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Nutritional Status of Under- five Children in Hawassa Zuria District, Southern Ethiopia

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Abstract: Almost, half of the under five children in Ethiopia are malnourished. The objective of this study was to estimate and identify determinants of nutritional status among under-five children in Hawassa Zuria District Southern Ethiopia. This survey was conducted by house to house visit through two-stage sampling using community based cross-sectional study design in 6 randomly selected kebeles during April 15-30, 2011. 721 children in total, aged 6-59 months old were studied to assess nutritional status in terms of stunting, wasting, and underweight. Socio-economic, health related and demographic measures were obtained from structured questionnaire. Also, anthropometric measurements were taken from each child in the study. Binary and multinomial logistic regressions were used to relate underlying factors to the adjusted odds of malnutrition indices. The results indicated that the overall prevalence of stunting, underweight, and wasting were 45.8 %, 31.9 %, and 23.6%, respectively. Female children were more stunted, under weight and wasted relative to males (OR = 1.67, 0.600 and 1.47), respectively. Children who had uneducated mothers were significantly more likely to be moderately underweight as compared to those of whose mothers had secondary and above educational level (OR= 0.35, CI: 0.16–0.79). Nutritional status in the study area among study population was categorized in low levels. However, planning the public preventive strategies in the district can help to control under-nutrition based on underlying factors of in the study population including, maternal education, maternal pre-natal health care services, toilet facility, child health care services and safe water supply.

Keywords: Nutritional Status, Under-five Children, Underweight, Wasting, Stunting, Hawassa Zuria district, Ethiopia

1. Introduction

Malnutrition is an important indicator of child health. A significant contributing factor to infant and child mortality, poor nutritional status during childhood also has implications for adult economic achievement and health [1]. Worldwide, over 10 million children under the age of 5 years die every year from preventable and treatable illnesses despite effective health interventions [2]. In developing countries, malnutrition is a major health problem [3].

Currently, 195 million under-five children are affected by malnutrition; 90% of them live in sub-Saharan Africa and South Asia [4]. Ethiopia is among the nations with the highest under-five mortality rates in the world and at least 53% of mortality can be attributed directly or indirectly to malnutrition [3]. The Ethiopian Demographic Health Survey [5] report shows that nearly one in two (44%) of Ethiopian under five children are being stunted, 10% wasted, and 29% underweight. According to the estimates, one in every 17 Ethiopian children dies before the first birthday, and one in every 11 children dies before the fifth birthday [5].

Improved nutrition and health enhance the learning ability of children. In the long run it leads to an increase in the strength of the labor force and thereby it contributes positively to the economic growth and a good nutrition is essential for healthy, thriving individuals, families and a nation [6]. Moreover, the nutritional status of children is a manifestation of a host factors, including household access to food and the distribution of this food within the household, availability and utilization of health services, and the care provided to the child [7]. Nevertheless, the nutritional problem still is a major concern in Ethiopia and little is identified about nutritional status and related factors amongst under-five children in Hawassa Zuria district. Therefore, this study was aimed to assess the nutritional status of the children (6-59 months) of under five and more specifically to find out and investigate the demographic, socioeconomic and health and related factors associated with anthropometric measurement, and to explore the association between various

demographic and socioeconomic variables responsible for contributing child under-nutrition status.

2. Materials and Methods

2.1. Study Design and Sampling

The cross-sectional community-based survey was conducted in Hawassa Zuria district during April 15-30, 2011. Participants were 721 children between 6-59 months of age selected through door-to-door visits using two-stage cluster sampling technique. On the first stage, 6 kebeles were randomly selected out of the total 21 kebels. Then systematic sampling technique was employed to approach the study participants. To determine the sample size, a single population proportion formula with the prevalence of malnutrition reported as 60% [8] was used with a 5% degree of precision. A non-response rate considered as 10%. Sample size (UN economic division, 2005) calculated $n = (z^2)(r)(1-r)(f)(k)/(p)(n_h)(e^2)$, where, n = is number of target population (6-59 months old children), z = is the upper $\alpha/2$ points of standard normal distribution at $\alpha = 0.05$, r = is anticipated prevalence, f = is the sample design effect (deff), the study design effect is assumed to be (1.5), k = is taken as 1.1 which is recommended value for household survey [22], p = is the proportion of the target population over total population which is 0.15, n_h = 5:- is the average household size (source: woreda health office), and margin of error (e) = is 5% which is the maximum recommended values [21].

