Journal of Nutrition & Food Sciences

Tsedeke et al., J Nutr Food Sci 2016, 6:2
http://dx.doi.org/10.4172/2155-9600.1000466

Research Article Open Access

Prevalence of Acute Malnutrition (Wasting) and Associated Factors among Preschool Children Aged 36-60 Months at Hawassa Zuria, South Ethiopia: A Community Based Cross Sectional Study

Tsedeke W[1*], Tefera B[2] and Debebe M[3]

[1]*Department of Public Health, College of Medical and Health Sciences, Wollega University, P.O. Box 395, Nekemte, Ethiopia*

[2]*Department of Population and Family Health, Collage of Public Health and Medical Sciences, Jimma University, P.O. Box, 1104, Jimma, Ethiopia*

[3]*Institute of Nutrition, Food Sciences and Technology, Hawassa University, P.O. Box, 05, Hawassa, Ethiopia*

[*]**Corresponding author:** Tsedeke W, Department of Public Health, College of Medical and Health Sciences, Wollega University, P.O. Box 395, Nekemte, Ethiopia, Tel: 251910943969; E-mail: tsedekewolde@yahoo.com

Rec Date: Dec 15, 2015; **Acc date:** Feb 11, 2016; **Pub Date:** Feb 18, 2016

Abstract

Background: In Ethiopia, child malnutrition is one of the most serious public health problem and the highest in the World. Many studies have focused on the relationship between wasting and its determinant factors. However, it has not been exhaustively documented in the study area.

Objective: The objective of this study was to assess the prevalence of acute malnutrition and its associated factors in children aged 36-60 months in Hawassa, South Ethiopia.

Methods: A community based cross-sectional survey was conducted from February to March, 2012 using two stage cluster sampling technique was used to select representative samples of 358 preschool children's at three kebeles of the study area. A structured, validated and pre-tested questionnaire was used to obtain information on socioeconomic characteristics. Weight-for-height (WFH) was used to assess nutritional status by taking height and weight measurements using standard procedures. Dietary intake was assessed using 24 hour dietary diversity recall. Statistical package for social sciences (SPSS) windows version 16 was used to analyze the data. Data was analyzed using descriptive statistics and binary logistic regression was used to determine association between acute malnutrition and predictors of variables. Logistic regression analyses were performed to identify predictors of.

Results: The prevalence of acute malnutrition (wasting) was 28.20%. The prevalence of wasting was significantly higher among female children (31.10%) than male children (24.20%). Prevalence of wasting was greatest among children aged between 48-60 months (35.6%). Binary logistic regression revealed that wasting was significantly associated with poor /lower wealth rank households' socio-economic conditions (adjusted odds ratio (AOR)=4.41 [95% CI: 2.94-8.45]). Those children between 36-47 months of age were 2.87 times more likely to be wasted than 48-60 months age (AOR=2.87 [95% CI: 1.73-4.77].

Conclusion: The magnitude of acute malnutrition was high. It mainly indicates that low family socioeconomic status and aged between 36-47 months was an important predictor of acute malnutrition (wasting). Thus, especial attention should be given for intervention on causes of acute malnutrition among preschool children.

Keywords: Acute malnutrition; Wasting; Preschool children; Hawassa zuria; South Ethiopia

Introduction

Acute malnutrition (wasting) is defined as reflected a nutritionally deficient state of recent onset related to sudden food deprivation or mal-absorption utilization of nutrients which results weight loss, weight-for-height below-2SD from the NCHS/WHO median value. Severe wastage was diagnosed if it was below -3 SD [1].

Malnutrition remains one of the most common causes of morbidity and mortality among children under five children throughout the World [2]. Worldwide, over 10 million children under the age of 5 years die every year from preventable and treatable illnesses despite effective health interventions. At least half of these deaths are caused by malnutrition. Malnourished children have lowered resistance to infection; therefore, they are more likely to die from common childhood ailments such as diarrheal diseases and respiratory infections. In addition, malnourished children that survive are likely to suffer from frequent illness, which adversely affects their nutritional status and locks them into a vicious cycle of recurring sickness, faltering growth and diminished learning ability. In developing countries, malnutrition is a major health problem [3].

