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Prevalence and Predictors of Underweight, Stunting and Wasting in Under-Five Children

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ABSTRACT

Background: Malnutrition is a major underlying cause of the child morbidity and mortality in Nepal. In the past ten years there hasn't been any significant progress in the nutritional status of the under-fives in Nepal. In such situation this study determines the prevalence of undernutrition and the factors associated with it which helps district health managers monitor undernutrition and identify different associated factors essential in order to better design and implement the nutritional interventions.

Methods: A cross-sectional comparative study was conducted in Belahara VDC among 150 underfive children in 2008. Primary caretakers were interviewed for different socio-demographic and maternal & child health related factors. Through anthropometry, prevalence of underweight, stunting and wasting was determined. Logistic regression statistical tool was used to analyze the influence of different predictors.

Results: Prevalence of underweight, stunting and wasting was 27%, 37% and 11% respectively. In the final model of logistic regression statistical tool, male sex was found protective for stunting. Comparatively, the risk of being underweight in the children from the poor socioeconomic status is almost four times as much as in the children from the rich socioeconomic status [OR= 4.336 (1.719 <OR<10.936)]. Children from joint family were found protective against stunting than children in the nuclear family. Other covariates such as age at pregnancy and ethnicity of the child were found to be significantly associated only at 10% level of significance.

Conclusion: Acute undernutrition was found more in the VDC as of national figure. Emphasis should be placed on the girl children and the disadvantaged ethnic groups for nutritional interventions. These interventions should be coordinated with income generation and food production activities for sustainability of nutritional interventions. Maternal age at pregnancy, as found determining the nutritional status of children, should be included as a part of nutrition counseling during ANC visits.

Key words: Underweight, stunting, wasting, predictors, nutritional intervention

INTRODUCTION

Malnutrition is a major public health problem in Nepal. It is one of the foremost underlying causes of the child morbidity and mortality.[1] It is a major determinant of the standard of living, quality of life and overall social and economic development. Throughout the country, stunting is 49% and it is more common in mountain areas than in the terai, while underweight and wasting, 39% and 13% respectively, are more common in terai than in

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the mountain areas.[2] The disease burden study showed that more than two third of the disease burden is occupied by group A category such as communicable and infectious diseases, maternal and perinatal disorders and malnutrition.[3] The underlying cause of most of them is undernutrition. Furthermore, in rural domain countries, the condition becomes worse when they occur in combination.[4]

In past ten years, there has not been seen any significant progress in the nutritional status of under-fives in country.[3] This study, in such situation, was done to determine the prevalence of stunting, underweight and wasting, and factors associated with them that would help district health managers monitor undernutrition and identify different associated factors that are essential in order to better design and implement nutritional interventions to reduce the child mortality and morbidity.

METHODS

A cross-sectional comparative study was conducted in Belahara VDC of Dhankuta district during June-July, 2008. The approval was taken from District Health Office, Dhankuta to conduct the study. Verbal informed consent was attained before biological mother/primary care taker of each child was invited for the interview. A sample size of under five children was taken based on national prevalence of underweight that is 39%[3] with 8% precision at 95% confidence interval.

Sample size (N) = $z^2pq/d^2 = 2^2 \times 0.39 \times 0.61/8^2 = 150$

Study units were selected randomly from the list of total number of under-five children in the study VDC which was available from the Belahara Health Post. The random number table was used for this purpose. Study units that were below the age of 60 months were included in the study. The study units were excluded in case child or biological mother/primary caretaker or both were not available during home visit or the child was severely ill.

Weight for age, weight for height and height for age z-scores were based on CDC/WHO reference data. A cut off of -2 z-score was used to define under nutrition for binary logistic regression. Socioeconomic status, a composite indicator, was classified as rich, medium and poor based on three different variables viz. food sufficiency from agricultural product, land holding of family and housing standard. Ethnic groups were classified as advantaged and disadvantaged according to national ethnicity classification available for HMIS. All the covariates were entered and analyzed in SPSS version 13.

The study described the variables in the study, and compared undernourished and not undernourished children to determine the socio-economic, behavioral and other covariates contributed to under nutrition. For each covariate, the category that was found to weigh the least risk for under nutrition in the literature was considered as the reference/comparison group except for the sex of the child. At last, study determined the chances of being undernourished for children in any group as compared to the reference group for each covariate. For this purpose, the logistic regression statistical tool was used using backward stepwise approach. Sex, socioeconomic status and diarrhea during last 30 days of data collection were forced in the final model since they have been found to be significant risk factors in the literature and are potential confounders. Since very few children in the sample were found wasted (n=16), the significance of bivariate relationship was assessed using Chi-square test. Anthropometric data were calculated by Epi-Info 3.0 NutStat programme.

