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Determinants of Malnutrition among under-five Children: A Case of ARSI Zone Selected Woredas in Oromia Regional State, Ethiopia

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Malnutrition is one of the major problem in Ethiopian and there are various factors contributing to malnutrition among children under-five years of age.
Objective: The study has been aimed to identify determinants/factors associated with malnutrition of under-age five children.
Methods: Cross-sectional data and probabilistic sampling method, anthropometric measurements of 997 sampled children under the age 6-59 months and information were taken from mothers/care givers of children on demographic, maternal factors, health seeking and nutritional factors and Multivariate logistic regression analyses were applied.
Results: The study revealed that the Prevalence of stunting, underweight and wasting was 43.4%, 27.1% and 14.8%, respectively. On the levels of malnutrition by gender, the analyses indicate that stunting and underweight were higher among male than female children at 47.8%,

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40.5%and 30.3%, 24.8% respectively. Whereas female children were slightly more wasting than their male counterparts. From the common forms of malnutrition such as stunting, wasting and underweight, stunting was the most common problem among under-five children in the woredas. The empirical results of the overall findings underlines that the key determinants of child nutrition status are complex and interrelated, requiring a multilayered and all rounded interventions for improving the severity and ultimately alleviating the problem. The prevalence of stunting is high for the child who never breast feed at all. A child who feed breast milk for 13-24 months was less likely to be stunted than the reference category (>24 months). A source of drinking water is also found to be significant determinant of the child nutrition. Specifically, the estimation result shows that children from households, who use safe water source, are less likely to be underweight than those who do not use safe water sources for drinking purpose.

Conclusion: Prevalence of stunting, underweight and wasting was 43.4%, 27.1% and 14.8%, respectively. The prevalence of stunting is high for the child who never breast feed at all. A child who feed breast milk for 13-24 months was less likely to be stunted than the reference category (>24 months). A source of drinking water is found to be significant determinant of the child nutrition.

Keywords: Nutritional status; multivariate logistic regression; stratified sampling malnutrition; anthropometrics.

1. INTRODUCTION

The World Health Organization estimates that there are 178 million children that are malnourished across the globe, and at any given moment, 20 million are suffering from the most severe form of malnutrition. Malnutrition contributes to between 3.5 and 5 million annual deaths among under-five children. UNICEF estimates that there are nearly 195 million children suffering from malnutrition across the globe. In 1997, the World Health Organization had observed that 60% of the deaths occurring among all the under-five children in developing countries were attributed to malnutrition [1]. Most of the damage caused by malnutrition occurs in children before they reach their second birthday, in the time when the quality of a child's diet has a profound impact on his or her physical and mental development.

The effects of malnutrition on human performance, health and survival have been the subject of extensive research for several decades and studies shown that malnutrition affects physical growth, morbidity, mortality, cognitive development, reproduction, and physical work capacity and contributes greatly to the disability-adjusted life years worldwide [2].

In Ethiopia child malnutrition is enormous challenge [3,4]. It constitutes a particularly daunting challenge as the country had a 10.4 % under-five mortality rate in 2009, of which the majority was linked to severe and mild to moderate malnutrition [5]. National data, according to the 2005 Demographic and Health Survey, show that stunting (chronic malnutrition) and underweight (chronic and acute malnutrition) in children less than five years of age were 47% and 38%, respectively [6].

Nutritional status during childhood has consequences until adulthood. Deficiencies in nutrients or imbalances between them can have dire long-term effects for the individual [7]. As different literatures illustrated, malnutrition is one of the major problem in Ethiopian and there are various factors contributing to malnutrition among children under-five years of age [8].

Thus, measuring the child's nutritional status is important because of both the long-term and short-term effects on the health, educational, the cognitive abilities of the child, and also severe consequences effects to the child's ability to function as a healthy, productive and self-supporting community member in the long-term. The general objective of this study is to identify the determinants/factors of nutritional status of children under-five in the selected woredas.

One of the core points of the country's policies is bringing sustainable growth and development for under-five children and to reduce risk factors associated with nutritional status. Since children are economic assets to the world and their future development outcome can be influenced by their nutritional status, the mechanism and consequences of malnutrition need to be understood better. Therefore, the purpose of this study is to identify factors affecting nutritional status of children under the age 6-59 months old Hence, the study provides information that could be used for nutritional surveillance and targeting programs that would focus more on populations at risk particularly the under-five children. The study also makes important contribution to future research by contributing to the existing literature particularly on nutrition among under-five children. The finding further avails information that could be used in policy planning and implementation particularly in vulnerable groups.

