International Journal of Research in Medical Sciences
Ghane VR et al. Int J Res Med Sci. 2017 Jul;5(7):3190-3196
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20173011

Original Research Article

Nutritional status of underfive children of Mumbai suburban region

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Received: 09 May 2017
Accepted: 05 June 2017

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ABSTRACT

Background: Children below five years of age are an at-risk population due to their susceptibility to malnutrition. They contribute significantly for malnutrition related morbidity and mortality, especially in India. Malnutrition in under-five children belonging to middle or low-income group urban or suburban population is more severe and compounded compared to its rural counterparts. The objective of the study was to assess the nutritional status of under-five urban children. To study correlation of determinants like birth weight, exclusive breastfeeding, immunization status, maternal education and socioeconomic status with nutritional status of under five children.
Methods: The prospective cross-sectional study included 315 under-five children attending paediatric outpatient department of upcoming new tertiary care hospital in Mumbai. Anthropometric assessment for underweight, wasting and stunting was calculated based on age, weight and height measurements.
Results: As per WHO classification, moderate underweight (W/A) was present in 74 (23.49%) and severe underweight in 38 (18.71%). Wasting (W/H) in the form of moderate acute malnutrition (MAM) was noted in 64 (20.32%) and severe acute malnutrition (SAM) in 42 (13.33%). Height for age revealed moderate stunting in 37 (11.75%) and severe stunting in 5 (1.59%). The sociodemographic determinants birth weight, exclusive breastfeeding, immunization status, maternal education and socioeconomic status had statistically significant association with malnutrition.
Conclusions: Malnutrition is common between age of 12 to 24 months. Underweight was the commonest type of malnutrition followed by wasting and stunting. None of the patient was overweight. Quality antenatal care to reduce incidence of low birth weight, exclusive breast feeding, and appropriate weaning, complete, immunization, improvement in maternal education and socioeconomic status can reduce the incidence of malnutrition.

Keywords: Nutritional status, Stunting, Sociodemographic determinants, Underweight, Under five, Wasting

INTRODUCTION

Nutritional status of under-five children is a serious concern worldwide especially in developing countries due to its persistence as significant public health problem. Nutritional status of under-five children is an index of quality of health care, growth and development of a country. Recent research has convincingly depicted that nearly two third of childhood mortality is associated with malnutrition. UNICEF has reported that 53% of Indian children are malnourished.[1-3]

Rapid urbanization, migration of people in urban area, colonization in urban areas with compromised living conditions and lower income predisposes to adverse health outcomes. Hence, malnutrition in under-five children now is no longer a problem restricted to rural area.[4] The nutritional status of poor urban children is worst among the urban groups and even poorer than the rural average child. Malnutrition in urban poor children is

aggravated due to nutritional factors like lack of or inadequate nutritious diet, superadded with significant contributory factors like compromised living conditions, poor hygiene and sanitation secondary to low income and overcrowding.[3,5]

Assessment of growth and nutritional status of children with help of anthropometric parameters is a widely recognized and accepted. Weight for age (W/A), height for age (H/A), and weight for height (W/H) are the indices by WHO to assess the nutritional status of children.[6,7] The present study was conducted with an aim to assess the nutritional status and its correlation with sociodemographic determinants of children aged 1 to 5 years of age residing in Mumbai suburban area.

METHODS

This prospective cross-sectional study enrolled 315 under-five children who attended medical services in paediatric outpatient department of an upcoming tertiary care hospital in Mumbai. The study was conducted from March 2014 to October 2015.

Children of age 1 to 5 years were included after obtaining an informed consent from the parents. Children suffering from chronic illnesses like congenital heart disease, haemolytic anaemia, nephrotic syndrome, cerebral palsy, children on steroid therapy were not included in the study. Proforma included demographic details like name, age, sex, address, chief complaints, past medical/surgical illness, birth history, immunization, dietary history, maternal education and socioeconomic details relevant to modified Kuppuswamy's scale. Child was weighed with minimal clothing on a digital weighing scale and reading to the nearest 0.01kg. Recumbent length for children less than 24 months was measured by infantometer. Height for children more than 24 months of age was measured against a non-stretchable measuring tape fixed vertically to a wall, with the participant standing on a firm level surface with head in Frankfurt plane, calf touching the wall and reading rounded to nearest 0.5 centimeter.

