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Nutritional status and its associated factors among children aged 6-23 months in rural and urban communities of Kaski district of Nepal: A comparative study

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ABSTRACT

Background: Child malnutrition is a significant factor contributing to infant and under-five mortality in developing countries including Nepal, making it a serious public health concern. Child nutritional status varies between urban and rural areas due to differences in educational status, socio-economic conditions, and healthcare services.

Objectives: This study aimed to assess the differences in the nutritional status of children in rural and urban areas of Kaski district and identify the factors associated with nutritional status in both rural and urban areas.

Methods: A community-based comparative cross-sectional study was conducted in the Kaski district. A random sample of 195 children from both urban and rural communities was included in the study. Information was collected through interviews with mothers using a structured questionnaire along with anthropometric measurements of the weight of children. Data was entered into EpiData version 3.1 and analysed using IBM SPSS version 20.

Results: A total of 390 children aged 6- 23 months were included in this study for analysis. The prevalence of stunting, wasting, and underweight was 33.3%, 8.2%, and 13.8% in rural areas, and 23.1%, 4.6%, and 5.1% in urban areas, respectively. More than four-fifths of the children (84%) in urban areas and three-fourths of the children (73.3%) in rural areas were fed meals more than three times per day. Families with food insecurity were 2.77 times more likely to have underweight children (95%CI: 1.01-7.35) in comparison to families that are food secure. Children aged 12-23 months were more likely to be stunted than younger children in rural areas.

Conclusion: This study found significant associations between age, sex, food insecurity, minimum dietary diversity, and food frequency, and the nutritional status of children in both rural and urban area. In rural areas, male children had a higher likelihood of being stunted compared to female children. Additionally, households experiencing food insecurity were more prone to having stunted and underweight children. To improve these conditions, enhanced nutrition education and targeted interventions, including proper counselling, are necessary to address poor dietary diversity and inadequate food frequency across both rural and urban areas.

Keywords: Children, Nutrition status, Nepal, Rural, Urban

1. Introduction

Nutrition is one of the fundamental aspects of living which encompasses process leading to and involved with utilization of nutrients for growth, development, maintenance and activity [1]. Malnutrition prevails every-where around the world and both the developed and developing countries are suffering from malnourishment. The effect of malnutrition remains and brings devastation in the individual, community and nation's standard of living [2].

Women and children are the primary victims of malnutrition [1], and children aged 6- 23 months are in an important stage of life where the nutrition plays an important role and has long lasting effects in the later years of life [2]. Freedom from hunger and malnutrition was declared a basic human right in the 1948 Universal Declaration of Human Rights [1]. Failing to ensure protection of children from the hunger and under-nutrition often results in the vicious cycle of malnutrition, poor health and cognitive and intellectual underdevelopment. When combined with household food insecurity, frequent illness and infections, poor hygiene, inadequate dietary intake, care and practices, the cycle of intergenerational malnutrition perpetuated [3].

Nutritional status is an important measure of child's health. The height-for-age index provides an indicator of linear growth retardation and cumulative growth deficits in children. Weight-for-age is a composite index of height-for-age and weight-for-height. It considers both chronic and acute malnutrition. Children whose weight-for-age is below minus two standard deviations (-2 SD) are classified as underweight [4, 5]. Child under-nutrition is one of the most important public health and development problems in the developing world and is an underlying factor in over 50% of all deaths in children under 5 years of age, resulting in 3.1 million deaths annually [6]. Stunting was 1.45 times higher in rural than urban areas [6]. The same is true for underweight, i.e., twice as likely in rural areas than urban areas [7].

In Nepal 25% of children are stunted, 19% are underweight and 8% are wasted. Similarly rural children are more likely to be undernourished (21.5% stunted, 16.9 % underweight and 7.9% wasted) than urban children (31.0% stunted, 21.9% underweight and 7.5% wasted) [5].

