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Nutritional Status of Under Five Children and its Associated Factors in Urban Slums of Kathmandu Valley, Nepal

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ABSTRACT

Introduction: Child malnutrition is a major contributor to the global burden of disease, significantly affecting vulnerable children living in substandard environmental conditions of poverty-stricken urban slums. The study aimed to assess the prevalence of nutritional status and identify associated factors in the urban slums of Kathmandu Valley, Nepal.

Methods: A community-based cross-sectional study was conducted in 11 small urban slums of Kathmandu Valley among children aged 6-59 months. Standard anthropometric measurement tools were used to measure the height and weight of children. Structured questionnaires were used to collect data through direct interviews and household visits. A descriptive analysis of variables and a chi-square test was used to find the association.

Results: The prevalence of stunting, wasting, and underweight were 34.9% [95% CI: 25.8-44], 14.2% [95% CI: 7.6-20.8], and 30.2% [95% CI: 21.4-33] respectively. Both being underweight and stunting were found significantly associated with socioeconomic status of the family and ethnicity. Underweight was found significantly associated with the age of child and stunting was found significantly associated with the educational status of the mother and the age of child.

Conclusions: The study found a high prevalence of stunting and underweight in the urban slums of Kathmandu Valley. Socio-economic status, ethnicity, age of the child, and maternal education were found to be associated with malnutrition in children.

Keywords: *Child feeding practices; Child malnutrition; Malnutrition; Nutritional status; Urban slums.*

INTRODUCTION

Child malnutrition significantly contributes to the global disease burden, especially in low-income countries.[1] Various forms of malnutrition, such as underweight, stunting, and wasting, continue to be a cause for concern. Nearly 45% of deaths among children under the age of five are attributed to undernutrition.[2,3] Urban slums face even worse conditions regarding child nutrition compared to rural areas,[4,5] with detrimental environmental factors and inequalities in wealth distribution exacerbating the issue.[6,7]

The urban population is ever-growing along with the proliferation of slums with 1 in 8 people in the world living in slums.[8] This manifestation is evident in Nepal with an estimated 10% of urban population living in slums,[9,10,11] perpetuating urban poverty and vulnerability to children and mothers.[6,9] Urban slums remain underserved and neglected segments with poor child nutritional status,[12] despite the Government of Nepal's prioritized national nutrition program and its commitment to SDGs to end all forms of malnutrition by 2030. Thus, this study aimed to determine the prevalence of under-five malnutrition and its associated factors in the urban slums of Kathmandu valley.

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METHODS:

A community-based cross-sectional study design was done among children under five years of age. The study was conducted in slums of Kathmandu and Lalitpur Metropolitan city identified by Lumati, a non-governmental organization working in the sector of urban poverty, informal settlements and child health. Altogether, 11 slums were studied, 6 from Kathmandu Metropolitan City and 5 from Lalitpur Metropolitan City. Kathmandu and Lalitpur metropolitan city were purposely selected in the Kathmandu valley and all slums as identified by Lumanti Nepal in the selected study area were studied. The sampling frame was drawn in a month prior to data collection with the help of volunteers from cooperatives working for the urban slums in each metropolitan city as recommended by Lumanti. The sampling units proportional to the sample size of each slum were drawn through random sampling from the list provided by Lumanti.

The minimum sample size was 106 based on the formula, $n = z^2pq/d^2$. Where Z is the standard normal variate (1.96) at a 95 % confidence interval, p is prevalence (29%)[12], q is 1-prevalence (71%), and d is the allowable error (0.09). Moreover, 8% non-response rate was added to get the final sample size of 106.

Information regarding socioeconomic, demographic, child-related, and maternal factors were collected from the mother of the child through face-to-face interviews using pretested structured questionnaires through house-to-house visits. The interview usually took 10-15 minutes. In case of unavailability of the mother or child, data were collected on the next visit. The interviews were carried out on the 15 days duration: September 15 to 30, 2018.

