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Research Article

MALNUTRITION AND COMORBIDITY PATTERN AMONG UNDER FIVE CHILDREN IN URBAN SLUMS OF BERHAMPUR: A CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: To access the nutritional status and associated comorbidities among under five children in the urban slums of Berhampur.
Nutritional status of under five children is a matter of concern worldwide and malnutrition is one of the most important public health problems. The children of urban slums carry relatively more risk due to their epidemiological profile, exposure to infectious agents and lifestyle-related risk factors, and culture-based health beliefs.

Methods: A cross-sectional community-based study was carried out among 385 children between 6 and 59 months of age residing in the urban slum areas of Berhampur Odisha. Out of total 174 slums, 20% (35) were selected randomly and from each of these 35 slums, 11 children were selected. The assessment of the nutritional status of the child was done using the World Health Organization, weight for age (WFA), weight for height (WFH), height for age (HFA), and MUAC and general physical examination.

Results: In our study, the prevalence of underweight (low WFA), stunting (low HFA), and wasting (low WFH) was 152 (39.48%), 160 (41.43%), and 144 (37.20%), respectively. No children were observed with overweight or obesity. The prevalence of ARI, diarrhoea, worm infestation, skin diseases, dental problems, ear and eye infections, and injury were 32.98%, 13.77%, 9.61%, 4.67%, 4.41%, 2.86%, and 1.03%, respectively.

Conclusion: It was observed that the prevalence of undernutrition was more than the state average but overnutrition was absent in our study area. Regarding the comorbid conditions, nearly one-third of the children had anemia and RTI, both were significantly associated with malnutrition.

Keywords: Malnutrition, Cross-sectional study, Multistage random sampling, Underweight, Stunting, Wasting, MUAC.

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INTRODUCTION

Malnutrition can be categorized as undernutrition, which includes wasting, stunting and underweight, micronutrient-related malnutrition, and overweight, obesity and diet-related noncommunicable diseases. Every country in the world is affected by one or more forms of malnutrition. According to the World Health Organization (WHO), million <5 year children are wasted, out of which 17 million are severely wasted, 155 million are stunted and 41 million are overweight or obese [1]. Poor nutrition continues to cause nearly half of the deaths in children under five, while low- and middle-income countries now witness a simultaneous rise in childhood overweight and obesity-increasing at a rate 30% faster than in richer nations. In India at present, 37.5% of <5 year children are underweight. Among them moderate to severe wasting is seen in 7.5% and moderate to severe stunting is seen in 38.4%. Malnutrition is more common among rural poor and urban slums of India [2].

In India, 13.12% of the population lies in the tender age bracket of 0–6 years as per the provisional Census 2011 figures [3]. As per the Global Nutrition Report 2018, nearly half of all under-5 child mortality in India is attributable to undernutrition [4]. In the 2019 Global Hunger Index, India ranks 102 out of 119 qualifying countries. With a score of 30.3, India suffers from a level of hunger that is serious [5]. Nearly 47 million or 4 out of 10 children in India are not able to meet their full human potential because of chronic undernutrition or stunting. Malnutrition increases health-care costs, reduces productivity, and slows economic growth, which can perpetuate a cycle of poverty and ill health.

Nearly one-third of the urban population are slum dwellers. The impact of malnutrition on slum-dwelling children causes poor health status and vulnerability to diseases. Feeding practices including breastfeeding and the introduction of timely complementary foods can prevent malnutrition in these children. Addressing the nutritional problems of urban poor children is therefore of paramount importance for overall development [6].

Women in urban slums work outside their homes as unskilled laborers and domestic servants. They are not protected by labor laws regarding maternity or sick leave, hours of work, etc. thus affecting breastfeeding and child-feeding practices. Lack of basic amenities sch as safe drinking water, proper housing, drainage, and waste disposal makes this population vulnerable to infections which further compromise the nutrition of those living in the slums. Their children carry a health risk due to their epidemiological profile, exposure to infectious agents and lifestyle related risk factors, and culture-based health belief.

