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Prevalence of Undernutrition and Determinant Factors among Preschool Children in Hawassa, Southern Ethiopia

Tsedeke Wolde[1], Tefera Belachew[2] and Tadesse Birhanu[3]
1.Lecturer of Nutrition, Department of Public Health, College of Medical and Health Sciences, Wollega University, Nekemte, Ethiopia
2.Professor of Nutrition, Population and Family Health Department, Collage of Public Health and Medical Sciences, Jimma University, Jimma, Ethiopia
3.Assistant Professor Infectious Diseases, School of Veterinary Medicine, Collage of Medical and Health Science, Wollega University, P.O. Box 395, Nekemte, Ethiopia
Corresponding author: tsedekewolde@yahoo.com

Abstract
The aim of the present study was estimate the magnitude and assesses associated risk factors with under nutrition among Preschool children at selected Hawassa City, South Ethiopia. A community based cross-sectional study was employed in Hawassa from February to March 2012.Weight and heights of the selected children were measured and the socio-demographic characteristics of the subjects were collected using a structured interviewed questionnaire. After standardizing Preschool children weight and height using the new 2006 WHO child growth standard, a cut-off of two standard deviations below the mean defined the prevalence of stunting (length-for-age<-2),underweight(weight-for-age<-2)and wasting (weight-for-length <-2).Logistic regression analyses were performed to identify predictors of malnutrition. Out of 358 participants (50.6%) were girls while (49.4%) were boys with mean (±SD) age were 48.8±9 months. The overall prevalence of malnutrition in the community was high with 43.6% of the children being underweight (53.1%) stunted and (28.2%) wasted. Prevalence of severe stunting, underweight and wasting were 2.50%, 0.30% and 0.80% respectively. The children with age group 36-47 months were 2.9 times more likely to be wasted when compared to children from age group 48-60 months (AOR = 2.87 [95% CI: 1.73-4.77]. The study participants who were categorized in the low socioeconomic status tertiles were 4.4 times more likely to be wasted as compared to the high socioeconomic status tertiles AOR = 4.41 [95% CI: 2.94-8.45]. There was a high prevalence of under nutrition in the study area. The nutritional status (Wasted) of children in Hawassa was affected by low socioeconomic status and early age of child (36-47months). Thus, to improve nutritional status of children the full implementation of the poverty alleviation programmes should be considered and appropriate measures need to be taken to support needy families with children.
Keywords: Determinant Factors, Ethiopia, Hawassa, Preschool children, Undernutrition

INTRODUCTION

There is an ongoing worldwide effort focused on the complete eradication of extreme poverty and hunger (UNICEF, 2009). However, the burden of under nutrition is still a major public health problem especially in resource poor countries (Muller and Krawinkel, 2005; Black *et al*., 2008). Ninety percent of the world's stunted children live in 36 developing countries (Bhutta *et al*., 2008; Black *et al*., 2008). Under nutrition remains a major cause of disability and mortality (World Bank, 2012) ranked as the top cause of global burden of disease (Ezzati *et al*., 2006) and underlying 53% of deaths in children under five years (Bryce *et al*., 2005; Muller and Krawinkel, 2005). The potential negative impact of child under nutrition goes beyond the individual, affecting society and future generations (Grantham-McGregor *et al*., 2007; Victora *et al*., 2008).

In Ethiopia, child malnutrition is one of the most serious public health problem and the highest in the world (Alemu *et al*., 2005). Nationally about 44% stunted, 29% underweight and 10% children were wasted. In Southern Ethiopia region prevalence of child malnutrition indicated that 26% are underweight with 7.8% severe underweight, 9.7% of the children are wasted (2.8% severe wasting) and 41.4% of the children are stunted with 18% sever stunting (Ethiopian DHS, 2011). The study conducted in Gimbi district show that the main associated factors of wasting were childhood illness indicated by fever, low household income and maternal lack of education. Low birth size of children, paternal lack of education, maternal lack of decision making on use of money and lack of animals were associated with chronic malnutrition (stunting). ARI in children and lack of windows of houses are the most important factors of underweight (Zewdu, 2012).

