# **Research Article**

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# Assessment of prevalence of protein energy malnutrition in under 5 year children in an urban slum of Mumbai, India and to study associated factors

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#### **ABSTRACT**

**Background:** In urban slums, several socio-demographic factors contribute for the occurrence of protein energy malnutrition (PEM) in under-five year children, this study aims at Assessment of prevalence of protein energy malnutrition in under-5 year children in an urban slum of Mumbai and to study associated factors.

**Methods:** A cross-sectional study was conducted in Urban Slum which is a field practice area of institution. Under-5 children were included in the study and information was gathered by interviewing mother/guardian and recording anthropometric measurement of the child. Data was analysed with SPSS v.16 with suitable tests.

**Result:** Prevalence of PEM was found 56%, more per cent of PEM was found in 13-24 month age 64 (66.7%), 120 (54.1%) boys, 122 (55%) non-nuclear family dwellers, in 126 (56.8%) children whose mothers got married<18 years age. About 116 (52.3%) children of illiterate mothers, 158(71.2%) children of birth order >2, 198(89.2%) children who were not given colostrum and 168 (75.7%) who were not given exclusive breast feeding, in 152(68.5%) children with incomplete immunisation, 122 (55%) children with more than 3 episodes of ARI, 142(64%) with >3 episodes of Diarrhoea. 86 (82.7%) children with PEM belonged to Class V, (B.G Prasad classification), statistically significant association of PEM was found with the factors age of child, mother's education, birth order, immunisation status, mother's age at marriage, exclusive breast feeding, history of acute respiratory infection (ARI) and diarrhoea, and socio-economic status.

**Conclusion:** Study has found certain socio-demographic factors like age, gender and birth order of child, type of family, age of mother during marriage and her literacy level, giving colostrum, exclusive breast feeding, immunisation and frequency of ARI and diarrhoea associated with PEM.

Keywords: Protein energy malnutrition, Under-5 year children, Urban slum, Mumbai

### INTRODUCTION

Each type of malnutrition is the result of a complex interplay of factors involving such diverse elements as household access to food, maternal and child-care, safe water and sanitation and access to basic health services. Children, who fail to get enough medical attention or receive only fragmented care, grow up shattered, both in body and mind. These children are to become our next generation. We will be left with a legacy of damaged

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adults with chronic ill health and whose will power and education has been stunted in all respects. Over the last decade, a great deal of attention has been paid to malnutrition in the tribal areas of Maharashtra. Attention of the media and planners have been focused almost exclusively on rural and tribal malnutrition. However, malnutrition among urban children, particularly the economically vulnerable slum population, has been almost entirely neglected. As far as urban slums are concerned, problems other than nutrition have got the larger share of attention from policy makers. Problems of urban slums are generally evaluated from the point of view of the non-slum urban population, which sees slums as a 'problem' to be solved rather than as an integral and necessary part of the urban environment. For households that cannot afford the nutritionally sufficient minimum consumption bundle, malnutrition will occur irrespective of their ethnic or spatial location. Malnourishment is very likely to occur when insufficient incomes co-exist with poor coverage of basic amenities and health services. Even if the extent of urban malnutrition is somewhat lower than its rural incidence, the absolute numbers could be very high. This alone would make it important to study the extent of malnutrition in urban slums. Children under five year of age are most vulnerable and high risk group, who need special health services. Around 12-15% of world population is in this age group. 25-30% of mortality in developing countries occurs in this age group.<sup>2</sup> UNICEF, WHO and the World Bank released an updated joint dataset on child malnutrition indicators (stunting, wasting, severe wasting, overweight and underweight) and new global and regional estimates for 2013 with 95% confidence intervals in September 2014 through an interactive dashboard, Globally, 99 million under-five year olds were underweight.<sup>3,4</sup> In 2013, two thirds of malnourished lived in Asia and about one third in Africa. Almost half of children under five years of age (48 per cent) are stunted and 43 per cent are underweight, under-nutrition peaks at age 20 months. Wasting generally decreases throughout the age range. Even during the first six months of life, when most babies are breastfed, 20-30 per cent of children are undernourished. It is notable that at age 18-23 months, when many children are being weaned from breast milk, 30 per cent of children are severely stunted and one-fifth are severely underweight.5