Malnutrition continues to be a major public health problem in developing countries. It is the most important risk factor for the burden of disease causing about 300, 000 deaths per year directly and indirectly responsible for more than half of all deaths in children [4].

Health and physical consequences of prolonged states of malnourishment among children are: delay in their physical growth

and motor development; lower intellectual quotient (IQ), greater behavioral problems and deficient social skills; susceptible to contracting diseases [5]. Much of the burden of deaths resulting from malnutrition, estimated to be over half of childhood deaths in developing countries, can be attributed to just mild and moderate malnutrition, varying from 45% of deaths due to measles to 61% of deaths due to diarrhea [6]. The majority of studies on child nutritional status has described prevalence of malnutrition among under-five children and analyzed socioeconomic, demographic and cultural factors associated with child malnutrition in sub-Saharan Africa (SSA) [7].

The global burden of malnutrition in its several major forms is telling evidence of failed infant feeding worldwide. Inappropriate feeding practices may account for around one-third of malnutrition, depending on population, place, time and season, and in combination with other causes such as infection, and food shortage [8].

Poor breastfeeding and complementary feeding practices are widespread. Worldwide, it is estimated that only 34.8% of infants are exclusively breastfed for the first 6 months of life, the majority receiving some other food or fluid in the early months. Complementary foods are often introduced too early or too late and are often nutritionally inadequate and unsafe [9].

In Ethiopia, child malnutrition is one of the most serious public health problem and the highest in the world [10]. Nationally about 44% stunted, 29% underweight and 10% children were wasted. In South Ethiopia region state prevalence of child malnutrition indicated that 9.7% of the children are wasted (2.8% severe wasting) [11].

The causes of malnutrition are numerous and multifaceted which causes are intertwined with each other and are hierarchically related. The most immediate determinants are poor diet and disease which are themselves caused by a set of underlying factors; household food security, maternal/child caring practices and access to health services and healthy environment. These underlying factors themselves are influenced by the basic socio-economic and political conditions [4].

However, the prevalence of acute malnutrition and associated factors in children aged 36-60 months has not been well documented in the study area. Therefore, this study designed to assess the prevalence of acute malnutrition and its associated factors in children aged 36-60 months in Hawassa zuria, South part of Ethiopia.

Knowing the extent of the problem and identifying the risk factors related with nutritional status of fewer than five children in the study area will enable to guide public health planners and policy makers in determining priorities, in designing appropriate and effective nutritional intervention programs to address the problem and its associated consequences.

Methods and Materials

Study area, subjects and sample recruitment

A community based cross sectional study design was conducted in Hawassa zuria from February to March, 2012. The study area is located at 275 km south of Addis Ababa, 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 36-60 months is 17,425 [12]. 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: 10% national prevalence of wasting [11], 95% confidence level, 4% degree of desired precision, a design effect of 1.5 (de*n) and 10% 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 random sampling method. Eligibility criteria were selected mothers who have permanent residence in the study area having apparently healthy children from 36-60 months 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.

Data collection instrument and measurement

A structured interview 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, anthropometric measurements, food consumption patterns, and dietary diversity. 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 [13].

Wealth index information on household assets was collected and included as follows: ownership of various durable goods (radio/tape, television, car, refrigerator, sofa, bicycle, motorcycle, mobile/telephone and others). Wealth index was ranked and divided into low, medium and high socio-economic status tertiles). A socio-economic status/ SES index was constructed as an indicator of the level of wealth that is consistent with expenditure and income measures.

Dietary diversity score (DDS) was collected as the sum of the number of different food groups consumed by the child in the 24 hours prior to the assessment. The dietary diversity score (DDS) was calculated by giving a score of "1" for those who consumed the food item and a score of "0" for those who did not consume the food item over the past 24 hours. The DDS was also ranked and divided into three subgroups (tertiles): six and over (higher), 4-5 (medium) and less than or equal to 3 (lower) food groups consumed in the previous day. According to USAID a total of eight food groups were considered in this study, i.e., (1) grains, roots and tubers, (2) vitamin A-rich fruits and vegetables, (3) other fruits and vegetables, (4) meat, poultry and fish, (5) eggs, (6) pulses, legumes and nuts, (7) milk and milk products and (8) foods cooked in oil/fat/butter and sweet drinks/foods [14].