Study conducted by Bayesian Approach to identify predictors of nutritional status in Ethiopia, the main predictors of children nutritional status were place of residence, maternal education, occupation of mother, preceding birth interval, source of water drinking, age of child, sex of child, Mother's BMI and age of mothers (Tesfaye,2009). However, the study of prevalence and associated factors of under nutrition among 36- 60 months age children has not been conducted at Hawassa yet. Therefore, this study designed to assess the prevalence of under nutrition and associated factors among children aged 36-60 months. The objective of our study was to determine the prevalence of under nutrition of preschool children aged 36-60 months and associated

risk factors, in a community based cross sectional survey. Therefore, the finding of this study, which specifies the prevalence of child malnutrition with these various causes and their relative contributions, can serve as reference in priority setting, designing effective nutritional programs to address the problem and its consequences, in monitoring and evaluation of the impacts of programs and for policy responses specifically tailored to the needs of different population groups.

MATERIALS AND METHODS

Study area, Subjects and Sample Recruitment

This study was conducted in Hawassa City from February to March 2012. The City is located in the South part of Ethiopia with a total population of 258,808. The target population included 31,421 are under five children, of this 16,410 were girls and 15,011 were boys while the eligible source population of preschool children aged between 3-5 years is 17,425 (CSA, 2007). Data were collected from February 22 to March 22, 2012. The sample size was calculated using a sample size determination formula for a single population proportion ($n= [(Z_{(1-\alpha/2)})^2.p.(1-p)]/d^2$) with the following assumptions: 16%prevalence of urban children are underweight(Ethiopian DHS, 2011) 95% confidence level, 5% degree of desired precision or margin of error for sampling, a design effect of 1.5 for error due to cluster sampling (de*n) and 15% for non-response rate. A total of 358 preschool children were selected by two stage cluster sampling method based on probability proportional to population size allocation. Households with an eligible child were selected using a systematic sampling method. Eligibility criteria were selected mothers who have permanent residence in the study area having apparently healthy children from 3-5 years old. An exclusion criterion was a child with evidence of physical impairment (such as physical defects or a grossly deformed), mental impairment and edematous conditions.

Measurement

A structured interviewer administered questionnaire was used to collect data related to the objectives of the study. The questionnaire covered a range of topics including socio-economic and demographic factors. Socio-economic and demographic data on: educational status, religion, ethnicity, occupation, household family sizes, wealth index, sex of child, age of child were collected through face-to-face interview of child's mother/caregiver. Age of the child was calculated both from the child's date of birth and date of interview, since the year of birth is frequently reported incorrectly. In events where birth dates are not recorded or known with certainty, the mother/caregiver were probed for the approximate date of birth based on a local events calendar. The age was calculated using precise day by subtracting the date of birth from the date of data collection (WHO, 2009).

Wealth index was developed based on the ownership of fixed assets including radio/tape, television, car, refrigerator, sofa, bicycle, motorcycle, mobile/telephone and others using factors analyses. The wealth index was then rank divided into Tertiles. Height and weight of each child were measured using standardized and calibrated equipment. Height was measured children with shoes taken of Pins and braids that could affect the measurement were also removed from the hair. Height was recorded to the nearest 0.1cm and positioning the subject at the Frankfurt plane using a stadiometer (Seca, Germany). Weight was measured using UNICEF seca digital weighing scale (Seca, Germany) (Gibson, 2005) with shoes take off and with the child wearing clothing (underwear, t-shirt only) to nearest 0.1 kg. A variety of methods are commonly used for assessing the nutritional status of populations based on anthropometric, clinical, dietary and biochemical measurements. Anthropometric measurements (body dimensions and composition) are often used as proxies for assessing the eventual extent and severity of malnutrition.

Height-for-age (HFA)

The height-for-age index provides an indicator of linear growth retardation and cumulative growth deficits in children. Children whose height-for-age Z-score is below minus two standard deviations (−2 SD) from the median of the WHO reference population are considered short for their age **(stunted)**, or chronically malnourished. Children who are below minus three standard deviations (−3 SD) are considered severely stunted. Stunting reflects failure to receive adequate nutrition over a long period of time and is affected by recurrent and chronic illness. Height-for-age, therefore, represents the long-term effects of malnutrition in a population and is not sensitive to recent, short term changes in dietary intake (WHO, 2006).

Weight for Age (WFA)

Weight-for-age is a composite index of height-for-age and weight-for-height. It takes into account both chronic and acute malnutrition. A child can be underweight for his/her age because he or she is stunted, wasted, or both. Weight-for-age is an overall indicator of a population's nutritional health. Children with weight-for-age below minus two standard deviations (−2 SD) are classified as **underweight.** Children with weight-for-age below minus three standard deviations (−3 SD) are considered severely underweight (WHO, 2006).

