

Original Research Article

Prevalence and correlates of undernutrition in children of 6-60 months of the age living in urban slums of Mumbai, India: a cross-sectional study

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ABSTRACT

Background: In urban slums, several socio-demographic factors contribute for the occurrence of undernutrition in children, this study aimed at assessment of prevalence and correlates of undernutrition in children of 6-60 months of the age 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. Children of 6-60 months of the age were included in the study. Data was analysed with SPSS v.22.0 with suitable tests.

Results: Prevalence of undernutrition was found 50.6%, more per cent of undernutrition was found in 25-60 months age 100 (54.1%), 90 (53.3%) girls, 132 (51%) nuclear family dwellers, in 9 (56.3.3%) and 39 (50.0%) children defecation practices in anywhere and open within compound. About 75 (72.1%) children whose mother not practiced hand washing before eating/handling food, 90 (63.8%) children whose mother not practiced hand washing with soap and water after defecation, 20 (80.0%) children whose mother's hands appeared were unclean and 106 (94.6%) children who intake of daily energy requirement were inadequate, 139 (72.4%) children who intake of daily protein requirement were inadequate. 88 (71.5%) children with undernutrition belonged to class IV, (B. G. Prasad classification) and it was statistically significant association of undernutrition.

Conclusions: Mumbai's urban slums continue showing a higher prevalence of undernutrition, and is significantly influenced by inadequate intake of daily requirement of protein, unclean water, poor sanitation and hygiene, and with the improvement in these socio-demographic factors, enhancement in the nutritional state of the child is expected.

Keywords: Children of 6-60 months of the age, Mumbai, Undernutrition, Urban slum

INTRODUCTION

Health is the basic requirement of any society to develop and progress. Growth and development of any country is reflected by growth and development of its children. Health of children is most important for nation's future development.¹

It is now being recognized that the great majority of malnourished children (other than those born with low birth weight) become malnourished within from 6 months to 2 years of age. There is evidence from all over India suggests that growth curve of many infants begin to falter

as early as the four months of life. This coincides with the time when foods other than breast milk are generally introduced into the diet.²

Malnutrition at the early stages of life can lower child resistance to the infections, increase child morbidity and mortality. It also decreases mental development and cognitive achievement, and nutritional status is the best global indicator as well as being in the children. Malnutrition is largest single underlying cause of death worldwide and is associated with over one third of childhood deaths.^{3,4}

The WHO cites malnutrition as the gravest single threat to world's public health.⁵ In children malnutrition is synonymous with growth failure.⁶ Globally, malnutrition has been responsible, directly or indirectly for 60% of 10.9 million deaths annually among under-5 children. Well over two thirds of these deaths, which are often associated with inappropriate feeding practices, occur during the first year of life. Malnourished children who survive are more frequently sick and suffer the life-long consequences of impaired development.

Malnutrition is major public health problem throughout the world, mainly in southern Asia and sub-Saharan Africa. Malnutrition is more common in India than in sub-Saharan Africa. One in every three malnourished children in the World, lives in India. The prevalence of child malnutrition in India is highest in the World, nearly double that of sub-Saharan Africa. Each year approximately 2.3 million deaths amongst 6-60 months aged children in developing countries are associated with malnutrition and which is about 41% of total deaths in above age group.^{7,8}

Malnutrition among urban children particularly the economically vulnerable slum population, has been almost completely neglected. The problems of urban slums are generally evaluated from point of view of non-slum urban population, which see slums as a "problem" to be solved rather than as an integral and necessary part of urban population. Even if the extent of urban malnutrition is somewhat lower than its rural incidence, the absolute numbers could be very high because they fall prey to different communicable diseases like waterborne diseases, respiratory infections, that can spread easily due to high population density, poor hygiene, illiteracy and poor socioeconomic status in these areas.⁹

The NFHS-IV, 2015-16 reports show an improvement in all 3 nutritional indicators for Maharashtra for the period following 2005-06 (NFHS-III) with significant reduction in 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 slums). SAM is most extreme form of acute under nutrition, is reported to afflict 9.4% of children in Maharashtra. The percentage of children suffering from SAM is slightly higher in rural area, in slums and amongst SC/ST and in the population belonging to second lowest wealth index category.^{10,11}

