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Nutritional Status of Under Five Year Children Residing in Selected Wards of Barahachhetra Municipality, Sunsari, Nepal: a Cross-sectional Study

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Abstract

Background: The nutrition of under five children reflects a country's health status. We aimed to assess the nutritional status of the under five year children of selected wards of Barahachhetra municipality, Sunsari.

Methods: In this cross-sectional study, we enrolled 167 under five year children in ward no. 4 and 5 of Barahachhetra municipality. Height/ length, mid-upper arm circumference (MUAC), weight and clinical signs of malnutrition were noted. The relevant information regarding the predictors of malnutrition was obtained from parents/ caregiver.

Results: Nearly half (47.9%) of the children were in the age group 25-59 months with almost equal gender distribution. About one-tenth of children (11.3%) had MUAC less than 12.5 cm, 20.4% of children were wasted, 47.2% were stunted and more than a quarter (29.6%) were underweight. The MUAC was significantly associated with per capita income ($p = 0.01$). Wasting was significantly associated with the age of the children ($p = 0.005$) and occupation of their father ($p = 0.002$). Underweight was significantly associated with their age ($p = 0.007$), ethnicity ($p = 0.03$), parents' education (mother: $p = 0.02$, father: $p = 0.002$), parents' age (mother: $p = 0.04$, father: $p = 0.02$) and fathers' occupation.

Conclusion: Substantial number of under five year children were malnourished. One-fourth of the children were wasted, nearly half were stunted, and more than a quarter of the children were underweight. Malnutrition (as per MUAC) and stunting were higher among younger children (6-24 months) whereas wasting and underweight were higher among older children (25-59 months).

Keywords: Malnutrition; Nutritional status; Under five children

Declarations

Ethics approval and consent to participate: This study was conducted after the ethical approval obtained from Institutional Review Committee of B. P. Koirala Institute of Health Sciences (IRC No.: 484/075/076).

Consent for publication: Not applicable.

Availability of data and materials: The full data set supporting this research is available upon request by the readers.

Competing interest: None

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Childhood is a critical time in the growth and development of a person, and a key stage in the establishment of their physical and mental abilities. The effects of severe malnutrition during critical phases of growth may result in a significant reduction in the size and/or function of specific organs. In addition, malnutrition leads to depression of the host's immune response and increased susceptibility to infection. The maintenance of a favorable nutritional status is essential to minimize disease-associated morbidity and maximize the child's quality of life [1 - 3].

Nutritional assessment is crucial in children because undernutrition is the single most important cause of growth retardation. The World Health Organization (WHO) states that early identification of malnutrition is important for initiating treatment and minimizing the risk of complications. This can be done in both community and healthcare settings using appropriate indicators [4]. Stunting is an indication of chronic undernutrition whereas wasting and mid-upper arm circumference (MUAC) are signs of acute malnutrition, and underweight is an indication of weight for age.

Monitoring the growth of children helps prevent and control protein-energy malnutrition and provides the opportunity for taking preventive and curative actions. Health workers at all public health facilities in Nepal monitor the growth of children using the growth monitoring card that is based on WHO's new growth standard [5]. However, children are not routinely taken to health facilities for growth monitoring after they have completed their immunization schedule at the age of two years.

Studies have shown the socioeconomic and literacy status of parents, feeding practices of infants, and young children, size of the family and child's age as the contributing factors to the nutritional status of children [6, 7]. Barahachhetra Municipality is a newly formed municipality located in the Sunsari District. Most of the areas of the municipality are rural. Ward number 4 and 5 lie in South-West part of the municipality. The majority of the population lives below the poverty line. The net literacy rate is only 69% [8].

Nepal has substantially progressed in improving the survival of children. However, achievement at a national level cannot guarantee the same level of improvement at sub-national level. Additionally, there are less privileged groups that do not benefit from development to the same extent, resulting in increasing inequity in health. The published data on the nutritional status of children of Barahachhetra Municipality is lacking. Hence, this study was conducted to assess the nutritional status of under five years children of Barahachhetra Municipality.

METHODS

A descriptive cross-sectional design was used. Data was collected from 30 May to 15 July 2019. The ward number 4 and 5 of Barahachhetra municipality were purposively selected. Total enumeration of the population was done. A total of 167 under five year children were available at the time of data collection. The parameters such as weight for height (wasting), weight for age (undernutrition), height for age (stunting), and MUAC were measured to assess the nutritional status of the children. More than one eligible child from the same household was also enrolled. Information regarding under five year children was asked with their parents or their caregiver. Height of the children ≥ 2 years and the length of the children < 2 years were measured using a measuring tape. Weight was measured using standard weighing scale of Lars Medical Company. The MUAC was measured using a measuring tape. Clinical signs of malnutrition were observed using a self-prepared checklist by the principal investigator.

