor hygiene, illiteracy and poor socioeconomic status in these areas. Malnutrition is not a single problem with a single solution. Multiple and interrelated determinants are responsible for under nutrition.[4]

Malnutrition in under-five children can be easily assessed by measurement of height and weight. With release of WHO child growth standards in 2006 the trajectory of malnutrition can be studied in terms of weight for age (underweight), height for age (stunting) and weight for height (wasting).[5] The Lancet series on maternal and child health has emphasized and promoted the use these anthropometric parameters for assessing nutritional status of under five children.[6-8] Hence, with an aim to assess the nutritional status of under five children in the slums of Pune this study was planned.

MATERIALS AND METHODS

A total of 658 children were examined in field practice area during September-October 2012. All the children who were more than five years of age were excluded from this study. Informed consent of the parents of under five children was obtained before under taking the study. The data was collected

using a pretested questionnaire. Age of the child and vaccination status was confirmed using the hospital records and immunization card whenever available. These details were confirmed from a reliable informant when these records were unavailable. An attempt was also made to take the history of any major illness in last 6 months.

Anthropometry

All children were divided in small groups and anthropometric measurements were taken using standardised equipments. Length of children up to the age of two years was measured with the child on horizontal measuring scale. Height of children above 2 year of age was measured by the child standing on a horizontal surface against a vertical measuring scale. Standing height was measured up to nearest of 0.1 cm. The child was made to stand against the scale without shoes, heels together and shoulder, buttocks and heels touching the vertical surface. Height was recorded with a head piece touching the top of the head when child was looking straight and arms hanging by the sides in a natural manner. Weight was recorded on a salter type of portable weighting machine up to nearest 0.1kg for children less than two years with minimal clothes. Children more than two year were weighed with minimal clothes and bare feet with a weighing machine (beam type) pretested for accuracy.[9] Mean of three different readings was taken as final weight of the child.

Statistical analysis

Data collected was entered in Microsoft excel. Confidence interval, Chi square and Chi square for trend were calculated to analyse data using SPSS 18, Quarry Bay, Hong Kong, China. Emergency Nutrition Assessment software, Ireland was used to analyse anthropometric data, to calculate the Z score, analysis of scores and generating growth curves.[10] The WHO standards were used for comparing the data. Analysing the data using this software and then comparing it with WHO growth curves was a novel experience.

Operational Definitions for categorising the malnutrition according to Z score.[5]

(<-2 z-score) Global Acute Malnutrition (wasting)/Underweight / Stunting

(<-2 z-score and >=-3 z-score) Moderate Acute Malnutrition (wasting)/Underweight / Stunting

(<-3 z-score) Severe Acute Malnutrition (wasting)/Underweight/ Stunting

Each anthropometric indicator has a different meaning, hence to get a comprehensive picture of a child's nutritional status, it would be important to derive all three nutrition indices.

RESULTS

There were 658 children who were examined in the study out of which 53.7% (355/ 658) were boys and 46.3% (303/658) were girls. The mean age of the children in the study was 28.9 months (SD 15.6).

The age and sex wise distribution of students is given in Table 1.

Most of the children examined in the study belongs to the age group of 13 to 36 months. The child sex ratio of the study group was 1.2. The mean birth weight of the children was 2.7 kg (n = 538). There was no significant difference in the mean height and weight of male (Mean weight = 10.4 kg Mean height = 80.09 cm) and female (Mean weight = 10.3 kg Mean height = 81.3 cm) children in the study. Mean weight and height for the age group of 1to12 months and 37to 60 months was 7.1 kg, 65.3 cm and 12.9 kg, 93.5 cm respectively.

Figure 1 shows the comparison of anthropometric parameters with WHO growth standards as weight for age, height for age and weight for height.