Odisha is one of the poor states of India where malnutrition is widely prevalent. Urban slum areas are also worst in child health and nutrition due to the large migrant population and unorganized health infrastructures. Berhampur is a southern coastal city with a large slum population. No recent study has been conducted on malnutrition in this age group. Therefore, the study was carried out with the following objectives.

METHODS

Study design and settings

The present study was a community-based cross-sectional study, carried out in the urban slum areas of Berhampur Municipal

Corporation (BeMC), Ganjam for a period of 2 years from October 2019 to October 2021. The children between 6 and 59 months of age residing in the study area were selected as study participants.

Sample size

The sample size was calculated using the statistical formula for sample size determination for cross-sectional study.

The following formula used: $N = Z^2 \times P(1-P)/L^2$

Where N= Sample size, Z= Z statistics for the level of confidence (0.05), P=Prevalence of stunting among children <5 years of age in India 38.4% (NFHS 4) [7], and L= Absolute precision (5%=0.05). The required sample size was found to be 363. Taking into account the non-response rate of 5%, the actual sample size =381. Finally, it was decided to include 385 subjects from 20% of total slums in Berhampur and 11 children from each slum.

Sampling method

Multi-stage simple random sampling technique was adopted. Ganjam district comprises 1 Municipal Corporation (MC) and 17 NACs [8]. Berhampur is the only MC in this district having the highest number of slum population. It has 174 notified slums with a cumulative under-five population of 25,391 distributed over 40 wards across the city [9]. As BeMC has maximum number of slums with the highest slum population in the district, it was purposively selected as a study area.

Information about the number of households and children (6–59 months) residing in each slum of BeMC was obtained with due permission of CDM and PHO, Ganjam district.

Out of total 174 slums, 20% (35) were selected randomly by a random number app generator. Again, from each of these 35 slums, 11 children were selected to meet the required sample size of 385.

Inclusion criteria

The children aged 6–59 months whose parents were residing in the study areas for the last 1 year were selected as the study participants.

Exclusion criteria

1. Children whose parents show unwillingness to participate in the study
2. Children with congenital malformation, mental retardation and critically ill were excluded from the study.

Study instrument

Data were collected with the help of a predesigned and pretested questionnaire. The questionnaire was finalized after conducting a pilot study. Based on the pilot study appropriate changes were made in the initial questionnaire. Data so collected were divided into the following sections:

1. Socio-demographic profile
2. Obstetric history
3. Environmental and sanitation factors
4. Feeding practices and health-care utilization
5. Assessment of the nutritional status of the child and associated comorbidity.

Data collection

After obtaining Ethical consent, selected slum areas were visited for data collection. On an average, 4–5 participants were contacted per visit. The visit was made twice a week over a period of 12 months. During data collection, appropriate Covid protocol was followed. The list of households having children 6–59 months of age were obtained from the survey register of the Anganwadi center. Using a random number generator application, the desired households (11) were obtained. Households were visited and the mother of the child was interviewed. The anthropometric measurements and clinical examinations, both general and systemic examinations were carried out after obtaining consent using the final questionnaire. The mother of the child was interviewed for every selected child. If she was not available, the grandmother was given preference followed by his/her father. If informed consent was not given by the parents, then the subsequent house-having child of aged 6–59 months was approached. If more than one child were found, the youngest child in the family was selected as the study participant.

