Assessment of Prevalence and Factors Associated with Malnutrition Among Under-five Children in West Shoa Zone, Oromia Region, Ethiopia

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Abstract: Malnutrition is a primary cause of child mortality and morbidity in developing countries, particularly during the first 5 years of life. Worldwide, under nutrition contributes to one third of under-five deaths which also plays a significant role as an underlying cause for growth problem in 230 million children and severe wasting in 50 million children. Hence, the aim of this study was to determine the prevalence and factors associated with malnutrition among under-five year children in West Shoa Zone, Ethiopia. Institution based cross-sectional study was conducted on 374 under-five year children. Systematic random sampling was utilized to include study subjects into the study. Data were collected by using pre-tested structured questionnaire. The data were entered into epi data and transferred into SPSS and World Health Organization Anthro software for analysis. In order to identify significant predictors of malnutrition both bivariate and multivariable logistic regression models were used. The prevalence of stunting, underweight and wasting were 40%, 24.9% and 13.8% respectively. Magnitude of wasting and underweight was higher for female children while stunting was higher for male children. In addition, malnutrition was more prevalent among rural children than urban dwellers. Antenatal care attendance was predictor of wasting whereas place of residence and growth monitoring were found to be predictors of stunting. In conclusion stunting was more prevalent among study subjects and antenatal care attendance, place of residence and growth monitoring were variables that showed significant association with malnutrition. Hence, there is a need to implement nutritional interventions in the study area giving priority to these identified factors.

Keywords: Stunting, Under-five Children, West Shoa

1. Introduction

Malnutrition involves both under-nutrition and overweight. Childhood under-nutrition incorporates combination of nutritional disorders such as stunting, underweight and wasting. The overconsumption or overweight is nutritional disorder and is used to measure nutritional imbalance [1]. Under nutrition is one of the main causes of under-five children deaths. Worldwide, under nutrition contributes to one third of under-five deaths [2] which also plays a significant role as an underlying cause for growth problem in 230 million children and severe wasting in 50 million children [3].

Worldwide, in 2011, approximately 165 million (26 per cent), 101 million (16 per cent) and 52 million (8 per cent) of under five year children were stunted, underweight and wasted respectively. However, the distribution of this problem around the world is not even as more than 90 per cent of stunted and 70 percent of the wasted children in the world live in Sub-Saharan Africa and South Asia. The magnitude of stunting among under-five year children was 36 percent in Sub-Saharan Africa and 27 per cent in South Asia. Although the magnitude of under nutrition is decreasing worldwide, the overall progress is insufficient because

millions of children are malnourished and still a significant proportion of children remain at risk [4, 5].

According to Dewey, Kathryn and Begum as quoted in UNICEF (United Nations Children's Fund) 2013 report, it is evident that the effects of childhood under nutrition has long term impact on health and welfare of children as it has great impact on future education, income and productivity. School achievement and school performance of children has association with stunting. In addition, the probability of undernourished girls is greater to become undernourished mothers which may increase the likelihood of delivering babies with low birth weight resulting in intergenerational cycle continuation. Young mothers, especially adolescent girls, face more complex problems if they become pregnant before physical and psychological maturity attained. Nutritional deficiencies may be intensified and passed on to children due to too close pregnancies and giving birth to many children [5].

The magnitudes of malnutrition are shocking among at risk groups and children's poor nutritional status remains severe problem in Ethiopia [6]. Studies in Ethiopia revealed that a child under nutrition is still a common problem. For instance, four studies conducted in Bule Hora district, Oromia region, Dollo Ado district, Somali region, Kombolcha district Oromia region and Hawasa zuria district, South Ethiopia indicated magnitudes ranging from 34.4 to 47.6 per cent, 29.1 to 47.7 per cent and 11.2 to 42.3 per cent for stunting, underweight and wasting respectively [7-10]. In Ethiopia, there exits regional variations on prevalence of stunting with lowest rate (22 per cent and 23 per cent) in Gambela Regional State and Addis Ababa respectively, and highest rate (46 per cent each) in Tigray and Affar Regional States [6].

It was indicated in Ethiopian Mini Demographic and Health Survey (EMDHS) of 2014 that the health sector has worked more in order to increase good nutrition practices through strategies such as, health education, treatment of extremely malnourished children and provision of maternal and child micronutrient [6]. In spite of the increased effort, the mean rate of stunting remained 40 percent. However, despite higher prevalence of malnutrition among under-five children, there are limited studies that report about risk factors of stunting among under-five children in Ethiopia and none in the study area. Hence, the aim of this study was to determine the prevalence and factors associated with malnutrition among under-five year children in West Shoa Zone.