Weight-for-Height (WFH)

The weight-for-height index measures body mass in relation to body height or length; it describes current nutritional status. Children with Z-scores below minus two standard deviations (−2 SD) are considered thin **(wasted)** or acutely malnourished. Wasting represents the failure to receive adequate nutrition in the period

immediately preceding the survey and may be the result of inadequate food intake or a recent episode of illness causing loss of weight and the onset of malnutrition. Children with a weight-for-height index below minus three standard deviations (−3 SD) are considered severely wasted (WHO, 2006).

Data Quality Control

Five percent (5%) pre-test of questionnaires was done on 18 preschool children in a similar area, which was not included in the study and some modifications were made on the basis of the findings. Measurements of height and weight were taken in duplicate on each child. All the anthropometric measurements were taken by both investigator and trained diploma nurses to eliminate within-examiner error. Weight scale was calibrated to zero level with no object on it and placed in level surface before measurement was performed. Continuous checkup of scales was carried out for their reliability. The data collection was supervised by the principal investigator. The principal investigator supervised and reviewed every questionnaire for completeness and logical consistency and made corrections on the spot.

Statistical Data Analysis

The data were checked for completeness, coded and entered in to a computer and then edited, cleaned, processed and analyzed using SPSS for windows version 16.0. The z-score values for WFA, HFA and WFH of children generated with WHO child growth standards using WHO AnthroPlus 2009 program, version 3.2.2 (WHO, 2009). A one-sample Kolmogorov-Smirnov test was used to assess whether the data were normally distributed. Hosmer-Lemeshow test was performed for model fitness and Multicollinearity also checked using variance inflation factor and correlation coefficients. Those variables that were not normally distributed were transformed log into logarithmic scale. Descriptive statistics (mean ± SD, frequencies, proportions and tables) were used. All tests were two sided and P-value < 0.05 was considered to be statistically significant. First bivariate regression analyses were done to determine the association between the dependent variable and its predictors. Then, multivariable logistic regression was carried out to isolate an independent effect of the predictors that showed significant association with malnutrition. To evaluate the association between under nutrition and predictor variables, both crude odds ratio (COR) and adjusted odds ratio (AOR) with 95% confidence interval were reported.

Ethical Consideration

The study was reviewed and approved by the Institutional Review Board (IRB) of Hawassa University. Informed written consent was obtained from parents or caregivers. Child assent was taken for anthropometric measurements. Confidentiality of information collected from each study participant was maintained.

RESULTS

A total sample of 358 mothers/caregivers and their 36-60 months old children, giving a response rate of 100%. Regarding socio-demographic characteristics, 48.9% were Protestants and 31.6% were Orthodox by their religion, while the majority 36.0% was Sidama, followed by Wolaita (18.7%) by their ethnicity. About 31.3% of the mothers/caregivers completed grade 9-12 followed by 24.3% who completed college or university level education and 8.10% of them had no formal education. The larger proportion (40.2%) of respondents, were housewives followed by government employees, merchants and others accounted for 18.4%, 8.9% and 32.4%, respectively. Over half of study participants had five or above and below five people per household accounting for 56.7% and 43.3% respectively. The majority (41.9%) of the study participants were from high socioeconomic status (SES) whereas 23.7% of the participants were categorized into low SES. The girls-boys ratio was 1.02 with 50.6% being girls and 49.4% being boys. Very large majority of the study subjects, 60.6% were under the age range of 48-60 months **(**Table 1).

Table 1: Socio-economic and demographic characteristics of mothers/caregivers and their children in Hawassa City, 2012

Variables (n=358)		Frequency	Percent (%)
Religion	Orthodox	113	31.6
	Protestant	175	48.9
	Muslim	61	17
	Others*	9	2.5
Ethnicity	Sidama	129	36
	Wolaita	67	18.7
	Amhara	53	14.8
	Gurage	35	9.8
	Others**	74	20.7
Educational status			
	Write and read only	29	8.1
	1-4 grade	58	16.2
	5-8 grade	72	20.1
	9-12 grade	112	31.3
	College/University	87	24.3
Occupation			
	House wife	144	40.2
	Government employee	66	18.4
	Merchant	32	8.9
	Others***	116	32.4
Family size			
	<5	155	43.3
	≥ 5	203	56.7
SES Tertiles			
	Low	85	23.7
	Medium	123	34.4
	High	150	41.9
Sex of child			
	Male	177	49.1
	Female	181	50.6
Age in months			
	36-47	141	39.4
	48-60	217	60.6

* Catholic and Hawariat ** Kembata, Hadiya, Oromo and Silite *** Non-government employee, Self-employed, Student and house-worker.