Weight for age (under weight) (n=658)

The prevalence of low weight for age, i.e. underweight was 34.3% (226/ 658) (30.7 to 38.0 C.I.) with girls being more underweight 37.6% (114/303) (32.2 to 43.1 C.I.) as compared to boys 31.5% (112/355) (26.7 to 36.4 C.I.). Prevalence of moderate acute malnutrition, based on weight for age Z score (under weight) was 22.5% (148/658) (19.3 to 25.7 C.I.) with marginal difference between boys 21.7% (77/355) and girls 23.4% (71/303). Prevalence of severe acute malnutrition was 11.9% (78/658) (9.4-14.3 C.I.). The prevalence of severe malnutrition using weight for age Z score was more among girls 14.2% (43/303) (10.3 to 18.1 C.I.) as compared to boys 9.9% (35/355) (6.8 to 13.0 C.I.).

Table 1: Age and sexwise distribution of children in the study

Age (months)	Male		Female		Total		Ratio
	no.	%	no.	%	no.	%	Male : Female
1-12 months*	74	56.9	56	43.1	130	19.9	1.3
13-36 months	197	56.4	152	43.6	349	53.4	1.3
37-60 months	80	45.7	95	54.3	175	26.8	0.8
Total	351	53.7	303	46.3	654	100.0	1.2

*o-1 month age group was excluded because there were only four children in this category
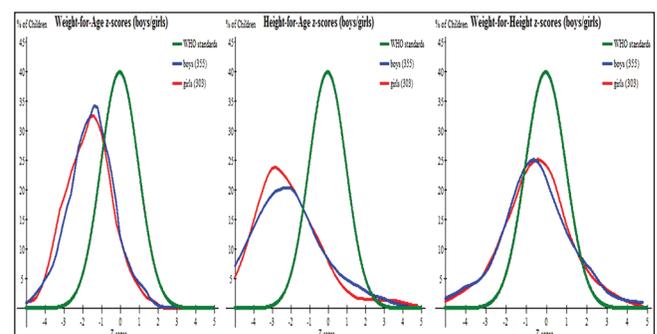
Figure 1: Comparison of anthropometric parameters with WHO growth standards (The graph shows the comparison of weight for age, height for age and weight for height Z scores of children (boys and girls) included in the study with the WHO growth curves generated using the Emergency Nutrition Assessment software.(n = 658)

Height for age (stunting) (n= 658)

The prevalence of low height for age, i.e. stunting is 58.7% (386/658) (54.9-62.4 C.I.). It was observed that girls were more stunted 61.4% (186/303) (55.9-66.9 C.I.) as compared to boys 56.3% (200/355) (51.2 to 61.5 C.I.). Prevalence of moderate stunting was 24% (158/658) (20.7 to 27.3C.I.) with boys being 23.4% (83/355) and girls 24.8% (75/303) stunted. Prevalence of severe stunting was 34.7% (228/658) (31.0-38.3 C.I.) with severe stunting being more commonly seen among girls 36.6% (111/303) (31.2-42.1 C.I.) as compared to boys 33.0% (117/355) (28.1-37.8 C.I.).

Weight for Height (Wasting) (n= 658)

The prevalence of wasting was 16.9% (111/658) (14.0 - 19.7 95% C.I.). It was seen that in general boys were more wasted as compared to girls especially the prevalence of severe wasting was very high (8.7%) (31/355) among boys than girls (6.6%) (20/303).

Table 2 shows severely underweight children were more in 37 to -60 (15.4%) (27/175) age group whereas severe stunting was high in 1 to 12 months and 37 to 60 months age group. The proportion of sever and moderately underweight children was found to increase with advancing age of the child.

The percentage of children who were found to have severe wasting was more (12.3 %)(16/130) in 1 to 12 months age group as compared to higher age groups i.e. 13 to -36 months and 37 to 60 months. The moderate wasting was seen to increase with advancing age of the child.