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. That's why 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.¹²

Environmental factors, infectious diseases, inadequate diet and the poverty appear to be far more important than genetic predisposition as socioeconomic determinants of childhood malnutrition. No more than 35.0% of infants worldwide are exclusively breastfed during the first four months of life and complementary feeding frequently begins too early or too late, and foods are often nutritionally inadequate and unsafe. Malnourished children who survive are more frequently ill and suffer the life-long consequences of impaired development.¹³

The nutritional status of under-five children in urban slums is very important because this is a vulnerable group which may fall prey to different communicable diseases that can spread easily due to high population density, poor hygiene, illiteracy and poor socioeconomic status in slum areas. Multiple and interrelated determinants are responsible for under nutrition.¹⁴

Various studies which have been done in India, have shown that respiratory and gastrointestinal tract infections are the leading cause of morbidity in children. These infectious diseases are affected by several factors such as birth weight, gestational age, socio-economic status, ethnicity, immunization status, nutritional status of infants, number of siblings, day care attendance and parental smoking. Breastfeeding has been suggested as a modifiable influencing factor, given exclusively, breastfeeding reduces the risk of infectious diseases in infants in developing countries.¹⁵

Maternal and child health indicators among slum population show that their health is two to three times worse than people living in better areas. Children of the urban poor suffer accentuated vulnerability to illnesses as outbreaks of vaccine-preventable diseases are more common in urban slums owing to high population density and continuous influx of infective agents with immigrating population.¹⁶ Undernutrition among children depends on complex interactions of various factors like: socio-demographic, environmental, reproductive, institutional, cultural, political and regional factors.¹⁷

METHODS

Study design and type

It was an observational descriptive cross-sectional study

Study period

This study took place from October 2018 to November 2019 in the health post area having population of 84,783 within the slum.

Study area

It was conducted at urban slum of Mumbai has total population around 1,37,000 which is the field practice area of department of community medicine of parent

medical college. It consists 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 are housewives, maid servants or vegetable vendors.

Sample size

Total population of under-five children in above area was around 6800. Taking a prevalence of 36% underweight (as stated by NFHS 4) children, a sample size (n) was derived by using the formula:

$$n = \frac{Z^2 pq / e^2 * N}{Z^2 pq / e^2 + (N - 1)}$$

where, N=6800 p = prevalence =36% q =100-P =64% e = sampling error =5%. After putting values in the formula, n=350.

Sampling method

Simple random sampling has been used for the study. Simple random table has been used for selection of sample population.

Inclusion criteria

All the children in the age group of 6-60 months. Children living in above mentioned locality.

Exclusion criteria

Children having any congenital deformities or genetic disorders. Children born prematurely. Children whose parent does not want to participate in the study.

Data collection

Data was collected using preformed questionnaire, which includes general information, anthropometry and socio-demographic factors. Voluntary consent form was prepared in English, Hindi and Marathi and consent was taken from parents or care takers. 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 millimeter 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 age and sex. Three commonly used under nutrition indicators namely stunting, underweight and

wasting were used to evaluate the growth status of children.

Statistical analysis

The data obtained was compiled and entered in Microsoft-excel 2013 and analysed by using SPSS (22.0) software for appropriate statistical tests, 95% confidence level was used for the study and $p \leq 0.05$ was considered significant.

RESULTS

Prevalence of undernutrition as per present study was 50.6%.

Table 1: Association of age group with nutritional status.

Age group (months)	Nutritional status N (%)		Total
	Normal	Under nourished	
6-12	37 (64.9)	20 (35.1)	57 (100.0)
13-24	51 (47.2)	57 (52.8)	108 (100.0)
25-60	85 (45.9)	100 (54.1)	185 (100.0)
Total	173 (49.4)	177 (50.6)	350 (100.0)

*Rows pooled and chi square test applied. Chi-square value: 6.57 and 'p' value: <0.001.