Malnutrition was based on WHO classification according to Z score, weight- for- height (W/H) (wasting), height- for- age (H/A) (stunting) and for weight- for- age (W/A) (underweight) was used. A Z score <-2 was Acute malnutrition(wasting)/underweight/Stunting, Z score between <-2 >= -3 Z score was Moderate wasting (MAM)/ Underweight/Stunting and Z score <-3 was Severe wasting (SAM)/ underweight/ stunting.

The qualitative data collected was noted in Microsoft excel sheet. The data was analysed and results are presented in frequency and percentage table. Association among the study parameters was assessed with Chi square and Pearson Chi square test (Fisher exact test for 2*2 tables). P value of less than 0.05 was taken as significant level. The complete statistical analysis was performed by SPSS version 15 for windows.

RESULTS

Three hundred and fifteen children of underfive age group enrolled for the study, 166 (52.70%) were of 12 to 24 months, 61 (19.37%) of 25 to 36 months and 88 (27.94%) of 37 to 60 months. It included 194 (61.59%) males and 121 (38.41%) females; sex ratio was 1.6:1 (Table 1 and Table 2).

Table 1: Age wise distribution of cases.

Age (Months)	Frequency	Percent (%)
12 to 24	166	52.70
25 to 36	61	19.37
37 to 60	88	27.94
Total	315	100.00

Table 2: Gender wise distribution of cases.

Sex	Frequency	Percent (%)
Male	194	61.59
Female	121	38.41
Total	315	100.00

Birthweight

Out of 315 children, 241 (76.51%) had birth weight >2.5 kg and 74 (23.49%) had low birth weight (LBW ie <2.5 kg). (Table 3) Of 241normal birth weight, 176 (73%) had normal W/H, 39 (16.2%) had MAM, 26 (10.8%) had SAM. Two hundred twenty (91.3%) had normal H/A, 19 (7.9%) had moderate stunting, 2 (0.8%) had severe stunting. One hundred and seventy-seven (73.4%) had normal W/A, 45 (18.7%) were moderate underweight and 19 (7.9%) were of severe underweight.

Table 3: Distribution of cases as per the determinants.

Determinants	Parameter	Frequency	(%)
Birthweight n= 315	Normal	241	76.51
	LBW	74	23.49
Immunisation status n = 315	Immunised	210	66.67
	Partially immunised	100	31.75
	Un-immunised	5	1.59
Exclusive breast feeding n = 315	No	188	59.68
	Yes	127	40.32
Maternal education n = 315	Above secondary	80	25.40
	Secondary	84	26.67
	Primary	103	32.70
	Illiterate	48	15.24
Socioeconomic status N = 315	Upper middle	86	27.30
	Lower middle	143	45.40
	Upper lower	85	26.98
	Lower	1	0.32

From 74 LBW 33 (44.6%) had normal W/H, 25 (33.8%) had MAM, 16 (21.6%) had SAM, 53 (71.6%) had normal

W/H, 18 (24.3%) had moderate stunting, 3 (4.1%) had severe stunting, 26 (35.1%) had normal W/A 29 (39.2%) had moderate underweight, 19 (25.7%) had severe underweight. The association of birthweight with wasting, stunting and underweight individually is statistically significant with p value 0.000.

Underweight and wasting was common, followed by stunting in both normal and low birth weight (Table 4).

Exclusive breast feeding

Among 315, only 127 (40.32%) were exclusively breast fed and 188 (59.68%) were not (Table 3).

From exclusively breastfed 127 (40.32%), 100 (78.7%) had normal W/H, 17 (13.4%) had MAM and 10 (7.9%) had SAM. H/A was normal in 119 (93.7%), 8 (6.3%) had moderate stunting and none (0%) had severe stunting. W/A was normal in 105 (82.7%). 14 (11%) had moderate underweight and 8 (6.3%) had severe underweight.