The studies explore the dynamics of urban-rural malnutrition i.e. rural urban child under nutrition and associated factors in both

settings [4, 5]. In Nepal, the child nutritional status has not been assessed holistically by considering socio-demographic factors, maternal and child health care practices, food security, household environmental conditions, and child feeding practices, particularly in both rural and urban settings of Gandaki Province and Kaski district. This study aimed to assess nutritional status and its associated factors among children aged 6-23 months in rural and urban communities.

2. Methods

2.1 Study Area

The study was conducted in both rural and urban communities of Kaski District located in Gandaki Province, Nepal.

2.2 Study Design

A community-based comparative cross-sectional study design was used to assess the nutritional status and its associated factors among children aged 6-23 months, comparing outcomes between rural and urban areas of Kaski district.

2.3 Sample size and sampling

Children aged 6-23 months and their mothers were considered as study population. Only one child from each family was included and if more than one child was eligible, one child was selected randomly. Children with congenital anomalies and physical disabilities were excluded from the study.

The sample size was calculated for urban community and rural community using the prevalence of stunting was 41% Nepal Demographic Health Survey (NDHS), 2011 [4]. The Cochran formula was used to calculate the sample size.

Sample Size (n) = $[z^2.p\ (1-p)]/d^2$

Where,

z = critical value which is equal to 1.96 in two-tailed test

p = prevalence of stunting is 41% (NDHS 2011)

d = absolute sampling error that can be tolerated and it is fixed at 5%

The total sample size for the study was 371. Non-response rate was taken as 5%. The final sample was 390, which was equally divided into urban and rural community i.e. for urban community 195 and for rural community 195 samples was taken.

Metropolitan city was considered urban community, and rural municipalities were considered rural community. For the sample collection in urban community, first, core

urban wards were listed in consultation with Metropolitan office and then four wards were selected randomly out of 33 core wards of the Metropolitan city and using the list of households, random sampling was applied to select desired sample of 195. Similarly, for the sample collection in rural community, two wards from each of the four rural municipality were selected randomly and using the list of households desired sample of 195 was obtained by random sampling method.

Sampling frame for the study was the list of households which consist of at least one child of aged 6-23 months and that list was obtained from the records of Female Community Health Volunteers (FCHV) of respective Metropolitan city and rural municipalities.

2.4 Data Collection

The data collection techniques were interviews and anthropometric measurements of weight and length. Anthropometric measurements of children aged 6-23 months were taken using Salter scale for measuring weight and Infantometer for measuring length. A face-to-face interview was done with the mother of child using pre-tested structured questionnaire tool by researcher and three assigned enumerators. The child was weighed using a Salter scale on bare feet and in minimal clothing. The Salter scale was hung and fixed in the pillar while taking the weight of the child. The Infantometer (Length measuring Mat) was placed on a flat surface to measure the length of child. The child was laid flat in the middle of mat on his/her back, looking directly up. Length of the child was taken without shoes and cap. These measuring instruments were obtained from District Public Health Officer (DPHO).

2.5 Data Analysis

The collected data were systematically compiled. The filled questionnaires were checked, edited and coded by the researcher in the same day of data collection and the refined data were entered in Epi Data 3.1 and transferred to IBM-SPSS version 20 for further analysis. For the generation of z-score values for the degree of stunting, wasting and underweight, WHO Anthro was used. Descriptive analysis was done in terms of frequency, percentage, mean and standard deviation (SD). For continuous variables the mean and SD were calculated while the proportions were calculated for categorical variables. The Pearson Chi-square test or Fisher's exact test if expected number in any

cell was ≤ 5 was used for comparing categorical variables. The odds ratio was used to estimate the magnitude of the association between study variables and outcome variables. Statistically significant variables observed in the bivariate analysis were included in the multivariate analysis. Multivariate logistic regression model was applied to assess independent association between dependent and independent variables after Hosmer and Lemeshow chi-square test applied for testing logistic regression model for goodness of fit. P-values less than 0.05 was considered as statistically significant where confidence interval (CI) for the odds ratio was set at 95 percent throughout the analysis in this study.

