Prevalence and Associated Factors of Malnutrition in Under Five Children in a Rural Mountainous Area of Nepal: A Community Based Cross Sectional Study

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ABSTRACT

Background

Nutrition is believed to be very essential for socio economic development of the country and is an essential component of sustainable development goals. Malnutrition is a major public health problem in Nepal and is more common among under-five year children. Malnutrition among children is complex problem globally, affecting the physical, mental and social development.

Objective

To estimate the prevalence and explore the associated factors of malnutrition in study population.

Method

It was a community based cross-sectional study conducted among rural population of Nepal. Wards were selected by simple random sampling technique and household in each ward were selected by systemic random sampling. The mothers of 302 participants aged 12 to 59 months were interviewed for requisite information using pretested questionnaire and anthropometric measurements were taken using standard technique for each participant. Statistical Package for Social Sciences (SPSS) version 16.0 was used for data analysis.

Result

The prevalence of underweight, stunting and wasting was 36.8%, 37.5%, and 14.6% respectively. We found statistical significant association between underweight and children in lower age group, larger family size, lower level of mother's education and illness in past one month. Factors that are significantly associated with stunting are children in lower age group, lower level of mother's education and illness in past one month and wasting is significantly associated with children in lower age group.

Conclusion

This study showed the prevalence of malnutrition is high in study population. Factors associated with malnutrition were child's age, family size, mother's education and illness in past one month.

KEY WORDS

Malnutrition, Stunting, Underweight, Wasting

INTRODUCTION

Nutrition is very essential for socio economic development of the country and is an essential component of sustainable development goals. Malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients.[1] According to World Health Organization (WHO) 2018 estimates, 462 million are underweight, 52 million children under 5 years of age are wasted, 17 million are severely wasted and 155 million are stunted. Around 45% of deaths among children under-five years of age are linked to undernutrition. These mostly occur in low- and middle-income countries. The developmental, economic, social, and medical impacts of the global burden of malnutrition are serious and lasting, for individuals and their families, for communities and for countries.[1]

Malnutrition is a major public health problem in most of the developing countries and is more common among under-five year children.[1,2] Malnutrition among children is considered to be one of the most challenging and complex problem globally, affecting the physical, mental and social development particularly that of under privileged and the poor.[3] It is closed in a vicious cycle that can increase the morbidity and mortality rate and poor health in children. Malnutrition can influence physical and psychological development that leads to lower performance and productivity when children grow up.[4,5]

Malnutrition is one of the major public health problems among under 5 children in Nepal particularly in rural areas.[6] The Nepal Demographic and Health Survey 2016 (NDHS 2016) has found that more than one-third (36%) of children under five in Nepal are stunted, or too short for their age. Overall, 10% of children are wasted (too thin for height), a sign of acute malnutrition and 27% of children are underweight or too thin for their age. Stunting is more common in rural children (40%), compared to urban children (32%).[7]

The aim of this study was to determine the prevalence and causes of malnutrition. This information will enable government and other concerned bodies to design appropriate nutrition intervention programs and take steps to promote the health of children.

METHODS

This community based descriptive cross sectional study was conducted in Panchpokhari Thangpal rural municipality of Sindhupalchok district, province 3 of Nepal between April and August 2019. The study was conducted in four out of eight wards of Panchpokhari Thangpal rural municipality which was selected by lottery method.

The sample size 333 was estimated by using formula n = z^2pq/d^2 at 95% Confidence interval (Z), with prevalence (p) of underweight children 27% and allowable error or precision (d) of 5% with addition of 10% non-response rate.[7] Of the total participants, 302 (90.7) participated and were included in the final data analysis.

Of the eight wards in Panchpokhari Thangpal municipality, four wards were selected by simple random sampling method. Each household was considered to be a single unit. The number of sample households to be taken from each ward was done by using Systematic Random Sampling Technique. The sample size was equally divided into 4 wards i.e. 83 from each ward. For the sample of 83 households from each ward, households were selected systematically from every 7^{th}, 9^{th}, 5^{th} and 7^{th} households in Thangpalkot, Thangpaldhap, Gunsakot and Bhotang respectively. One eligible participant was selected from each household. If there were more than one eligible participant we selected one participant using simple random sampling technique following lottery method. In the absence of eligible candidate in the systematically selected household, replacement of eligible participant from the adjacent household was taken.

