

Determinants of Child Malnutrition in Nepal: A Case Analysis from Dhanusha, Central Terai of Nepal

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ABSTRACT

Introduction Malnutrition is an important factor contributing to illness and diseases of adults and children in Nepal. There are many variables or factors that cause malnutrition among children.

Objective The purpose of this research is to predict the effect of various independent variables on underweight and stunting of children.

Methods An analytic sample of 860 children under age three for anthropometric, and healthcare and feeding was drawn from the Final Evaluation Survey of Child Nutrition Program in Dhanusha in 2003. Logistic regression and multiple classification analysis techniques in SPSS were used to predict the effects of various independent variables on stunting and underweight malnutrition.

Results The analysis found that older age children and children whose mothers are illiterate are more likely to be underweight and stunted. Children from families who do not discard rice scum are more advantageous to be wellnourished. Colostrum feeding and suffering from diarrhoea have significant effect on underweight but not on stunting.

Conclusion The study found that rice scum has significant effect on nutritional status of under three children. Similarly, children are benefited from colostrum feeding and prevention or management of diarrhea in terms of nutritional status by weight for age but not for stunting, which is similar to the findings from other studies. The analysis shows further need of research to see the effect of rice scum, colostrum feeding and suffering from diarrhoea on nutrition status of children.

Keywords Child malnutrition; underweight and stunted; predictors; adjusted proportions; Nepal

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Introduction

Among children in developing countries, malnutrition is an important factor contributing to illness and death. Malnutrition during childhood can also affect growth potential and the risk of morbidity and mortality in later years of life. Malnutrition among children is rampant among the South Asian countries. About half of all children deaths are associated with malnutrition, of which three quarters are linked to mild and moderate forms.¹ Malnutrition among children is also very common in Nepal. Nepal Micronutrient Status Survey (NMSS) reports 47% of children below five age being underweight; 54% of them being stunted (less height as per age), and 7% being wasted (thin for height).² Nepal Demographic and Health Survey (NDHS) also reports 48% children under weight, 50% stunted and 10% wasted.⁵ Studies show less stunting in Terai but comparatively high rate of wasting than mountains.^{3, 7}

There are many factors that directly or indirectly cause malnutrition among children. Researchers have found child malnutrition as cause of a combination of inadequate or inappropriate food intake, gastrointestinal parasites and other childhood diseases, and improper care during illness.⁴ Further, Food and Agriculture Organization (FAO) identifies the dimensions of good nutrition as enough food, proper health, and adequate care.⁵ Research shows nutrition status as the result of the complex interaction between the food we eat, our overall health, and the environment in which we live- in short, food, health and caring, the three 'pillars of well being'.⁵ Among the factors that cause malnutrition, intake of adequate and nutritious foods is one of the important factors that need to be considered to prevent malnutrition in long run. Insufficient quantity and less nutritious food consumption leads to lack of energy, protein and vitamins in the body, which affect the growth, development as well as resistance, thus leading to many illness. In turn, people become malnourished and enter the vicious cycle of malnutrition.

Studies show striking relationship of malnutrition with age.^{6, 7} Stunting increases steeply up to about 18 months of life and after a peak it tends to level off in the third year of life.⁶ NDHS also reports same relationship of malnutrition with age.³ It reports that low weight-for-age is more common among children more than six months old. The prevalence of low weight-for-age also shows steep rise from 6 to 18 months and consequent flattening.⁶

The relationship of malnutrition with age indicates combination of other factors such as quantity of food eaten by mothers of the child, breastfeeding, colostrums feeding at birth of child and initiation of feeding (solid and liquids) to the child. Nepal Multiple Indicator Surveillance (NMIS) shows only 30% of children are exclusively breastfed in the first three months of life; however, median age for any breastfeeding is about 30 months.⁶ It also reports inadequate feeding practices as a major factor contributing to malnutrition.⁶ Studies show strong relationship of mothers' diet and children's nutritional status. For example, NMIS reports that children whose mothers

are not having enough food to eat the previous day are more likely to be stunted or wasted than children whose mothers had enough to eat.⁷ Similarly, children who had the colostrums thrown away at their birth are at increased risk of being malnourished both at increased risk of being wasted and stunted.⁷ This study also reports children to have had liquids and solids added to the diet relatively later are more likely to be stunted or wasted.⁷

Malnutrition is also associated with suffering from childhood diseases such as diarrhea or other severe illness. Children who suffer from repeated episodes of diarrhea or Acute Respiratory Infections (ARI) are more likely to suffer from malnutrition.⁷ This is partly because of reduced appetite, less quantity of fluids and foods offered during diarrhea and other sickness.