Table 1 shows the association of age group of children with nutritional status maximum percentage of undernourished was found in 25-60-month age group 100 (54.1%), followed by 13-24-month age group showing undernourished in 57 (52.8%), minimum undernourished was in 20 (35.1%) children of 6-12-month age group, and the difference was found statistically significant.

Table 2: Association of socioeconomic status with nutritional status.

Socio economic status scale	Nutritional status N (%)		Total
	Normal	Under nourished	
Class II	51 (62.2)	31 (37.8)	82 (100.0)
Class III	87 (60.0)	58 (40.0)	145 (100.0)
Class IV	35 (28.5)	88 (71.5)	123 (100.0)
Total	173 (49.4)	177 (50.6)	350 (100.0)

*Rows pooled and chi square test applied. Chi-square value: 33.47 and 'p' value: <0.001.

Table 2 shows the association of socio-economic status with nutritional status, maximum undernourished 88 (71.5%) was found in class IV, which is statistically significant, followed by 58 (40%) of class III, and minimum undernourished n was found in 31 (37.8%) children class II (B. G. Prasad classification).

Table 3 shows association of various socio-demographic factors with nutritional status, study detected more

undernourished among girls than boys in i.e. 90 (53.3%) boys were found undernourished, while among boys it

was in 87 (48.1%), but the study was not able to find a statistically significant difference ($p=0.33$).

Table 3: Association of socio-demographic factors with nutritional status.

Particulars	Nutritional status N (%)		P value
	Normal	Undernourished	
Sex of child	Female	79 (46.7)	0.33
	Male	94 (51.9)	
Type of family	Non-nuclear	46 (50.5)	0.804
	Nuclear	127 (49.0)	
Defecation practices in home	Latrine	135 (52.7)	0.031
	Open within compound	39 (50.0)	
	Anywhere	7 (43.8)	
Hand washing by mother before eating/handling food	Yes	144 (58.5)	<0.001
	No	29 (27.9)	
Hand washing by mother after defecation	Clean and covered	122 (58.4)	<0.001
	Unclean and uncovered	51 (36.2)	
Appearance of the mother's hands	Clean	168 (51.7)	0.02
	Unclean	5 (20.0)	
Child- hands and nails	Clean and cut	144 (56.3)	<0.001
	Unclean and uncut	29 (30.9)	
Intake of daily energy requirement	Adequate	167 (70.2)	<0.001
	Inadequate	6 (5.4)	
Intake of daily protein requirement	Adequate	120 (75.9)	<0.001
	Inadequate	53 (27.6)	

45 (49.5%) children living in non-nuclear families that is joint family or extended family had undernourished while 132 (51.0%) children belonging to nuclear family showed undernourished, but there was no significant difference ($p=0.804$),

9 (56.3.3%) and 39 (50.0%) children were undernourished who defecation practices in anywhere and open within compound, while 141 (47.3%) children showed undernourished whose defecation practices in latrine, and there was statistically significant difference (p value =0.031).

75 (72.1%) children whose mother not practiced hand washing before eating/handling food while 102 (41.5%) children whose mother practiced hand washing before eating/handling food showed undernourished, and it was statistically significant ($p<0.001$).

Only 87 (41.6%) children whose mother practiced hand washing with soap and water after defecation suffered from undernourished while 90 (63.8%) children whose mother not practiced hand washing with soap and water after defecation, $p<0.001$, that was statistically significant.

20 (80.0%) children were found undernourished whose mother's hands was unclean, while only 157 (48.3%) children were found undernourished whose mother's hands was clean, it was statistically significant association ($p=0.02$).

65 (69.1%) of children whose hands and nails were unclean and uncut were found undernourished, while only 112 (43.8%) of children were undernourished whose hands and nails were clean and cut, and the association was found statistically significant with $p<0.001$.

106 (94.6%) children whose intake of daily energy requirement were inadequate, while only 71 (29.8%) children whose intake of daily energy requirement were adequate were undernourished, it was statistically significant ($p<0.001$),

139 (72.4%) children whose intake of daily protein requirement were inadequate, while only 38 (24.1%) children whose intake of daily protein requirement were adequate were undernourished, it was statistically significant ($p<0.001$).