2.6 Ethical Clearance

Ethical Clearance was obtained from the Institutional Review Board (IRB) of Institute of Medicine (IOM) (156-072/073) and approval was taken from Department of Community Medicine and Public Health and DPHO Kaski. Verbal and written consent was taken from the parents of the children. The parents were well informed about the purpose, objectives and procedures of the study. They were also informed about the benefits and risks from the study. Participation was voluntary, and they were allowed to withdraw at any time during data collection if they wished. Individuals' autonomy was respected, rights and dignity were protected, and privacy was maintained throughout the study. Those who were found under-nourished during data collection were given counselling, and advised their families to seek health care from the nearest health facility.

3. Results

Figure 1 shows the prevalence of stunting, wasting and underweight was found to be 33.3%, 8.2% and 13.8% in rural area and 23.1%, 4.6% and 5.1% in urban area respectively. This shows that prevalence of stunting, wasting and underweight were higher in rural area compared to urban area.

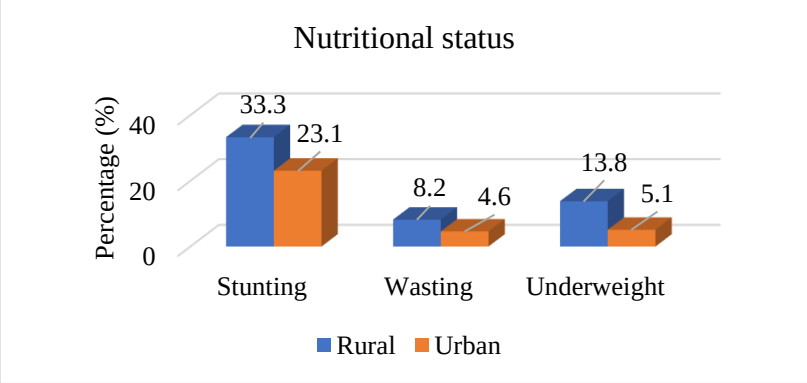

Figure 1: Nutritional status of children

Table 1 shows that higher proportion of children were in age group 12-23 months and median age of children was 15 months in both rural and urban areas. Joint/extended families were slightly increased in rural area, at 53.8 percent while nuclear families were slightly rose than half (52.3%) in urban area. Majority of mothers (90%) had birth interval of more than 24 months between study child and previous child in both rural and urban areas. More than half of families (53.3%) were of lower socio-economic status in rural area while more than half of families (54.4%) were of higher socio-economic status (54.4%) in urban area.

Table 1: Socio-demographic characteristics of study population

Characteristics	Rural		Urban	
	(n = 195)	%	(n = 195)	%
Age of child				
6-11 months	67	34.4	60	30.8
12-23 months	128	65.6	135	69.2
Median age (in month)	15		15	
Sex of child				
Male	99	50.8	107	54.9
Female	96	49.2	88	45.1
Ethnicity				
Upper caste	77	39.5	108	55.4
Janajati	43	22.1	51	26.2
Dalit	47	24.1	36	18.5
Muslim	28	14.4		
Family Type				
Nuclear	90	46.2	102	52.3
Joint/Extended	105	53.8	93	47.7
Household size				
< 5	69	35.4	106	54.4
≥ 5	126	64.6	89	45.6
Mean household size ± SD	5.55±2.38		4.98±2.19	
Birth order				
1st Birth	83	42.6	115	59.0
2nd-3rd Birth	95	48.7	78	40.0
> 3 births	17	8.7	2	1.0