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) [15] with shoes take off and with the child wearing clothing (underwear, t-shirt only) to nearest 0.1 kg.

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 during 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 [1].

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 on a 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 into a computer and then edited, cleaned, processed and analyzed using SPSS for windows version 16.0. The z-score values for weight for height (WFH) of children generated with WHO child growth standards using WHO Anthro 2009 program, version 3.2.2 [13]. 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 acute malnutrition. To assess the association between wasting 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

Socio demographic characteristics of the participants

In this study 358 households were included with response rate of 100%. Out of the total study subject preschool children 50.6% were female, and the rest 49.4% were male in sex with the mean age of 48.26 ± 9.15 months. Average family size of the study participant household was 5.11 people. About 31.3% of the mothers completed grade 9-12 and 8.10% of them had no formal education. Majority 41.9% of the study participated households were from higher socioeconomic status (SES) and main occupation of respondents was housewives (40.2%) (Table 1).

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
Others**	74	20.7
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
Wealth index of household		
Low	85	23.7
Medium	123	34.4
High	150	41.9
Sex of child		
Male	177	49.1
Female	181	50.6
Age of child in months		
36-47	141	39.4
48-60	217	60.6

Table 1: Socio-economic demographic characteristics of study participants in Hawassa, 2012, *Catholic and Hawariat, **Kembata, Hadiya, Oromo and Silite ***Non-government employee, Self-employed, Student and house-worker.

Dietary diversity score of preschool children in the past 24 hrs

The dietary diversity food groups reported by mothers/care givers in the previous 24 hrs are presented in Table 2. The mean (± SD) intake of dietary diversity score (DDS) was 5.8 (± 1.7). In this study, the majority of the subjects (97.5%) of consumed foods from grain, root and tuber products, 68.2% ate foods from vitamin A rich fruits and vegetables, 73.7% ate foods from other fruits and vegetables, 74% from eggs, 72.6% ate foods from meat, poultry and fish (MPF), 46.1% from legumes, nuts and pulses, 78.2% from milk and dairy products and 66.5% consumed from foods with oils/fats and sweet/soft drinks (Table 2).

Food groups (n=358)	Frequency	Percentage (%)
Foods made from grains, roots and tubers	349	97.5
Vitamin A-rich fruits and vegetables	244	68.2
Other fruits and vegetables	264	73.7
MPF*	260	72.6
Egg	265	74
Food made from pulses, legumes and nuts	165	46.1
Milk and milk products	280	78.2
Miscellaneous (foods cooked with oil/fat or butter, sugars, honey, tea, soft drinks)	238	66.5
Children mean DDS	5.8	

Table 2: Dietary diversity food groups consumed by preschool children in the past 24 hrs in Hawassa, 2012, MPF*=Meat, Poultry and Fish.

This study showed that out of listed 8 food groups the mean dietary diversity of the previous 24 hrs were 5.7682 ± 1.71 food groups consumed at the household level. Likewise 58.90% of preschool children had consumed ≥ 6 food groups, 28.20% of preschool children consumed 4-5 food groups and 12.80 % of preschool children consumed less than or equal to three food groups for the last 24 hrs.

Magnitude of acute malnutrition in the study area

The mean and standard deviations (± SD) of the WHZ score of children 36-60 months old based on WHO Anthro software was analyzed as 0.6 (± 1.26).

Variables (n=358)	Prevalence of Wasted Children No. (%)
Over all	101 (28.2)
Sex of child	
Boys	43 (24.2)
Girls	56 (31.1)
Child age groups (in months)	
36-47	26 (17)
48-60	73 (35.6)

Table 3: Prevalence of acute malnutrition by sex and age groups among preschool children in Hawassa, 2012.

According to the WHO reference standard taking -2SD as cutoff point, the study children who fell below -2SD of the indicator 101 (28.20%) was wasted. Prevalence of severe wasting was 3 (0.84%). The highest prevalence of wasting (acute malnutrition) found in the age group of 48-60 months (35.6%) (Figure 1). The prevalence of wasting was higher in female children (31.1%) than male (24.2%) (Table 3).