The NFHS-3, 2005–06 (IIPS and Macro International 2008) reports an improvement in all the three nutrition indicators for Maharashtra for the period following 1998–99 (NFHS-2) with a significant reduction in the proportion of underweight children. Some of the observations of malnutrition reported include: higher prevalence of malnutrition in rural areas and their counterpart in urban areas(that is an urban slum) for all the malnutrition characteristics; higher prevalence amongst slum children in urban areas (especially the stunting and underweight attributes); gender disadvantage for female children with respect to the underweight attribute; and children belonging to the SC, ST and the

lowest wealth category reporting stunting and being underweight in higher proportions. SAM, which is the most extreme form of acute under-nutrition, is reported to afflict 5.2 per cent of children in Maharashtra. The percentage of children suffering from SAM is slightly higher in rural areas, in slums, amongst the SC and in the population belonging to the second lowest wealth index category. Therefore a detailed study of different etiological factors affecting the health of preschool children in its milieu, i.e. in the community where they belong, becomes a necessity.

Various etiological factors such as poverty, unhygienic environments, dietetic habits, customs and beliefs are well known to cause nutritional deficient states, morbidity and mortality. These factors vary from place to place and contribution made by each, ultimately sums up to affect the overall health status of preschool children in a country. Illness is frequently a consequence of malnutrition and malnutrition is also commonly the result of illness. This present study is an attempt to understand the health and nutritional profile of preschool children in a selected community by assessing their dietary pattern and nutritional intake and also influence of various etioecological factors on their health.

## **METHODS**

The study was conducted at Shivaji Nagar urban slum which is the field practice area of Department of Community Medicine of parent medical college, situated in M East ward of Municipal Corporation of Greater Mumbai. It consist of mainly migrant population from different parts of India; Uttar Pradesh, Bihar, Tamil Nadu. Residents are engaged in small scale industrial jobs like Zari work, bag making, mat weaving, tailoring etc. Most of the men are self-employed and females house wives, maid servants or vegetable vendors. The present community based descriptive cross-sectional study was conducted from January 2013 to November 2014 in the Health post area having population of 84,783 within the slum. Sample size is calculated considering the underweight status of children between 0-5 year age. According to NFHS-3 - underweight population in underfive age group is a composite index of chronic and acute malnutrition and basic indicator of status of population's health. Under-weight population in under five age group is 48% (NFHS-3) and the sample size is calculated using the formula;  $\mathbf{n} = 4pq/L^{2}$ ; Where  $\mathbf{n} = \text{sample size}$ ,  $\mathbf{p} =$ prevalence of underweight= 48%, q=(100-p)=52; **L**=admissible error (10% of  $\mathbf{p}$ ) = 4.8. After putting values in the formula  $\mathbf{n} = 434$ .

Now, as the study area comprises of 50 plots and each plot consist of nearly 180 households. Extending the sample size to 450, we will select 9 households by simple random sampling technique (table of random numbers) from each plot, as soon as the target of 9 samples from 1 plot is accomplished, other plot will be targeted.

Data was collected using preformed questionnaire, which includes general information, anthropometry and sociodemographic factors. Voluntary consent form was prepared in English, Hindi and Marathi and consent was taken from parents or family head. The age of child was confirmed either by parents or as per birth certificate. An anthropometric measurement like weight, was recorded with minimum clothes, using weighing machine, the height was recorded by the non-stretchable measuring tape. Head circumference and chest circumference was measured using a narrow, flexible and non-stretchable tape. Mid upper arm circumference was measured to the nearest millimetre at exact midpoint of the left arm using flexible and non-stretchable tape. The indices of nutritional status like weight for age, height for age and weight for height was compared with the WHO growth charts for particular age and sex. Three commonly used under nutrition indicators namely stunting, underweight and wasting were used to evaluate the growth status of children. The data obtained was compiled and entered in Microsoft-excel 2007 and analysed by using SPSS (16.0) software for appropriate statistical tests, 95% confidence level was used for the study and p≤0.05 was considered significant.

### **RESULTS**

Prevalence of protein energy malnutrition (stunting and wasting) as per present study is 56%

Table 1 shows the association of age group of children with PEM, maximum percentage of malnutrition was found in 13-24 month age group 64(66.7%), followed by 25-36 month age group showing PEM in 70(66%), minimum malnutrition was in 40(43%) children of 49-60 month age group, and the difference was found statistically significant.

Table 1: Association of age group with PEM.