The research instruments utilized in the study comprised anthropometric measurement tools and a structured questionnaire. To measure the child's weight, a seca digital weighing scale was employed, while the height and length of the child were assessed using a calibrated wooden board designed for height/length measurements. Similarly, Shakir tape (S0145620 MUAC, Child 11.5 Red/PAC-50) was also used to measure undernutrition through MUAC (Mid-Upper Arm Circumference) measurements. Adopted structured questionnaires on socio-demographic characteristics and infant and young child feeding practices were used.[13,14]

Measurement of socio-economic status

To assess the socio-economic status of households, we employed a modified Kuppuswamy scale, which is commonly used in urban and peri-urban communities and has been adapted to suit the context of Nepal. This scale derives a composite score based on the head of the family's education, occupation, and the monthly income of the household, resulting in a score ranging from 3 to 29.[15] It classifies each household into high, middle, or low socio-economic status. For the purpose of this study, the income ranges were adjusted for the year 2017/18 due to changes in the National Consumer Price Index (NCPI). We obtained the NCPI data for March/April 2018 from the Quarterly Economic Bulletin Mid-April 2018.[16]

NCPI for 1976 = 4.3 (Base year: 2014/15 =100)

NCPI for March/April 2018 = 119.5 (Base year: 2014/15 =100)

The conversion factor between the index of 1976 and 2018 was calculated as: (119.5/4.3= 27.72) and all income groups in the original scale 1976 were multiplied by the conversion factor and again by 1.6 (INR 100 is equivalent to NPR 160) to get appropriate income groups.

Anthropometric measurements

Anthropometric data were collected by recording height and weight measurements. Weight measurements were taken using a seca digital weighing scale, with the child wearing minimal clothing and no footwear, and rounded to the nearest 0.1 kg. In cases where a child refused to be measured, the mother would hold the child and both of their weights would be recorded. The child's actual weight was then determined by subtracting the mother's weight from the combined weight of the two.

For children aged 24 months and older, standing height was measured using a calibrated length/height wooden board without any footwear, and rounded to the nearest 0.1 cm. The child was positioned in an upright manner with their heels, buttocks, shoulders, and the back of their head touching the board's wall. The child's head was held comfortably erect, with the lower border of the eye's orbit aligned horizontally with the external canal of the ear, and their arms hanging loosely by their sides, with palms facing the thighs. The measurement was taken by placing a horizontally held wooden board/scale touching the top of the child's head. For children below 24 months of age (below 85 cm), measurements were obtained in a recumbent position using the same length/height wooden board equipped with a headpiece, and rounded to the nearest 0.1 cm. The child's head touched the headpiece, while the back, back of knees, and heels touched the board, and their hands were relaxed during the measurement process. These height and length measurements were then compared to the WHO child growth standards, specifically the 2006 reference data for the corresponding age and sex, to determine the child's height for age.

Data Management and Analysis

The filled questionnaires were reviewed thoroughly at the end of each day of data collection to ensure the completeness of the data. Data were coded and entered in Epidata v3.1 and exported to SPSS v22 for data cleaning

and analysis. Data cleaning and editing were done before analysis. WHO Anthropometry Software v3.2.2 was used to determine z-scores for anthropometric indicators. Descriptive analysis for the independent variables was done in terms of frequency, percentage, proportion, mean, and standard deviation and the prevalence of outcome variables were also calculated. In this study, the association between variables was examined using the Chi-square test. In cases where the cells had fewer than 5 observations, the Fisher exact test was employed for analysis. P-value less than 0.05 was considered as statistically significant.

Ethical considerations

The respondents were fully explained about the purpose and outcome of the research. Verbal consent and written consent was obtained before the interview. Dignity and respect for all the study participants was adhered to, throughout the data collection process. The approval letter was taken from the Department of Community Medicine and Public Health and ethical approval was obtained from the Institutional Review Committee, Institute of Medicine (Ref no: 176 (6-11-E)^2/075/076. Children who were found moderately and severely malnourished from MUAC measurements, their mothers were given nutritional education on proper diet, and proper child care and informed about the availability of nutritional rehabilitation homes within the valley and also to seek health workers/health centers for child inspection and treatment. Necessary coordination was made between the mothers and volunteers from the co-operatives. Such work was carried out even after data analysis to mothers of children who were found wasted.

RESULTS:

Child nutritional status

Table 1 represents the nutritional status of children from anthropometric measurements. In the study, 30.2% [95% CI: 21.4-39] of under five children were underweight with 18.9% and 11.3% moderately and severely underweight respectively. Similarly, among 34.9% [95% CI: 25.8-44] of stunted children, 16% and 18.9% were moderately and severely stunted respectively. The proportion is lower for wasting. Among 14.2% [95% CI: 7.6-20.8] wasted, 9.4% were moderately wasted and 4.7% were severely wasted.