Literacy and social status of mothers are also key factors contributing to malnutrition in children. NDHS shows decrease of stunting with increasing level of mother's education.⁵ Similar evidence is found in the National Family Health Survey (NFHS) carried out in India.⁴

Similarly, place of residence has some association with malnutrition in children. Children from rural areas are more prone to malnutrition compare to the children from urban areas. For instance, 64% and 49% of 6-36 months children are reported with chronic malnutrition (low height for age) and 49% and 35% with general malnutrition (underweight for age) in rural areas and urban areas respectively.^{3, 6} However, on the other hand, there is mix picture of malnutrition in *Terai* and hills/mountains. Stunting is higher in hills/mountains compare to *Terai* whereas wasting is higher in *terai* than hills/mountains.^{3, 7}

Despite prevalence of widespread discrimination against girls, and caste differences and untouchability in Nepal, there is not significant association of malnutrition with gender^{3, 6, 7} and ethnicity. There is also no significant gender difference in malnutrition in India.⁴ However, data segregation by various caste/ethnic groups' shows relationship with malnutrition in children.⁷ Muslim and *Terai* caste children suffer more from malnutrition than hilly caste people.

Food intake is one crucial factor that affects nutrition status of people in general and children in particular. Food intake involves many practices related to preparation of food (processing), combination of various types of foods, cooking, and sanitation during cooking and eating and feeding (in case of children). Although food intake has major contribution on improving nutrition status of human being, some traditional practices related to food intake seem hazardous. For instance, great majority of households in *Terai* extract and throw rice scum.⁸ However, such factors are not taken into consideration in nutrition research.

The literatures show effects of many factors on child nutritional status. Since this study has collected information on various socio-cultural backgrounds including

knowledge, attitude and practices and includes anthropometrical measurement of children under age three, the assumption behind this study is that the same effect of the variables would be on nutritional status of children under age three in *Terai*. Hence, this research will analyze the relationship among various factors / variables affecting child nutritional status. After completion of this study, the report would conclude about the effects of the factors that contribute nutritional status of children in *Terai*.

Based on the knowledge of literatures, this research will be testing the following propositions.

- Aged children are more likely to suffer from malnutrition than younger children.
- Children who are fed colostrums after birth are less likely to suffer from malnutrition than those who are not.
- There is not significant relationship between malnutrition among children under age three and their sex.
- There is not significant relationship between malnutrition among children under age three and their ethnicity.
- There is not significant and strong association between overall economic sufficiency of the household and nutrition status of children.
- There is strong and significant association between suffering from diarrhoea and malnutrition of children.
- Literacy status of mothers and nutrition status of children are strongly and significantly associated.
- Use of rice scum (extra water poured while cooking rice) has strong and significant association with nutritional status of children.
- Use of material such as soap or ash for washing hand before feeding children [by mothers] has strong and significant association with nutritional status of children.

Materials and Methods

This study utilized the data gathered during final evaluation of child nutrition program in Dhanusha district carried out by Save the Children Japan and Aasaman Nepal in 2003. Anthropometric measurement (height-for-age and weight-for-age) of 860 under three age children from 1,005 household of 17 Village Development Committees (VDCs) in Dhanusha was taken. Similarly, information on feeding

practices of 567 children (out of 860 children under age three) of 0-23 month age was taken. Information on knowledge, attitude and practices related to child health and feeding practices was gathered for 567 children of 0-23 month age.

The total number of data for each variable varies due to limited number of responses for child feeding practices whereas more number of anthropometric measurement and socio-cultural determinants. This data is appropriate for this analysis mainly due to the following reasons. First, it utilizes a wider coverage of 17 VDCs and includes somewhat large sample size. Second, this study has gathered information on knowledge, attitude and practices, information on socio-economic variables and current nutritional status of children. And, third this study represents the nutritional status of the children in Eastern and Central *Terai* region due to similarities in the socio-economic and cultural factors. Some of the findings of this study may not be generalized for hills and mountain regions of Nepal due to contrast differences in the socio-economic and cultural aspects than that of *Terai*.