2. Methods and Materials

2.1. Study Design and Setting

Institution based cross-sectional study was conducted among outpatient department attending under-five year children from January to February 2015 in West Shoa Zone, Western Ethiopia. The capital city of West Shoa zone is Ambo town which is located about 114 km away from Addis Ababa. During the data collection, there were three public hospitals and 88 public health centers in West Shoa zone.

2.2. Sample Size and Sampling Technique

The sample size was calculated by using a single population proportion formula considering confidence interval (CI) of 95%, proportion of child malnutrition (p) to be 0.33, [11], and 5% margin of error (d). Finally, 10% non-response rate was added giving a final sample size of 374. A systematic random sampling was used using patients' queue as sampling frame for selecting study participants.

2.3. Data Collection and Quality Control

Data were collected using structured questionnaire which was adapted by reviewing various literatures. The questionnaire was first prepared in English and then translated to the local language, Afan oromo. In order to consider possible modifications, the questionnaire was pre-tested on similar population in one of the health centers in West Shoa zone which was not included in the study. Data collectors were given two days training which covered study objectives, a thorough review of the questionnaire, use of survey instruments, interview techniques, and how to take anthropometric measurements in line with predesigned measurement protocol. Close supervision of enumerators was also made during the data collection by the investigators.

2.4. Anthropometry

Length of infants aged 0-23 months was measured in a recumbent position to the nearest 0.1 cm using a board with an upright wooden base and a movable head piece. Height of children 24 months and older was measured in a standing-up position to the nearest 0.1cm using a measuring board. Weight of the lightly clothed infants and children was measured to the nearest 10 g by UNICEF Electronic Scale. Accuracy of all anthropometric measurements was upheld according to the international reference standard. Measurements were carried out carefully to avoid inconsistencies in data or anthropometric measures.

2.5. Data Management and Analysis

Data were entered into Epi data 3.1 and transferred to SPSS version 20.0 for analysis. Descriptive analyses were done for each variable in the study by running frequencies. Anthropometric indices were calculated using WHO (World Health Organization) Anthro version 3.2.2. The indices were expressed as standard deviation units from the median values of the National Center for Health Statistics (NCHS) standard reference data of United States children. Children whose height-for-age, weight-for-height and weight-for-age were below minus two standard deviations from the median of the reference population were considered stunted, wasted and underweight respectively. Prevalence of stunting, wasting and underweight were estimated by running frequencies with their 95% CI estimates. A biviriate analysis was performed to determine the differentials of under-five stunting, underweight and wasting by explanatory variables. For testing the strengths of the associations and their statistical

significance, odds ratio and 95% CI were calculated for each independent variable against the dependent variables (stunting, wasting underweight) using binary logistic regression. Secondly, the variables with p-value less than 0.2 in bivariate analysis were subsequently included in multivariate analysis.

2.6. Ethical Approval

Permission was obtained from Ethical Clearance Committee of Ambo University, College of Medicine and Health Sciences and letter of permission was written to zonal health office and health facilities. Oral informed consent was obtained from mothers or caregivers of the children included in the study.

3. Results

3.1. Socio-demographic Characteristics of Parents/Care Givers

Three hundred seventy four under-five year children with their mothers/caregivers were selected to participate in the study and 362 responded appropriately making a response rate 96.8%. Out of the total children observed at under-five OPDs, 309 (85.4%) of them were brought by their mothers, 36 (9.9 %) by their fathers and 17 (4.7%) by others. Majority, 303 (83.7%), of the respondents belong to the Oromo ethnic group and 177 (48.9%) of them were Orthodox Christianity followers (Table 1).

Table 1. Demographic and socio-economic status of the parents/caregivers, West Shoa, Oromia Regional State, Ethiopia, 2015.