Associated factors with acute malnutrition in the study area

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 wasting was significantly associated with age, socioeconomic status, and family size ($P<0.001$), and maternal education ($P<0.05$). However, there was no statistically significant association with child sex, ethnicity, occupation and religion. Finally, binary logistic regression analysis was done to control confounding effect variables and acute 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 who were significantly and independently associated with acute malnutrition (wasting) ($P<0.001$). However, wasting was no statistically significant association with maternal education and family size of household. 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. The study participants who were categorized in the low socioeconomic status were 4.4 times more likely to be wasted as compared to the high socioeconomic status (AOR=4.41 [95% CI: 2.94-8.45]) (Table 4).

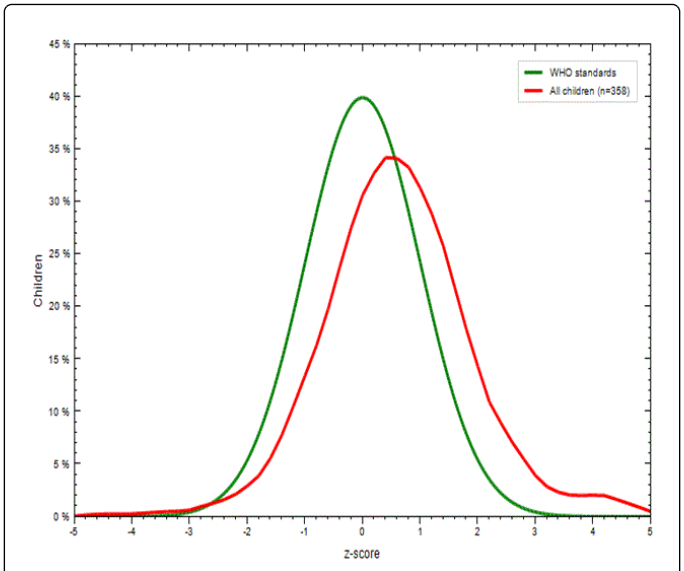

Figure 1: Weigh-for-height z score of children aged 36 to 60 months in Hawassa, 2012.

Discussion

In the present study, the prevalence of wasting was 28.2% and found to be higher as compared with a community based cross-sectional study conducted in rural kebeles of Haramaya district, 14.1% was wasted [16]. This finding was also higher than the result of [17], who reported 16.8% in Hidabu Abote district, North Shewa, Oromia Regional State. The present study result also 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, and 15.9% wasting [18]. This difference might be due to seasonal variation, study period, study area, age difference of study subject and sample size.

The prevalence of acute malnutrition in this study was high as compared to study conducted in Ethiopian DHS, 2011 survey, which showed that 10% of children under five are wasted (too thin for height), which is a sign of acute malnutrition. 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 [11]. The high prevalence of wasting status may be attributed to unprotected drinking water sources that may lead to different infection and data collection period from February to March when most of the households have shortage of food.

In this study, the prevalence of acute malnutrition is the highest in this finding as compared to study conducted in Mongolia (4.70%) [19]. 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 also high as compared to study conducted in Southern Sudan; approximately one out of every five children (22%) suffers wasting. The study conducted in a decertified area of Sudan-Alrawakeeb valley, 27.5% were severely malnourished and 35% suffered from either mild or moderate malnutrition [20,21]. This might be due to the difference of study period, study area, socioeconomic characteristic, health service delivery, and geographical characteristics of study area.

The present 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 11% respectively [22].

This study also showed, wasting was more prevalent in female children compared to male children which are consistent with other studies [23-26]. In contrary other studies report that wasting was more prevalent in male children than female children [27,28]. These discrepancies in findings could be attributed to differences in cultures, socioeconomic dynamics, parents' educational status and nutritional factors among the various communities.

Factors related to wasting; 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 lower socioeconomic status was 4.4 times more likely to be wasted as compared to high socioeconomic status family (AOR= 4.41 [95% CI: 2.94-8.45]). Family/household income was significantly associated with nutritional status of the under five children. Children belonging to the low-income group were at a higher risk of being wasted than children of better income families [17]. Although the economic differentials seem to be silent in rural society it appears to be an important predictor of childhood nutritional status. Low income levels of developing nation limits the kinds and the amounts of food available for consumption. Low income also increases the likelihood of infection through such mechanisms as inadequate personal and environmental hygiene [29]. Income or wealth index/household asset possessions [29-31] was significantly associated with the occurrence of wasting.