The WHO child growth standard was used to interpret the result of nutritional status. Z score < 2 of the WHO Child growth standards median was taken as cutoff value to determine stunting (height-for-age), wasting (weight-for-height) and underweight (weight-for-age) [9]. Similarly, MUAC ≤ 12.5 cm was used as the cutoff of malnutrition among 6 - 59 months children [10]. Less than 6 months of age children were excluded from inferential analysis as the MUAC is recommended only for use with children between 6 and 59 months of age. The per-capita income of families was classified as above and below the poverty line taking the cut-off of US dollars 1.90 per day [11].

Pre-testing was done in 16 under five years children of Barahachhetra Municipality ward no 6 to determine the feasibility of the study and appropriateness of the instrument and the designed data collection tool. Ethical approval was obtained from the Institutional Review Committee of B. P. Koirala Institute of Health Sciences. Consent was obtained from the guardian of the children before data collection. Confidentiality was maintained throughout the study

and the information collected was used only for the research purpose. Anthropometric measurements of the children were carried out in front of the guardian.

The collected data were coded and entered in MS Excel 2007 and Statistical Package of Social Sciences version 16 was used for statistical analysis. Descriptive statistics such as frequency, percentage, mean, and SD were used. The Chi-square test was used to show the association between the dependent and independent variables.

RESULTS

A total of 167 under five-year children were assessed. The majority (47.9%) of the children were in the age group 25-59 months **(Table 1)**. The female and male were 49.1% and 50.9% respectively. The majority (40.7%) of the children belonged to Brahmin/ Chhetri ethnicity followed by Janajati (38.3%). Twenty-five children were less than or equal to 6 months of age and all were exclusively breastfed. None of the children had clinical signs of malnutrition. For analysis, 25 children ≤ 6 months were excluded and the remaining 142 children between 6 - 59 months were taken. Among 142, a little more than one tenth children (11.3%) had MUAC less than 12.5 cm and one fifth (20.4%) of the children was wasted i.e., their weight for height was less than -2 z-score. Nearly half (47.2%) of the children were stunted i.e., their height for age was less than -2 z-score. Similarly, more than a quarter (29.6%) of children were underweight i.e., their weight for age was less than -2 z-score.

The majority of the parents were more than 20 years of age. Nearly a quarter (24.0%) of mothers were illiterate whereas only 8.4% of fathers were illiterate. The majority of mothers (92.2%) were homemakers and the majority of the fathers were migrant workers (37.1%). Nearly equal number of children belonged to families with ≤ 5 (49.1%) and > 5 (50.9%) family members. More than a third quarter (76.6%) of the children belonged to the family living below the poverty line **(Table 2)**.

As per the MUAC measurement, the percentage of malnutrition was higher among male children (13.0%), children in the age group 6 - 24 months (14.5%), children of Dalit ethnicity (22.7%), children whose mother's education was below secondary level (14.3%), children whose mothers were homemakers (12.2%), children whose fathers were laborers (21.4%) and children who belonged to family living below poverty line (15.5%). There was a statistically significant association between per capita income and malnutrition as measured by MUAC (p = 0.01) **(Table 3)**.

The percentage of wasting was higher among female children (21.9%), children of 25 - 59 months of age (28.7%), children of Dalit ethnicity (27.3%), children whose mothers had below secondary level education (24.3%), children whose fathers had below secondary level education (25.0%), children of homemaker mothers (21.5%), children of laborer fathers (46.4%) and children who belonged to below poverty line (21.8%) **(Table 4)**. Wasting of the children was significantly associated with the age of the children (p = 0.005) and the occupation of their father (p = 0.002).

The percentage of underweight children was higher among male children (36.2%), children of age group 25-59 months (38.7%), children of Dalit ethnicity (45.5%), children of mothers aged less than or equal to twenty years (53.8%), children of father aged less than or equal to 20 years (100%), children of mothers having below secondary level education (38.6%), children of fathers having below secondary level education (43.3%), children of laborer father (57.1%) and the children from below the poverty line (32.7%). Being underweight was significantly associated with the age of the children (p = 0.007), ethnicity (p = 0.033), education of their parents (mother: p = 0.02, father: p = 0.002), age of their parents (mother: p = 0.04, father: p = 0.02) and occupation of their father.