The data was collected using pretested Household Food Insecurity Access Scale (HFIAS) measurement tool. The data collection tools included sociodemographic details of the respondents, natal history, immunization history, anthropometric measurements of the child which includes measurement of height/length, weight and mid-upper arm circumference of the child. Door to door survey was done and the purpose of the study was explained to the parents of the study subjects. After obtaining the informed verbal consent from the mother, the information was obtained by face to face interview of the respondent and the anthropometric measurements of the child was done. The study participants included children 12 months to 59 months of age whose parents were permanent residents of the study area. Children with any congenital abnormality and with any illness and under treatment during our visits were not included in the study.

Ethical approval was taken from Institutional Review Committee of Kathmandu University School of Medical Sciences. The nature of the study, its purpose was clearly explained to the respondents before initiation of the study. Informed verbal consent was taken from each respondent the child of who were under the study.

Data entry was done in MS-Excel 2007 and analyzed with Statistical Package for Social Sciences (SPSS) version 16.0. Descriptive statistical tools like frequency, percentage; mean and standard deviation were used. Chi-square test and Fisher's Exact test were applied for univariate analysis. All the tests were done at the significance level of 5% (p value < 0.05)

RESULTS

Characteristics of the study participants

Table 1 depicts the characteristics of study participants. Three hundred two children aged twelvemonths to sixty months were included in the study. There were 158 (52.3%) male and 144 (47.7%) female. Proportion of males and females in the study was 52.3% and 47.7% respectively. Most of the participants (57.9%) were in the 12–23 months age group, followed by 31.5% in the 24–35 months age group with a mean age of 24 ± 8.7 months. Majority (79.1%) of the study participants belonged to Buddhist religion followed by Hindu religion (19.9%). Most of the study participants belonged to Tamang ethnicity (42.7%) followed by Lama ethnicity (36.1%). Only total of 12.2% belonged to Brahmin and Chhetri ethnicity. Regarding family size, majority (68.5%) of the children belonged to the households with > 4 family members and 31.5% were from the households which had ≤ 4 family members. Most (46%) of the mothers of the participants received primary level of education and 11.6% received no formal education. Almost all (98.7%) the participants had birth weight above 2500 grams. Regarding history of infection in the past one month, 42.4% were reported to have suffered from infection.

Table 1. Sociodemographic profile of children aged 12 to 59 months

Variables		No. of under five children	Percentage (%)
Gender	Male	158	52.3
	Female	144	47.7
Age (months)	12 – 23 months	175	57.9
	24 – 35 months	95	31.5
	36 – 47 months	28	9.3
	48 – 60 months	4	1.3
Religion	Hindu	60	19.9
	Buddhist	289	79.1
	Islam	3	1.0
Ethnicity	Brahmin	10	3.3
	Chhetri	27	8.9
	Newar	23	7.6
	Tamang	129	42.7
	Lama	109	36.1
	Others	4	1.3
Family size	≤ 4 members	95	31.5
	> 4 members	207	68.5
Socioeconomic status	Upper middle	13	4.3
	Lower middle	209	69.2
	Upper lower	80	26.5
Maternal education	Illiterate	35	11.6
	Primary level	139	46.0
	Middle school	95	31.5
	High school	27	8.9
	Intermediate	5	1.7
	Bachelor and above	1	0.3
Birth weight	< 2500 grams	4	1.3
	2500-3500 grams	257	85.1
	> 3500 grams	41	13.6
Past history of infection	Yes	128	42.4
	No	174	57.6

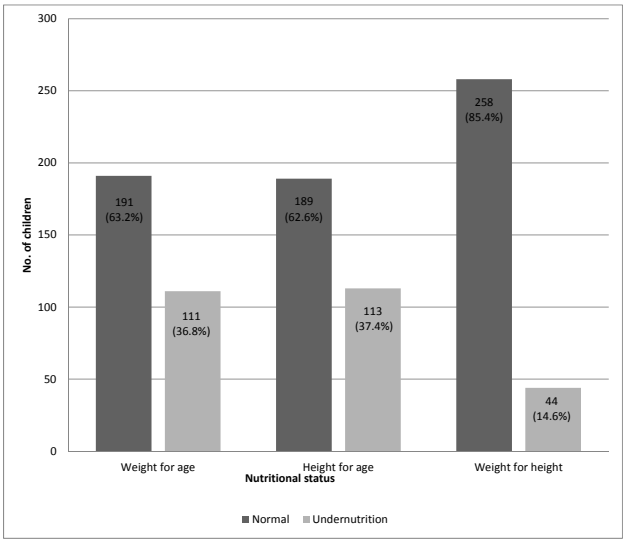

Figure 1. Nutritional status of the study participants

Figure 1 depicts the nutritional status of the study participants. By assessing weight for age (WAZ), the overall prevalence of underweight among participants was found to be 36.8%. By assessing the height-for-age (HAZ), 37.4% of stunting was revealed in the study participants. Assessment of weight for height (WHZ) revealed that prevalence of wasting among participants was 14.6%.