Age group	PE	Total		
months) No. (%)	Present	Absent		
00-12	30 (44.1%)	38 (55.9%)	68 (100.00%)	
13-24	64 (66.7%)	33 (34.0%)	97 (100.00%)	
25-36	70 (66.0%)	35 (33.3%)	105 (100%)	
37-48	48 (55.2%)	39 (44.8%)	87 (100.00%)	
49-60	40 (43.0%)	53 (57.0%)	93 (100.00%)	
Total	252 (56%)	198 (44.0%)	450 (100.00%)	

\*Rows pooled and chi square test applied. Chi-square value: 19.05 and 'p' value: <0.001.

Table 2 shows the association of socio-economic status with PEM, maximum malnutrition 86 (82.7%) was found in Class V, which is statistically significant, followed by 128 (55.9%) of Class IV, and minimum malnutrition was found in 2 (13.3%) children Class I (B. G Prasad classification).

Table 2: Association of socioeconomic status with PEM.

Socioeconomic	PEM		Total	
status scale	Present	Absent		
Class I (%)	2 (13.3%)	13 (86.7%)	15 (100.00%)	
Class II (%)	18 (54.5%)	15 (45.5%)	33 (100.00%)	
Class III (%)	18 (26.1%)	51 (73.9%)	69 (100.00%)	
Class IV (%)	128 (55.9%)	101 (44.1%)	229 (100.00%)	
Class V (%)	86 (82.7%)	18 (17.3%)	104 (100.00%)	
Total (%)	252 (56%)	198 (44%)	450 (100%)	

\*Rows pooled and Chi-square test applied. X<sup>2</sup>=66.24. 'P' value <0.001

Table 3 shows association of various socio-demographic factors with PEM, study detected more malnutrition among boys than in girls i.e. 120 (54.1%) boys were found malnourished , while among girls it was in 102 (45.9%), but the study was not able to find a statistically significant difference (p=0.079), 122 (55%) children living in non-nuclear families that is joint family or extended family had malnutrition while 100 (45%) children belonging to nuclear family malnutrition, but there was no significant difference (p=0.39), 126 (56.8%) children were malnourished whose mothers got married before the age of 18 years, while only 96 (43.2%) children showed malnutrition whose mothers got married at or after 18 year age, and there was statistically significant difference (p value=0.001), 116 (52.3%) children of illiterate mothers while 106 (47.7%) children of literate mothers showed malnutrition, and it is statistically significant (p=0.004). Only 64 (28.8%) children of birth order less than or equal to 2 suffered from malnutrition while 158 (71.2%) children of birth order >2 had malnutrition, p<0.001, that is statistically significant. 198 (89.2%) children were found malnourished who had not taken colostrum, while only 24 (10.8%) children were found malnourished who received colostrum, but the study failed to find statistically significant association(p=0.68). 168 (75.7%) of children who were not given exclusive breast feeding were found malnourished ,while only 54 (24.3%) of children were malnourished who received exclusive breast feeding, and the association was also found statistically significant with p=0.007.152(68.5%) children who were incompletely or not immunised found malnourished, while only 70 (31.5%) children with complete or up to date immunisation were malnourished, it is statistically significant (p=0.003), (immunization coverage was: 75% children were fully immunized, 22.3% were partially immunized and 2.7% were unimmunized)<sup>17</sup>, 122 (55%) children with more than 3 episodes of ARI were malnourished while 100(45%) children with<3 ARI episodes were malnourished. malnutrition was detected in 142 (64%) of children with >3 episodes of Diarrhoea, while only 80 (36%) were found malnourished who had<3 episodes of diarrhoea, association of malnutrition and both ARI and Diarrhoea was found statistically significant with p<0.001.

Table 3: Association of socio-demographic factors with PEM.

Particulars		PEM Yes (%)	No (%)	OR (Confidence interval)	P value
Sex of child	Female	102(45.9)	102(44.7)		0.79
	Male	120(54.1)	126(55.3)	1.05(0.72-1.52)	
Type of family	Non-nuclear	122(55)	116(50.9)	1 10/0 01 1 71)	0.38
	Nuclear	100(45)	112(49.1)	1.18(0.81-1.71)	
Age of mother at	≥18	96(43.2)	64(28.1)	1.05(1.22.2.0)	< 0.001
marriage	<18	126(56.8)	164(71.9)	1.95(1.32-2.9)	
Mothers education	Illiterate	116(52.3)	88(38.6)	1.74(1.19-2.53)	0.004
	literate	106(47.7)	140(61.4)	1.74(1.19-2.33)	
Birth order	≤2	64(28.8)	32(14)	2.48(1.55-3.98)	< 0.001
	>2	158(71.2)	196(86)	2.48(1.33-3.98)	
Colostrum	Yes	24(10.8)	22(9.6)	1.13(0.62-2.09)	0.68
	No	198(89.2)	206(90.4)	1.13(0.02-2.09)	
Exclusive	Yes	54(24.3)	82(36)	0.57(0.38-0.86)	0.007
breastfeeding	No	168(75.7)	146(64)	0.37(0.38-0.80)	
Immunization status	Incomplete	152(68.5)	184(80.7)	0.52(0.34-0.80)	0.003
	Complete	70(31.5)	44(19.3)	0.32(0.34-0.60)	
ARI episodes in past	>3	122(55)	166(72.8)	0.46(0.31-0.68)	<0.001
one year	≤3	100(45)	62(27.2)	0.40(0.31-0.08)	
Diarrhoea episodes in	>3	142(64)	186(81.6)	0.40(0.26-0.62)	<0.001
past 1 year	≤3	80(36)	42(18.4)	0.40(0.20-0.02)	