This might be due to high socioeconomic status households have greater purchasing power for food and other goods needed to ensure the health of children.

The result of this study showed the highest prevalence and significantly higher risk of wasting was occurred in age group 36-47 months compared to children in oldest age group. This finding is supported by previous studies [32,33].

However, dietary diversity score were not found any significance association with prevalence of wasting in the study area.

Limitation of the study: The prevalence of wasting during the study period was very high as compared to others study. This might be due to difficulty of entertaining the seasonal variation; since study was conducted during summer season when the shortages of foods happen at community level. There was also recall bias due to dietary diversity intake. Furthermore, it is difficult to establish a cause-effect relationship between wasting and it risk factors due the nature of the study design.

Conclusion

This study revealed a high magnitude of acute malnutrition. The finding mainly indicates that low family socioeconomic status and age between 36-47 months was an important predictor of acute malnutrition (wasting). Thus, especial attention should be given intervention on causes of acute malnutrition among preschool children. Moreover, further study should be done to assess explore determinant factors that were not included in the study area.

Variables (n=358)	Wasting (n=102) No. [%]	Non wasting (n=256) No. [%]	Crude OR [95% CI]	Adjusted OR [95% CI]
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]	1.00	1.00
Wealth index				
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)	1.00	1.00
Family size				
<5	17 [16.7]	57 [22.3]	2.88 [2.01-4.12]**	----------
≥5	85 [83.3]	199 [77.7]	1.00	
Maternal education				
Illiterate	62 [60.8]	79 [30.9]	2.22[1.01-4.89] *	----------
Literate	40 [39.2]	177 [69.1]	1.00	

Table 4: Multivariable logistic regression analysis predicting the likelihood of a child in Hawassa Zuria to be acute malnutrition (Wasted), 2012, P<0.05*, P<0.01**, P<0.001***.

Competing Interests

The authors declare that they have no competing interests.

Authors' Contribution

TW, TB, and DM were conceived and designed the study, performed analysis and interpretation of data and drafted the manuscript. TW, the corresponding author did the analysis and wrote the manuscript and had the responsibility to submit the manuscript for publication. All authors read and approved the final manuscript.

Acknowledgment

The authors would like to thank Hawassa University for the financial fund. The study participants and all individuals who render help during the study are highly acknowledged.

References

1. WHO Multicenter Growth Reference Study Group (2006). WHO Child Growth Standards: Length/ height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: Methods and development. Geneva, World Health Organization.
2. The State of the World's Children (2005). A UNICEF REPORT: Childhood under threat.
3. Caulfield LE, de Onis M, Blössner M, Black RE (2004) Undernutrition as an underlying cause of child deaths associated with diarrhea, pneumonia, malaria, and measles. Am J Clin Nutr 80: 193-198.
4. Müller O, Krawinkel M (2005) Malnutrition and health in developing countries. CMAJ 173: 279-286.
5. Black RE, Morris SS, Bryce J (2003) Where and why are 10 million children dying every year? Lancet 361: 2226-2234.
6. de Onis M, Blössner M, Borghi E, Frongillo EA, Morris R (2004) Estimates of global prevalence of childhood underweight in 1990 and 2015. JAMA 291: 2600-2606.
7. Reed BA, Habicht JP, Niameogo C (1996) The effects of maternal education on child nutritional status depend on socio-environmental conditions. Int J Epidemiol 25: 585-592.
8. WHO and UNICEF (2003) Global strategy for infant and young child feeding. Geneva, World Health Organization.
9. Cope MB, Allison DB (2008) Critical review of the World Health Organization's (WHO) 2007 report on 'evidence of the long-term effects of breastfeeding: systematic reviews and meta-analysis' with respect to obesity. Obes Rev 9: 594-605.
10. Alemu M, Nicola J, Belele T (2005) Tackling child malnutrition in Ethiopia; Young lives project working paper. Save the children UK, pp. 26.
11. Ethiopian DHS (2011) Central Statistical Agency, Addis Ababa, Ethiopia, pp. 19-20.
12. CSA (2007) Census conducted by the Central Statistical Agency/CSA/ of Ethiopia.
13. WHO (2009) WHO Anthro Plus for personal computers Manual: Software for assessing growth of the world's children and adolescents. Geneva: Switzerland.
14. Swindale A, Bilinsky K (2006) Household dietary diversity score (HDDS) for measurement of household food access: Indicator guide (V2). Food and Nutrition Technical Assistance Project, Academy for Educational Development, pp. 1-9.
15. Gibson RS (2005) Principles of Nutritional Assessment. (2nd edn) Oxford University Press, New York, pp. 275-276.
16. Zewdu S (2012) Magnitude and Factors Associated with Malnutrition of Children Under Five Years of Age in Rural Kebeles of Haramaya, Ethiopia. Harar Bulletin of Health 4: 221-232.
17. Mengistu K, Alemu K, Destaw B (2013) Prevalence of Malnutrition and Associated Factors Among Children Aged 6-59 Months at Hidabu Abote District, North Shewa, Oromia Regional State. J Nutr Disorders Ther.
18. Kebede E (2007) Prevalence and Determinants of Child Malnutrition in Gimbi district, pp. 27-39.