RESULTS

Prevalence of underweight, stunting and wasting in the study VDC were 27.3%, 37% and 11% respectively. The mean z-score for weight for age and height for age was found to be decreasing with age while for weight for height it decreased till the age of 36 months and then gradually increased. Boys were found less likely to be stunted [OR= 0.4 (0.188<OR<0.851)]. Poor socioeconomic status was found a risk factor for both stunting [OR= 3.17 (1.321<OR<7.615)] and underweight [OR= 2.82 (1.00<OR<8.31)]. Children reared in the joint family were found less like to be stunted than those in nuclear family [OR= 0.23 (0.054<OR<1.00)].

Forty nine% among hundred fifty study children were boys. Mean age was 23.8 months. The age range varied from 15 days to 57 months. Since there was no significant difference between boys and girls in weight, height and weight for height, the sexes were combined for the purpose of analysis. Disadvantaged ethic groups viz. Rai, Limbu, Sherpa, Bhujel, Yakkha, Lepcha, Kami, Damai, Sarkii, Pariar, BK, Magar formed the majority in the study population i.e. 72%. And, the rest formed advantaged ethnic group (Bhramin, Chhetri, Newar (Shrestha), Gurung, Thakuri). Almost half of the underfive children were reared in poor family. Four in ten children were living in family having two children and almost one third were living in the family having three or more children. Half of the underfive children were living in nuclear family and almost one third were living in joint family. More than half of the underfive children were reared by the mothers completed primary education and almost one in four children by the mothers didn't get any formal education. Similarly, one in four children got ARI and only seven% got diarrhea during one month period prior to data collection. One out of three children was born when maternal age at pregnancy was less than 20

years and 12% were born when their mothers were 35 years or more. One in three children was born to mother who either smoked or took alcohol during pregnancy.

Prevalence of undernutrition (below 2SD) in terms of underweight (27.3%), stunting (37%) and wasting (11%) was observed among them. The study revealed the severe degree (below -3SD) of underweight, stunting and wasting in 3, 12 and 2% children, respectively (Table 1).

Table 1. Frequency of stunting, wasting and underweight (n=150)

Nutritional status	Frequency (%)
Stunting	
Severely stunted	18 (12.0)
Moderately stunted	37 (24.7)
Normal	95 (63.3)
Underweight	
Severely underweight	5 (3.3)
Moderately underweight	36 (24.0)
Normal	109 (72.7)
Wasting	
Severely wasted	3 (2.0)
Moderately wasted	13 (8.7)
Normal	134 (89.3)

There is a downward shift of curves throughout the under-five age while plotting age against mean z-score for height for age, weight for age and weight for height . Height for age stabilized around -1 z-score till the age of 18 months. After that there is sharp decrease in z- score as age increased. On the other hand, for weight for age, there is continuous decrease in mean z-score till the 36 months and then curve stabilized around -1.5 z-score. Weight for height curve showed mean z-score positive till the age of 18 months, decreased till the age of 36 months, and then slowly started increasing till the end of underfive age (Figure 1).

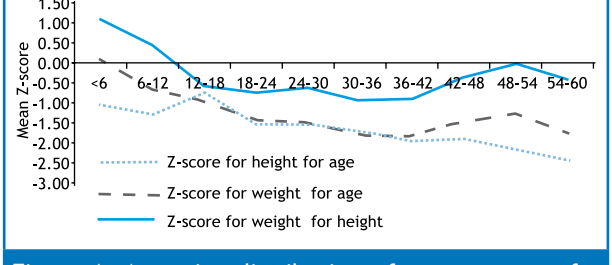

Figure 1. Age wise distribution of mean z-score for height for age, weight for age and weight for height

Predictors of undernutrition (unadjusted)

A significant association existed between underweight and not underweight children in their second year of life when compared with reference group of 0 to 12 months children [OR= 4.36(1.118<OR<4.36)] (Table 2,3).