2.2. Data Collection

Two types of instruments were used to collect required data: a structured questionnaire and anthropometric measurements including weight and height from health children aged 6-59 months during study period. Portable weighting scales (Seca Model 881) were used to measure weight of children. Ensuring light clothing during the measurement weight was recorded to the nearest 0.1 kg. Children who were unable to stand on the scale were weighed with the mother or caregiver, then the mother/caregiver was weighed alone, and the difference was used to obtain the net weight of the child. The height of children was measured with an appropriate length scale with minimal cloths. The headpieces were brought down until it touched the head. Height and length were measured with trained health extension workers. Anthropometric indices including stunting, underweight, and wasting were respectively defined as height for age, weight for age, and weight for height at least 2 standard deviations below the mean for children aged 6-59 months according to reference growth charts from the National Center for Health Statistics (NCHS)/Center for Disease Control and Prevention (CDC, 2000) [9].

The study protocol was approved by the ethical committee of Hawassa University, College of natural and computational science research and community service committee.

The parents or child care givers were informed about the study goals and verbal consent was obtained to take their child's anthropometric measurements explaining the nature and purpose of the study and it was confirmed that the personal information will be kept confidential. Inclusion criteria were healthy children aged 6-59 months during the study period.

2.3. Statistical Analysis

The Epi-Info version 3.4.3 software program was used to determine anthropometric indices and Statistical Package for Social Sciences version 15 (SPSS Inc. version 15.Chicago, Illinois) for windows were used for data analyses. WHO Z-score cut-off point of <−2 SD was used to classify, low height for-age, low weight-for-height and low weight-for-age as moderate and<−3 SD severe under-nutrition [10]. The prevalence of malnutrition (wasting, stunting and underweight) was expressed according to the degree of severity and both in magnitude and percentage. Binary and multinomial logistic regression analyses were used to relate socio-economic, health related and demographic factors on the nutritional status indices, and the results were presented by Odds Ratios (ORs) with 95% Confidence Interval (CI). The significance level was set at $P< 0.05$ in all statistical tests. The method of parameter estimation used in this study was maximum likelihood and several techniques were used to assess the appropriateness, adequacy and usefulness of the model using such as Likelihood-Ratio Test, Hosmer and Lemeshow, Test Statistic, Wald Statistic, and R^2 Statistic. The standardized residuals and Cook's distance has been employed for identifying potential outliers.

3. Results

3.1. Descriptive Analysis

A total of 721 children between 6-59 months of age participated in the study, 52.4% boys and 47.6% girls. Demographic, health related and socio-economic characteristics of the study subjects are shown in Table 1. The overall prevalence of stunting, wasting and underweight were 45.8, 31.9, and 23.6%, respectively. Among all the children under consideration 8.6% had less than 6 months exclusive breast feeding. Mothers and child care givers participated in the study 59.4% were uneducated, 40.4% had no hand washing practice after toilet, 23 % of households used drinking water from surface or unprotected well source and 86.6% of the households had four and more household members.

Table 1. *Demographic and socio-economic characteristics of the study subjects (n =721) (Hawassa zuria district 2011).*

Predictor Variable	Category	Total number of children n (%)
Age of child (in months)	48-59	174 (24.1)
	25-47	250 (34.7)
	6-24	297 (41.2)
Age of mother	15-20	11 (1.5)