DISCUSSION

Prevalence of protein energy malnutrition (stunting and wasting) as per present study was 56%, according to NFHS-4, children under five years of age (38 percent) were stunted and 36 percent were underweight.

Association of age with nutritional status

In the present study it was found that 108 out of 350 children were in the age group 13-24 months, in which 57 (52.8%) were undernourished and 185 out of 350 children were in the age group of 25-60 months, in which 100 (54.1%) were stunted. Statistically significant relation

was found between age of the child and nutritional status. Similar findings was noted in the study which was conducted by Tiwari et al that means as age of child increases, the undernourishment of the children tends to increase., their study showed the association of age group of children with PEM, maximum percentage of malnutrition was found in 13-24 months age group 64 (66.7%), followed by 25-36 months age group showing PEM in 70 (66%), minimum malnutrition was in 40 (43%) children of 49-60 months age group, and the difference was found statistically significant.¹²

Critical age at which under-nutrition starts is around 6 months and growth flattening 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 undernutrition

In the present study found that, according to modified B. G. Prasad socio-economic scale, out of total 350 children, 145 children belonged to class III, in which 58 (40%) and 123 children belonged to class IV, in which 88 (71.5%) were undernourished. It was statistically significant. That means children belonged to lower socio-economic class are more undernourished as compared to children belonged to upper socio-economic status. Similar results were found in Tiwari et al, the association of socio-economic status with PEM, maximum malnutrition 86 (82.7%) was found in class V, which was statistically significant, followed by 128 (55.9%) of class IV (B. G. Prasad classification).¹² Nale et al study found that poor the social class of family more the chances of child being malnourished. Out of 22 children from class IV socioeconomic class 19 (86.36%) were detected malnourished compared to 4 (33.33%) of class I. Significant association was seen between nutritional status and socioeconomic status of the family.¹³

Association of socio-demographic factors with undernutrition

Study finds slightly undernutrition in males, 87 (48.1%) were malnourished, compared to 90 (53.3%) of females, but the difference was not statistically significant. Demissie et al, in their study child sex showed a significant association with wasting, stunting and underweight in this study. All three forms of malnutrition (wasting, stunting and underweight) were more prevalent among boys than girls, which is incongruent with present study.¹⁸

In the present study found that 259 children, in total 350, belonged to nuclear family. Out of total 259 children, 132

(51%) were undernourished. 91 children belonged to joint family, in total 350 children and out of total 91, 45 (49.5%) were undernourished. Statistically significant relation was not found between type of family and nutritional status of children. Sengupta et al, the type of family, nuclear or joint, was also observed not to significantly affect child nutrition (p value- 0.665).¹⁹

Undernutrition was more in children whose defecation practices in anywhere and open within compound, 9 (56.3.3%) and 39 (50.0%) respectively compared to defecation practices in latrine 141 (47.3%). The association between defecation practices and undernutrition was statistically significant (p=0.031). Similar findings were found in study conducted by Singh et al, the difference in prevalence of underweight in relation to housing and environmental sanitation was found to be statistically significant (p<0.001) as maximum children were underweight (81.4%) who were living in poor housing and environmental sanitation conditions.²⁰

Undernutrition was more common in children whose mother not practiced hand washing before eating/handling food 75 (72.1%) compared to mothers who practiced hand washing before eating/handling food 102 (41.5%), and the difference was statistically significant (p<0.001). Similar findings were found in studies conducted by Nale et al, found that children belonging to families with good sanitary practices had less percentage of malnutrition compared to children with poor sanitary practices. Good sanitary practices reduce incidence of diarrhoea which results in good nutritional status of child.¹³

Association with hand washing with soap & water after defecation was found as undernourished was more common in children's mother practiced 90 (63.8%) followed by children's mother not practiced 87 (41.6%), it was statistically significant (p<0.001). Similar findings were reported by Bantamen et al, in this study there was statistically significant association between hand washing of mother after defecation and nutritional status of children (p value- 0.002), which is similar to the present study. Hand washing of the caregiver is critically important to break link between food intake and development of infection. Caregiver need to wash their hands before feeding baby and after using of toilet or disposing of child feces.²¹