The percentage of stunting was higher among male children (55.1%), children who belonged to the age group 6-24 months (56.5%), children from Dalit ethnicity (68.2%), whose parent's age was less than or equal to twenty years (mother's: 53.8%, father's: 5 0.0%), whose parent's education was below secondary level (mother's: 48.6%, father's: 51.7%), who belonged to family with more than 5 members (55.2%) and children who belong to family living below poverty line (49.1%). There is no statistically significant association between stunting and socio-demographic variables.

DISCUSSION

This study found that the majority (47.9%) of the children were in the age group of 25 - 59 months. Both female and male were nearly equal. The majority (40.7%) of the children belonged to Brahmin/ Chhetri ethnicity followed by Janajati (38.3%). There

Table 1: Demographic characteristics of under five year children (n = 167). Values are presented as number and percentage.

Characteristics	Categories	Frequency	Percentage
Age (months)	≤ 6/ 7 - 24/ 25 - 59	25/ 62/ 80	15.0/ 37.1/ 47.9
Sex	Female/ Male	82/ 85	49.1/ 50.9
Ethnicity	Brahman Chhetri/ Dalit/ Janajati/ Others	68/ 25/ 64/ 10	40.7/ 15/ 38.3/ 6
Exclusive breast feeding in children ≤ 6 months (n = 25)		25	100
MUAC of children 6 - 59 months (n = 142)	≤ 12.5/ > 12.5	16/ 126	11.3/ 88.7
Weight for height (n = 142)	z score: < -2/ ≥ -2	29/ 113	20.4/ 79.6
Weight for age (n = 142)	z score: < -2/ ≥ -2	42/ 100	29.6/ 70.4
Height for age (n = 142)	z score: < -2/ ≥ -2	67/ 75	47.2/ 52.8

MUAC: Mid-upper arm circumference

Table 2: Family background of under five years children (n = 167). Values are presented as number and percentage.

Characteristics	Categories	Frequency	Percentage
Age of mother (y)	≤ 20 / > 20	19/ 148	11.4/ 88.6
Age of father (y)	≤ 20 / > 20	3/ 164	1.8/ 98.2
Education of mother	Illiterate	40	24.0
	Primary	34	20.4
	Secondary	58	34.7
	Above secondary	35	21.0
Education of father	Illiterate	14	8.4
	Primary	53	31.7
	Secondary	53	31.7
	Above secondary	47	28.1
Occupation of mother	Homemaker/ Others	154/ 13	92.2/ 7.8
Occupation of father	Agriculture	33	19.8
	Business	22	13.2
	Labour	29	17.4
	Migrant worker	62	37.1
	Others	21	12.6
Total family members	≤ 5/ > 5	82/ 85	49.1/ 50.9
Per capita income	Above poverty line/ Below poverty line	39/ 128	23.4/ 76.6

were 25 children less than or equal to 6 months of age and all were exclusively breastfed. At the national level, according to Nepal Demographic and Health Survey 2016, two-thirds of children under six months are exclusively breastfed [11]. The possible reason for this higher percentage of exclusively breastfed children is that majority of the mothers are homemakers. They do not need to leave their children for work. More than eleven percent of children had MUAC less than 12.5, one-fifth (20.4%) of the children were wasted and more than a quarter (29.6%) were underweight. Similarly, nearly half (47.2%) of the children were stunted.

The MUAC was significantly associated with per capita income (p = 0.01). Wasting was significantly associated with the age of the children (p = 0.005) and the occupation of their father (p = 0.002). Underweight was significantly associated with the age of the children (p = 0.007), ethnicity (p = 0.03), education of their parents (mother: p = 0.02, father: p = 0.002), age of their parents (mother: p = 0.04, father: p = 0.02) and

Table 3: Association between selected socio-demographic variables and mid upper arm circumference (n = 142). Values are presented as number (%).