This study intends to analyze the effects of various variables on nutritional status of children. Hence, the nutritional status of children (height-for-age i.e. stunting and weight-for-age i.e. underweight) are mainly used as dependent variable in this analysis. Individual attributes of the children such as age and sex; family background such as mother's education status, ethnicity, economic sufficiency of the family; and health and care [including feeding practices] related attributes such as practice of throwing rice scum, colostrum feeding to children, materials used for hand washing [by mothers] before feeding child, and suffering from diarrhea [of children] last year are taken as independent variables. Required coding and modification of data was done to fit the appropriate statistical method.

Logistic regression and multiple classification analysis are used to estimate the effects of each individual independent variable by controlling effects of other variables by setting them at their mean values. Similarly, cross-tabulation method is used as bivariate analysis to test the significance of relationship between predictor variables and the nutrition status of children. The SPSS data processor program is used for these analyses.

Results

The result of the analysis is divided into two parts: first part presents the result from the bivariate analysis and the second part presents the result from the multivariate analysis.

Bivariate results

The bivariate analysis showed not significant ($p=.062$ for underweight & $p=.778$ for stunting) relationship of sex, ethnicity ($p=.478$ for underweight & $p=.243$ for stunting), and household economic status ($p=.690$ for underweight & $p=.354$ for stunting) with nutritional status of children under age three; significant association between age of the children ($p=.000$ for both underweight & stunting), mothers' education ($p=.004$ for underweight & $p=.002$ for stunting), and use of rice scum at household ($p=.040$ for underweight & $p=.038$ for stunting) and nutrition status of children under age three. The association between suffering from diarrhea last year and malnutrition among children under age three was found significant ($p=.000$) for weight-for-age (underweight) malnutrition but non-significant ($p=.571$) for height-for-age (stunting). Similarly, association between colostrum feeding and nutrition status of children under age three was found significant ($p=.004$) for weight-for-age (underweight) malnutrition but non-significant ($p=.193$) for height-for-age (stunting). On contrast, association between materials used for hand washing [by mothers] before feeding child and malnutrition among children under age three was found significant ($p=.022$) for height-for-age (stunting) but non-significant ($p=.294$) for weight-for-age (underweight) malnutrition.

Multivariate Results

Among the individual attributes sex and age of the child, the analyses show significant effect of age on underweight and stunting status whereas no or little effect of sex. The analysis shows much noticed effect of age on nutritional status of children. More proportion of children of older age are found underweight and stunted than 6 months and below children, however, the stunting is also high in this age group (Figure 1). Given the evidence of wide spread of discrimination against girls in

Figure 1. Adjusted effects of age on the proportion of children under age three who are underweight or stunted: Dhanusha, 2003

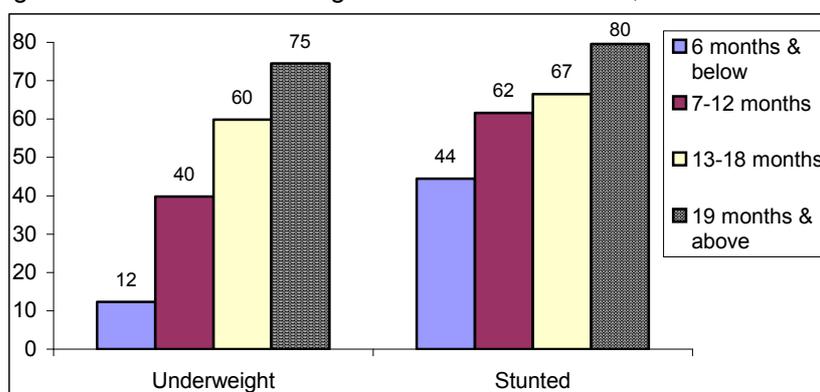
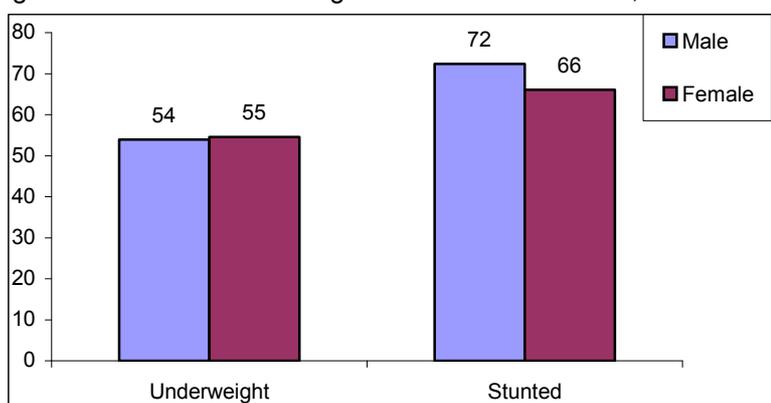