19. Otgonjargal D, Bradley A, Woodruff F, Batjargal (2012) Nutritional status of under- five children in Mongolia. Journal of Medicine and Medical Sciences 3: 341-349.
20. USAID (2007) Nutritional status and its determinants in southern Sudan, pp. 5-7.
21. Ola E, Mofida Y (2011) Nutritional status of the children under age of five in a decertified area of Sudan-Alrawakeeb Valley. IJCR 2: 103-108.
22. Sapkota VP, Gurung CK (2009) Prevalence and Predictors of Underweight, Stunting and Wasting in Under-Five Children. Nepal Health Res Counc 7: 120-126.
23. Tadiwos Z, Degnet A (2013) Determinants of child malnutrition: empirical evidence from Kombolcha District of Eastern Hararghe Zone, Ethiopia. QJIA 52: 357-372.
24. Madhu BS, Ranjana F, Lakshminarayana J, Anand PK (2006) Studies on the nutritional status of children aged 0-5 years in a drought-affected desert area of western Rajasthan, India. Public Health Nutrition 9: 961-967.
25. Joshi HS, Joshi MC, Arun S, Preeti J, NadeemIsrar K (2011) Determinants of protein energy malnutrition (PEM) in 0-6 year's children in rural community of Bareilly. Indian J Prev Soc Med 42: 155-158.
26. el-Sayed N, Mohamed AG, Nofal L, Mahfouz A, Zeid HA (2001) Malnutrition among pre-school children in Alexandria, Egypt. J Health Popul Nutr 19: 275-280.
27. Girmay M, Charlotte H, Michael D, Atalay A, Fikru T, et al. (2010) Prevalence and predictors of undernutrition among infants aged six and twelve months inButajira, Ethiopia: The P-MaMiE Birth Cohort. BMC Public Health 10: 27.
28. Bisai S, Mallick C (2011) Prevalence of undernutrition among Kora-Mudi children aged 2-13 years in Paschim Medinipur District, West Bengal, India. World J Pediatr 7: 31-36.
29. Melkie E (2077) Assessment of nutritional status of preschool children of Gumbrit, North West Ethiopia. Ethiop J Health Dev 21: 125-129.
30. Gudina E, Yemane B, Alemayehu W (2014) Predictors of acute undernutrition among children aged 6 to 36 months in east rural Ethiopia: a community based nested case - control study. BMC Pediatrics 14: 91.
31. Masibo PK, Makoka D (2012) Trends and determinants of undernutrition among young Kenyan children: Kenya Demographic and Health Survey; 1993, 1998, 2003 and 2008-2009. Public Health Nutr 15: 1715-1727.
32. Alemu A, Sileshi G, Habtamu F, Wondu G (2014) Prevalence's of undernourishment and its associated factors of children among 6-59 months age in Guto Gida district, East Wollega Zone, Oromia, Ethiopia. J of Applied Science And Research 2: 50-72.
33. Asres G, Eidelman AI (2011) Nutritional assessment of Ethiopian Beta-Israel children: a cross-sectional survey. Breastfeed Med 6: 171-176.