Sex wasn't significant to predict the underweight but stunting was found less likely among boys [OR= 0.399 (0.204<OR<0.780)]. Stunting was found more likely among the children from disadvantaged ethnic group family [OR= 2.522 (1.150<OR<5.527)] but the same wasn't significant to predict the underweight. Socioeconomic status was a strong predictor of the underweight. Comparatively, the risk of being underweight in the children from the poor socioeconomic status is almost four times as much as in the children from the rich socioeconomic status [OR= 4.336 (1.719 <OR<10.936)]. Similarly, in poor socioeconomic group, the risk of getting stunted is three times as much as in rich socioeconomic group [OR= 3.083 (1.443<OR<6.586)]. It was found that number of children in the family wasn't associated with under nutrition. Stunting was found less likely among the children in joint family [OR= 0.268 (0.071<OR<1.014)]. Neither underweight nor stunting were found to be associated with mother's educational status. Diarrheal disease during one month before survey was found to be associated with underweight [OR= 4.333 (1.517<OR<16.233)]. Neither fever nor ARI was found to have any association with underweight and stunting. When maternal age at pregnancy was more than 35 years, there was 2.6 times risk of underweight in the children [OR= 2.615 (1.139<OR<6.005)]. Similar association was also found for stunting. Furthermore, when maternal age at pregnancy was less than 20 years, it was found protective factor for underweight [OR=0.25(0.08<OR<0. 782)]. Smoking and alcoholism during pregnancy wasn't observed to have any association with the child's being underweight or stunting.

Female sex was found strongly associated with child's being wasted (x2=4.016, P=0.045). More wasting cases were found when maternal age at pregnancy was 35 years or more. But this statement wasn't statistically significant (x2=2.911, P=0.233). Consistent results weren't found for age wise distribution of wasting cases but figures shows that during the second year of life, children are more likely to be wasted but this statement was not statistically significant (x2=4.537, P=0.334). Illness during one month prior to survey wasn't found to have any significant association with wasting.

Model of logistic regression for undernutrition (adjusted)

In the final model, boys were found less likely to be stunted [OR= 0.4(0.188<OR<0.851)]. Poor socioeconomic status was found a risk factor for both stunting [OR=3.17(1.321<

Table 2. A comparison between underweight and not underweight children using crude odds ratio

Survey Variables	Underweight	Not underweight	Crude OR		
			OR	95% CI	P-value
Children's age in month					
<12.00	5 (11.1%)	40 (88.9%)	-	-	-
12.00 - 23.99	9 (25.0%)	27 (75.0%)	4.36	1.118-17.028	0.034
24.00 - 35.99	10 (33.3%)	20 (66.7%)	1.64	0.470-5.702	0.439
36.00 - 47.99	12 (54.5%)	10 (45.5%)	1.09	0.312-3.812	0.892
48.00 - 59.99	6 (35.3%)	11 (64.7%)	0.46	0.124-1.670	0.235
Sex of child					
Male	18 (24.7%)	55 (75.3%)	0.732	0.352-1.482	0.376
Female	24 (31.2%)	53 (68.8%)	-	-	-
Ethnicity					
Advantaged group	12 (28.6%)	30 (71.4%)	-	-	-
Disadvantaged group	30 (27.8%)	78 (72.2%)	0.962	0.436-2.12	0.923
Socioeconomic status					
Rich	6 (23.1%)	20 (76.9%)	-	-	-
Medium	7 (13.5%)	45 (86.5%)	2.248	0.805-6.276	0.122
Poor	29 (40.3%)	43 (59.7%)	4.336	1.719-10.936	0.002
No. of children in family					
One	8 (24.2%)	25 (75.8%)	-	-	-
Two	16 (24.6%)	49 (75.4%)	1.654	0.621-4.408	0.314
Three or more	18 (34.6%)	34 (65.4%)	1.621	0.726-3.619	0.238
Type of family child lives in					
Nuclear	20 (25.6%)	58 (74.4%)	-	-	-
Joint	20 (37.0%)	34 (63.0%)	0.363	0.07-1.717	0.201
extended	2 (11.1%)	16 (88.9%)	0.053	0.044-1.022	0.053
Education level of mother					
No formal education	7 (20.0%)	28 (80.0%)	0.509	0.197-1.314	0.163
Primary education	27 (32.9%)	55 (67.1%)	0.781	0.248-2.464	0.674
Secondary and above	8 (24.2%)	25 (75.8%)	-	-	-
Illness within last one month					
Fever	1 (14.3%)	6 (85.7%)	0.415	0.048-3.552	0.422
Diarrhoea	6 (60.0%)	4 (40.0%)	4.333	1.517-16.233	0.03
ARI	2 (5.7%)	33 (94.3%)	0.571	0.228-1.432	0.232
Age of mother when child born					
Less than 20	17 (33.3%)	34 (66.7%)	0.25	0.08-0.782	0.017
20-35	13 (16.0%)	68 (84.0%)	-	-	-
More than 35	12 (66.7%)	6 (33.3%)	2.615	1.139-6.005	0.023
Smoking and alcoholism during pregnancy					
Yes	116 (31.4%)	35 (68.6%)	1.284	0.611-2.695	0.51
No	226 (26.3%)	73 (73.7%)	-	-	-