Characteristics	Rural		Urban	
	(n = 195)	%	(n = 195)	%
Birth Interval	(n=112)		(n=80)	
<2 years	10	8.9	2	2.5
≥ 2 years	102	91.1	78	97.5
Number of Children				
≤ 2 children	152	77.9	180	92.3
> 2 children	43	22.1	15	7.7
Wealth Index				
Lower	104	53.3	32	16.4
Medium	68	34.9	57	29.2
Higher	23	11.8	106	54.4
Mother Education				
No education	6	3.1	7	3.5
Primary	38	19.5	12	6.2
Secondary	103	52.8	70	35.9
+2 and above	48	24.6	106	54.4
Mother Occupation				
Domestic work	131	67.2	142	72.8
Service	12	6.2	14	7.2
Agriculture	35	17.9	2	1.0
Business	14	7.2	32	16.4
Daily wage	3	1.5	5	2.6

Table 2 shows that the age of child, sex of child, food insecurity, food diversity and food frequency were independently associated with stunting in the rural area after adjusting for independent variables. It was found that children of age group 12-23 months were 5.81 times more likely to be stunted (95% CI: 1.63-20.61) than children of age group 6-11 months. The odds of being stunted were found 2.67 times higher in male children compared to female children. Households with food insecurity status were 2.76 times more likely to have stunted children (95% CI: 1.34-5.71) in comparison to families with food secure status. Children receiving less than the minimum food diversity were more likely to be stunted (AOR: 2.65, 95% CI: 1.40-6.44) than those children receiving at least four food groups. Likewise, children eating meals for less than three times per day were 6.64 times more likely to be stunted (95% CI: 2.66-16.58) in rural area.

Table 2: Adjusted relationships of characteristics with stunting in rural

Characteristics	Nutritional Status		Unadjusted OR (95% CI)	P-value	Adjusted OR(95% CI)	P- value
	No Stunting	Stunting				
Age of child				0.001*		0.006*
6-11 months	56	11	1		1	
12-23 months	74	54	3.71 (1.78-7.75)		5.81 (1.63-20.61)	
Sex of child				0.035*		0.009*
Female	71	25	1		1	
Male	59	40	1.92 (1.04-3.53)		2.67 (1.27-5.59)	

Food security status				0.04*		0.006*
Food secure	90	31	1		1	
Food insecure	40	34	2.46 (1.33-4.55)		2.76 (1.34-5.71)	
Vit A Supplement				0.024*		0.132
Yes	95	57	1		1	
No	35	8	0.38 (0.16-0.87)		0.32 (0.07-1.40)	
Food Diversity				0.003*		0.005*
≥ 4 food groups	68	19	1		1	
< 4 food groups	62	46	2.65 (1.40-5.01)		3.01 (1.40-6.44)	
Food Frequency				0.001*		0.001*
≥ 3 times	105	38	1		1	
< 3 times	25	27	2.98 (1.54-5.76)		6.64 (2.66-16.58)	

*Significant ($p<0.05$)

Table 3 depicts that the age of child, food security, food diversity and vitamin A supplementation were not found significantly associated with wasting after adjusting for the independent variables in rural area.

Table 3: Adjusted relationships of characteristics with wasting in rural

Characteristics	Nutritional Status		Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
	No Wasting	Wasting				
Age of child				0.019*		0.119
12-23 months	122	6	1		1	
6-11 months	57	10	3.56 (1.23-10.29)		3.13 (0.74-13.18)	
Food Security Status				0.042*		0.083
Food secure	115	6	1		1	
Food insecure	64	10	2.99 (1.04-8.62)		2.67 (0.88-8.09)	
Vit A Supplement				0.036*		0.973
Yes	143	9	1		1	
No	36	7	3.09 (1.07-8.85)		1.02 (0.23-4.43)	
Food Diversity				0.041*		0.146
≥ 4 food groups	84	3	1		1	
< 4 food groups	95	13	3.83 (1.05-13.90)		2.71 (0.70-10.46)	

*Significant ($p<0.05$)

Table 4 shows that the number of children was independently associated with wasting in urban area after adjusting for independent variables. The study showed that children of mothers who had more than two children were more likely to be wasted compared to children of mothers with two or fewer children (AOR: 6.20, CI: 1.27- 30.13).