2. MATERIALS AND METHODS

2.1 Data Source and Study Design

The research instruments that were employee under this study were a primary data. The designs used in this study were cross-sectional quantitative study. Data were gathered using a combination of a structured questionnaire and the collection of anthropometric measurements, such as height, weight and age of children under-five.

The Epi-Info version 3.4.3 and the 1978 NCHS/CD/WHO child growth chart reference score system were used to calculate height-for-age (HAZ), weight-for-age (WAZ) and weight-for-height (WHZ) scores. The other data related to covariate variables were collect by train data collectors using standard, structured and pre-tested questionnaires The questionnaires were design to have quantitative data.

2.2 Sampling Design

The target population for this study were children under age five (6-59 months) and residing in the selected kebele's. In this study, a probabilistic sampling (stratified random sampling) technique was adopted as an appropriate sampling method for selecting a representative sample of the child in the selected kebele's. The stratification in the study were depends on the number of administrative ekeble's of the selected Woredas. Also we used systematic sampling technique to select the sample elements in each respective district (Kebele).

2.3 Sample Size Determination

Sample size determination formula adopted for this study was [9]:

$$n = \frac{\sum_{i=1}^{k}\left[\frac{N_i^2 P_i(1-P_i)}{W_i}\right]}{\frac{N^2 d^2}{Z_{\alpha/2}^2} + \sum_{i=1}^{k} N_i P_i (1-P_i)}$$

Where P_i is the estimated sub population proportion for strata i, N_i is the size of stratum (i); W_i is the estimated proportion of N_i to the total population N. The maximum allowable difference between the maximum likelihood estimate and the unknown population parameter, denoted by d, desired to be 0.04,is the precision level usually set by the investigator. The specification of d must be small to have a good precision. Z is the upper $\alpha/2$ points of standard normal distribution with α = 0.05 level of significance, which means $Z_{\alpha/2}$= 1.96.

The zone has 26 Woreda's and using SRS we select the two woredas (Merti and Chole) from the selected woredas, Merti woreda has 23 districts and Chole wereda has 20 districts. A randomly selected 29 districts, 16 from Merti and 13 from Chole wereda considered to be strata for this study. The size of the sample in each stratum was determined in proportion to the size of the population of each stratum, termed proportional allocation described in Table 1.

2.4 Anthropometric Measurements

These variables were considered as the dependent variables during statistical analysis.

2.5 Statistical Analysis

Data were enter into a microcomputer and analyzed using Epi-Info version 3.4.3 and SPSS version 16.0. The Epi-Info version 3.4.3 software was used to analyze the anthropometric values. Weight, height, and age data were used to calculate the weight-for-age, height-for-age, and weight-for-height z-scores based on the National Center for Health Statistics 1978/WHO reference data. The SPSS software was used for statistical analysis of factors associated to nutritional status of children under the age five. Statistical significance were set at $p<0.05$.

2.5.1 Binary logistic regression model

Model Description: It is assumed that the outcome variable is a linear combination of a set of predictors. For outcome variable Y, and a set of n predictor variables, X_1, X_2,. . .X_n, we have the following **[10]**:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \varepsilon = \beta_0 + \sum_{j=1}^{n} \beta_j X_j + \varepsilon$$

Table 1. proportional allocations of sample size for each stratum

No	Merti District	Populatio N Size (Ni)	Sample Size (ni)	No	Chole District	Populatio N Size (Ni)	Sample Size (ni)
1	Kebiro Oromo	361	22	1	YaeGugu	458	44
2	GateraKobire	385	23	2	Koro Gugu	371	33
3	GadoArba	580	38	3	Weregu	469	41
4	Hela Gadula	481	30	4	AshuteKofechisa	272	25
5	ShemoGado	292	17	5	Manga Werke	453	43
6	DembekaEftu	330	21	6	NiboLafto	531	47
7	Homba	463	28	7	MoyeGado	498	46
8	Ashe	534	32	8	Shabo Shule	285	27
9	AbasaGorba	367	21	9	Gado Sika	357	30
10	Wetero Dino	478	30	10	Manga Legebuna	464	40
11	Hela Tiya	452	27	11	JersaKechema	559	52
12	DembekaGerjele	545	33	12	ManjaAdere	446	42
13	Angada	286	16	13	GenboDuwa	257	22
14	Abomssa 01	827	54		**Total Populations**	**N**	**13,340**
15	Abomssa 02	1001	60		**Total Sample Size**	n	976
16	Golegota	538	32	With 5% No- Responses Rate (**n = 1,025)**			