Table 4: Distribution of cases as per type of malnutrition in correlation with the determinants.

Determ inant		W/H (wasting)			H/A (stunting)			W/A (underweight)		
		Normal W/H	**mod**	**sev**	**Normal H/A**	**mod**	**sev**	**Normal W/A**	**mod**	**sev**
Birth weight n=315	Normal 241 (76.51%)	176 (73%)	39 (16.2%)	26 (10.8%)	220 (91.3%)	19 (7.9%)	02 (0.8%)	177 (73.4%)	45 (18.7%)	19 (7.9%)
	LBW 74(23.49%)	33 (44.6%)	25 (33.8%)	16 (21.6%)	53 (71.6%)	18 (24.3%)	3 (4.1%)	26 (35.1%)	29 (39.2%)	19 (25.7%)
		P value = 0.000			P value = 0.000			P value = 0.000		
Exclusive breast feeding n=315	Yes 127 (40.32%)	100 (78.7%)	17 (13.4%)	10 (7.9%)	119 (93.7%)	8 (6.3%)	0 ()%)	105 (82.7%)	14 (11%)	8 (6.3%)
	No 188 (59.68%)	109 (58%)	47 (25%)	32 (17%)	154 (81.9%)	29 (15.4%)	5 (2.7%)	98 (52.1%)	60 (31.9%)	30 (16 %)
		P value = 0.001			P value = 0.007			P value = 0.000		
Immunis ation n=315	Imm 210 (66.67%)	162 (77.1%)	34 (16.2%)	14 (6.7%)	193 (91.9%)	13 (6.2%)	4 (1.9%)	162 (77.1%)	35 (16.7%)	13 (6.2%)
	Partial Imm 100 (31.75%)	46 (46%)	29 (29%)	25 (25%)	77 (77%)	22 (22%)	1 (1%)	40 (40%)	37 (37%)	23 (23%)
	Unimm 5 (1.59%)	1 (20%)	1 (20%)	3 (60%)	3 (60%)	2 (40%	0 (0%)	1 (20%)	2 (40%)	2 (40%)
		P value = 0.000			P value = 0.000			P value = 0.000		
Maternal education n=315	Above Secon dary 80(25.40%)	79 (98.8%)	1 (1.3%)	0 (0%)	77 (96.3%)	1 (1.3%)	2 (2.5%)	75 (93%)	5 (6.3%)	0 (0%)
	Secon dary 84(26.67%)	78 (92.9%)	5 (6%)	1 (1.2%)	78 (92.9%)	5 (6%)	1 (1.2%)	69 (82.1%)	12 (14.3%)	3 (3.6%)
	Primary 103 (32.70%)	49 (47.6%)	38 (36.9%)	16 (15.5%)	86 (83.5%)	17 (16.5%)	0 (0%)	52 (50.5%)	36 (35%)	15 (14.6%)
	Illiterate 48 (15.24%)	3 (6.3%)	20 (41.7%)	25 (52.1%)	32 (66.7%)	14 (29.2%)	2 (4.2%)	7 (14.6%)	21 (43.8%)	20 (41.7%)
		P value = 0.000			P value = 0.000			P value = 0,000		
SES n=315	Upper middle 86 (27.30%)	70 (81.4%)	9 (10.5%)	7 (8.1%)	83 (96.5%)	3 (3.5%)	0 (0%)	72 (83.7%)	9 (10.5%)	5 (5.8%)
	Lower mid 143 (45.50%)	100 (69.9%)	27 (31.8%)	16 (11.2%)	125 (87.4%)	15 (10.5%)	3 (2.1%)	96 (67.1%)	31 (21.7%)	16 (11.2%)
	Upper lower 85(26.98%)	39 (45.9%)	27 (31.8%)	19 (22.4%)	64 (75.3%)	19 (22.4%)	2 (2.4%)	35 (41.2%)	33 (38.8%)	17 (20%)
	Lower 1(0.32%)	0 (0%)	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)
		P value = 0.000			P value = 0.007			P value = 0.000		

Of 188 not exclusively breastfed, 109 (58%) had normal W/H, 47 (25%) had MAM and 32 (17%) had SAM. H/A was normal in 154 (81.9%), 29 (15.4%) had moderate stunting and 5 (2.7%) had severe stunting, 98 (52.1%) had normal W/A, 60 (31.9%) had moderate underweight and 30 (16%) had severe underweight.