Characteristics	Categories	Mid-upper arm circumference		p-value
		Malnourishe (≤ 12.5cm)	Normal (> 12.5cm)	
Age (months)	6 - 24	9 (14.5%)	53 (85.5%)	0.41*
	25 - 59	8 (10.0%)	72 (90.0%)	
Sex	Female	8 (11.0%)	65 (89.0%)	0.70*
	Male	9 (13.0%)	60 (87.0%)	
Caste	Brahman/ Chhetri	6 (10.9%)	49 (89.1%)	0.39***
	Dalit	5 (22.7%)	17 (77.3%)	
	Janajati	5 (8.9%)	51 (91.1%)	
	Others	1 (11.1%)	8 (88.9%)	
Age of mother (y)	≤ 20	1 (7.7%)	12 (92.3%)	> 0.99**
	> 20	16 (12.4%)	113 (87.6%)	
Age of father (y)	≤ 20	0 (0.0%)	2 (100.0%)	> 0.99**
	> 20	17 (12.1%)	123 (87.9%)	
Education of mother	Below secondary	10 (14.3%)	60 (85.7%)	0.40*
	Secondary and above	7 (9.7%)	65 (90.3%)	
Occupation of mother	Homemaker	16 (12.3%)	114 (87.7%)	> 0.99**
	Others	1 (8.3%)	11 (91.7%)	
Education of father	Below secondary	9 (15.0%)	51 (85.0%)	0.34*
	Secondary and above	8 (9.8%)	74 (90.2%)	
Occupation of father	Agriculture	4 (13.3%)	26 (86.7%)	0.30***
	Business	3 (15.8%)	16 (84.2%)	
	Labour	6 (21.4%)	22 (78.6%)	
	Migrant worker	3 (5.9%)	48 (94.1%)	
	Others	1 (7.1%)	13 (92.9%)	
Total family members	≤ 5	10 (13.3%)	65 (86.7%)	0.59*
	> 5	7 (10.4%)	60 (89.6%)	
Per capita income	Above poverty line	0 (0.0%)	32 (100.0%)	0.01**
	Below poverty line	17 (15.5%)	93 (84.5%)	

**Chi square test, **Fisher exact test, ***Likelihood ratio*

occupation of their father.

The findings of our study are very close to the similar studies conducted in India and Bangladesh where 17% to 21% of children under five years were wasted, 30% to 41% were stunted and 29% to 39% were underweight [6, 12]. The main contributing factors for under five malnutrition in those studies included child's age, mother's education, father's education, father's occupation, family wealth index, current breastfeeding, and place of delivery which were significantly associated with malnutrition in our study too [6, 12]. Our findings are also comparable with the national data where wasting, stunting, and underweight are 10%, 35.8%, and 27% respectively [5].

We have attempted to describe the nutritional status of under five children of an economically poor community that had been otherwise overlooked. The majority of these types of studies are being conducted at the national level or in major cities, but this study attempted to describe the nutritional status of the children of a newly formed municipality which helps the concerned municipality to be aware of the situation.

The major limitation of this study was that only the children available at the time of data collection were enrolled. Many school-going children were left out. Hence our findings cannot be generalized. We recommend further study with a larger sample size. We also recommend studies on complementary feeding

Table 4: Association between selected socio-demographic variables and nutritional status of children (n = 142). Values are presented as number (%).