Table 2 depicts the factors associated with underweight in the study participants. In this study we found that age, family size, maternal education and past history of infection were significantly associated with underweight in the study participants whereas gender, ethnicity, socioeconomic status and birth weight were not found to be significantly associated with underweight.

Association of different variables with stunting in study participants is shown in Table 3. Statistically significant association is found between age, maternal education and history of infection and stunting. There was no association found between gender, ethnicity, family size, socioeconomic status, birth weight with stunting.

Table 2. Factors associated with underweight in study participants

Variables		Underweight		Total	p-value
		Yes	No		
Gender	Male	50(31.6)	108(68.4)	158(100)	0.054*
	Female	61(42.4)	81 (57.6)	144(100)	
Age (months)	12 – 23 months	68(38.9)	107(61.1)	175(100)	0.024**
	24 – 35 months	28(29.5)	67(70.5)	95(100)	
	36 – 47 months	11(39.3)	17(60.7)	28(100)	
	48 – 60 months	4(100.0)	0(0.0)	4(100)	
Ethnicity	Brahmin	1(10.0)	9 (90.0)	10 (100)	0.066**
	Chhetri	5(18.5)	22 (81.5)	27 (100)	
	Newar	6(26.1)	17 (73.9)	23 (100)	
	Tamang	4(41.9)	75 (58.1)	129 (100)	
	Lama	44(40.4)	65 (59.6)	109 (100)	
	Others	1(25.0)	3 (75.0)	4 (100)	
Family size	≤4 members	25(26.3)	70(73.7)	95(100)	0.011*
	>4 members	86(41.5)	121(58.5)	207(100)	
Socioeconomic status	Upper middle	2(15.4)	11(84.6)	13(100)	0.250**
	Lower middle	80(38.3)	129(61.7)	209(100)	
	Upper lower	29(36.2)	51(63.8)	80(100)	
Maternal education	Illiterate	24(68.6)	11 (31.4)	35 (100)	0.002**
	Primary level	50(36.0)	89 (64.0)	139 (100)	
	Middle school	28(29.5)	67 (70.5)	95 (100)	
	High school	8(29.6)	19 (70.4)	27 (100)	
	Intermediate	1(20.0)	4 (80.0)	5 (100)	
	Bachelor and above	0 (0.0)	1 (100.0)	1 (100)	
Birth weight	< 2500 grams	0(0.0)	4(100.0)	4(100)	0.225**
	2500-3500 grams	98(38.1)	159(61.9)	257 (100)	
	>3500 grams	13(31.7)	28(68.3)	41 (100)	
Past history of infection	Yes	60(46.9)	68(53.1)	128 (100)	0.002*
	No	51(29.3)	123(70.7)	174 (100)	