The association of exclusively breast feed with wasting stunting and underweight was statistically significant with p value of 0.001, 0.007 and 0.000 respectively.

Wasting was common followed by underweight and stunting both exclusively breastfed and non-exclusively breastfed children (Table 4).

Immunization

Out of 315 children, 210 (66.67%) were completely immunized, 100 (31.75%) partially immunized and 5 (1.59%) were unimmunized (Table 3).

Among 210 immunized children, 162 (77.1%) had normal W/H, 34 (16.2%) had MAM and 14 (6.7%) had SAM. Normal H/A was seen in 93 (91.9%), 13 (6.2%) had moderate stunting and 4 (1.9%) had severe stunting, Normal W/A was seen in 162 (77.1%), 35 (16.7%) were moderate underweight and 13 (6.2%) were severe underweight.

Out of partially immunized 100 children, 46 (46%) had normal W/H 29 (29%) had MAM and 25 (25%) had SAM. Seventy-seven (77%) had normal H/A, 22 (22%) had moderate stunting and 1 (1%) had severe stunting, forty (40%) had normal W/A, 37 (37%) had moderate underweight and 23 (23%) had severe underweight.

Out of 5 unimmunized children 1 (20%) had normal W/H, 1 (20%) had MAM and 3 (60%) had SAM, three (60%) had normal H/A, 2 (40%) had moderate stunting and zero (0%) had severe stunting. One (20%) had normal W/A, 1 (20%) had moderate underweight and 2 (40%) had severe underweight.

The correlation of immunization status with wasting stunting and underweight individually was significant with p value 0.000. Underweight was common followed by wasting and stunting in both completely and partially/unimmunized children (Table 4).

Maternal education

Out of 315 children, mothers of 80 (25.40%) children were educated above secondary education, 84 (26.67%) up to secondary education, 103 (32.70%) to primary education and 48 (15.24%) were illiterate (Table 3).

Among children of 80 mothers with above secondary education, 79 (98.8%) had normal W/H, 1 (1.3%) had MAM while none had SAM. Seventy-seven (96.3%) children had normal H/A, 1 (1.3%) had moderate stunting and 2 (2.5%) had severe stunting. Seventy-five 75 (93.0%) children had normal W/A, and 5 (6.3%) had moderate underweight while zero had severe underweight.

Among children of 84 mothers with up to secondary education 78 (92.9%) normal W/H, 5 (6%) had MAM and 1 (1.2%) had SAM. Seventy-eight (92.9%) children had normal, H/A, 5 (6%) had moderate stunting and 1 (1.2%) had severe stunting. Sixty-nine (82.1%) children had normal W/A, 12 (14.3%) had moderate underweight and 3 (3.6%) had severe underweight.

Among children of 103 mothers with primary education 49 (47.6%) had normal W/H, 38 (36.9%) were MAM and 16 (15.5%) were SAM. Eighty-six (83.5%) children had normal H/A, 17 (16.5%) had moderate stunting and 0(0%) had severe stunting. Fifty-two (50.5%) had normal W/A, 36 (35%) had moderate underweight, 15 (14.6%) had severe underweight.

Among children of 48 illiterate mothers, only 3 (6.3%) had normal W/H, 20 (41.7%) had MAM and 25 (52.1%) had SAM, thirty-two (6.3%) had normal H/A, 14 (41.7%) had moderate stunting and 2 (4.2%) had severe stunting. Seven (14.6%) had normal W/A, 21 (43.8%) had moderate underweight and 20 (41.7%) had severe underweight.

The association of maternal level of education with wasting stunting and underweight is statistically significant with p value of 0.000 for each. Underweight was common followed by wasting and stunting among children of illiterate mothers who are illiterate and upto primary educated (Table 4).

Socioeconomic status

In the present study, 86 (27.30%) children belonged to upper middle class**,** 143 (45.40%) to lower middle class**,** 85 (26.98%) to upper lower class**,** and 1 (0.32%) child to lower class (Table 3).