Characteristics	Categories	Weight for height (wasting)			Weight for Age (Underweight)			Height for Age (stunting)		
		Normal (≥ -2z-score)	Wasting (< -2z-score)	p- value	Normal (≥ -2z-score)	Under-weight (< -2z-score)	p- value	Normal (≥ -2z-score)	Stunting (< -2z-score)	p- value
Age of children (months)	6-24	56 (90.3%)	6 (9.7%)	0.005*	51 (82.3%)	11 (17.7%)	0.007*	27 (43.5%)	35 (56.5%)	0.05*
	25-59	57 (71.2%)	23 (28.7%)		49 (61.3%)	31 (38.7%)		48 (60.0%)	32 (40.0%)	
Sex	Female	57 (78.1%)	16 (21.9%)	0.64*	56 (76.7%)	17 (23.3%)	0.09*	44 (60.3%)	29 (39.7%)	0.06*
	Male	56 (81.2%)	13 (18.8%)		44 (63.8%)	25 (36.2%)		31 (44.9%)	38 (55.1%)	
Caste	Brahman/ Chhetri	49 (89.1%)	6 (10.9%)	0.16***	46 (83.6%)	9 (16.4%)	0.03***	31 (56.4%)	24 (43.6%)	0.15 ***
	Dalit	16 (72.7%)	6 (27.3%)		12 (54.5%)	10 (45.5%)		7 (31.8%)	15 (68.2%)	
	Janajati	41 (73.2%)	15 (26.8%)		37 (66.1%)	19 (33.9%)		33 (58.9%)	23 (41.1%)	
	Others	7 (77.8%)	2 (22.2%)		5 (55.6%)	4 (44.4%)		4 (44.4%)	5 (55.6%)	
Age of mother (y)	≤ 20	11 (84.6%)	2 (15.4%)	0.63**	6 (46.2%)	7 (53.8%)	0.04*	6 (46.2%)	7 (53.8%)	0.61*
	> 20	102 (79.1%)	27 (20.9%)		94 (72.9%)	35 (27.1%)		69 (53.5%)	60 (46.5%)	
Age of father (y)	≤ 20	1 (50.0%)	1 (50.0%)	0.36**	0 (0.0%)	2 (100.0%)	0.02**	1 (50.0%)	1 (50.0%)	0.93**
	> 20	112 (80.0%)	28 (20.0%)		100 (71.4%)	40 (28.6%)		74 (52.9%)	66 (47.1%)	
Education of mother	Below secondary	53 (75.7%)	17 (24.3%)	0.26*	43 (61.4%)	27 (38.6%)	0.02*	36 (51.4%)	34 (48.6%)	0.74*
	Secondary and above	60 (83.3%)	12 (16.7%)		57 (79.2%)	15 (20.8%)		39 (54.2%)	33 (45.8%)	
Occupation of mother	Home maker	102 (78.5%)	28 (21.5%)	0.46**	92 (70.8%)	38 (29.2%)	0.76**	71 (54.6%)	59 (45.4%)	0.15**
	Others	11 (91.7%)	1 (8.3%)		8 (66.7%)	4 (33.3%)		4 (33.3%)	8 (66.7%)	
Education of father	Below secondary	45 (75.0%)	15 (25.0%)	0.24*	34 (56.7%)	26 (43.3%)	0.002*	29 (48.3%)	31 (51.7%)	0.36*
	Secondary and above	68 (82.9%)	14 (17.1%)		66 (80.5%)	16 (19.5%)		46 (56.1%)	36 (43.9%)	
Occupation of father	Agriculture	28 (93.3%)	2 (6.7%)	0.002***	24 (80.0%)	6 (20.0%)	0.007***	14 (46.7%)	16 (53.3%)	0.19***
	Business	14 (73.7%)	5 (26.3%)		15 (78.9%)	4 (21.1%)		12 (63.2%)	7 (36.8%)	
	Labour	15 (53.6%)	13 (46.4%)		12 (42.9%)	16 (57.1%)		18 (64.3%)	10 (35.7%)	
	Migrant worker	44 (86.3%)	7 (13.7%)		40 (78.4%)	11 (21.6%)		27 (52.9%)	24 (47.1%)	
	Others	12 (85.7%)	2 (14.3%)		9 (64.3%)	5 (35.7%)		4 (28.6%)	10 (71.4%)	
Total family members	≤ 5	57 (76.0%)	18 (24.0%)	0.26*	55 (73.3%)	20 (26.7%)	0.42*	45 (60.0%)	30 (40.0%)	0.07*
	> 5	56 (83.6%)	11 (16.4%)		45 (67.2%)	22 (32.8%)		30 (44.8%)	37 (55.2%)	
Per capita income	Above poverty line	27 (84.4%)	5 (15.6%)	0.44*	26 (81.2%)	6 (18.8%)	0.12*	19 (59.4%)	13 (40.6%)	0.39*
	Below poverty line	86 (78.2%)	24 (21.8%)		74 (67.3%)	36 (32.7%)		56 (50.9%)	54 (49.1%)	

practices after six months of age and feeding practices of two to five years children are recommended as the age of the children, in this study, is significantly associated with stunting, wasting, and underweight. We recommend a nutritional support program at Barahachhetra municipality.

The findings of this study can help the municipal authority to identify the priority areas to improve the child health situation in those particular wards. The findings of this study can serve as the basis for planning nutrition education and other nutrition related intervention and also serve as the baseline data for future research.

CONCLUSION

All forms of malnutrition were prevalent among the children of Dalit ethnicity, children of mothers having below secondary level education, and children who belonged below poverty line. Similarly, all forms of malnutrition except wasting were prevalent among male children. All children less than or equal to 6 months of age were exclusively breastfed. However, among 6 - 59 months children more than eleven percent had MUAC less than 12.5 and one-fifth were wasted, nearly half were stunted, and more than a quarter of the children were underweight.

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