## **DISCUSSION**

Prevalence of protein energy malnutrition (stunting and wasting) as per present study is 56%, according to NFHS-3, almost half of children under five years of age (48 percent) are stunted and 43 percent are underweight.<sup>5</sup>

## Association of age with PEM

Shows, PEM was more common in 13-24 month age group 64(66.7%), compared to 3-5 years age group, and the association between age and PEM was statistically significant (p=0.001). Rao S et al carried out a longitudinal study to investigate changes in nutritional status and morbidity over time among pre-school slum children. They studied 845 children in the age group of 0-5 years from three slums in Pune, Maharashtra for a period of 2 years. Peak prevalence of malnutrition was observed around 18 months. <sup>9</sup> Critical age at which undernutrition starts is around 6 months and growth flattering is at peak in second year of life. Up to 6 months, the babies thrive well on breast milk which is adequate for normal growth and development, thereafter the baby needs supplementary feeds in addition to breastfeeding. Most mothers delay the weaning in young children and secondly the quantities of foods given are quite inadequate for normal growth and development.

#### Association of socio-economic status with PEM

Shows, PEM was more common in children with socioeconomic status Class V, 86 (82.7%) followed by 128 (55.9%), 18 (54.5%), 18 (26.1%) and 2 (13.3%) in Class IV, Class II, Class III and Class I respectively. The association between lower socioeconomic status and PEM was statistically significant (p=<0.001). Similar findings were found in a study done by Dwivedi SN et al conducted a cross-sectional study in Bhopal slum children. An inverse correlation was observed between socioeconomic status and the prevalence of malnutrition (p<0.05). Avachat SS et al. conducted a study in six villages of rural Maharashtra in the year 2009. Majority of children from the socioeconomic status IV (58.03%) and V (64.84%) were malnourished ( $\chi^2$  =39.2, d.f=4, p<0.01 highly significant).

## Association of socio-demographic factors with PEM

Study finds slightly lower PEM in females, 102 (45.9%) of females were malnourished, compared to 120 (54.1%) of males, but the difference was not statistically significant. Usually prevalence of severe malnutrition is much more in young girls compared to young boys below 5 years of age. This is due to differential child rearing practices observed including feeding and health care seeking behaviour, PEM was more common in three generation families, Joint family and extended families

and it was found in 122 (55%) and among 100 (45%) children belonging to Nuclear family, the difference was not found statistically significant (p=0.38). Similar results were found in a study conducted by Patel KA, Langare SD, Naik JD and Rajderkar SS about nutritional status among under-five children in western Maharashtra, India; type of family (P<0.05) was found to be significantly associated with malnutrition. <sup>12</sup>

PEM was more common in children whose mother's age of marriage was less than 18 years 126 (56.8%) compared to mothers age of marriage, 18 years and above 96 (43.2%). The association between mother's marriage at less than 18 years and PEM was statistically significant. (P=0.001) Similar findings were found in study conducted by Anita Raj in 2005-06, which showed malnutrition was more common in children, whose mothers were married before the age of 18 years. 13 Also PEM was more common in illiterate mothers 116 (52.3%) of illiterate mothers) compared to literate mothers 106 (47.7%) of literate mothers, and the difference was statistically significant (p=0.004). Similar findings were found in studies conducted by Chakraborty S et al in children (0-6 year) in rural population of Jhansi district in the state of Uttar Pradesh found significant difference (2=12.53, p<0.05) between the per cent of malnutrition in children of mother who are illiterate or having primary education in comparison to those of having education up to middle school and / or above. 14

The prevalence of malnutrition was significantly higher among those children whose fathers were illiterate (p<0.05). Ray SK, Deysarkari RP et al conducted a study to determine the extent of malnutrition among young children in an urban slum community in India in 1986. 64.71% of the undernourished and 51.35% of the nourished had illiterate parents. Association with birth order was found as PEM was more common in birth order three or more 158 (71.2%) followed by birth order two, and one 64 (28.8%). The association between higher birth order and malnutrition was statistically significant (p<0.001).