Table 2. Categories of nutritional status

HAZ	WAZ	WHZ
-2 to 6 z-score **Normal**	-2 to 5 z-score **Normal**	-2 to 5 z-score **Normal**
< -2 **Stunted**	< -2 **Underweight**	< -2 **Wasted**

Table 3. Categories of Nutritional Status and Levels of Malnutrition

Height-for-Age (HAZ-)	Weight-for-Age (WAZ)	Weight-for-Height (WHZ)
-2 to 6 **Normal**	-2 to 5 **Normal**	-2 to 5 **Normal**
-3 to -2.01 **Mild/Moderately Stunted**	-3 to -2.01 **Mild/Moderately Underweight**	-3 to -2.01 **Mild/Moderately wasted**
-6 to -3.01 **Severely stunted**	-6 to -3.01 **Severely Underweight**	-5 to -3.01 **Severely wasted**

3. RESULTS AND DISCUSSION

3.1 Children Characteristics

Table 4 below shows both the total number of children under consideration as well as the percentage of each category in all dependent variables included in the study. A summary statistics of nutritional status of children in the study area reveals that stunting was the most common malnutrition problem among under-five children in the woredas.

With regard to the levels of malnutrition by gender, results in the table 5 indicate that stunting and underweight were higher among male than female at 47.8%, 40.5%and 30.3%, 24.8% respectively. Whereas female children were slightly more wasting than their male counterparts.

3.2 Discussion of the Final Model for "Height –for-Age"

The logistic regression model indicated that height-for-age nutritional status of under-five children (stunting, normal) is affected by some factors considered in the study. Based on the results on Table 6, the variables that found to be significant in multivariate analysis were age of a child, Breast feeding duration, birth order, occupational status of mother of child, and mother had postnatal care visit after birth were found to have significant effect at $p < 0.05$.

Maternal education is a crucial factor for stunted nutritional status of children in the country. Children whose mothers had high school completed were 1.101 times more likely to be stunted than the children whose mothers had higher education (Ref. category). And also children whose mothers had no education were more likely to be stunted (OR=3.034, CI: .039 – 1.156) than the children whose mothers had higher education (Ref. category). This showed that children whose mother had no education were more exposed to malnutrition than children who were born from educated mothers.

Birth order also had the overall significant effect on the (HAS) nutritional status of children under age five in the woreda's. In this case, the only category which has a significant effect on stunted nutritional status was a child had 5 and more birth order with p –value of 0.011which is less than 5% level of significance. Children who had 5 and more birth order were 2.021 times more likely to significantly different nutritional status of children under-five.

Results in table 5 below indicated that, breast feeding duration of a child have statistically significant effect on a stunted nutritional status (HAS) of a child. Accordingly, children who had breast feeding duration of 13 – 24 months were .454 times less likely to be stunted than the children who fed breast more than 24 months (reference category). This means that children who fed breast more than 24 months had 45.4% odds of being stunted than the children who fed 13 – 24 months. Furthermore, children who had breast feeding duration of <6 months were more likely to be stunted (OR=2.572, CI: .356 – 1.223) than the children who fed breast more than 24 months (reference category).Also children who had never breast fed at all were more likely to be stunted (OR=3.012, CI: 1.258 – 3.469) than the children who fed breast more than 24 months (reference category). The results signifying that, breast feeding duration of a child had positive or direct relationship with stunted (HAS) nutritional status. This also similar with the result in a study conducted by Tahereh [11].

3.3 Discussion of the Final Model for "Weight–for- Height"

Odds of being wasted for children born from household size 7 and more were 1.568 more than children in the reference category (children who were born from household size of 2-3). Age of mother's at first birth has significant result with weight-for-height nutritional status of children. Children born from the mother gave first birth between 20-29 years old were **.876** times less likely to be wasted than children born from mothers gave first birth 40 and above years old (p=**0.030,** 0.034 less than α = 0.05 significance level).