*Chi-square test ** Fisher's exact test

Table 3. Factors associated with stunting in study participants

Variables		Stunting		Total	p-value
		Yes	No		
Gender	Male	57 (36.1)	101 (63.9)	158 (100)	0.614*
	Female	56 (38.9)	88 (61.1)	144 (100)	
Age (months)	12 – 23 months	67 (38.3)	108 (61.7)	175 (100)	0.027**
	24 – 35 months	33 (34.7)	62 (65.3)	95 (100)	
	36 – 47 months	8 (28.6)	20 (71.4)	28 (100)	
	48 – 60 months	4 (100.0)	0 (0.0)	4 (100)	
Ethnicity	Brahmin	2 (20.0)	8 (80.0)	10 (100)	0.240**
	Chhetri	6 (22.2)	21 (77.8)	27 (100)	
	Newar	7 (30.4)	16 (69.6)	23 (100)	
	Tamang	48 (37.2)	81 (62.8)	129 (100)	
	Lama	48 (44.0)	61 (56.0)	109 (100)	
	Others	1 (25.0)	3 (75.0)	4 (100)	
Family size	≤ 4 members	32 (33.7)	63 (66.3)	95 (100)	0.407*
	> 4 members	80 (38.6)	127 (61.4)	207 (100)	
Socioeconomic status	Upper middle	3 (23.1)	10 (76.9)	13 (100)	0.564**
	Lower middle	79 (37.8)	130 (62.2)	209 (100)	
	Upper lower	30 (37.5)	50 (62.5)	80 (100)	
Maternal education	Illiterate	20 (57.1)	15 (42.9)	35 (100)	0.029**
	Primary level	49 (35.3)	90 (64.7)	139 (100)	
	Middle school	30 (31.6)	65 (68.4)	95 (100)	
	High school	13 (48.1)	14 (51.9)	27 (100)	
	Intermediate	0 (0.0)	5 (100.0)	5 (100)	
	Bachelor and above	0 (0.0)	1 (100.0)	1 (100)	
Birth weight	< 2500 grams	1 (25.5)	3 (75.0)	4(100)	0.877**
	2500-3500 grams	96 (37.4)	161 (62.6)	257 (100)	
	>3500 grams	15 (36.6)	26 (63.4)	41 (100)	
Past history of infection	Yes	56 (43.8)	72 (56.2)	128 (100)	0.040*
	No	56 (32.2)	118 (67.8)	174 (100)	

*Chi-square test ** Fisher's exact test

Table 4 reveals that only age is significantly associated with wasting in study participants whereas gender, ethnicity, family size, socioeconomic status, maternal education, birth weight and past infection were not found to have association with wasting.

Table 4. Factors associated with wasting in study participants

Variables		Wasting		Total	p-value
		Yes	No		
Gender		23 (14.6)	135 (85.4)	158 (100)	0.803*
		21 (14.6)	123 (85.4)	144 (100)	
Age (months)		34 (19.4)	141 (80.6)	175 (100)	**0.003****
		7 (7.4)	88 (92.6)	95 (100)	
		1 (3.6)	27 (96.4)	28 (100)	
		2 (50.0)	2 (50.0)	4 (100)	
Ethnicity		1 (10.0)	9 (90.0)	10 (100)	0.739**
		5 (18.5)	22 (81.5)	27 (100)	
		2 (8.7)	21 (91.3)	23 (100)	
		17 (13.2)	112 (86.8)	129 (100)	
		19 (17.4)	90 (82.6)	109 (100)	
		0 (0.0)	4 (100.0)	4 (100)	
Family size		12 (12.6)	83 (87.4)	95 (100)	0.518*
		32 (15.5)	175 (84.5)	207 (100)	
Socioeconomic status		0 (0.0)	13 (100.0)	13 (100)	0.249**
		30 (14.4)	179 (85.6)	209 (100)	
		14 (17.5)	66 (82.5)	80 (100)	
Maternal education		9 (25.7)	26 (74.3)	35 (100)	0.337**
		20 (14.4)	119 (85.6)	139 (100)	
		13 (13.7)	82 (86.3)	95 (100)	
		2 (7.4)	25 (92.6)	27 (100)	
		0 (0.0)	5 (100.0)	5 (100)	
		0 (0.0)	1 (100.0)	1 (100)	
Birth weight		0 (0.0)	4 (100.0)	4(100)	0.624**
		39 (15.2)	218 (84.8)	257 (100)	
		5 (12.2)	36 (87.8)	41 (100)	
Past history of infection		24 (18.8)	104 (81.2)	128 (100)	0.077*
		20 (11.5)	154 (88.5)	174 (100)	

*Chi-square test ** Fisher's exact test

DISCUSSION

Our study sought to estimate the prevalence and associated factors of underweight, stunting and wasting among participants residing in rural area of Nepal as malnutrition is one of the main causes of the death of children under the age of 5 years and is one of the most common causes of the decline in the health and life of children, which results in decreased learn ability, inefficiency, and inability to acquire skills.[8] Our study revealed that the prevalence of underweight, stunting and wasting was 36.8%, 37.5%, and 14.6% respectively. The prevalence of stunting and wasting found in this study is high compared to 2018 estimates of the global prevalence of stunting (21.9%) and wasting (7.3%) but our findings are consistent with the prevalence of stunting and wasting in South Asia which was estimated to be 34.4% and 14.6% respectively.[9,10]

Statistics for Nepal according to NDHS 2016 revealed that the prevalence of underweight, stunting and wasting to be 27%, 36% and 10% respectively.[7] The prevalence of underweight and wasting in our study is higher than national results whereas prevalence of stunting is comparable. The discrepancy in the prevalence may be because NDHS is the national average data which included participants from all the geographical regions whereas our finding is only from a Himalayan community.