The mean and standard deviations (±SD) of the WAZ, HAZ and WHZ score of children 36-60 months old based on WHO AnthroPlus software were analyzed as 0.2 (±0.99), -0.4 (±1.28) and 0.6 (±1.26), respectively.

Nutritional status of the Preschool children

According to the WHO reference standard taking–2SD as cutoff point, the study children who fell below –2SD of the indicators (Underweight, Stunted, and Wasted) were computed as 156 (43.6%), 190 (53.1%) and 101 (28.2%), respectively. Prevalence of severe stunting, underweight and wasting was 2.5%, 0.3% and 0.8% respectively. Also in this study, the combined prevalence of overweight and obesity was 10.7% (Figure 1; Table 1).

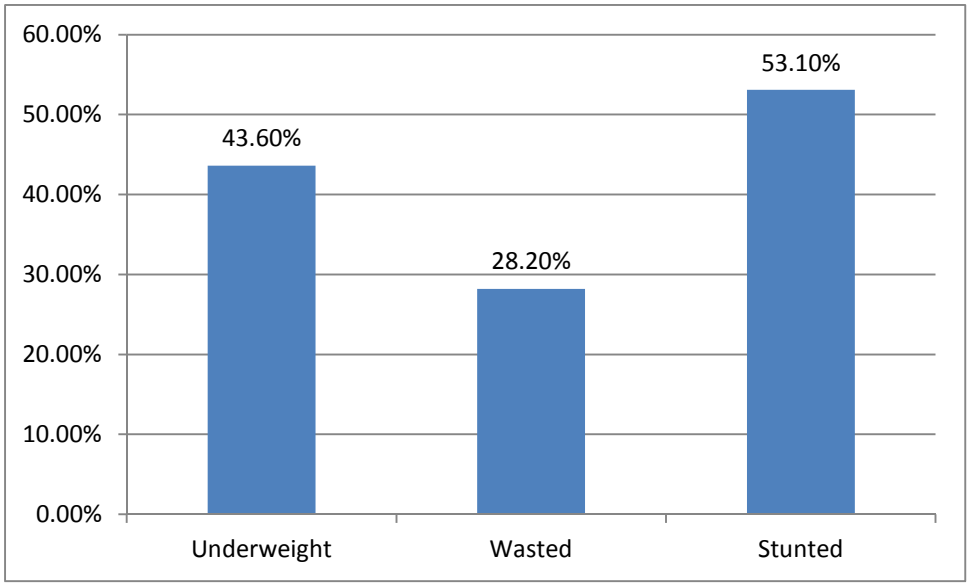

Figure 1: Prevalence of Malnutrition among Pre-school Children in Hawassa, 2012

The highest prevalence of stunting (chronic malnutrition) found in children age 36-47 months (62.7%) and underweight was also highest in the age group of 36-47 months (43.8%). The prevalence of stunting (height for age between -2 and -3SD of the median WHO reference values was higher in female children (55.6%) than males but severe stunting (height for age below-3SD of the median WHO reference values) was higher in males (2.8%). The prevalence of underweight was higher in females (45.6%) than males (41.6%). The prevalence of wasting was also higher in females than males **(**Table 2).

Table 2: Prevalence of Undernutrition by sex and age groups among Preschool children in Hawassa, 2012

Variables (n=358)	Stunted	Wasted	Underweight
	No. (%)	No. (%)	No. (%)
Sex			
Boys	89 (50)	43 (24.2)	74 (41.6)
Girls	100 (55.6)	56 (31.1)	82 (45.6)
Age (months)			
36-47	96(62.7)	26 (17)	67 (43.8)
48-60	93 (45.4)	73 (35.6)	89 (43.4)