In total 209, 87 (41.6%) were undernourished. 141 out of 350 children were using drinking water facility from unclean and uncovered storage facility, in which 90 (63.8%) were undernourished. Statistically significant relation was found between drinking water storage and nutritional status of children. That means children using drinking water from unclean and uncovered storage were more undernourished. Bantamen et al, in this study there was statistically significant association between source of drinking water and nutritional status of children (p value-

0.047), which is similar to the present study. The study revealed that use of unprotected source of drinking water increased the risk of malnutrition three-fold and above than protected water source.²¹

Out of total 325 children, 157 (48.3%) were undernourished. Appearance of mother's hands of 25 children were not clean, in total 350 children and out of total 25, 20 (80%) were undernourished. Statistically significant relation was found between appearance of mother's hands and nutritional status of children. That means children, whose mother's hands were clean in appearance had less undernourished as compare to children, whose mothers had unclean hands. Nale et al, found that children belonging to families with good sanitary practices had less percentage of malnutrition compared to children with poor sanitary practices. Good sanitary practices reduce incidence of diarrhoea which results in good nutritional status of child (p value <0.001).¹³

In total 256, 112 (43.8%) were undernourished. 94 out of 350 children were having unclean hands and nails uncut, in which 65 (69.1%) were undernourished. Statistically significant relation was found between hygiene of child and their nutritional status. That means children had unclean hands and nails uncut, were more undernourished as compared to children had clean hands and nails cut. Naik et al, the incidence of diarrheal episodes among 57 infants with untrimmed fingernails (0.93/infant/year) was found to be significantly more than those infants with trimmed finger nails (0.65/infant/year) (p=0.028). It suggested that there is strong association between hygiene of children and their nutritional status.¹⁵

Association of undernutrition and children's dietary intake like daily energy requirement, daily protein requirement was found as 106 (94.6%) children were found undernourished who had taken inadequate daily energy requirement, while only 71 (29.8%) of children were found undernourished who taken adequate daily energy requirement, it was found statistically significant (p<0.001), Goel et al, this study showed that less than 16% of undernourished children were not consuming not more than 90% of the recommended calorie intake and intake of calorie decreases significantly as the nutritional status of children deteriorates (p value <0.001). 139 (72.4%) of children who were not taking inadequate daily protein requirement were found malnourished, while only 38 (24.1%) of children were malnourished who took adequate daily protein requirement, and the difference was statistically significant (p<0.001).²² Kapur et al, in this study showed that inadequate food/nutrient intake is a major contributory factor of malnutrition has been identified. Analysis for difference in dietary intake among those who were undernourished/stunted and those normal revealed low intake for most nutrients in the undernourished/stunted group with significant differences in the energy intake (p-0.035).²³

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.

Recommendations of the study are primary health workers, social workers, and other staff members in the public health system can be trained to perform street play on nutrition and importance of exclusive breast feeding. Trained urban primary health centre workers should take periodic visits and sessions on the consequences of under-nutrition, and simultaneously mothers and care takers can be taught, how to use locally available traditional food items which are more nutritious, cheaper, and easily available, through lectures by primary health workers in the community, and mothers and care takers can be taught about the importance of exclusive breast feeding, hygiene, immunisation, periodic deworming, hygienic practices like hand washing techniques, and how to take care of minor illness of childhood at home, health seeking behaviour, the importance of family planning. Access to clean water and proper sanitation reduces the spread of waterborne diseases. Hygiene practices, such as handwashing, promote the disease prevention and malnutrition. Adequate quantity and frequency of meals is recommended to be known to each mother and caretaker, 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

Mumbai's urban slums continue showing a higher prevalence of undernutrition, worse during the weaning age of the child and low socioeconomic status, and is significantly influenced by inadequate intake of daily requirement of protein, unclean water, poor sanitation and hygiene, and with the improvement in these socio-demographic factors, enhancement in the nutritional state of the child is expected.

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