Table 3. A comparison between stunted and not stunted children using crude odds ratio

Study Variables	Stunted	Not Stunted	Crude OR		
			OR	95% CI	P-value
Children's age in month					
0-12	14 (31.1%)	31 (68.9%)	-	-	-
12- 24	18 (50.0%)	18 (50.0%)	3.163	0.998-10.028	0.05
24- 36	11 (36.7%)	19 (63.3%)	1.429	0.445-4.585	0.549
36 - 48	9 (40.9%)	13 (59.1%)	2.468	0.730-8.344	0.146
48- 60	10 (58.8%)	7 (41.2%)	2.063	0.570-7.471	0.27
Sex of child					
Male	22 (30.1%)	51 (69.9%)	0.399	0.204-0.780	0.007
Female	40 (51.9%)	37 (48.1%)	-	-	-
Ethnicity					
Advantaged group	11 (26.2%)	31 (73.8%)	-	-	-
Disadvantaged group	51 (47.2%)	57 (52.8%)	2.522	1.150-5.527	0.021
Socioeconomic status					
Rich	7 (26.9%)	19 (73.1%)	-	-	-
Medium	15 (28.8%)	37 (71.2%)	3.393	1.269-9.071	0.015
Poor	40 (55.6%)	32 (44.4%)	3.083	1.443-6.586	0.004
No. of children in family					
One	18 (54.5%)	15 (45.5%)	-	-	-
Two	26 (40.0%)	39 (60.0%)	0.441	0.181-1.077	0.072
Three or more	18 (34.6%)	34 (65.4%)	0.794	0.373-1.693	0.550
Type of family child lives in					
Nuclear	35 (44.9%)	43 (55.1%)	-	-	-
Joint	22 (40.7%)	32 (59.3%)	0.268	0.071-1.014	0.052
Extended	5 (27.8%)	13 (72.2%)	0.336	0.085-1.318	0.118
Education level of mother					
No formal education	11 (31.4%)	24 (68.6%)	0.557	0.242-1.286	0.171
Primary education	37 (45.1%)	45 (54.9%)	0.622	0.230-1.679	0.349
Secondary and above	14 (42.4%)	19 (57.6%)	-	-	-
Illness within last one month					
Fever	1 (14.3%)	6 (85.7%)	0.224	0.026-1.910	0.171
Diarrhoea	6 (60.0%)	4 (40.0%)	2.250	0.607-8.335	0.225
ARI	12 (34.3%)	23 (65.7%)	0.678	0.308-1.494	0.335
Age of mother when child born					
Less than 20	27 (52.9%)	24 (47.1%)	0.900	0.306-2.651	0.848
20-35	25 (30.9%)	56 (69.1%)	-	-	-
More than 35	10 (55.6%)	8 (44.4%)	2.52	1.221-5.199	0.012
Smoking and alcoholism during pregnancy					
Yes	19 (37.3%)	32 (62.7%)	0.773	0.387-1.546	0.467
No	43 (43.4%)	56 (56.6%)	-	-	-

Table 4. Adjusted odds ratios for the covariates in the final logistic model for stunting and underweight

Study Variables	Stunting			Underweight		
	OR	95% CI	P-value	OR	95% CI	P-value
Sex of child						
Male	0.4	0.188-0.851	0.017			
Female	-	-	-			
Ethnicity						
Advantaged	-	-	-			
Disadvantaged	2.08	0.860-5.028	0.104			
Socioeconomic status						
Rich	-	-	-	-	-	-
Medium	2.37	0.949-12.773	0.07	2.054	0.55-7.66	0.28
Poor	3.17	1.321-7.615	0.010	2.821	1.00-8.31	0.05
Type of family						
Nuclear	-	-	-	-	-	-
Joint	0.23	0.054-1.00	0.050	0.90	0.01-1.11	0.06
Extended	0.49	0.108-2.234	0.358	0.104	0.01-1.33	0.08
Age at Pregnancy						
< 20	1.00	0.280-3.354	0.960	0.253	0.06-1.01	0.052
20-35	-	-	-	-	-	-
> 35	2.16	0.960-4.915	0.064	2.435	1.00-6.42	0.072