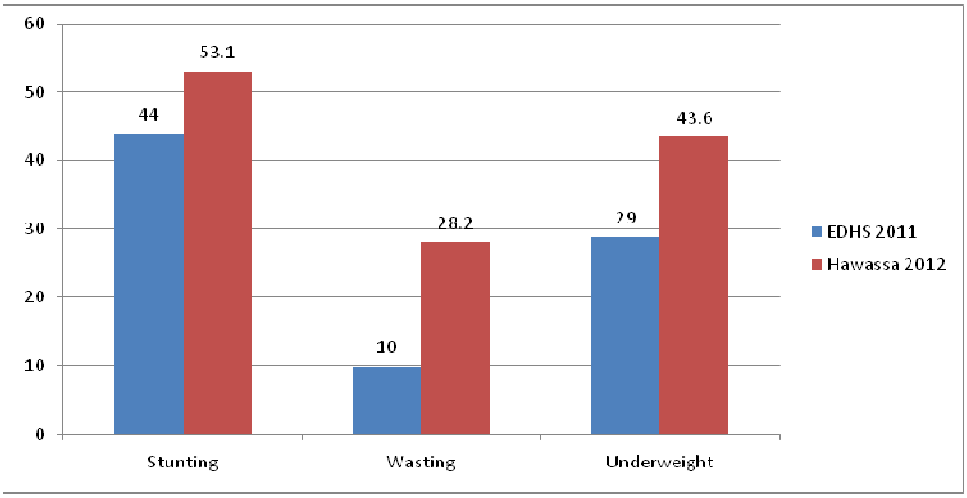

Figure 2: A bar graph comparison of EDHS 2011 Prevalence of Malnutrition among Pre-school Children in Hawassa, 2012

In order to investigate the association of selected demographic and socio-economic variables with the anthropometric results, both bivariate and multivariate analysis were used. In bivariate analysis, the nutritional status as measured by wasted was significantly associated with age, socioeconomic status tertiles, family size (P<0.00) and maternal education (P<0.05). However, there was no statistically significant association with child sex, ethnicity, occupation and religion. The bivariate analysis also carried out between Malnutritionas measured by stunted and each of the variables (age, sex, socioeconomic status tertiles, maternal education, religion, ethnicity, occupation and family size of household) did not show any statistically significant association (P>0.05).

Maternal occupation and socioeconomic status tertiles were the only variables which were associated with malnutrition as measured by underweight (P<0.01 for each variable). On the other hand, sex of children, maternal education, religion, ethnicity, age of child and family size of household were not any statistically significant association with malnutrition (underweight).

Finally binary logistic regression analysis was done to control confounding effect variables and malnutrition of the study children using multivariable logistic regression analyses showed that children with age group 36-47 months and children from low socioeconomic status tertiles who were significantly and independently associated with malnutrition (wasting) (P<0.001). However, wasting was no statistically significant association with maternal education and family size of household. On the other hand, underweight was no statistically significant association between maternal occupation and socioeconomic status tertiles. Children with age group 36-47 months were 2.9 times more likely to be wasted when compared to children from age group 48-60 months (AOR = 2.87 [95% CI: 1.73-4.77])**.** Stepwise logistic regression showed that the risk of wasting was significantly (P<0.001) higher among children from the lowest households wealth index (SES tertiles). The study participants who were categorized in the low socioeconomic status tertiles were 4.4 times more likely to be wasted as compared to the high socioeconomic status tertiles (AOR = 4.41 [95% CI: 2.94-8.45]) (Table 3).

Table 3: Multivariable logistic regression analysis predicting the likelihood of a child in Hawassa to be Malnutrition (Wasted), 2012

Variables (n=358)	**Wasted (n=102)**	**Non wasted (n=256)**	**Crude OR [95%CI]**	**Adjusted OR [95%CI]**
	No.[%]	**No.[%]**		
Age (months)				
36-47	26 [17]	78 [50.9]	1.28 [1.55-4.56] ***	2.87[1.73-4.77] ***
48-60	76 [37.1]	178 [86.8]	1	1
SES tertiles				
Low	50 (49.0)	86(33.6)	1.15 [2.01-7.41] **	4.41 [2.94-8.45] ***
Medium	34 (33.3)	51(19.9)	0.35 [0.11-3.22]	----------
High	18(17.6)	119(46.5)	1	1
Family size				
<5	17[16.7]	57 [22.3]	2.88 [2.01-4.12]**	----------
≥5	85 [83.3]	199 [77.7]	1	
Maternal Education				
Illiterate	62 [60.8]	79 [30.9]	2.22[1.01-4.89] *	----------
Literate	40 [39.2]	177 [69.1]	1	

P< 0.05* P < 0.01 P <0.001*****

DISCUSSION

The prevalence of stunting, underweight and wasting were about 53.1%, 43.6% and 28.2% respectively. The result of this study revealed that, the prevalence of stunting and wasting were higher as compared with a community cross-sectional study conducted in rural kebeles of Haramaya district, 42.2% stunted and 14.1% were wasted (Zewdu, 2012). A cross-sectional study conducted in Hidabu Abote district, North Shewa, Oromia Regional State showed that the prevalence of stunting, underweight and wasting were about 47.6%, 30.9% and 16.8%, respectively (Mengistu *et al*., 2013).