Table 4. Nutrition Status of Children Under-Five Years in Chole and Merti Woreda of Arsi Zone

Categories of malnutrition	Level of malnutrition	Number of Children	Percentage	Total (100%)
HAZ	Normal	564	56.6%	56.6%
	Moderately stunted	330	33.1%	43.4%
	Severely stunted	103	10.3%	
WAZ	Normal	727	72.9%	72.9%
	Moderately underweight	163	16.4%	27.1%
	Severely underweight	107	10.7%	
WHZ	Normal	849	85.2%	85.2%
	Moderately wasted	107	10.7%	14.8%
	Severely wasted	41	4.1%	

Table 5. Levels of Malnutrition among Under-five Children by Gender

Nutrition Status	Normal (>+2SD)		Moderately Malnourished (< -2SD)		Severely Malnourished (< -3SD)		Overall Status (<-2SD and< -3SD) Combined	
	Male %	Female %	Male %	Female %	Male %	Female %	Male %	Female %
Stunted	52.2	59.5	30.1	27.6	17.7	12.9	47.8	40.5
Underweight	69.7	75.2	10.6	19.8	19.7	5.0	30.3	24.8
Wasted	86.5	84.3	8.8	4.9	4.7	10.8	13.5	15.7

Table 6. Parameter Estimates for the Logistic Regression for Height- for- Age of Children under Age five (Arsi Zone Selected Weredas' September 2017).

Covariates	Category	$\hat{\beta}$	$S.E(\hat{\beta})$	Wald	Df	P-value	Exp.$(\hat{\beta})$	95.0% CI for exp.$(\hat{\beta})$	
								Lower	Upper
Age of a child	<=12 months (Ref0			13.651	2	.001			
	13-36 months	.825	.257	21.391	1	.009*	.231	.583	.996
	37-59 months	.231	.236	18.124	1	.002*	2.864	1.383	2.567
Breast feeding duration	>24months (Ref)			10.286	4	.000			
	13-24months	.756	.246	14.384	1	.030*	.454	.258	1.995
	6-12months	-1.586	.425	18.321	1	.208	.651	.069	.816
	<6months	.652	.452	11.325	1	.042*	2.572	.356	1.223
	Never breast feed at all	.865	.125	13.461	1	.007*	3.012	1.258	3.469
Birth order	1 – 2 (Ref)			15.236	2	.009			
	3 – 4	-3.698	.497	10.542	1	.071	.676	1.117	2.289
	5 +	-3.037	.427	19.256	1	.011*	2.021	.263	.968
Mother's educational status	Higher education (Ref)			10.914	3	.010			
	High school completed	2.356	.342	18.050	1	.005*	1.101	.534	.987
	Elementary level	1.461	.162	17.531	1	.130	.351	.685	1.352
	No education	3.364	.462	10.339	1	.001*	3.034	.039	1.156
Mother had pre-natal care visit	Yes (Ref)			8.369	1	.000			
	No	-.581	.725	4.016	1	.024*	1.687	.365	1.090
Constant	-2.367		.514	11.629	1	.018	1.029		

(Ref)* = *Reference category*, * =** *Statistically significant at 95% confidence level*, ***Method: *Forward Stepwise (Likelihood Ratio)*

Table 7. Parameter Estimates for the Logistic Regression for Weight –for-Height of Children under Age five (Arsi Zone Selected Weredas' September 2017).