Variable		Frequency	Percent
Maternal age (n = 352)	15-34	260	73.9
	35-49	92	26.1
Marital status	Single	6	1.7
	Married	337	93.1
	Divorced	8	2.2
	Widowed	11	3.0
Ethnicity	Oromo	303	87.7
	Amhara	39	10.8
	Tigre	6	1.7
	Others	14	3.9
Residence	Urban	174	48.1
	Rural	188	51.9
Head of the house hold	Husband	337	93.1
	Wife	21	5.8
	Others	4	1.1
Occupation of house hold head	Government employee	92	25.4
	NGO employee	18	5.0
	Farmer	81	50.0
	Merchant	57	15.7
	Others	14	3.9
Farm land	Yes	182	50.3
	No	180	49.7
Decision making in family	Husband	184	50.8
	Wife	16	4.4
	Husband & wife jointly	159	43.9
	Others	3	0.8
Maternal education	Formal education	204	56.4
	No formal education	158	43.6
Paternal education	Formal education	300	82.9
	No formal education	62	17.1
Family size	2-5	237	65.5
	>5	125	34.5
Under 5 year children in HH	1	337	93.1
	2-3	25	6.9
Family income in Birr	<500	118	32.6
	>501	244	67.4

3.2. Child Characteristics and Caring Practice

Out of 362 under-five children observed at outpatient departments, 196 (54.1%) of them were males. Two hundred twenty one (61%) of the children were born in health institutions and the rest were born at home. Most of the children, 297 (82%), were exclusively breast fed for four to six months (Table 2).

***Table 2.** Child characteristics and caring practices, West Shoa, Oromia Regional State, Ethiopia, 2015.*

Variable		Frequency	Percent
Child characteristics			
Child sex	Male	187	51.7
	Female	175	48.3
Place of birth	Home	141	39.0
	Health institution	221	61.0
Birth order	1	105	29.0
	2-4	201	55.5
	>4	56	15.5
Birth interval (in years)	<2	255	70.4
	≥2	107	29.6
Birth weight	≥2500 gm	174	48.1
	<2500 gm	15	4.1
	Not weighed	123	34.0
	Don't remember	50	13.8
Child care practices			
Exclusive breastfeeding	< 4 months	33	9.1
	4-6 months	302	83.4
	> 6 months	27	7.5
Duration of total breastfeeding	≥ 24 months	206	56.9
	<24 months	156	43.1
Immunization	Ever immunized	334	92.3
	Not immunized	28	7.7
Vitamin A supplementation	Yes	246	68.0
	No	116	32.0
Seek treatment for sick child	Yes	297	82.0
	No	65	18.0

3.3. Maternal and Environmental Conditions

Age of a mother at first child birth was greater than eighteen for most of them, 231 (65.6%). Two hundred eighty three (78.2%) of the mothers had given birth to a maximum of four children. Only 18 (5%) of the households reported pipe water as their source of water, and two hundred ninety (80.1%) of households dispose waste on open field (Table 3).

***Table 3.** Maternal and Environmental Conditions, West Shoa, Oromia Regional State, Ethiopia, 2015.*

Variable		Frequency	Percent
Maternal conditions			
Age of mother	15-34	260	73.9
	35-49	92	26.1
Age at first child birth (n = 352)	15-18	123	34.9
	>18	229	65.1
Total child born to a mother	≤4	283	78.2
	>4	79	21.8
Antenatal care visit	Yes	250	69.1
	No	112	30.9
Ever using family planning	Yes	228	63.0
	No	134	37.0
Use of extra food during pregnancy	Yes	57	15.7
	No	305	84.3
Environmental conditions			
Water source	River	36	9.9
	Unprotected spring	66	18.2
	Protected spring	52	14.4
	Private well	36	9.9
	Common well	154	42.5
	Pipe water	18	5.0
Per capita water use	≤10 liters	168	46.4
	10-20 liters	61	16.9
	>20 liters	133	36.7
Latrine available	Yes	240	66.3
	No	122	33.7

Variable		Frequency	Percent
Presence of window	Yes	310	85.6
	No	52	14.4
Waste disposal system (solid and liquid wastes)	Open field	290	80.1
	Private/Communal pit	39	10.8
	Burn	26	7.2
	Others	7	2.0