Table 1: Distribution of study participants according to socio-demographic profile and obstetrics history

Characteristics	Number	Percentage
Age		
6–11 month	91	23.65
12–23 month	84	21.9
24–35 month	76	19.72
36–47 month	69	17.92
48–59 month	65	16.88
Sex		
Male	194	50.39
Female	191	49.61
Caste		
General	151	39.22
OBC	114	29.61
SC	81	21.04
ST	39	10.13
Religion		
Hindu	360	93.5
Muslim	9	2.3
Christian	16	4.2
Type of family		
Nuclear	108	28.05
Joint	241	62.60
3 Generation	36	9.35
Education of mother		
Illiterate	251	65.2
Primary	65	16.9
Highschool	39	10.1
Intermediate/diploma	24	6.2
Graduate/above	6	1.6
Occupation of mother		
Homemaker	345	89.6
Working	40	10.4
SES of the family		
Upper	5	1.3
Upper middle	34	8.8
Middle	70	18.2
Lower middle	117	30.4
Lower	159	41.3
Maternal age at birth		
<20 years	19	4.94
20–40 years	345	89.61
>40 years	21	5.45
Mode of delivery		
Normal	292	75.8
LSCS	93	24.2
Place of delivery		
Home	21	5.45
Institutional	364	94.55
Birth order		
≤2	221	57.4
>2	164	42.6
Birth interval		
<3	276	71.69
≥3	109	28.31
Birth weight		
Normal	283	73.5
LBW	102	26.5
Immunisation status		
Complete	343	89.1
Partial	42	10.9

Data compilation and analysis

The interview schedule was verified for the completeness of the data at the end of each interview. The data were tabulated into Excel and the analysis was done with SPSS version 17 in the Department of Community Medicine, M.K.C.G. Medical College and Hospital, Berhampur. Both descriptive and inferential statistics were used to analyze the data. Results on continuous measurements were presented with mean and standard deviation (SD) and results on categorical measurements were presented in number and percentage. Significance was assessed at 5% significance level.

Statistical analysis

The association of socio-demographic factors, obstetric factors, and comorbidity pattern with nutritional status was analyzed using Pearson Chi-square test.

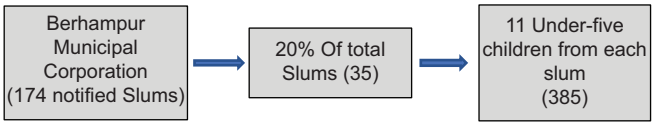

Fig. 1: Schematic diagram of sampling method

Table 2: Distribution of study participants according to nutritional status (WHO ZWA, ZWH, ZHA)

Indices	Normal		Malnutrition	
	Number	Percentage	Number	Percentage
WFA	233	60.52	152	39.48
WFH	241	62.80	144	37.20
HFA	225	58.57	160	41.43

WHO: World Health Organization, WFA: Weight for age, HFA: Height for age, WFH: Weight for height

Table 3: Morbidity profile of under-five children

S. No.	Morbid conditions	No. of children	Percentage
1.	RTI	127	32.98
2.	Anaemia	139	36.10
3.	Diarrhea	53	13.77
4.	Worm infestation	37	9.61
5.	Skin diseases	18	4.67
6.	Dental problems	17	4.41
7.	Ear and eye infection	11	2.86
8.	Injury	4	1.03

Ethical consideration

Ethical approval for the study was obtained from institutional ethics committee. Parents and care givers of the participating children were provided a brief description about the study and informed, voluntary written consent was taken before data collection.

RESULTS

Out of 385 children of aged between 6 months and 5 years, 194 (50.4%) were males and 191 (49.6%) were female and maximum number of children were in 6 to 11 months years of age group. Majority (39.2%) belonged to the general category, 93.5% were Hindus, 62.6% were from nuclear family and 41.3% were from the lower class (41.3%). Most of the mothers were Illiterate (65.2%) and in the age group of 20–40 years. Regarding occupation, it was found that about 89.6% were homemakers.

Most of the babies (73.50%) had normal birth weight. However, 26.50% of children had birth weight below 2500 g. Majority of children (73.50%) belonged to birth order ≤2 and birth interval of <3 (71.69%). About 89.1% of the study population was immunized as per NIS schedule according to their age. However, 10.9% partially immunized. None wereunimmunized. The prevalence of exclusive breastfeeding was found to be 60.8% in our study.

According to the WHO recommended classification, the prevalence of underweight (low weight for age [WFA]), stunting (low height for age), and wasting (low weight for height [WFH]) was 152 (39.48%), 160 (41.43%), and 144 (37.20%), respectively. No children were observed with overweight or obesity in the present study.