Table 1. Nutritional status of under five children from anthropometric measurements

Characteristics	Male	Female	Overall
	n (%)	n (%)	n (%) [95% CI]
Underweight (Weight for age)			
Normal	33 (44.6)	41 (55.4)	74 (69.8)
Moderately underweight	11 (55)	9 (45)	20 (18.9) [11.1-26.7]
Severely underweight	9 (75)	3 (25)	12 (11.3) [5.3-17.3]
Stunting (Height for age)			
Normal	31 (44.9)	38 (55.1)	69 (65.1)
Moderately stunted	10 (58.8)	7 (41.2)	17 (16.0) [8.9-26.1]
Severely stunted	12 (60)	8 (40)	20 (18.9) [11.5-26.3]
Wasting (Weight for height)			
Normal	46 (50.5)	45 (49.5)	91 (85.8)
Moderately wasted	5 (50)	5 (50)	10 (9.4) [3.9-14.9]
Severely wasted	2 (40)	3 (40)	5 (4.7) [0.6-8.8]

In the study, the majority of the respondents were Janjati and had attained formal education. Many were housewives, had at least two children and almost half were at the age of 20-24 years at the birth of the index child. With average monthly family income of Rs. 25,678±17,900 and almost half of households owning small businesses, the majority of the households belonged to upper lower (44%) and lower middle income (41%) socio-economic status as shown in Table 2.

Table 2. Socio-demographic characteristics of respondents and children

Characteristics	n (%)
Ethnicity	
Janjati	63 (59.4)
Brahmin and Chhetri	9 (8.5)
Dalit	6 (5.7)
Muslim	5 (4.7)
Madhesi	1 (0.9)
Others	22 (20.8)
Mother's educational status	
Illiterate	16 (15.1)
Literate	11 (10.4)
Basic	37 (34.9)
Secondary	32 (30.2)
Higher Education	10 (9.4)
Age of mother at the birth of index child	
10-14	1 (0.9)
15-19	17 (16.0)
20-24	49 (46.2)
25-29	16 (15.1)
30-34	15 (14.2)
35-39	8 (7.5)
Mean age of mother	**24.36±5.6 years**
Number of children from same mother	
At least two children	88 (83)
Three or more than three children	18 (17)
Household head main occupation	
Runs own small business	44 (41.5)
Private job	27 (25.5)
Foreign Employment	7 (6.6)
Government Job	2 (1.9)
Labor	1 0.9)
Others	25 (23.6)
Occupation of mother of index child	
Housewife	77 (72.6)
Business	16 (15.1)
Employed in informal sectors	13 (12.3)
Mean monthly income of the family	**NRs. 25,679±17,900**
Socio-economic status	
Upper middle	15 (14.2)
Lower middle	43 (40.6)
Upper Lower	47 (44.3)
Lower	1 (0.9)
Sex of child	
Male	53 (50)
Female	53 (50)
Age of child in months	
6-11	9 (8.5)
12-23	28 (26.4)
24-35	30 (28.3)
36-47	23 (21.7)
Mean age of child in months	**Mean±SD = 30.43±14 months**

Table 3 represents infant and young child feeding practices. In regards to dietary feeding practices of complete and non-missing data from respondents, more than half of the children did not meet the minimum dietary diversity. Similarly, nearly 58% of breastfed children and 80% of non-breastfed children did not meet the minimum acceptable diet as shown in Table 2.

Table 3. Infant and young child feeding practices

Characteristics	n (%)
Minimum Dietary Diversity	
Met	17 (47.2)
Not Met	19 (52.6)
Minimum Meal Frequency	
For breastfed child	
Met	19 (61.3)
Not Met	12 (38.7)
For Non-breastfed child	
Met	4 (80)
Not Met	1 (20)
Minimum Acceptable diet	
For Breastfed Child	
Met	13 (42)
Not Met	18 (58)
For Non-breastfed child	
Met	1 (20)
Not Met	4 (80)

Association of malnutrition with socio-demographic characteristics

The analysis of the relationship between stunting, wasting, and underweight with socio-demographic characteristics of respondents and child-related factors indicated that ethnicity had a significant association with underweight and stunting. Furthermore, only stunting showed a significant association with the mother's education status. Both underweight and stunting was found to be significantly associated with socio-economic status. However, there was no observed association between socio-demographic characteristics of respondents and wasting. Table 4 displays the results of the association between malnutrition and socio-demographic characteristics.