3.4. Child Nutritional Status

From the total children observed at under-five OPDs, 50 (13.8%) were wasted (WHZ<-2), 112 (40%) were stunted (HAZ<-2) and 90 (24.9%) were under weight (WAZ<-2). Out of the total malnourished children, most of them were rural dwellers (Figure 1).
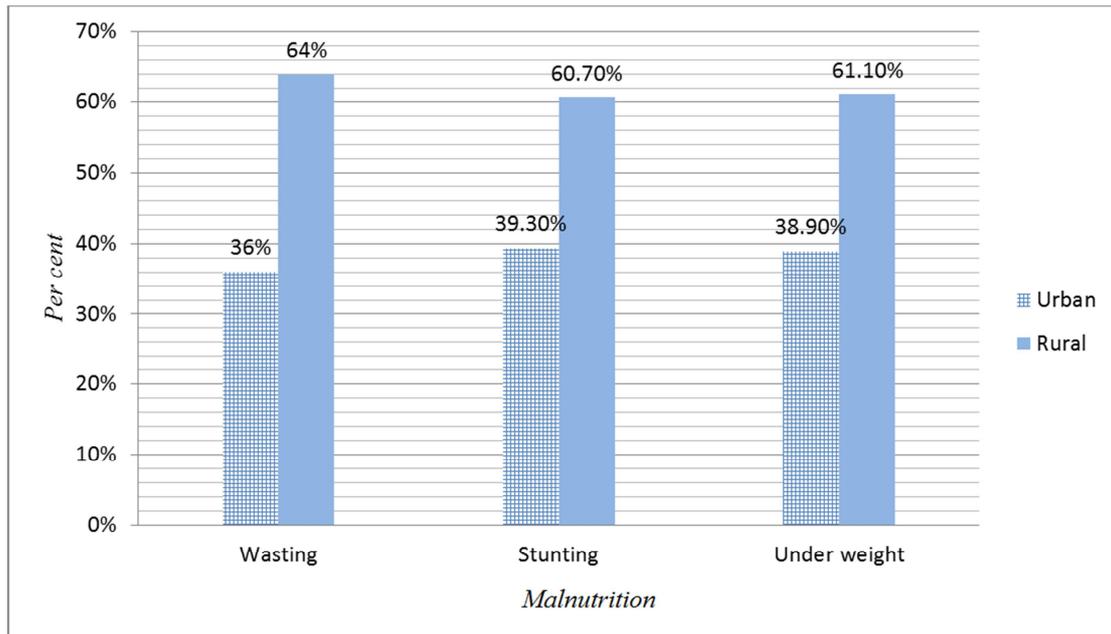

Figure 1. Child malnutrition by residence, West Shoa, Oromia Regional State, Ethiopia, 2015.

3.5. Analysis of Determinants of Child Malnutrition

Bivariate and multivariate analysis of the determinants of malnutrition: wasting, stunting and underweight, among under-five year children was performed.

Wasting had significant association with having farm land, attending antenatal care (ANC) and the time at which ANC visit initiated in binary logistic regression analysis. However, in multiple logistic regression analysis, only ANC visit was significantly associated with wasting of children. The likelihood of wasting was 2.1 times higher in children born to mothers who did not attend ANC visit regardless of the number of visit (AOR = 2.1, 95% CI: 1-2.5) in contrast to children born to mothers who had ANC visit (Table 4).

The result of binary logistic regression showed that place of residence, maternal and paternal education, maternal age, growth monitoring follow up and family size had association with stunting. However, only growth monitoring follow up and place of residence were found to be significantly associated with stunting in multiple logistic regression analysis. Children who did not attend growth monitoring follow up had higher likelihood of stunting (AOR = 3.4, 95% CI: 1.7-6.9) when compared to children who had growth monitoring follow up. The probability of developing stunting (AOR = 1.4, 95% CI: 1.4-2.5) was higher among rural children compared to urban children (Table 5).

For underweight, binary logistic regression analysis showed association with residence, maternal education, ANC attendance, treatment seeking when child is sick, child's sex and measles. However, in multiple logistic regression analysis, no variable was found to be significantly associated with underweight.

Table 4. Bivariate and multiple logistic regression analyses of selected correlates of wasting, West Shoa, Oromia Regional State, Ethiopia, 2015.

Variable		Wasting (n= 50)		Crude OR (95% CI)	Adjusted OR (95% CI)
		No	%		
ANC attendance	Yes	22	44	1.0	1.0
	No	28	56	1.9 (1-3.6)*	2.1 (1.0-2.5)*

Table 5. Bivariate and multiple logistic regression analyses of selected correlates of stunting, West Shoa, Oromia Regional State, Ethiopia, 2015.