Predictor Variable	Category	Total number of children n (%)
Age of mother at first birth	21-25	84 (11.7)
	26-32	354 (49.1)
	33-38	187 (25.9)
	≥39	85 (11.8)
Breast feeding duration of child (in months)	15-20	145 (20.1)
	21-25	539 (74.8)
	≥26	37 (5.1)
	Never	9 (1.2)
	< 6	53 (7.4)
	6-12	239 (33.1)
	13-24	184 (25.5)
	>24	236 (32.7)
Child had any sickness of within past 6 months	Diarrhea	145 (20.2)
	Malaria	52 (7.2)
	Others	28 (3.8)
	No sickness	496 (68.8)
Child BCG vaccinated	No	40 (5.5)
	Yes	681 (94.5)
Child ever received any supplementary foods	No	583 (80.9)
	Yes	138 (19.1)
Child of single birth	No	26 (3.6)
	Yes	695 (96.4)
Child received pre-lacteal feeds	No	554 (76.8)
	Yes	166 (23.0)
Educational level of HH head	Uneducated	391 (54.2)
	Primary	259 (35.9)
	Secondary	35 (4.9)
	Secondary^{+}	36 (5.0)

Table 1. *Continued.*

Predictor variables	Category	Total number of children *n* (%)
Educational level of mother	Uneducated	428 (59.4)
	Primary	224 (31.1)
	Secondary	36 (5.0)
	Secondary^{+}	33 (4.6)
Meal eating frequency per day	1	25 (3.5)
	2-3	372 (51.6)
	≥3	324 (44.9)
Health status of child for past two weeks	Sick always	6 (.8)
	Sick some times	217 (30.1)
	Healthy	498 (69.1)
HH head's relationship to index child	Cara giver	3 (.4)
	Father	665 (92.2)
	Mother	53 (7.4)
Last time child was given vitamin A (months)	Not given	66 (9.2)
	> 6	184 (25.5)
	2 - 6	337 (46.7)
	0.5 - 1	115 (16.0)
	<0.5	19 (2.6)
Marital status of mother	Other status	24 (3.3)
	Married	697 (96.7)
Mother of child has health service access	No	9 (1.2)
	Yes	712 (98.8)
Mothers had pre-natal care visit	No	158(21.9)
	Yes	563 (78.1)
Mother wash her hands after use of toilet	No	291 (40.4)
	Yes	430 (59.6)
Mother always wash her hands before meal	No	93 (12.9)
	Yes	628 (87.1)
Number of siblings from same mother	≥4	346 (48.0)
	2-3	268 (37.2)
	1	107 (14.8)
Number of children b/n 6-59 months in HH	≥3	10 (1.4)
	≤ 2	711 (98.6)
Number of household members	≥7	296 (41.1)
	4-6	328 (45.5)
	2-3	97 (13.4)

Table 1. *Continued.*

Predictor variables	Category	Total number of children n (%)
Occupation status of HH head	Wage labor	15 (2.1)
	Farmer	592 (82.1)
	Civil servant	22 (3)
	Other	92 (12.8)
Occupational status of mother	Wage labor	52 (7.2)
	Farmer	511 (70.9)
	Civil servant	26 (3.6)
	Other	132 (18.3)
Preceding birth interval of index child(in years)	1 year	46 (6.4)
	2 years	232 (32.2)
	≥3	304 (42.2)
	No preceding	139 (19.3)
Sex of child	Female	343 (47.6)
	Male	378 (52.4)
Sex of HH head	Female	53 (7.4)
	Male	668 (92.6)
Source of drinking water for HH	Surface	57 (7.9)
	Unprotected well	109 (15.1)
	Protected well	59 (8.2)
	Pipe	496 (68.8)
Source of food for the HH	Food aid	2 (0.3)
	Purchase	27 (3.7)
	Agricultural production	692 (96.0)
	Renting land	20 (2.8)
Source of income for HH earn its money	Agricultural products	598 (82.9)
	Own business	103 (14.3)
Succeeding birth interval of index child	1 year	41 (5.7)
	2 years	108 (15.0)
	≥3 years	83 (11.5)
	No preceding	489 (67.8)
Type of toilet facility for HH	Open field	312 (43.3)
	Pit latrine	409 (56.7)

3.2. Binary Logistic Regression Analysis: Height-for-Age and Weight-for-Age

Table 2 reported the determinants of stunting and wasting. The adjusted Odds Ratio (OR) of stunting and wasting in girls were 1.67 and 1.47 relative to boys, respectively. Children in age category 6-24 and 25-47 months were significantly less likely to be stunted and wasted as compared to those in age category 47-59 months (OR = 0.86; 0.42 and 0.56; 0.61), respectively. Other significant predictor of stunting and wasting was child's meal eating frequency per day. Children who had meal once a day showed significantly

increased risk of stunting and wasting.