In the present study, 51% of study participants showed one or more medical ailments. Among them 36.10% under five children had anemia. Prevalence of ARI, Diarrhoea, worm infestation, Skin diseases, Dental problems, ear and eye infection, and injury was 32.98%, 13.77%, 9.61%, 4.67%, 4.41%, 2.86%, and 1.03%, respectively.

The prevalence of RTI was more among children having stunting and wasting. Similarly, anemia was more prevalent among underweight children and among children having stunting and the association was statistically significant. Eye and ear infection was significantly associated with only stunting.

Undernutrition was significantly associated with age, sex, SES, and LBW. Wasting was significantly associated with age, sex, maternal age, and LBW. Similarly, stunting was significantly associated with sex (female) only.

Table 4: Association of malnutrition with comorbidities

S. No.	Morbid conditions	Malnutrition					
		WFA		WFH		HFA	
		N	Mal	N	Mal	N	Mal
1.	RTI						
	Yes	76 (59.8)	51 (40.2)	60 (47.2)	67 (52.8)	48 (37.8)	79 (62.2)
	No	157 (60.8)	101 (39.2)	181 (70.1)	77 (29.9)	177 (62.1)	81 (37.9)
Chi-square (p-value)		χ^2=0.0363 (p=0.84)		χ^2=19.0805 (p=0.000)		χ^2=33.2619 (p=0.00036)	
2.	Anaemia						
	Yes	69 (49.6)	70 (50.4)	82 (59.0)	57 (41.0)	78 (56.1)	61 (43.9)
	No	164 (66.7)	82 (33.3)	159 (64.6)	87 (35.4)	163 (66.2)	83 (33.8)
Chi-square (p-value)		χ^2=10.776 (p=0.001)		χ^2=1.2072 (p=0.271)		χ^2=3.9043 (p=0.048)	
3.	Diarrhea						
	Yes	34 (64.1)	19 (35.9)	32 (60.4)	21 (39.6)	30 (56.6)	23 (47.4)
	No	199 (59.9)	133 (40.1)	201 (60.5)	131 (39.5)	195 (58.7)	137 (41.3)
Chi-square (p-value)		χ^2=0.3392 (p=0.56)		χ^2=0.0005 (p=0.98)		χ^2=0.0855 (p=0.77)	
4.	Worm infestation						
	Yes	23 (62.1)	14 (37.9)	23 (62.1)	14 (37.9)	21 (56.7)	16 (43.3)
	No	210 (60.3)	138 (39.7)	218 (62.6)	130 (37.4)	204 (58.6)	144 (41.4)
Chi-square (p-value)		χ^2=0.0462 (p=0.82)		χ^2=0.0033 (p=0.95)		χ^2=0.0478 (p=0.82)	