Among 86 children of upper middle class, 70(81.4%) had normal W/H, 9 (10.5%) had MAM and 7 (8.1%) had SAM. Eighty-three (96.5%) had normal H/A, 3 (3.5%) had moderate stunting and none had severe stunting. Seventy-two (83.7%) had normal W/A, 9 (10.5%) had moderate underweight and 5 (5.8%) had severe underweight.

Among 143 children of lower middle class, 100(69.9%) had normal W/H, 27 (18.9%) had MAM and 16 (11.2%) had SAM. Normal H/A was seen in 125(87.4%) children, 15 (10.5%) had moderate stunting and 3 (2.1%) had severe stunting. Ninety-six (67.1%) had normal W/A, 31 (21.7%) had moderate underweight and 16 (11.2%) had severe underweight.

Among 85 children of upper lower class, 39 (45.9%) had normal W/H, 27 (31.8%) had MAM and 19 (22.4%) had SAM. Sixty-four (75.3%) had normal H/A, 19 (22.4%) had moderate stunting and 2 (2.4%) had severe stunting. Thirty-five (41.2%) had normal W/A, 33 (38.8%) had moderate underweight and 17 (20%) had severe underweight.

Among lower class out of 1 (100%) had MAM. Among lower class, 1 (100%) was normal. Among lower class out of 1, 1 (100%) had moderate underweight.

The association of SES with wasting, stunting and underweight is statistically significant with P value of 0.000, 0.007 and 0.000 respectively. Underweight was common followed by wasting and stunting. All the three types of malnutrition were more common in upper lower class of patients (Table 4).

DISCUSSION

This study was conducted in an upcoming tertiary care hospital in suburban area of Mumbai. The study assessed the nutritional status of urban children aged 1 to 5 years as per WHO growth standards. The association of nutritional status with sociodemographic factors like birth weight, exclusive breast feeding, immunization, maternal education and socioeconomic status was analyzed.

Total of 315 children were enrolled, 166 (52.70%) were of 12 to 24 months, 61 (19.37%) of 25 to 36 months, 88 (27.94%) of 37 to 60 months. Similar observations are reported by Mittal et al, Megha et al, Narkhade et al.[8-10] National Family Health Survey data highlights the critical period when growth faltering occurs to be six months to 2 years (Table 1).[3]

In this study, 194 (61.59%) were males and 121 (38.41%) were females with sex ratio estimated of 1.6:1. This gender wise distribution correlates with the studies by Bhawana et al, Goel et al, Megha et al, Mittal et al, Narkhade et al, Sengupta et al and Poonam et al.[8-14] On the contrary Badami et al, Avisek et al and Bhatia et al noted higher female preponderance (Table 2).[15-17]

Birth weight wise distribution showed 241 (76.51%) of normal birth weight (>2.5kgs) and 74 (23.49%) children of low birth weight. Wasting followed by stunting, and underweight were more among those born low birth weight. The correlation of birth weight with wasting, stunting, and underweight had significant statistical correlation with p value of 0.000, 0.000, and 0.000 respectively. Sengupta et al, found that all the three indices of malnutrition were higher in those with LBW, and the differences were statistically significant for underweight (p=0.024).[13] Rayhan and Khan et al, by bi-variate and multivariate analysis indicated size of the baby at birth as an important risk factor for all these three indices of malnutrition.[18] Poonam et al found that 18 (85.71%) low birth weight children were found to be malnourished and showed significant statistical association (p<0.05).[14] Megha et al, Saiprasad et al, also reported significant statistical association of low birth weight with malnutrition (p<0.01) (Table 3 and Table 4).[9,19]