Figure 2. Adjusted effects of sex on the proportion of children under age three who are underweight or stunted: Dhanusha, 2003



Terai region, the proportions of underweight are identical for boys and girls, whereas under stunting the proportion is higher for boys (Figure 2).

Under the family attributes, the ethnicity shows slight effect, the economic status of household no effect, and mother's education status prominent effects on nutritional status of children under age three. Although there is high level of caste untouchability and deprivation among Dalits in Nepal, the ethnicity of the children shows mild effect on their nutritional status. The proportion of underweight and stunted is slightly higher for Dalit children than non-Dalit (Figure 3). Despite the high level of economic disparity in the areas, the analysis shows no direct effect of economic sufficiency on nutritional status of children under age three. The adjusted proportions of underweight and stunted are identical for both children from households with economic sufficiency and insufficiency (Figure 4). But another variable mothers' education status has prominent effects on both underweight and stunting of children under age three. Children whose mothers are literate are less likely to be underweight or stunted than are children whose mothers are illiterate (Figure 5).

Figure 3. Adjusted effects of ethnicity on the proportion of children under age three who are underweight or stunted: Dhanusha, 2003

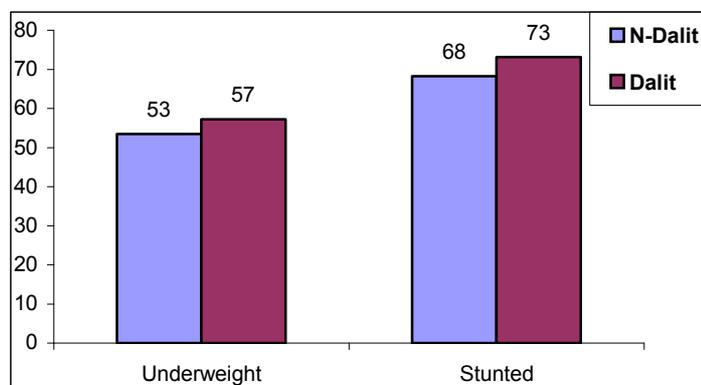


Figure 4. Adjusted effects of economic sufficiency of the household on the proportion of children under age three who are underweight or stunted: Dhanusha, 2003