Table 4. Association of child malnutrition with socio-economic characteristics

Characteristics	Underweight			Stunting			Wasting		
	Underweight	Normal	p value	Stunted	Normal	p value	wasted	normal	p-value
Ethnicity									
Janjati	13	50	0.035**	16	47	0.01**	9	54	0.725
Brahmin/Chhetri	4	5		1	8		2	7	
Others	15	19		20	14		4	30	
Mother's educational status									
Illiterate	8	8	0.061	11	5	0.002**	3	13	0.567
Literate and/or had formal education	24	66		26	64		12	78	
Mother's age at the birth of child									
<20 years	6	12	0.75	6	12	0.878	3	15	0.717
20-49 years	26	62		31	57		12	76	
No. of child from same mother									
2 or <2 child	12	34	0.421	13	33	0.209	8	38	0.402
3 or > 3 child	20	40		24	36		7	53	
Socio-economic status									
Lower	22	26	0.001**	25	23	0.001**	6	42	0.657
Middle	10	48		12	46		9	49	

**p-value-<0.05

Association of child malnutrition with child related factors

Table 5 represents the results of the test of association with child related factors. There was no significant association of child malnutrition with being male or female child and having met minimum dietary diversity and minimum meal frequency. However, the association for stunting and underweight was significantly associated with the age of a child.

Table 5. Association of child malnutrition with child related factors

Characteristics	Underweight			Stunting			Wasting		
	Underweight	Normal	p value	Stunted	Normal	p value	wasted	normal	p-value
Sex of child									
male	20	33	0.091	22	31	0.154	7	46	0.78
female	12	41		15	38		8	45	
Age of child (months)									
6-23	5	32	0.006**	7	30	0.011**	8	29	0.273
24-59	27	42		30	39		7	62	
Minimum dietary diversity									
Met	2	15	1.00*	5	12	0.219*	4	13	1.00*
Not met	3	16		2	17		4	15	
Minimum meal frequency									
Met	2	21	0.557*	4	19	1.00*	5	18	1.00*
Not met	2	7		2	7		2	7	

*Fisher's exact test

**p-value-<0.05

DISCUSSION

This community-based cross-sectional study was conducted to examine the prevalence of nutritional status and its associated factors among children under the age of five in the urban slums of Kathmandu Valley. The study revealed that the rates of stunting, wasting, and underweight were 34.9%, 14.2%, and 30.2%, respectively. The proportion of severe malnutrition was notably high, with 18.9% severely stunted, 4.7% severely wasted, and 11.3% severely underweight. Interestingly, no children were found to be overweight or obese in the study. The prevalence of stunting and underweight was similar to a previous study conducted by Helen Keller International in urban slums in 2010.[12] However, the prevalence of wasting was higher in the current study, indicating a significant presence of acute malnutrition, which is associated with a higher mortality rate. Furthermore, when compared to studies conducted in urban slums in Bangladesh and India, the prevalence of all forms of undernutrition was lower in the present study.[4,5]

The proportion of undernutrition among male and female children showed that stunting and underweight were more prevalent in male children while wasting was relatively equal in both genders. No significant association was found between sex of child and all forms of undernutrition. When looked into the age category, there was a high prevalence of stunting and underweight in children aged 24-59 months while wasting was more prevalent in children aged 6-23 months. Further, stunting and underweight were significantly associated with age of child. This result of association for stunting and underweight was consistent with other two studies.[12, 17] No significant association was found between all forms of undernutrition with infant and young child feeding practices despite a high proportion of children having their minimum dietary diversity and minimum acceptable diet not met. This might be due to formula feeds given to babies resulting in having minimum dietary diversity and minimum meal frequency not met.

The finding of the study showed that underweight and stunting were significantly associated with ethnicity. Contemporaneously, no association was found between ethnicity and undernutrition in another study.[18] Only stunting was significantly associated with a mother's educational status. Contemporaneously, some of the studies found significant association with all three indicators of under nutrition.[17,18]

The present study showed that underweight and stunting were significantly associated with socio-economic status of the family. Children from families of lower socio-economic status were at increased risk of underweight and stunting compared to those belonging to middle class families which is consistent with other studies.[19] This showed that income and poverty are the major contributing factors for undernutrition in children because having good income and higher socio-economic status results in access to services which are available in the urban areas.

There were few limitations in the study. Firstly, the low number of households with children under five years of age and frequent migration of the slum dwellers together with lack of reliable data for the slums presented difficulty in drawing random samples with large size. Secondly, only anthropometric measurements were used to ascertain nutritional status of under five children. Lastly, due to small sample size, the findings are not generalizable to the whole urban slum population.

CONCLUSIONS

The findings of this study indicate that stunting and being underweight are highly prevalent while wasting poses a significant public health concern in the urban slums of Kathmandu Valley. Underweight was found to be significantly associated with socio-economic status, ethnicity, and the age of the child. Similarly, stunting was significantly associated with socio-economic status, ethnicity, education status of the mother, and the age of the children. Enhancing awareness about child nutrition and improving socio-economic conditions have the potential to improve the nutritional status of children in these areas.

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CONFLICT OF INTEREST

None

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