In the present study, 127 (40.32%) were exclusively breastfed and 188 (59.68%) children were not. Wasting and underweight followed by stunting were found to be more common among those who were lacking exclusive breast feeding. The correlation of exclusive breast-feeding practices with wasting, stunting, and underweight had significant statistical correlation with p value of 0.001, 0.007, and 0.000 respectively. Bhawana et al, found that 53.27% of the children were malnourished who have not received exclusive breast feeding and late introduction of foods in to complementary feeding diet.[11] Poonam et al, found that the prevalence of malnutrition was 26 (81.25%) in children not exclusively breastfed (p<0.05).[17] Sengupta et al, Saiprasad et al and Biswas et al, also reported significant statistical association of lack exclusive breast feeding with malnutrition (p<0.05). (Table 3 and Table 4).[13,19,20]

In the present study, 210 (66.67%) children were completely immunized, 100 (31.75%) were partially immunized and 5 (1.59%) were unimmunized. Underweight followed by wasting, stunting was found to be more common among those who were partially immunized and unimmunized. The correlation of immunization with wasting, stunting, and underweight had significant statistical correlation with p value of 0.000, 0.000, and 0.000 respectively. Poonam et al, found that 32 (76.19%) nonimmunized children had malnutrition and had statistically significant association (p<0.05).[14] Saiprasad et al, found that out of 116 children who were suffering from malnutrition, only 43 (37.1%) of the children were completely immunized for their age, 63 (54.3%) were partially immunized for their age and 10 (8.6%) not immunized at all and concluded that immunization has definite protective role against malnutrition.[19] Similar associations were also reported by Semba et al, Sengupta et al and Biswas et al.[13,20,21] However, Kavitha Baranawal et al, Megha et al found no statistical significant association between nutritional status and immunization (Table 3 and Table 4).[9,22]

In the present study, mothers of 80 (25.40%) children had above secondary education, 84 (26.67%) had up to secondary education, 103 (32.70%) had primary education and 48 (15.24%) were illiterate. Wasting, stunting and underweight were found to be more common among mothers who were illiterate and educated up to primary level. The correlation of maternal education with wasting, stunting, and underweight had significant statistical correlation with p value of 0.000, 0.000, and 0.000 respectively. Poonam et al found that prevalence of malnutrition was 56 (77.78%) in children having their mothers literacy below S.S.C with a statistically significant association (p value<0.001).[14] Sengupta et al,

found that 46.3 per cent children of illiterate mothers had wasting and 77.8 per cent had stunting.[13] Mittal et al, found that the education of mother significantly influenced the nutritional status of under-fives as the prevalence of undernutrition was 60.9% where mother was illiterate and it was only 21.2% where education level was more than high school.[8] Bhawana et al, found that 154 (39.28%) children of PEM belong to illiterate mothers and has got statistically significant influence on mothers education.[11] However Harishankar et al, Srivastava et al, observed no statistically significant association between mothers literacy and malnutrition (p>0.01) (Table 3 and Table 4).[23,24]

In the present study, as per Kuppuswamy classification 86 (27.30%) children were of upper middle socioeconomic class**,** 143 (45.40%) were of lower middle socioeconomic class**,** 85 (26.98%) were of upper lower socioeconomic class**,** and 1 (0.32%) child belonged to lower socioeconomic class., underweight, wasting and stunting were found to be more common among those belonging to upper lower class. The correlation of socioeconomic class with wasting, stunting, and underweight had significant statistical correlation with p value of 0.000, 0.007, and 0.000 respectively. Bhawana et al, found that majority of the children suffering from PEM 88 (22.44%) belong to social class IV which was statistically significant.[11] Damorramon et al, found that majority of families (42.89%) belonged to socio-economic class IV, followed by socio-economic class-III (28.44%) and Class V (17.43%).[25] Saiprasad et al, found that 93 (80.2%) children had malnutrition belonging to lower socioeconomic class (class IV, V).[19] Poonam et al, Algur et al, Biswas et al, also reported higher percentage of children belonging to lower socio-economic classes with a statistically significant association with malnutrition (Table 3 and Table 4).[14,20,26]

ACKNOWLEDGEMENTS

Authors would like to thank Dr. Mrs. Meenakshi Mathur, Dean ESIPGIMSR and ESIC Model Hospital Andheri, Mumbai for granting permission to publish this manuscript.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Ghane VR, Kumar R. Nutritional status of underfive children of Mumbai suburban region. Int J Res Med Sci 2017;5:3190-6.