Covariates	Category	$\hat{\beta}$	$S.E(\hat{\beta})$	Wald	d. f	P-value	Exp.$(\hat{\beta})$	95.0% CI for exp.$(\hat{\beta})$	
								Lower	Upper
Household size	2-3 (Ref)			11.235	2	.010			
	4-6	2.325	.564	5.328	1	.082	1.203	.258	.987
	7 and more	1.027	.421	7.351	1	**.011***	**1.568**	.561	1.025
Child birth weight	>3500g (Ref)			8.364	3	.000			
	3001-3500g	.153	.086	8.365	1	.091	2.356	.218	1.698
	2500-3000g	-3.110	.351	13.274	1	.165	1.450	.986	2.356
	<2500g	.812	.863	10.983	1	**.003***	**1.219**	.768	.965
Mother's age at first birth	40 and above (Ref)			17.235	3	.003			
	30-39	5.358	.964	14.258	1	.062	1.589	.897	1.235
	20-29	.987	.256	11.346	1	**.030***	**.876**	.258	.875
	<20	4.125	.537	8.954	1	**.008***	**2.791**	.854	1.222
Mother's occupation	Housewife (Ref)			7.364	3	.009			
	Business/ Civil servant	-1.258	.365	11.253	1	**.021***	**.052**	.865	1.235
	Wage labor	-2.153	.992	4.269	1	**.040***	**2.463**	-1.766	.856
	Other	.684	.126	10.864	1	.081	1.054	.897	1.521
Mother of a child had post-natal care visit	Yes(Ref)			18.256	1	.005			
	No	2.158	.989	11.023	1	**.023***	**1.064**	2.684	5.362
Constant	-2.521		.946	7.256	1	.108	3.269		

(Ref)* = *Reference category*, * =** *Statistically significant at 95% confidence level,* ***Method: *Forward Stepwise (Likelihood Ratio)*

Table 8. Parameter Estimates for the Logistic Regression for Weight- for- Age of Children under Age five (Arsi Zone Selected Wereda's December 2016)

Covariates	Category	$\hat{\beta}$	$S.E(\hat{\beta})$	Wald	Df	P-value	Exp.$(\hat{\beta})$	95.0% CI for exp.$(\hat{\beta})$	
								Lower	Upper
Sex of child	Female (Ref)			8.235	1	.010			
	Male	.843	.136	2.137	1	**.007***	**1.321**	.678	1.969
Age of a child	<=12 months (Ref0			5.432	2	.001			
	13-36 months	-2.825	.365	11.284	1	.108	.743	1.258	2.926
	37-59 months	.584	.351	8.625	1	**.042***	**4.823**	.783	1.432
Breast feeding duration	>24months (Ref)			6.286	4	.000			
	13-24months	.369	.052	11.625	1	.061	.323	.974	1.595
	6-12months	-2.276	.762	10.562	1	.307	.834	.173	.854
	<6months	.932	.231	13.860	1	**.005***	**1.634**	.846	1.093
	Never breast feed at all	.547	.104	9.682	1	**.014***	**3.603**	1.973	2.385
Kind of toilet	Traditional pit latrine (Ref)			11.514	1	.000			
	No facility/bush/field	3.215	.631	9.567	1	**.030***	**1.542**	1.304	2.111
Preceding birth interval	No preceding birth (Ref0			10.658	3	.000			
	5 and above years	-4.867	.565	14.532	1	.122	.586	.974	1.885
	3-4 years	.768	.196	9.867	1	.072	.857	.744	.995
	<=2 years	.556	.353	11.629	1	**.002***	**3.102**	1.256	1.998
Household size	2-3 (Ref)			12.584	2	.002			
	4-6	1.526	.857	7.685	1	.071	.586	1.834	2.683
	7 and more	.869	.666	3.625	1	**.042***	**.757**	.875	1.665
Household source of drinking water	Pipe line (Ref)			13.775	3	.004			
	Protected well/public tap	-1.391	.421	10.236	1	.108	2.685	.728	.999
	Unprotected well	3.235	.789	6.561	1	**.026***	**1.356**	1.964	3.254
	Ground surface water	.887	.326	8.236	1	.0966	3.845	1.756	4.284
Constant	2.192		.514	3.629	1	.072	9.029		

(Ref)** = Reference category, ** = Statistically significant at 95% confidence level, **Method:** Forward Stepwise (Likelihood Ratio)*

In the other hand, Children who born from the mothers who have age at first birth of less than 20 years were **2.791** times more likely to be wasted than children born from mothers gave first birth 40 and above years old with P-value equals **.008** which is less of our significance level. The results regarding to mothers age at first birth is in contradict with the results of the finding which is done by Dereje D. at SNNPR Hawassa Zuria woredas with similar population (under-five children).

Another categorical variable that had statistically significant effect on weight-for-height nutritional status of children was birth weight of a child. In these categories, children who had <2500g birth weight at birth were 1.219 times more likely to be wasted than children who had birth weight of >3500g in the reference category. Another report in Butajira, SNNPR showed that low birth weight was one of the factors affecting infants' nutritional status [12].