Table 5: Association of nutritional status of children with different variables

Variables	Malnutrition					
	WFA		WFH		HFA	
	N	Mal	N	N	Mal	N
Age (in months) (%)						
6–11	38 (41.8)	53 (58.2)	46 (50.5)	45 (49.5)	50 (54.9)	41 (45.1)
12–23	40 (47.6)	44 (52.4)	41 (48.8)	43 (51.2)	47 (55.9)	37 (44.1)
24–35	59 (77.6)	17 (22.4)	61 (80.3)	15 (19.7)	50 (65.8)	26 (34.2)
36–47	52 (75.4)	17 (24.6)	52 (75.4)	17 (24.6)	40 (58.0)	29 (42.0)
48–59	44 (67.7)	21 (32.3)	41 (63.0)	24 (37.0)	38 (58.5)	27 (41.5)
Chi-square (p-value)	χ^2=36.3323 (p=0.0001)		χ^2=27.4009 (p=0.0001)		χ^2=2.3682 (p=0.66)	
	N n (%)	**Mal n (%)**	**N n (%)**	**Mal n (%)**	**N n (%)**	**Mal n (%)**
Gender						
Male	137 (70.6)	57 (29.4)	136 (70.1)	58 (29.9)	141 (72.7)	53 (27.3)
Female	96 (50.3)	95 (49.7)	105 (55.0)	86 (45.0)	94 (49.2)	97 (50.8)
Chi-square (p-value)	χ^2=16.6922 (p=0.0004)		χ^2=9.4092 (p=0.002)		χ^2=22.2846 (p=0.00001)	
	N n (%)	**Mal n (%)**	**N n (%)**	**Mal n (%)**	**N n (%)**	**Mal n (%)**
SES						
Upper	4 (80.0)	1 (20.0)	3 (60.0)	2 (40.0)	3 (60.0)	2 (40.0)
Upper middle	29 (85.3)	5 (14.7)	26 (76.5)	8 (23.5)	27 (79.4)	7 (20.6)
Middle	45 (66.1)	23 (33.9)	41 (60.3)	27 (39.7)	42 (61.8)	26 (38.2)
Lower Middle	63 (54.3)	53 (45.7)	69 (59.5)	47 (40.5)	65 (56.0)	51 (44.0)
Lower	92 (56.8)	70 (43.2)	108 (66.7)	54 (33.3)	98 (60.5)	64 (39.5)
Chi-square (p-value)	χ^2=13.2536 (p=0.01)		χ^2=4.2664 (p=0.37)		χ^2=6.0853 (p=0.19)	
	N n (%)	**Mal n (%)**	**N n (%)**	**Mal n (%)**	**N n (%)**	**Mal n (%)**
Maternal age						
<20 years	11 (57.9)	8 (42.1)	9 (47.4)	10 (52.6)	9 (47.4)	10 (52.6)
20–40 years	211 (61.1)	134 (38.9)	225 (65.2)	120 (34.8)	207 (60.0)	138 (40.0)
>40 years	11 (52.4)	10 (47.6)	7 (33.4)	14 (66.7)	9 (42.9)	12 (57.1)
Chi-square (p-value)	χ^2=0.6961 (p=0.70)		χ^2=10.5748 (p=0.005)		χ^2=3.4042 (p=0.182)	
	N n (%)	**Mal n (%)**	**N n (%)**	**Mal n (%)**	**N n (%)**	**Mal n (%)**
Birth weight						
Normal	184 (65.0)	99 (35.0)	186 (65.7)	97 (34.6)	172 (60.7)	111 (39.3)
LBW (<2500 g)	49 (48.0)	53 (52.0)	55 (59.8)	47 (40.2)	53 (57.6)	49 (42.4)
Chi-square (p-value)	χ^2=9.0457 (p=0.002)		χ^2=4.4611 (p=0.03)		χ^2=2.3996 (p=0.12)	

DISCUSSION

The present study was conducted among under 5 children in the urban slums of Berhampur. It was observed that the overall prevalence of malnutrition was quite high. More than one-third of the study population were either underweight or stunted or wasted. However, there were no children who were either obese or overweight. Similar results were observed in a study by Rehan *et al*. in Rishikesh where 37.3% of the participants were underweight, 43.3% were stunted and 24.3% were wasted [10]. According to NFHS 5 Odisha, the prevalence of stunting, wasting, underweight and overweight were 31%, 18.1%, 29.7%, and 3.5%, respectively [11]. In the study by Goyal *et al*. 29.2% were underweight, 66.8% were stunted, and only 12.9% were wasted [12].

In our study, the prevalence of underweight, wasting and stunting was higher among females. The study by Sengupta *et al*. revealed females (37%) were more underweight than males (23.1%) which was statistically significant. (p=0.033) [13] but in the study by Kumar *et al*. the prevalence of underweight, stunting, and wasting among males were 30.55%, 42.1% and 15.1% and 32.1%, 42.2% and 13.3% respectively among females. This difference was not statistically significant (p>0.05) [14].