Variable		Stunting (n= 112)		Crude OR (95% CI)	Adjusted OR (95% CI)
		No	%		
Residence	Urban	44	39.3	1.0	1.0
	Rural	68	60.7	1.7 (1.1-2.6)*	1.4 (1.4-2.5)*
Growth monitoring	Yes	61	54.5	1.0	1.0
	No	51	45.5	2.2 (1.4-3.4)*	3.4 (1.7-6.9)*

4. Discussion

The current study tried to identify the prevalence of under-five year children malnutrition and its associated factors. The study showed that the overall prevalence of stunting among study participants was 40%. This finding is similar to a finding of Mini Ethiopian Demographic and Health Survey (EDHS) of 2014. Other studies conducted in Ethiopia show varied magnitude of stunting. For instance, studies conducted in West Gojam, Hidabu Abote District and Shire Indaselassie of Tigray region show 43.2%, 47.6%, and 56.6% respectively. The current finding is slightly similar with the West Gojam case, however, lower than that of Hidabu Abote and Shire Indaselassie [12-14]. The difference may be due to seasonal variation, topography and difference in study period.

On the other hand, studies carried out in Ondo State, Nigeria, Ouagadougou, Burkina Faso and Bagamoyo district hospital in Tanzania show low prevalence of stunting compared to the current study, 12.5%, 8.37% and 8.8% respectively [15-17]. This variation may be explained in terms of socio-economic difference between the current and previous study area populations and types of food consumed based on cultures of the countries.

The magnitudes of all forms of malnutrition (wasting, stunting and underweight) were highest among rural children than urban children which is consistent with other research findings [6, 15, 18, 19]. This is possibly due to dependence of rural community mainly on seasonal agriculture to obtain their food [20].

Place of residence and growth monitoring follow up were the independent predictors of stunting. The likelihood of stunting among children dwelling in rural area was 1.4 times higher than their counterparts. This is similar with several studies [14, 17, 21, 22]. In addition, studies reveal that stunting can be prevented through monitoring of child growth by assessing them routinely using 'WHO standard' [23, 24]. This study also showed that the likelihood of stunting in under-five year children who had no routine assessment of growth was 3.4 times than children who had the assessment. Routine assessment of child growth is crucial for detecting inadequacy of nutrients intake by children. It enables on time identification of deviation from normal nutritional status indicating provision of corrective education (intervention) before malnutrition occurs [25].

The prevalence of underweight and wasting at national level was reported to be 9% and 25% respectively [6]. The current study showed that the magnitude of underweight was 24.9%, which is similar to the 2014 MEDHS result. However, wasting is 13.8% which is higher than the national report. This might be due to the fact that the current study subjects were sick children attending under-five outpatient departments in selected health institutions while the EDHS is a national level community based survey. It is also higher (1.41%) than finding of a study conducted in Bagamoyo district hospital, Tanzania, which may be as a result of socio-economic difference [17]. Conversely, the current finding is significantly lower (64.1%) than finding from Felegehiwot referral hospital, Bahir Dar [26]. As Felegehiwot is referral hospital, seriously ill children may be referred to the hospital from other health institutions resulting in variation of prevalence of wasting.

The result of multivariate analysis showed that antenatal care is significantly associated with wasting. Children whose mothers did not attend antenatal care service were 2.1 times more probable to face wasting than children whose mothers attended antenatal care service. Other studies show similar finding with the current study [9, 27]. Wasting may be related within appropriate breastfeeding, malpractices in weaning diet and food hygiene during early childhood which could be interceded by educating mothers during antenatal care visit.

5. Limitation of the Study

Difficulty to determine potential temporal relationship between malnutrition and various factors due to the study design (cross-sectional) and respondents' recall bias concerning past events like childhood illness history & breastfeeding patterns were the major limitations. Other limitations might include social desirability bias when responding to questions and information bias resulting from not knowing the precise age of a child and lack of growth monitoring card.

6. Conclusion and Recommendations

This study shows that wasting, stunting and underweight are high among under-five children indicating that under-five malnutrition is still an important public health problem in the study area. In addition, all forms of malnutrition were found to be more common among rural children than urban dwellers. Place of residence and growth monitoring were found to be independent predictors of stunting while antenatal care utilization was significantly associated with wasting. The study indicates that there is a need to design effective programs to solve malnutrition in the area taking the identified factors into consideration and giving special attention to children who are at greater risk. It is also essential to deliver appropriate health information.

Authors' Contributions

Tsegaye Benti conceived the idea, wrote the proposal and collected data. All of the authors participated in data analysis, drafting the manuscript and finally read and approved the manuscript.

Conflict of Interest

The authors declare that they have no competing interests.

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