Although present study result showed that the prevalence of malnutrition of children aged 36-60 months higher than a study conducted at Gimbi district, Oromia region on 490 children, 32.4% stunting, 23.5% underweight and 15.9% wasting (Kebede, 2007).

The finding of the study revealed that, the prevalence of stunting very high as compared to study conducted on 446 pre-school children aged 0-59 months at Gumbrit, with 24% prevalence of stunting. This might be difference due to study period, study area, age difference of study subject and sample size. Prevalence of both

stunting and underweight were higher as compared to study done in Bangladesh, 42% and 40% of children were stunted and underweight, respectively (Nure *et al*., 2011).

The prevalence of under nutrition in this study was high as compared to study conducted in EDHS 2011 survey, which showed that 44% of children under five are stunted or too short for their age. This indicates chronic malnutrition. Stunting is most common among children age 24-35 months (57%) and is least common among children of more educated mothers and those from wealthier families. Stunting also varies by region from 22% in Addis Ababa to 52% in Amhara region. As well as 44% were stunted in southern nation nationality people. Wasting (too thin for height), which is a sign of acute malnutrition, is far less common, only 10%. Twenty-nine percent of Ethiopian children are underweight or too thin for their age (Ethiopian DHS, 2011). The prevalence of wasting (28.2%) was higher than the national figure (10%) indicating a serious problem in the study area at the time of data collection (Ethiopian DHS, 2011). The data were collected in February to March when most urban areas have shortage of food this could probably be one of the reasons for high prevalence of wasting in the area.

Although the prevalence of malnutrition is the highest in this finding as compared to study conducted in Mongolia, the prevalence of stunting, wasting and underweight were 15.6%, 1.7% and 4.7% respectively (Otgonjargal *et al*., 2012). This might be due to difference also due to study area, socioeconomic characteristics, health service delivery, study area and age difference. The prevalence wasting in this study was high as compared to study conducted in Southern Sudan; approximately one out of every five children (22%) suffers wasting. Study conducted in a decertified area of Sudan - Alrawakeeb valley, 27.5% were severely malnourished and 35% suffered from either mild or moderate malnutrition (USAID, 2007; Ola *et al.,* 2011). This might be due to the difference of study period, study area, socioeconomic characteristic, health service delivery, and geographical characteristics of study area.

The finding also revealed that prevalence of malnutrition higher than a cross-sectional comparative study conducted in Belahara VDC of Dhankuta district in Nepal located in South Asia, the prevalence of underweight, stunting and wasting was 27%, 37% and 11% respectively (Sapkota and Gurung, 2009). Regarding associated factors of malnutrition, analysis of this study indicated that child age and family socioeconomic status were found to be significantly associated with wasting ($P<0.001$). The present study indicated that children from whose family were categorized in the low socioeconomic status tertiles were 4.4 times more likely to be wasted as compared to children those familyhigh socioeconomic status tertiles (AOR= 4.41 [95% CI: 2.94-8.45]).

Ssocioeconomic status was significantly associated with nutritional status of the preschool children (by wasting) ($P<0.001$). The children belonging to the low socioeconomic status group were at a higher risk of being wasted than children of better high socioeconomic status. Although the economic differentials seem to be silent in rural society it appears to be an important predictor of childhood nutritional status. Low socioeconomic status of developing nation limits the kinds and the amounts of food available for consumption. Low socioeconomic status also increases the likelihood of infection through such mechanisms as inadequate personal and environmental hygiene (Melkie, 2006).The present findings also showed that, children with age group 36-47 months were 2.9 times more likely to be wasted when compared to children from age group 48-60 months (AOR = 2.87 [95% CI: 1.73-4.77]). As result indicated on descriptive, the prevalence of child acute malnutrition decreased with age. It appears that acute child malnutrition, develop during the weaning period and rise sharply thereafter.

CONCLUSION

In this study, the prevalence of malnutrition was very high as compared to others study findings. The finding mainly indicated that low family socioeconomic status and aged 36-47 months was an important predictor of acute malnutrition (wasting). Thus, development and poverty alleviation programme must focus on the poorest segment of societies to improve their economic status and thereby the health conditions. Moreover, further study should be done to assess explored associated factors that were not included in the study.

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