Table 3 shows that low birth weight babies tend to remain malnourished as compared with their counter parts who have normal

Table 2: Prevalence of different forms of malnutrition by age

Age (mths)	Weight for age (Underweight) (n = 654)			Height for age (Stunting) (n = 654)			Weight for height (Wasting) (n = 654)		
	Severe under-weight	Moderate under-weight	Normal	Severe stunting	Moderate stunting	Normal	Severe wasting	Moderate wasting	Normal
1-12	14 (10.8)	26 (20.0)	90 (69.2)	48 (36.9)	21 (16.2)	61 (46.9)	16 (12.3)	4 (3.1)	110 (84.6)
13-36	37 (10.6)	71 (20.3)	241 (69.1)	118 (33.8)	99 (28.4)	132 (37.8)	22 (6.3)	32 (9.2)	295 (84.5)
37-60	27 (15.4)	51 (29.1)	97 (55.4)	63 (36.0)	37 (21.1)	75 (42.9)	11 (6.3)	24 (13.7)	140 (80.0)
Total	78 (11.9)	148 (22.6)	428 (65.4)	229 (35.0)	157 (24.0)	268 (41.0)	49 (7.5)	60 (9.2)	545 (83.3)
	226 (34.3)			386 (58.7)			109 (16.9)		
	P=0.03			*P*=0.05			*P*=0.006		

Table 3: Association of various socio-demographic factors (birth weight, type of family, education of mother and birth order) with nutritional status

Age (months)	Birth weight n = 538 as data for 120 was missing								
	Weight for age (under weight)			Height for age (Stunting)			Weight for height (Wasting)		
	SAM##	MAM###	NORMAL	SAM	MAM	NORMAL	SAM	MAM	NORMAL
≤2.5kg	43 (16.2)#	77 (29.1)	145 (54.7)	116 (43.8)	69 (26)	80 (30.2)	17 (6.4)	27 (10.2)	221 (83.4)
>2.5kg	19 (7.0)	45 (16.5)	209 (76.6)	77 (28.2)	61 (22.3)	135 (49.5)	21 (7.7)	19 (7)	233 (85.3)
Total	62 (11.5)	122 (22.7)	354 (65.8)	193 (35.9)	130 (24.2)	215 (40.0)	38 (7.1)	46 (8.6)	454 (84.4)
	X^2=29.1 *P*=<0.001			X^2=22.3 *P*=<0.001			X^2=2.0 *P*=<0.37		
	Type of family n = 635, as data for 23 children was not available								
Nuclear	38 (11.9)	63 (19.8)	217 (68.2)	108 (34.0)	64 (20.1)	146 (45.9)	27 (8.5)	25 (7.9)	266 (83.6)
Joint	36 (12.5)	69 (24.0)	183 (63.5)	100 (34.7)	75 (26.0)	113 (39.2)	23 (8.0)	28 (9.7)	237 (82.3)
Separated	1 (3.4)	9 (31.0)	19 (65.5)	11 (37.9)	13 (44.8)	5 (17.2)	0	1 (3.4)	28 (96.6)
Total	75 (11.8)	141 (22.2)	419 (66.)	219 (34.5)	152 (23.9)	264 (41.6)	50 (7.9)	54 (8.5)	531 (83.6)
	X^2=5.549., *P*=0.476			X^2=13.828, *P*=0.008			**		
	Education of mother n = 556, as data for 102 children was not available								
Illiterate and primary	8 (13.6)	11 (18.6)	40 (67.8)	23 (39.0)	14 (23.7)	22 (37.3)	3 (5.1)	4 (6.8)	52 (88.1)
Secondary	50 (13.0)	84 (21.9)	250 (65.1)	134 (34.9)	91 (23.7)	159 (41.4)	27 (7.0)	35 (9.1)	322 (83.9)
Higher secondary and above	11 (9.7)	28 (24.8)	74 (65.5)	41 (36.3)	25 (22.1)	47 (41.6)	12 (10.6)	10 (8.8)	91 (80.5)
Total	69 (12.4)	123 (22.1)	364 (65.5)	198 (35.6)	130 (23.4)	228 (41.0)	42 (7.6)	49 (8.8)	465 (83.6)
	X^2=1.6, *P*=0.812			X^2=0.6, *P*=0.9			X^2=2.6, *P*=0.6		
	Birth order n = 658								
1	25 (9.9)	53 (20.9)	175 (69.2)	80 (31.6)	77 (30.4)	96 (37.9)	16 (6.3)	19 (7.5)	218 (86.2)
2	28 (13.9)	43 (21.3)	131 (64.9)	76 (37.6)	36 (17.8)	90 (44.6)	21 (10.4)	19 (9.4)	162 (80.2)
≥3	25 (12.3)	52 (25.6)	126 (62.1)	73 (36.0)	44 (21.7)	86 (42.4)	14 (6.9)	22 (10.8)	167 (82.3)
Total	78 (11.9)	148 (22.5)	432 (65.7)	229 (34.8)	157 (23.9)	272 (41.3)	51 (7.8)	60 (9.1)	547 (83.1)
	X^2=3.7, *P*=0.4			X^2=10.6, *P*=0.03			X^2=4.6, *P*=0.3		