One or more morbidity was observed in more than 50% of the children. Anaemia was the commonest co-morbidity observed followed by RTI and Diarrhea. The other comorbidities were worm infestation, skin diseases, and dental problems. As per NFHS 5 Odisha data, the prevalence of Anaemia was 64.2%, whereas the prevalence of diarrhea and ARI was 9.7% and 3.2% respectively [11]. According to a study by Yamuna *et al*. ARI was the most common comorbidity (40.4%) followed by unspecified fever (6.7%), diarrhea (5.3%), and injury (0.6%) [15].

Both stunting and wasting were significantly associated with RTI. Anaemia was significantly associated with underweight and stunting. This could be because malnutrition can be both a cause of infections due to poor immune status well as anemia and also a consequence of any infection. Eye and ear infections were more in stunted children. Similarly, malnourished children are prone to develop RTI, Recurrent diarrhea, and worm infestation which was statistically significant according to a study by Nayak *et al*. similar to the study by Tiwari *et al*. and Kumar *et al*. (only Diarrhoea and ARI) [14,16,17]. However, the study by Rehan *et al*. revealed that episodes of diarrhea were significantly associated with malnutrition but fever, RTI, and worm infestation were not significantly associated with malnutrition [10].

According to WFA criteria malnutrition was highest among 53 (58.2%) children in 6–11 month age group. As per the WFH index wasting was highest, i.e., 43 (51.2%) among children in 12–23 months of age group. The prevalence of stunting was highest in 6–11 months children. In a study conducted by Tiwari *et al*. found maximum percentage (66.7%) of malnutrition was seen in 13–24-month age group followed by (66%) in 25–36 months and minimum (43%) was in 49–60-month age group. This difference was statistically significant [15]. Shukla *et al*. described in their study, the prevalence of malnutrition was found to be more in the children of 13–24 months of age group than other age groups. This distribution was not statistically significant [18].

There was statistically significant association between undernutrition and socio-demographic characteristics such as age, sex, SES, and birth weight. Wasting was significantly associated with age, sex, maternal age, and LBW. Similarly, stunting was significantly associated with sex. Stunting was more in females. This could be due to chronic deficiency of nutrients related to gender bias which is common even today.

CONCLUSION

Less than half of the children were stunted, more than one-third were stunted and wasted. No child was found to be overweight or obese. It was observed that the prevalence of Undernutrition was more than the state average but overnutrition was absent in our study area. Regarding the co-morbid conditions, nearly one-third of the children had Anemia and RTI, both were significantly associated with malnutrition. Age group 6–11 months and 12–23 months, female gender, lower socioeconomic status, maternal age <20 years and ≥40 years, were found to have adverse effect on the nutritional status of children.

Recommendations

- Awareness and sensitization through the interpersonal communication in UHND sessions, community mobilization by involving influential persons in the locality, and mass media about the importance of exclusive breastfeeding, complementary feeding, hand hygiene, immunization, periodic deworming, birth spacing should be promoted. In this regard, Swasthya kantha can be utilized.
- Vit. A and IFA supplementation and regular deworming should be monitored by checking MCP card. AWW and ASHAs should be encouraged for regular deworming and Vit. A and IFA supplementation in their respective areas.
- With the integration of Baby Friendly Hospital Initiative, early initiation of breastfeeding at the institutional level should be accelerated. Mothers should be encouraged to breastfeed their babies and the doctors and nursing staff should facilitate in this regard.
- Intermittent counseling to the mothers regarding proper feeding practices for their children should be continued throughout the childbearing and rearing period in the form of ante-natal and post-natal visits, interaction during immunization sessions, and mothers meeting held in the AWCs.
- Periodic health check-ups of under-five children through health camps should be promoted where the health problems can be identified early and serious complications can be prevented.
- Special attention should be given regarding appropriate nutrition to babies born with low birth weight so that catch-up growth can be attained.
- Sensitizing mothers about good health practices through workshops, roadshows, documentary films, and other media coverage may improve the overall health of under-fives.

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