Mothers prenatal care visit with indexed child was determined as protective factor of stunting (OR = 0.687). Children whose mother had prenatal care visit during pregnancy with indexed child were significantly less likely to be stunted compared to those whose mother had no prenatal care visit. Moreover, children whose succeeding birth interval was below one year were found to have significantly 0.291 and 0.294 times increased risk of stunting compared to those who had two and three or more years succeeding birth interval respectively. The other predictor of stunting was health condition of children within past two weeks of study period. Children who had no sickness for past two weeks from study period were found to have significantly 0.078 times decreased risk of wasting compared to those who were sick always.

Table 2. *Binary Logistic regression analysis of significant determinants related to stunting, and wasting (Hawassa Zuria, district, 2011).*

Variable	Category	Nutritional status					
		Stunted			Wasted		
		$\hat{\beta}$	p-value	Exp($\hat{\beta}$)	$\hat{\beta}$	p-value	Exp($\hat{\beta}$)
Age of child (in months)	48-59 (ref)		.009*			.001*	
	25-47	-.573	.002*	.564	-.487	.036*	.614
	6-24	-.146	.024*	.864	-.863	.000*	.422
Age of mother at a child birth	15-20 (ref)	.328	.041*	1.388		.034*	
	21-25				.642	.012*	1.900
	≥26				.245	.618	1.278
Child had any sickness within past 6 months	Diarrhea(ref)		.000*				
	Malaria	-1.507	.070	.222			
	Others	-1.509	.000*	.221			
	No sickness	-1.054	.008*	.348			
Meal eating frequency per a day	1(ref)		.015*			.000*	
	2-3	-.242	.003*	.504	-.465	.300	.628
	>3	-.684	.123	.785	-1.239	.007*	.290
Health condition of child for past two weeks	Sick always (ref)					.032*	
	Sick some times				-2.550	.030*	.061
	Healthy				-2.795	.017*	.078
Child ever received supplementary foods	No					.000	
	Yes				.545	.017*	1.725

Table 2. *Continued.*

Variable	Category	Nutritional status					
		Stunted			Wasted		
			p-value	Exp($\hat{\beta}$)		p-value	Exp($\hat{\beta}$)
Mothers had pre-natal care visit	No		0.000*				
	Yes	-.375	.044*	.687			
Occupational status of mother	Wage labor (ref)		.043				
	Farmer	-.401	.003*	.670			
	Civil servant	-1.441	.022*	.237			
	Other	-.559	.153	.572			
Sex of child	Female (ref)		0.000*			0.000	
	Male	.516	.001*	1.676	.388	.038*	1.474
Succeeding birth interval of index child	1 year		.012*				
	2 years	-1.225	.005*	.291			
	≥3 years	-1.235	.006*	.294			
	No succeeding	-1.189	.001*	.305			
Type of toilet facility for HH	Open field					0.000	
	Pit latrine				.466	.013*	.627
Constant		.876	.535	2.680	2.192	.080	8.957

NB: Ref = Reference category, * = p-value < 5% , level of significance (significant at 95% confidence level)

Two other significant predictors of wasting were toilet facility and mother's age at child birth. Children in households who used open field toilet were 0.627 times more likely to be wasted relative to children in household who used pit latrine. And children whose mothers at child birth were between ages 15-20 years were found to have significantly 1.900 and 1.278 times increased risk of wasting compared to those whose mothers were between ages 21-25 and above 25 years. Furthermore, children who had received any supplementary foods during study period were 1.73

times less likely to be wasted compared to those who had no any supplementary foods (OR= 1.725). Moreover, results in Table 2 revealed that mother's occupation and child's health condition for last six months from the study period were significantly determining predictors of stunting and wasting.