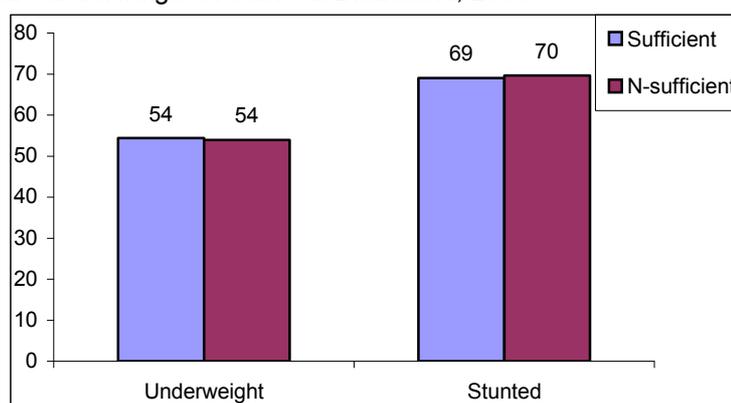
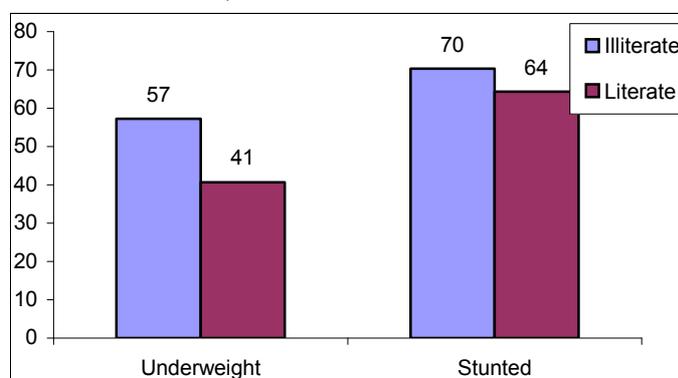
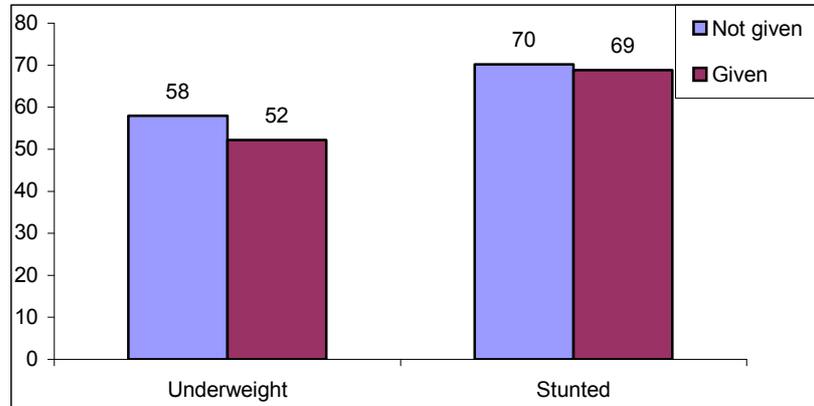


Figure 5. Adjusted effects of mothers' education status on the proportion of children under age three who are underweight or stunted: Dhanusha, 2003



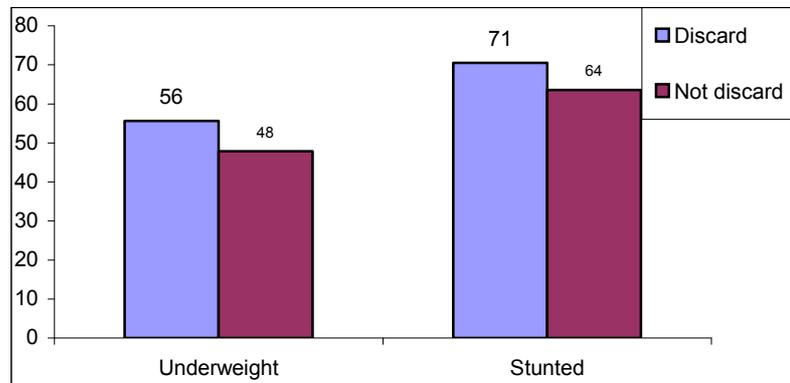
Under the attributes related to health and care and feeding practices, colostrum feeding has noticed effect on underweight but less on stunting; use of rice scum has noticed effect on both underweight and stunting; suffering from diarrhea last year has effect on underweight but opposite in stunting; and materials used for hand washing [by mothers] before feeding child has noticed effect on stunting but almost no effect on underweight.

Figure 6. Adjusted effects of colostrum feeding on the proportion of children under age three who are underweight or stunted: Dhanusha, 2003



The proportions of children who were fed colostrum were less likely to be underweight but the proportions of stunted children were almost same for both colostrum fed and not fed (thrown away) (Figure 6). The children from families where rice scum is extracted and discarded are more likely to be underweight and stunted than children from families who do not discard. The proportions of children underweight and stunted are higher from families who extract and discard rice scum (Figure 7).

Figure 7. Adjusted effects of use of rice scum on the proportion of children under age three who are underweight or stunted: Dhanusha, 2003



The children who had suffered from diarrhea last year are more likely to be underweight whereas it has no effect on stunting. Proportions of underweight children are higher for children suffered from diarrhea last year but the contrast is for stunting with slightly less proportions of stunted children who had suffered from diarrhea last year (Figure 8).