Table 4: Adjusted relationships of characteristics with wasting in urban

Characteristics	Nutritional Status		Unadjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P- value
	No Under weight	Under weight				
Number of children				0.010*		0.023*
≤ 2 children	174	6	1		1	
> 2 children	12	3	7.25 (1.61-32.63)		6.20 (1.27-30.13)	
Food security status				0.014*		0.074
Food secure	152	4	1		1	
Food insecure	34	5	5.58 (1.42-21.91)		3.75 (0.88-15.98)	
Growth Monitoring				0.017*		0.067

Yes	180	7	1	1
No	6	2	8.57 (1.46-50.29)	5.76 (0.88-37.45)

*Significant (p<0.05)

Table 5 shows that food insecurity and food diversity were independently associated with underweight in rural area. Families with food insecurity were 2.77 times more likely to have underweight children (CI: 1.01-7.35) in comparison to families that were food secure. The odds of being underweight were found 5.46 times higher in children receiving less than four food groups compared to children receiving at least four food groups (CI: 1.46-20.31).

Table 5: Adjusted relationship of characteristics with underweight in rural.

Characteristics	Nutritional Status		Unadjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
	No Under weight	Under weight				
Birth order						0.106
1st Birth	79	4	1		1	
≥ 2nd births	89	23	5.10 (1.69-15.39)	0.004*	2.95 (0.79-10.65)	
Number of children						0.278
≤ 2 children	138	14	1		1	
> 2 children	30	13	4.27 (1.82-10.01)	0.001*	1.81 (0.61-5.35)	
Mother Education						0.404
+2 and above	46	2	1		1	
Below +2	122	25	4.71 (1.07-20.69)	0.040*	1.98 (0.39-9.85)	
Food Security Status						0.040*
Food secure	112	9	1		1	
Food insecure	56	18	4.0 (1.68-9.47)	0.002*	2.77 (1.01-7.35)	
Vit A Supplement						0.973
Yes	135	17	1		1	
No	33	10	2.40 (1.009-5.73)	0.048*	1.01 (0.34-3.04)	
Food Diversity						0.011*
≥ 4 food groups	84	3				
< 4 food groups	84	24	8 (2.32-27.58)	0.001*	5.46 (1.46-20.31)	
Food Frequency						0.058
≥ 3 times	130	13	1		1	
< 3 times	38	14	3.68 (1.59-8.50)	0.002*	2.67 (0.96-7.39)	

*Significant (p<0.05)

4. Discussion

The nutritional status of the child was assessed by the indicators of height-for-age, weight-for-age and weight-for-height which are defined by z score less than -2 SD. This study showed that prevalence of stunting, wasting and underweight was found to be 25%, 8%, and 19% in the rural area in compared to 31.0%, 7.5%, and 21.9% in urban area, respectively. This was similar to the result of NDHS 2011 of Nepal for rural urban differences in nutritional status [5].

Stunting was found to be 1.67 times and underweight was found to be 2.97 times more likely to occur in rural than urban area and the study in other countries showed the similar results [6-11]. This may be due to the relatively poorer socio-economic status of household and lower level of mother education in rural area in comparison to urban areas which ultimately affects household food access, feeding practices, utilization of services and so on.

This study showed an association between age and sex with the stunting status of Children in rural area and a study conducted in Nepal showed the similar result in case of age but there was no significant difference between male and female [12]. Children aged 12-23 months were 5.81 times more likely to be stunted (95%CI=1.63-20.61) in comparison to children aged 6-11 months in this study. NDHS 2022 also showed that stunting is more in higher age groups [4, 5]. Likewise, a study in Andhra Pradesh had shown stunting was 3.02 times higher among 12-23 months children in comparison to under 12 month of children [13]. A study in Ethiopia showed that males were 1.5 times more likely to be stunted than female children [14] and this study also showed males were 2 times more likely to be stunted. Studies in Botswana and Ecuador reported similar findings with malnutrition significantly higher among boys than girls [15, 16]. Similarly, a meta-analysis of 16 demographic and health survey in Sub-Sahara Africa showed that male children were more likely to be stunted than female child. In almost all countries with available data, stunting rates are higher among boys than girls. While research is ongoing to determine underlying causes for this phenomenon are underway, initial review of the literature suggests that the higher risk for preterm birth among boys (which is inextricably linked with lower birth weight) could explain this sex-based disparity in stunting [17].