Post-natal care visit of mother of a child was another important variable which had statistically significant effect on weight-for-height nutritional status of children. Odds of being wasted for children whose mothers had no post-natal care visit with index children was 106.4% more than children whose mothers had post-natal care visit.

3.4 Discussion of the Final Model for "Weight–for- Age"

From table 8 below, sex of a child had significant effect on the nutritional status of children and male children were more likely to become underweight (OR=1.321) than female children. One of the studies done in our country has also shown an increase in malnutrition with increase in age of the child [13]. Here also the findings are similar in Chole and Merti woreda's where children aged 37-59 months were 4.823 times more likely to be underweight than their counterparts aged less than or equal 12 months.

A study conducted by Nguyen and Kam in Vietnam found out that the risk of malnutrition increases with age of a child. Children in the youngest age group 0-11 months had significantly lower risk of being underweight than children in the older age groups [14]. The low risk to malnutrition may be due to the protective effect of breastfeeding since almost all children are breastfed throughout the first year of life. Higher rates of malnutrition after the 12 months are linked to inappropriate food supplementation during the weaning period.

Among other important demographic variables, household size is also found to be significant determinant of the child nutrition status measured WAZ. Unexpectedly, the coefficients of the variable are found to be positive and statistically significant for WAZ. In other words, a child in households with large family (7 and more) is relatively less underweight than a child in a household with few members in a family.

The findings also indicate that there is a significant relationship between preceding birth interval and underweight among under-five children ($p<0.05$) in the woredas. As a result, children whose preceding birth interval was less than two years were 3.102 times more likely to be underweight than children who were born without any presiding interval (First order born).

Sure enough, this study proved that incidence of breast feeding (like >24 months, 13-24 months, 6-12 months, <6 months and never breast feed at all). As shown in Table 8 below, the variable is found to be highly significant (at <5%). Children who had less than six months breast feeding duration were 1.634 times more likely to be underweight than children who fed breast milk for more than 24 months (Ref). The odds of being underweight for children who never breast feed at all were 3.603 times more likely to be underweight than children in the reference category.

4. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

4.1 Summary of the Findings

The results from the study show malnutrition is one of the major challenges affecting under-five children in the selected woredas. The common forms of malnutrition were stunting, wasting and underweight. Among those forms of malnutrition stunting was the most common problem among under-five children in the woredas.

The Prevalence of stunting, underweight and wasting was 43.4%, 27.1 % and 14.8%, respectively. On the levels of malnutrition by gender, the analyses indicate that stunting and underweight were higher among male than female children at 47.8%, 40.5%and 30.3%, 24.8% respectively. Whereas female children were slightly more wasting than their male counterparts.

4.2 Conclusion

The main objective of this study was to identify main factors having an effect on nutritional status of under-five children in the selected woredas by using binary logistic regression model. Results from binary logistic regression showed that age of a child, sex of a child, breast feeding duration, birth order, mother's educational status, mothers' occupation, household size, source of drinking water for household, kind of toilet, preceding birth interval of child, mother's post natal care visit, mother's prenatal care visit, age at first birth of mother of a child and child birth weight were predictor variables contributing statistically significant effect in determining nutritional status of children under the age five in the woredas.

According to the results, age of a child, breast feeding duration, birth order, mother's education, and mother of a child had prenatal care visit were determinants of nutrition status measured HAZ of children. Maternal illiteracy had a negative effect on children's mean z scores of height-for-age. This result was confirmed by other studies which indicate that women's educational status are important underlying determinants of the nutritional status of children [15]. This may be due to the fact that illiterate mothers may be unaware about the nutritive value of feeding and hygiene practices. They may fail to prepare breakfast or lunch, and only send their children to school with bread. Many reports have indicated that schoolchildren who suffered under-nutrition, cannot benefit fully from formal education, and do not develop skills and abilities. Consequently, these children suffer further in terms of productivity and employment prospects, with implications for the economic development of the community.

Household size was independently associated with poor nutritional status both measured WHZ and WAZ. In this study it is found that children from larger households were more vulnerable to malnutrition. This could be because food for each household was limited and children were easily affected. Child birth weight was also one of the significantly associated factors with nutritional status measured WHZ of children. With a decrease of birth weight of children, increase risk of being under-nutrition. This means, children born with a lower weight had a higher chance of being wasted compared to those of higher birth weight.