OR<7.615)] and underweight [OR= 2.82(1.00<OR<8.31)]. Children reared in the joint family were found less like to be stunted than those in nuclear family [OR=0.23(0 .054<OR<1.00)]. Disadvantaged ethnic group, Medium socioeconomic status and age at pregnancy seem to have significant association with stunting and underweight only at 10% level of significance (Table 4).

DISCUSSION

Prevalence of underweight and stunting in the study VDC was 37% and 27% respectively. These figures were less than that of national prevalence.[3] Wasting was found more than 10% which suggests the immediate interventions. Age wise distribution of height for age, weight for age and weight for height z-scores suggested that most of the children hadn't reached their maximum growth potential and the interventions should be directed to all children in the age range at risk.

Age seemed predicting chronic nutritional status of under-five children but, in final model, no effect of age was found. On contrary a study carried out among Kenyan children found "children in the second year of life were more likely to be stunted and underweight".[1] Stunting was found less likely among males. Study conducted in Dailekh district found more cases of stunting among males but the association wasn't statistically significant.[5] Another study carried out in Pakistan showed females were three times more likely to be stunted than males.[6] As present study was conducted in community where most of the people were of disadvantaged ethnic group and poor in socioeconomic status, gender might have played significant role to determine the child rearing practices. These factors, in long run, might have put girls at risk of chronic under nutrition.

Ethnicity was found to predict the chronic undernutrition, as child reared in disadvantaged ethnic group family was found prone to stunting. Socioeconomic status of the family was found most important predictor of underweight and stunting. Availability of cultivable land and food sufficiency represents how much family is boosted up to provide sufficient food to their children which shows its effect in long run as children brought up in poor socioeconomic family were found prone to be stunted and underweight. Furthermore, children reared in the family with medium socioeconomic status were also found vulnerable to chronic under nutrition at 10% significance level. As the socioeconomic status of the family decreases gender and other social issues becomes more potent and act synergistically to put child vulnerable to undernutrition. A study carried out in

Ecuador found, after controlling for relevant covariates, economic inequality at the provincial scale had a statistically significant deleterious effect on stunting.[7]

Children living in joint family were found less likely to be underweight and stunting. Since many women are the family's primary laborers in the field, they may be unable to nurse their infants regularly. In such situation, in joint family, there is always someone (grandparents, for example) available to rear children. When maternal age at pregnancy was more than 35 years, it was found a risk factor for stunting and underweight in children at 10% level of significance.

Mother's educational status wasn't found significant to predict undernutrition. But some of the studies carried out in North America and Africa found significant association between them.[6] Similarly diarrhea & ARI in one month duration prior to survey, and mother's smoking and taking alcohol during pregnancy were not found predicting the nutritional status of under-fives, contrary to those found in other studies.[6]

About the limitations of study, sample size was determined considering the national prevalence of underweight and 8% level of precision. Mother's educational level and smoking and alcoholism during pregnancy that were established as significant predictors of undernutrition in national and international literature, were not found so here. In the final model, some of the variables that were proved to have influence on nutritional status of under-fives in literature were found statistically significant only at 10% level of significance. Sample size was small, and when groups were broken down into different exposure categories, power of the results may have affected. Since number of wasting cases was small, it was difficult to identify significant predictors in the analysis due to the lack of power. The observers' bias might have affected the association between undernutrition and illness within one month before survey.

CONCLUSION

The high prevalence of the acute undernutrition in the community requires that National Nutritional Programme should monitor the growth of the under-five children in terms of weight for height. Since socioeconomic status, in terms of food sufficiency, land holding, and housing type was found predicting nutritional status of under-five children; coordination with income generation and food production activities might be an option to make nutritional interventions more effective. The female children and the children belonging to disadvantaged ethnic group need special attention as they were found to predict nutritional status. Maternal age at pregnancy, as found determining the nutritional status of children, should be included as a part of nutrition counseling during ANC visits.

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