Furthermore, children whose mothers use ash and soap for hand washing before feeding child are less likely to be underweight and stunted. The effect is prominent in stunting than underweight. More proportions of children whose mothers' wash hand with only water, or water and mud are stunted than those children whose mothers wash hand with ash and water, or soap and water before feeding child. But the proportions of underweight are almost identical for both groups (Figure 9).

Figure 8. Adjusted effects of suffering from diarrhea on the proportion of children under age three who are underweight or stunted: Dhanusha, 2003

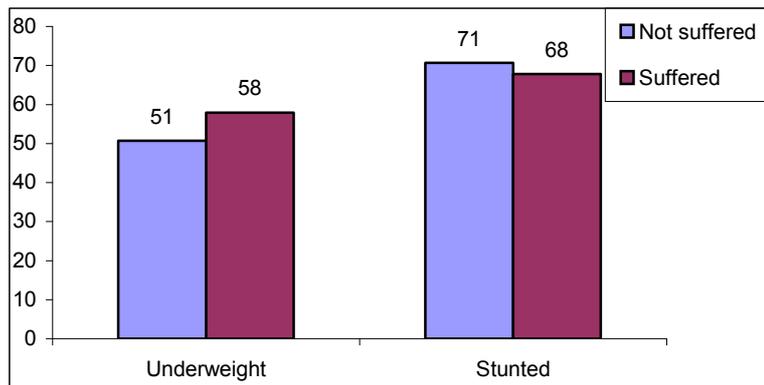
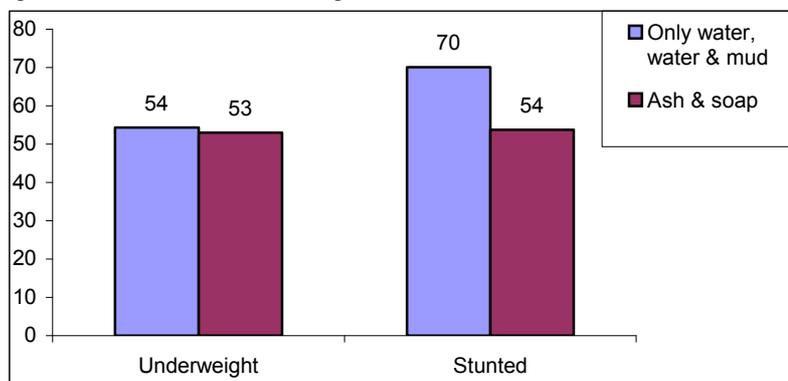


Figure 9. Adjusted effects of materials used for hand washing by mothers before feeding the child on the proportion of children under age three who are underweight or stunted: Dhanusha, 2003



Discussion

More proportions of older age children are found underweight and stunted. Only a tiny proportion of children of six months and lower age are underweight but it drastically increases for 7-12 months and higher age group. The similar finding was reported in the NFHS carried out in India.⁴ This indicates implication related to feeding practices after six months of age. Studies suggest initiation of regular supplementary feeding after six months age to enhance nutritional status of children since mother's milk is not adequate beyond this age. For instance, NMIS reports high level of malnutrition among children who were reported to have had liquids and solids added to the diet relatively later.⁷ Evidences show late initiation of supplementary feeding in Terai, which results in increased underweight in this region.⁶ Similar trend of stunting is found with increasing stunting with higher age. But, the proportion of stunted children is also higher for six months and below age. This indicates perpetuation of under-nutrition from the womb i.e. the nutritional and health status of mother during adolescent, pregnancy and lactating period, which result in low birth weight babies. For example, 71% of delivered women had received iron tablets during last pregnancy in program areas in Dhanusha; only 56% of delivered women had consumed same or more amount of food during pregnancy.⁸

This shows there is still prevalence of social taboos that prohibit women from consuming adequate quantity of nutritious foods and medical care during pregnancy and delivery. The findings suggest the need of initiation of supplementary feeding at proper age with adequate number of frequencies as well as emphasis on maternal care during adolescence, pregnancy and lactating period.