Association of PEM and certain social rearing practices colostrum, exclusive breastfeeding, giving immunisation was found as 198 (89.2%) children were found malnourished who had not taken colostrum, while only 24 (10.8%) of children were found malnourished who received colostrum, but the difference was not found statistically significant (p=0.68), 168 (75.7%) of children who were not given exclusive breast feeding were found malnourished, while only 54 (24.3%) of children were malnourished who received exclusive breast feeding, and difference was statistically significant (p=0.007) which is less, when compared with the NFHS data(53% of children in Maharashtra are Exclusively breastfed. 15 This may be due to the variation in the social and cultural practices in that area, and PEM was more common in partially unimmunised children 152 (68.5%), compared to completely immunized children 70 (31.5%). The association between children who were not completely immunized and PEM was statistically significant (p=0.003). Similar findings were found in studies conducted by Ray SK a significantly higher (p<0.05) prevalence of malnourished children were observed amongst partially immunized and non-immunized children (81.25% and 88.23% respectively) in comparison to fully immunized children (62.07%). Severe degree of malnutrition was also significantly higher (p<0.05) among partially immunized and non-immunized children (12.5% and 11.76% respectively) in comparison to the fully immunized children (6.89%). <sup>16</sup>

Association of h/o Respiratory tract infection and diarrhoea with PEM can be described as- 122 (55%) children with more than 3 episodes of ARI were malnourished while 100 (45%) children with <3 ARI episodes were malnourished. malnutrition was detected in 142 (64%) of children with>3 episodes of Diarrhoea, while only 80(36%) were found malnourished who had <3 episodes of diarrhoea, and in both cases the difference was statistically significant (p<0.001). Similar findings were found in studies conducted by, Dwivedi S.N, Banerjee N, Yadav OP conducted a cross-sectional study in Bhopal slum children. The prevalence of malnutrition was significantly (p<0.05) higher among the children with a history of infection (81.8%) and worm infestation (77.0%) in comparison to those without history of infection (13.1%) and worm infestation (61.9%), respectively. 10 Bhatia V, Puri S et al. conducted a community-based cross- sectional study found that there is a statistically significant relationship between acute ailments (diarrhoea, ARI) with malnutrition was observed where 73.08% children were suffering from malnutrition in comparison with 42.08% children when no acute ailment had occurred (p<0.001). Unclean food, utensils and dirty hands, unsafe water and unsafe excreta disposal leads to infections and most common being diarrhoea and worm infestation. Repeated attacks of diarrhoea and acute respiratory infections lower the nutritional status. Continuing feeding during illness and more diet during convalescence period is essential for catch up growth. Adequate eating during illness reduces the severity of illness and gives energy to the body. NFHS 3, number of children with diarrhoea and acute respiratory infection in the two weeks before survey were 8% and 5% respectively.15

Recommendations of the study are interns, social workers, and other staff can be trained to perform street play son nutrition and importance of exclusive breast feeding. Trained UHC staff should take periodic sessions on the consequences of under-nutrition, and simultaneously mothers can be to taught, how to use locally available traditional food items which are more nutritious, cheaper, and easily available, through lectures at Angan wadis, and mothers can be taught about the importance of Exclusive Breast feeding, hygiene, immunisation, periodic deworming, and how to take care of minor illness of childhood at home, about the

importance of family planning. Adequate quantity and frequency of meals is recommended to be known to each mother, and she should be capable of generating interest in the baby by coupling feeding with story or rhyme reciting and using attractive feeding cups, and usage of different coloured vegetables and fruits.

### **CONCLUSION**

Still a higher prevalence of protein energy malnutrition is observed in urban slums of Mumbai, worse during the weaning age of the child and low socioeconomic status, and is significantly affected by age of mother at marriage, mother's education, birth order of child, child rearing practices like giving colostrum, exclusive breast feeding, immunisation status of child, and history of ARI and Diarrhoea during past one year, and with the improvement in these socio-demographic factors, improvement in the nutritional state of the child is expected.

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