The prevalence of underweight (36.8%) found in this study is higher than the rates reported from other parts of the country and other parts of the world whereas other studies reported the prevalence of underweight (37.3%, 34.3% and 38.1%) which are in line with our findings.[11-19]

Apart from the national survey, other study conducted among rural population of Nepal by Chataut et al. reported the prevalence of stunting which is consistent with our findings (37.5%).[13] There are studies from Nepal and other countries which reported higher rates of stunting compared to our findings and lesser prevalence than ours.[2,11,12,14,17-22]

The prevalence of wasting in our study (14.6%) is high compared to other studies from rural Nepal and other part of the world.[2,11-15] Higher rates of wasting compared to current findings have been reported by many other studies.[16-18,21,22]

Associated factors of malnutrition

Several risk factors may contribute to child malnutrition. Our study reported that are the most contributing factors of underweight are child's age, family size, mother's education and illness in past one month. Factors that are associated with stunting in this study are child's age, mother's education and illness in past one month whereas only child's age is found to be associated with wasting. Our study revealed that there was a significant chance of being malnourished in children belonging to lower age group which is supported by other studies with similar findings whereas some studies reported that malnutrition increased with the increase in age.[14,16,19,23] In our study we found that large size of the family is significantly associated (0.011 fisher's) with underweight but not with stunting and wasting. Poor nutritional status in large families might be due to the fact that they might have experienced more economic burden for food consumption as the available food is shared by all members. Associate between large family size and malnutrition were reported in other studies too. Study done in rural population of India and Ethiopia found significant association between big family size and wasting.[16,20] Inconsistent to our findings, study conducted among rural population of Nepal revealed that children from larger family size were less likely to be malnourished.[11] Whereas there are studies which reported no association

between family size and malnutrition.[24,25]

Our study revealed that children of mothers either illiterate or with lower level education are at significant risk of developing underweight and stunting which is believable because mother with higher level of education would have better knowledge of child health, child care and nutrition. Similarly Karki et al. in their study in Nepal revealed that children of illiterate mothers have significant chances of developing underweight and stunting.[12] There are several studies conducted in various countries including Nepal, India, Pakistan, Ethiopia, Burkina Faso, Bangladesh which reported that significant association exists between lower level of mother's education and malnutrition.[15-19,23,24,26-29] There are studies which reported that there was no association between mother's education and malnutrition in their children.[25,30]

Association between infections and malnutrition is bidirectional, malnutrition can make a person more susceptible to infection, and infection also contributes to malnutrition, which causes a vicious cycle.[31] Malnutrition increases the host's susceptibility to infectious diseases, and these infections, in turn, have negative repercussions on the metabolism of the host, worsening the nutritional state.[32] In the current study, infection in the past one month is significantly associated with malnutrition in the children. Research studies had reported association between history of illness and malnutrition in children and findings of this study can corroborate to those studies.[12,15,20,22,23,33] Study done in the rural setting of Nepal reported no association between infection in the past two weeks and malnutrition in children.[17] We failed to reveal any significant association between gender and malnutrition in contrast to many other studies nor did we find any significant association between economic status and malnutrition unlike many other findings.[11,12,15,17,19,20,23,25-29,33,34] In contrast to the findings from several studies who had revealed the significant association between low birth weight and malnutrition our study failed to reveal such association.[14,18,22,23,27,35] This might be because there was only small sample (1.3%) under the category of low birth weight.

This study is a cross sectional design and therefore does not depict the causal relationship between the risk factors and development of malnutrition. Recall bias in the study cannot be ruled out because our findings are based on self reporting of several variables.

CONCLUSION

The high prevalence of underweight and stunting in present study enable us to conclude that malnutrition is still an important problem in under five children in Nepal. It also revealed that age of the child, size of the family, maternal educational status and history of infection in the recent past were the factors that affected nutritional status of children. The results of this present study should be considered to develop strategies to improve nutritional status of under-five children in Nepal and can be used as basic information for larger survey in the future.

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