#fig in parenthesis are percentages, SAM##Severe acute malnutrition, MAM###Moderate acute malnutrition, **statistical test could not be applied as >20% cells have expected count less than 5

birth weight. In this study, it was observed that children belonging to separated families are more likely to be malnourished as compared to children from joint and nuclear families. With increasing years of schooling in mothers the nutritional status of children improves except for the category of height for age where there was a marginal increase in cases of severe malnutrition. But this was not statistically significant. Children with higher birth order (2nd and ≥3rd) were more likely to be malnourished (underweight, stunted/wasted) as compared with first born child and the distribution was found to be statistically significant in stunting.

Children's morbidity

There were 70 children who had ARI, 14 children had diarrhoea, 18 children had only fever, 4 children with exanthematous fever and very few cases of chronic diseases like ARF, Asthma, Thalassemia etc six months prior to study.

Vaccination status

There were 2.9% (19/658) children out of 658 whose immunisation was incomplete. No statistical association could be observed between the current nutritional status and immunisation.

Breast feeding initiation

There were 82.8% (545/658) children for whom breast feeding was initiated within first three hours of delivery and for 10.3% (68/658) children BF was initiated within 1-3 days of delivery and remaining 45 children were started BF after 3 days of delivery. No statistical association could be proved between the current nutritional status and time required for initiation of breast feeding.

DISCUSSION

The present study was conducted in urban field practice area of a Medical college. The study was analyzed by WHO child growth standards obtained by multicentric growth reference study. The new WHO standards (2006) depict normal early childhood growth under optimal environmental condition and used to assess children everywhere, regardless of ethnicity, socioeconomic status and type of feeding.[11]

Total 658 children were in the study out of which 355 were boys and 303 were girls. The mean age of the children who were included in the study was 28.9 months (SD 15.6). Most of the children examined in the study were in the age group of 13 to 36 months. The child sex ratio in this study for 37 to 60 months category was 0.8, there was a slight decline in the child sex ratio to 1.3 for 1to 12 months and 13 to 36 months category and this trend i.e. decreasing child sex ratio is comparable to the national statistics.[12]

The mean birth weight of the children noted in this study is similar to the one found in slums of Mumbai (2.7 kg),[13] where as the mean height and weight of girls and boys was higher than the similar study carried out in Bagalkot.[11]

Graphical representation of the anthropometric parameters when compared gender-wise with the WHO standards showed that the Proportion of stunted girls was more as compared to boys. There is a leftward shift in case of means of all three anthropometric parameters compared to WHO Z score curve but is more obviously seen in means of Z scores of height for age (right/positive skew).