Table 3. *Multinomial logistic regression analysis of significant determinants related to underweight (Hawassa Zuria, district, 2011).*

	Independent Variables	$\hat{\beta}$	Std. Error	Wald	Df	Sig.	Exp ($\hat{\beta}$)	95% C I for Exp ($\hat{\beta}$)	
								LB	UB
Moderately underweight	Source of drinking water for household								
	Surface	.812	.318	6.534	1	.011*	2.253	1.209	4.199
	Unprotected well	-.077	.276	.078	1	.780	.926	.539	1.589
	Protected well/public tap	.169	.364	.217	1	.642	1.185	.580	2.418
	Pipe	0(b)	-	-	0	-	-	-	-
	Educational level of mother								
	Uneducated	-1.037	.402	6.660	1	.010*	.354	.161	.779
	Primary school	-1.532	.427	12.861	1	.000*	.216	.094	.499
	Secondary school	-.298	.521	.326	1	.568	.743	.267	2.063
	Secondary school+	0(b)	-	-	0	-	-	-	-
	Age of child (in months)								
	48-59	.154	.249	.383	1	.536	1.166	.716	1.899
	25-47	-.053	.222	.057	1	.811	.948	.614	1.465
	6-24	0(b)	-	-	0	-	-	-	-
	Sex of child								
	Female	-.511	.195	6.822	1	.009*	.600	.409	.880
	Male	0(b)	-	-	0	-	-	-	-
	Child of single birth								
	No	.885	.530	2.791	1	.095	2.423	.858	6.841
	Yes	0(b)	-	-	0	-	-	-	-
	Food feeding frequency of child in day								
	1	.675	.570	1.403	1	.236	1.964	.643	6.001
	2-3	.663	.202	10.733	1	.001*	1.940	1.305	2.884
	3 and more	0(b)	-	-	0	-	-	-	-
	Constant	-.367	.419	.765	1	.382	-	-	-

Table 3. *Continued.*

	Independent Variables	$\hat{\beta}$	Std. Error	Wald	Df	Sig.	Exp ($\hat{\beta}$)	95% C I for Exp ($\hat{\beta}$)	
								LB	UB
Severely underweight	Source of drinking water for household								
	Surface	-.434	.581	.557	1	.455	.648	.208	2.023
	Unprotected well	.881	.405	4.728	1	.030*	2.412	1.091	5.336
	Protected well	-.532	.398	1.785	1	.181	.588	.269	1.282
	Pipe	0(b)	-	-	0	-	-	-	-
	Educational level of mother								
	Uneducated	-.099	.675	.022	1	.883	.906	.241	3.400
	Primary school	-1.04	.715	2.103	1	.147	.355	.087	1.440
	Secondary school	-1.50	1.226	1.536	1	.215	.219	.020	2.420
	Secondary school+	0(b)	-	-	0	-	-		
	Age of child (in months)								
	48-59	1.180	.338	12.164	1	.000*	3.254	1.677	6.316
	25-47	.728	.328	4.941	1	.026*	2.072	1.090	3.937
	6-24	0(b)	-	-	0	-	-	-	
	Sex of child								
	Female	-.397	.265	2.248	1	.134	.672	.400	1.130
	Male	0(b)	-	-	0	-	-	-	-
	Child of single birth								
	No	2.060	.513	16.111	1	.000*	7.848	2.870	21.461
	Yes	0(b)	-	-	0	-	-	-	-
	Food feeding frequency of child in day								
	1	1.944	.548	12.581	1	.000*	6.987	2.387	20.457
	2-3	1.21	.305	16.827	1	.000*	3.494	1.922	6.352
	3 and more	0(b)	-	-	0	-	-	-	-
	Constant	-2.80	.725	15.328	1	.000*			

N.B, a = the reference category is: Nourished (Normal), LB = Lower bound, UB= Upper bound, b = this parameter is set to zero because it is redundant, *= $p < 0.05$.