4.3 Recommendations

Since children in older age category were highly prevalent to under nutrition, as analysis of this study showed, they should be given special care and support as much as possible. Mothers' age at first birth was one of the influential factors affecting children nutritional status especially when mothers' have less than twenty years old during first birth. Hence, awareness creations have to be made toward early marriage (effect of early marriage on under-nutrition).

Malnutrition is not only health related problem but it is also leading problem to enormous human potential. Therefore, government as well as the woreda health office should give due attention to the factors those contributing higher risk of under nutrition in children under age five. Moreover, use of family planning among mothers to increase birth intervals and reduced family size can result in significant reductions in childhood under nutrition.

The government should be taking community-based interventions by giving priority to the poor households. Multi-sectorial partnership and networking are important for health promotion and minimizing child's under-nutrition. Zonal Health Department and Woreda Health Office should be strengthening the health extension program to improve and provide necessary education on nutritional program, environmental sanitation, hygienic practice, breast feeding duration, and weaning practices.

Finally, further findings should be incorporating for additional findings on risk factors which are associated with children nutritional status and influential factors which are not considered in this finding.

CONSENT AND ETHICAL APPROVAL

Following university standard, first written approval of Ethics committee has been obtained and then before we started filling the questionnaire we have collected patient's written consent.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Murray CJ, Lopez AD. Alternative projections of mortality and disability by cause 1990-2020: Global Burden of Disease Study. The Lancet. 1997;349: 14981504. Available:http://dx.doi.org/10.1016/S0140-6736(96)07492-2
2. Ngoc and Sin: Measuring nutritional status in relation to mortality. In: Bull World Health Organ. 2008;78(10):1271-1274.
3. MoFED. Ethiopia: Sustainable Development and Poverty Reduction Program. Ministry of Finance and Economic Development (MOFED), FDRE, Addis Ababa; 2002.
4. MoFED .Ethiopia: Building on Progress- A Plan for Accelerated and Sustained Development to End Poverty (PASDEP) (2005/06-2009/10), Volume I: Main Text. Ministry of Finance and Economic Development (MoFED), FDRE, Addis Ababa; 2006.
5. WHO Document Publications Services, Geneva, Switzerland. UNICEF: The statistical result: Child mortality in Ethiopia. New York; 2010.
6. Ethiopia Demographic and Health Survey, Central Statistical Agency Addis Ababa, Ethiopia and ORC Macro Calverton, Maryland, USA; 2006.
7. Kibel AS, Nelson JB. Adjuvant and salvage treatment options for patients with high risk prostate cancer treated with radical prostatectomy. Prostate Cancer Prostatic Dis. 2007;10:119-126.
8. Yewelsew A, Tay SK, Gail EG, Barbara JS. Anthropometric assessment and maternal perceptions of infant wellbeing in a feeding center in Sidama, Southern Ethiopia Department of Rural Development and Family Sciences, Hawassa University, (Ethiopia). 2008;27-33.
9. Agresti. Categorical Data Analysis,2nd ed., ISBN 0-471-36093-7, John Wiley & Sons, Inc., Hoboken, New Jersey; 2002.
10. Cochran, W. G. Sampling Techniques. 3rd Edition. New York, John Wiley, 1977.
11. Tahereh S. Determinants of nutritional status in Children living in Mashhad, Iran; 2013.
12. Medhin G, Hanlon C, Dewey M, et al. Prevalence and predictors of undernutrition among infants aged six and twelve months in Butajira, Ethiopia: the P-MaMiE Birth cohort. BMC Public Health. 2010;10:article27,
13. Yimer G. Malnutrition among children in southern Ethiopia: Levels and risk factors. Ethiopian Journal of Health Development. 2000;14(3):283-292.
14. Nguyen NH, Kam S. Nutritional status and the characteristics related to malnutrition in children under-five years of age in Nghean, Vietnam. Journal of Preventive Medicine and Public Health. 2008;41(4): 232-240.
15. Smith LC, Haddad L. Explaining child malnutrition in developing countries: A stunting, and wasting among children aged 5 and under in Western Kenya. Journal of Tropical Pediatrics. 2000;50(5):260–270.

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