Underweight

The percentage of children who were underweight (34.3 %) (226/654) is less as compared to the national level statistics as per National Family Health Survey 3[2] and similar studies carried out in other parts of the country (Mumbai 35%, Bagalkot 65.4%)[11,13] There are few places like Ludhiana (29.5%) and West Bengal (28.6%) where the prevalence of underweight children is lower as compared to the present study.[14,15]

Stunting

National prevalence of stunting as observed in the National Family Health Survey 3 conducted in 2005 to 2006 was 51.7% which is slightly lower than this study (58.7%) (386/658).[2] Similar studies conducted in Mumbai (47%), Punjab (16.7%) and Qatar (4.4%) noted lower prevalence of stunting as compared to the present study.[13,16,17] Prevalence of stunting was found to be more in girls as compared to boys which is in contrast to the findings of NFHS 3 (Male 48.1%, Female 48%).[2] Stunting was the predominant growth faltering, as observed in studies carried out in Bagalkot (72.7%), Ludhiana (74%), West Bengal (50.9 %) and Kerala (61%).[11,14,15,18]

Wasting

The prevalence of wasting as noted in this study (16.9%) (109/654) was comparable with national and state level NFHS 3 data[2] and also with similar studies carried out in other parts of the country like Mumbai (17%).[13] Studies carried out in Bagalkot (32.5%) and Ludhiana (42%) revealed a high prevalence of wasting.[11,14]

The age wise trends in malnutrition in terms of all three anthropometric parameters (under weight, stunting and wasting) as given Table 2, it is evident that the nutritional status of children deteriorates progressively through the first three years of life and stunting is the predominant type of malnutrition seen; however wasting was not that common. Children who were born as low birth weight were found to be more stunted and underweight; wasting was not that prevalent in them also. A similar finding was noted in the study carried out in slums of Mumbai[13] and has reiterated the fact that wasting is not as big problem as stunting and children follow a stunted trajectory established early in life. As our study shows that weight for height i.e. wasting is less compared to other nutritional parameters which is related to the recent hypothesis 'small but healthy' and is yet to receive any sort of scientific support.[19]

The WHO multicentric study (Indian component of study sample from well of families in South Delhi) on growth reference found no evidence of Indian children being genetically shorter than other

children,[5] whereas; our study comprises of slum children where factors like intergenerational nutritional influence, environmental factors have an impact on the anthropometric parameters of children. This may be due to improper weaning and recurrent infections commonly seen in this age group. Thus appropriate feeding and weaning process has to be introduced in the population by appropriate parental health education to improve the nutritional status of under five children as has been proved in various studies conducted across the world.[20,21] This period is the critical window of opportunity to prevent under nutrition from before pregnancy to the first two years of life. Therefore, the first 1000 days comprising the prenatal period and the first two years of life are crucial to make a lifelong lasting difference by breaking the intergenerational cycle of under nutrition. Once these 1000 days are over this 'window of opportunity' closes for life.[22]

Prevalence of underweight and stunting was significantly more in children belonging to separated families as compared with children belonging to nuclear families as they may not be fed properly.

Limiting the family size to 2 can be considered as an important intervention to improve the nutritional status of children as children with higher birth order are more likely to be malnourished which is comparable to another study carried out in slums of Pune.[23]

Mother's education

As the education of mother increases- all three anthropometric parameters of their children were found to be improving, but the statistical association could not be proved in this study, similar findings were seen in studies carried out in Ludhiana and Kerala.[14,18] However mother's education remains an important factor influencing child's nutritional status as seen in various other studies conducted across the country.[24-27]

Recommendations

The families from the community should be encouraged for home based activities to improve the nutritional status of children.

Future nutrition monitoring

Severely malnourished children should be surveyed on regular basis and home visits should be given.

Parents of the malnourished children should be counselled for nutritious diet, importance of family planning and personal hygiene by the experts at the time of home visits.

A qualitative study in the form of in-depth interview and focused group discussion among parents of malnourished children should be carried out to study the causes of malnutrition in details and to find out the various measures to correct malnutrition.

LIMITATIONS

The causes of malnutrition could not be assessed in this study as this was a rapid survey to find out the prevalence of different forms of malnutrition. Association of malnutrition with only few socio-demographic factors were studied.

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