Mother's education was found to be associated with underweight in rural area during bivariate analysis but this association was diminished after multivariate analysis. Children of mothers having lower educational level were more likely to be under weight than the children of mother having higher education which was shown by the studies in Vietnam, Bangladesh, Nepal, Haryana, Ecuador, Orissa and Botswana [8, 11, 15, 16, 18, 19]. Higher level of education of mother might be related to more awareness, more earning of income and more

interest to child nutrition. But in this study just about one-fourth of mothers in rural areas had an education level above secondary school.

Household socio-economic status is an important determinant of child malnutrition, and many studies have shown that children from poor family were more likely to be malnourished than medium and rich family [11, 15, 16, 18]. Similarly NDHS showed that children in the highest wealth quintiles were least likely to be malnourished [4]. But wealth index was found not significantly associated with nutritional status of child in both the rural and urban areas in this study. This finding was supported by the study of Nghean Vietnam which showed that there was no association among the higher earning families and low income families and nutritional status of the child [20]. Though socio-economic status in this study didn't show direct association with nutritional status but indirectly it might have impact on household food security, feeding practices and so on.

This study showed that birth order and number of children was found to be associated with underweight in rural areas, but this finding was inconsistent in multivariate analysis while number of children was statistically significant with wasting in urban area after multivariate analysis. Findings from a study in Vietnam showed that number of children in family was associated with malnutrition [20] and study in Nepal showed higher birth order was associated with underweight [21].

In this study association between household food insecurity and nutritional status of the child was observed. Food insecurity was associated with stunting and underweight in rural area which was supported by studies in Nepal and Bangladesh [22] but it was contrary to the study in Kailali district of Nepal that found there was no association between food insecurity and malnutrition [23]. Wasting was associated with food insecurity in urban area in bivariate analysis but not consistent in multivariate analysis and this result resembled with a study in Nepal that showed no association between household food insecurity and wasting among children [22, 23]. More than one third of the children in this study were still passing their lives in food insecure environment in rural area. Proportion of underweight and stunting were significantly lower in food secure household in rural Bangladesh [24, 25] and similar result was seen in this study. Higher food insecurity in rural area might

result in an adequate food provision for their children and consumption of poor food in quality and quantity.

In this study food diversity and food frequency were significantly associated with the nutritional status of the child in both rural and urban areas. It was found that stunting and underweight were higher in children having less than four food groups in rural area and stunting was higher in urban areas in comparison to children having more than four food groups in respective rural and urban areas. It was supported by the study in Nepal, rural Bangladesh and urban Zambian [24, 26-28]. Similarly study in Ethiopia and rural Burkina Faso [29, 30] showed food diversity and number of meals the children ate per day significantly associated with stunting and underweight respectively which is similar to this study. Likewise study in Ghana showed that dietary diversity is related to under-nutrition and more seen in rural area [31] [31]. Lower dietary diversity and food frequency associated with nutritional status of children in rural area might be the result of more food insecurity household status and poor knowledge and practices regarding nutrition while in urban area it might be the result of poor nutritional knowledge since food security household does not resemble that there are diverse foods.

5. Conclusion

The study found the high prevalence of stunting, wasting and underweight in rural area compared to urban area. Age of child, sex of child, food insecurity, minimum food diversity and food frequency were found to be predictors for nutritional status of the children in rural area while number of children, food diversity and food frequency in urban area.

More focus should be placed on food programs to address food insecurity in rural areas. Nutrition education and interventions should be strengthened along with proper counselling for addressing poor dietary diversity and food frequency.

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