Although there is evidence of wide spread of discrimination against girls in *Terai* region, there is not differences in proportions of underweight for boys and girls, but the proportion of stunting is slightly higher for boys. This finding is similar to other studies. For instance, NMIS in Nepal and NFHS in India report the same.^{7, 4} Although there is not study on this aspect, this could probably be due to the existing practices that people provide all kinds of foods to the girl child whereas they become selective for boys. They consider that girls as they are neglected, can consume anything, but they become selective for boys considering that vegetables and other things may harm boys' health. However, this is discriminatory behavior; provision of all possible types of food to girls has resulted in improved nutritional status. Furthermore, as proven by study, girls are naturally/biologically stronger than boys and may have contributed towards this as well.

Ethnicity is a major factor affecting many aspects of health and education status. Given evidences of caste discrimination and untouchability in Nepal, there is some evidence of effect of ethnicity on the nutritional status of children though the bivariate analysis showed non-significant association between ethnicity and nutrition status of children, which is similar to the findings of NMIS 1995 and 1996 which report no differences in malnutrition by ethnic background. However, proportion of underweight and stunted is more for Dalit than non-Dalit children under age three.

Economic status of the household is associated with the general health and development status of the family. Past studies found that child whose mothers report not having enough food to eat the previous day were more likely to be stunted or wasted than children whose mothers had enough to eat.⁷ However, this is associated with the economic status of the family; general economic status of the family does not have effect on nutritional status of children. Proportions of underweight and stunted children are same from the families with sufficient and insufficient income. This may probably be due to that malnutrition is not merely effect of economic status, but is governed by food processing (preparation) and eating/feeding practices that is directly linked with the socio-cultural aspects.

On the other hand, mothers' education status has prominent effect on nutritional status of children. This finding is also similar to the findings from other studies such as NMIS from Nepal and NFHS from India.^{7, 4} This would probably be due to the fact that literate mothers adopt many improved behaviors related to maternal and child health care, feeding and eating practices which ultimately affect the nutritional status of children. The finding highlights girls' education to overcome the problem of child

malnutrition in the long run whereas to combine specific nutrition interventions to overcome the problem since high proportion of children from families with literate mothers are also underweight and stunted.

As suggested by researches colostrum feeding to the child right after birth is quite important to boost up immune system and their nutritional status. However, in many societies mothers throw away the colostrum milk considering that it is dirty. Children who are not fed colostrum are more likely to be underweight but not much effect on stunting. This finding is similar to the finding of NMIS, which reported the increased risk of being wasted among the children.⁷

Another variable related to food preparation and feeding is the practice of extracting and discarding rice scum. This is most common in *Terai* areas. There is not evidence of considering the effect of this variable on nutritional status of children and people in general. The finding shows increased risk of children being underweight or stunted from families who have had practice of extracting and discarding rice scum than children from families who do not. This may be due to the reason that most of the nutritious elements such as protein, fat and minerals are lost through the rice scum, which result into malnutrition. The finding suggests inclusion of this aspect, which is mostly associated with cultural practices into the nutrition intervention strategy.

Furthermore, suffering from severe illness has noticed impact on the nutritional status of children. The finding shows increased risk of children being underweight or stunted who had suffered from diarrhea last year than children who had not. The effect is higher on being underweight than stunting. The finding is similar to the finding of NMIS, which reports greater risk of being wasted, but no measurable association with stunting.⁷ The finding suggests improvement in diarrhea management including feeding practices [during diarrhea] to improve the nutritional status of children.

Lastly, practice of hand washing and materials used for hand washing by mothers before feeding child has consequences on health status of children. Finding shows high risk of children being stunted whose mothers wash hand only with water or water and mud before feeding child than children whose mothers wash hand with ash or soap and water, but shows no measurable association with being underweight. There is no evidence of analysis of effect of this variable on nutrition status of children in the past.

The major limitation of the study is to analyze the effect of these variables on wasting (thin for height) due to difficulty in merging data of height-for-age and weight-for-age since the very first raw data was not available for analysis.

Conclusion

Overall, this study has unveiled the importance of rice scum and materials used for hand washing before feeding child on the nutritional status of children, and of course, the whole family. The children who are fed rice with rice scum are wellnourished compared to their counterparts who are fed rice without rice scum. Further research is required to see its applicability in wider areas on the use of rice scum as well as other variables such as the factors that have helped to overcome the gender difference on child malnutrition.

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