3.3. Multinomial Analysis for Weight-for-Age Z-score (WAZ): Underweight

Table 3 suggested the net effects of independent variables on levels of underweight. Moderately and severely underweight children were compared with children in the reference category (nourished). Based on these estimates source of drinking water for household was significant predictor of underweight. Children who had used drinking water from surface source and unprotected well source were found to have significantly 2.25 (OR= 2.25, IC: 1.209-4.199) and 2.412 (OR = 2.41, IC: 1.09-5.34) times increased risk of moderately and severely underweight compared to those who used drinking water source from pipe, respectively. The OR of moderately underweight in girls was 0.600 relative to boys.

Moreover, maternal education in primary school and lower was determined as moderately underweight risk factors as compared to universal education. Children who had uneducated mothers were significantly more likely to be moderately underweight (OR= 0.35, CI: 0.16–0.79) and they were found to have significantly 0.91 times increased risk of severely underweight compared to those of whose mothers had secondary and above educational level (OR= 0.91, CI: 0.24 - 3.40). Birth type was also determined as the protective factor of severely underweight. Children in single birth were significantly less likely to be severely underweight compared to twin. Two other significant predictors of underweight were age of child and meal eating frequency, since children in age category 48-59 and 25-47 months were found to have significantly 3.25 and 2.07 times increased risk of severely underweight compared to those in 6-24 months, respectively.

4. Discussions

Children nutritional status is an important part for his/her development throughout the life as the earliest stages of fetal development, at birth, through infancy, childhood, adolescence, and on into adulthood, proper food and good nutrition are essential for survival, physical and mental development, performance and productivity, health and wellbeing[12]. Children are most vulnerable to malnutrition in developing countries because of low dietary intakes, infectious diseases, lack of appropriate care, and inequitable distribution of food within the household [2]. Current study assessed to estimate nutritional status determining factors among under-five children.

According to World Health Organization (WHO) category, this study suggested that the nutritional status of the study subjects was in the lower level of stunting and underweight and wasting [13]. Weight-for-age or underweight measures combination effect of both height-for-age and weight-for height nutritional status of under five children [11]. In this study almost one third (32%) of the children were underweight in the district. The least malnutrition status found in the district was wasting, which accounted 23.6% even if this figure shows lower level of nutritional status according to the WHO category. This figure has been previously suggested almost in the same way [14, 15]. Maternal education is a crucial factor for nutritional status of children in developing countries [17, 18, 19, and 20]. As mother's educational level increased, probability of nutritional well-being, also increased. This means that children whose mothers had secondary school and above educational level were significantly less likely malnourished. This showed that parental education is directly or indirectly associated with more efficient management within limited household resources, greater utilization of available health care services, better health promoting behaviors, lower fertility and more child centered caring practices, these all factors associated with better child health and nutrition [16].

Unfavorable health environment caused by inadequate water and sanitation can increase the probability of infectious diseases and indirectly can cause certain types of malnutrition. Birth interval was one of the other significantly associated factors with nutritional status of children under five [11], because with an increase of preceding birth intervals of children, there was decreased risk of malnutrition. The prevalence of stunting increases as the age of a child increase (Central Statistical Agency Ethiopia and [5]). Moreover, our study supports this finding in which children in upper age category were more likely to be stunted compared to those children in age 6-24 months old. In this study girls were more likely underweight, relative to boys (AOR=.600 CI: 409 - 880) which is similarly reported from study carried out in Tigray, northern part of Ethiopia [2]. This might be due to cultural child care difference.

5. Conclusions

Our study specially demonstrated child's gender, type of maternal occupation, maternal education, toilet facility, frequency of having meal per day, maternal prenatal care services, age of child, birth type, and source of water supply as nutritional status determining factors in the study population. So, there is a need to plan strategies and preventive public policies based on these district specific risk factors to alleviate early malnutrition among under- five children. Information gathered from this survey will be provided baseline data and will elicit support and promote cooperation among different stakeholders to improve nutritional status.

This study has been addressed only certain issues related with nutritional status of under five children and determining covariates because of some limitation: Since the study employ cross-sectional study it is difficult to establish cause effect relationship. Respondent might have not told us real information about their socio-economic and demographic characteristics, because of high dependency on the need to get support. Some measurements may not be accurate due to subjective responses and recall biases.

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