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Predictors of Poor Anthropometric Status among Children Under Two Years of Age in Gamo Gofa Zone, Southern Ethiopia, 2015; Cross-Sectional Study

Yinager Workineh Birhanu[1*] **and Aman Yesuf Endris**[2]

[1]*Department of Nursing, Arba Minch University, Arba Minch, Ethiopia*

[2]*Department of Public Health, Arba Minch University, Arba Minch, Ethiopia*

[*]**Corresponding author:** Yinager Workineh Birhanu, Department of Nursing, Arba Minch University, Arba Minch, Ethiopia, Tel: 251910837684; E-mail: workieyenie@gmail.com

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Abstract

Introduction: Worldwide over 195 million under five children are affected by malnutrition; 90% of them live in sub-Saharan Africa and South Asia. The prevalence of underweight children under five years of age in different regions of the world is expected to decline, but in sub-Saharan Africa, it will increase from 24 million children in 1990 to 43 million in 2015. Ethiopia is among the Sub Saharan nations with at least 53% of mortality can be attributed directly or indirectly to malnutrition. Therefore the aim of this study is to assess nutritional status and its determinants in the selected setting.

Methods and materials: Institutional based cross sectional study design was applied in four hundred nineteen children aged 0–24 months with their mothers using random sampling techniques. A structured questionnaire was administered to mothers in health centers growth monitoring, and immunization department. Information on health, household socio-economic status, child feeding practices and anthropometric measurement was gathered. Multivariate regression analysis was applied to identify potential determinants of poor anthropometric status, and ethical issue was assured by using assent form.

Results: The mean Z-score for weight-for-height was 46.3%, for height-for-age was 16.5%, and for weight-for-age was 16.7%. There were different factors for child poor nutritional status. In these regard, children from mothers attending above grade 12 were less likely under weight as compared with children with illiterate mother [AOR=0.344, (CI 95%: 0.123, 0.669)]. Children from family earned 3000 and above birr were less likely under weight as compared with a family who earned below 500 birr [AOR=0.974(CI 95%: 0.263, 0.605)]. Child didn't get breast milk at any time was more underweight as compared with child who got breast milk at any time [AOR=4.723, (CI 95%: 1.193, 18.696)]. Underweight was more likely among children in the age group of 6-12 month and 12-24 months [AOR=3.494, (CI 95%: 1.471, 8.301)] and [AOR=1.734, (CI 95%: 1.123, 3.892)] as compared to age group of 0-6 months. Children with EBF duration for below six month were 4 times more likely underweight [AOR=3.685, (CI 95%: 1.389, 34.917)] as compared to duration of EBF for more than 12 months. Factors for wasting of under two children were status of child, time of bathing of child, and age of child. The analysis showed that twin children were 2 times more likely to be wasted as compared to singleton children [AOR=1.666, (CI 95%: 1.448, 6.198)]. Bathing of child after 24 hours was less likely wasted as compared with children who bathed within 24 hrs [AOR=0.510, (CI 95%: 0.285, 0.914)]. Wasting was three times more likely among children in the age group 12-24 months [AOR=2.421, (CI 95%: 1.910, 6.443)] as compared to age group of 0-6 months. After adjustment for all potential confounders in this study, there was evidence of an association between child sex and stunting of children as figured by [AOR=1.710, (CI 95%: 1.083, 2.701)].

Conclusions: This finding indicated that there was lower level of underweight, and wasting, and high level of stunting of children. Poor nutritional status of children like underweight, stunting and wasting was determined by different predictors. Educational status, monthly income, providing milk at any time, child age and duration of exclusive feeding were predictor of underweight of child. Moreover, status of child, time of bathing of newborn, and age of child were significantly associated with wasting. Stunting was determined by sex of the child. Therefore, the study concludes that no single factor affected nutritional status, rather many factor were interwoven to affect the occurrence of poor nutritional status in those age group children in this settings.

Keywords Determinants; Poor nutrition; Stunting; Under two children; Underweight; Wasting; Gamo Gofa zone

Introduction

Even though there were declined of stunting prevalence from 33% to 25% or from 199 million to 161 million between 2000 and 2013, 161 million under-five years' old children were estimated to be stunted in

the world in 2013. From these, about half of all stunted children lived in Asia and over one third in Africa [1]. Similarly, 51 million under-five year olds were wasted in the globe with estimated prevalence of 8%. Of these, approximately two thirds of all wasted children lived in Asia and almost one third in Africa, with similar proportions for severely wasted children [2]. In the world, between 2000 and 2013, there was increment of under-five year olds overweight from 32 million to 42 million. In the same time interval, overweight prevalence increased from 11% to 19% in Southern Africa and from 3% to 7% in Southeastern Asia [1]. In terms of regional breakdowns in numbers of overweight children in 2013, there were an estimated 18 million under-fives in Asia, 11 million in Africa and 4 million in Latin America and the Caribbean [1,2]. Globally, 99 million under-five year olds were underweight in 2013, two thirds of which lived in Asia and about one third in Africa. The global trend in underweight prevalence continues to decrease; going from 25 per cent to 15 per cent between 1990 and 2013 [1]. Africa has experience the smallest relative decrease, with underweight prevalence of 17% in 2013 down from 23% in 1990, while in Asia for same period it reduced from 32% to 18% and in Latin America and the Caribbean from 8% to 3%. This means Asia and Latin America and the Caribbean are likely to meet the MDG while Africa is likely to fall short, reaching about only half of the targeted reduction [2].

From all malnourished children, ninety percent of them live in sub-Saharan Africa and South Asia [3]. Trends in childhood malnutrition suggest that the situation in sub-Saharan Africa is static or deteriorating. The prevalence of underweight in under five years of age children in different regions of the world is expected to decline, but in sub-Saharan Africa, it will increase from 24 million children in 1990 to 43 million in 2015 [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 [5]. Ethiopian Demographic Health Survey 2011 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 [6].

The International Food Policy Research Institute Report said Ethiopia's performance in reducing stunting is impressive and it is on the right track towards reducing stunting and anaemia while many African countries of sub Saharan Africa are off track. In this regard, making Ethiopia malnutrition free in 2030 is possible if its performance over the past decade like underweight reduction by 32% and stunting by 23% strengthen and continued for the coming 12 years [7]. Due to significant improvement in nutrition, and other measures, under five and infant mortality decline from 146/1000 live birth in 2000 to 68/1000 live birth, and 90/1000 live births in 2000 to 47/1000 respectively in 2013 [8]. This indicates that Ethiopia have faster rates of decline in stunting by direct increasing coverage of severe acute malnutrition treatment by 80 percent [7].

Even though the above achievement in Ethiopia was paramount success in health of children, but there are still many challenges which lead to morbidity and mortality of children in related to nutritional status.

The challenges or problems such as nutrition-specific interventions like exclusive breastfeeding rates, and duration, complementary breast feeding rate, and frequency, economic status, educational status of female, and MCH services utilization effects on nutritional status of children were not well assessed and investigated before in different remote area of Ethiopia in general, and Gamo Gofa zone in particular.

Therefore the aim of this study is to assess nutritional status and its determinants among under two children in Gamo Gofa zone selected health centers.

Methods

Setting, design and period

The study was conducted in Gamo Gofa zone which is located about 505 km South West of Addis Ababa from January 30, 2015 to March 20, 2015 by using facility based cross-sectional study design.

The name for Gamo Gofa is given for the Gamo and Gofa peoples whose homelands lie in this area and the administrative center of Gamo Gofa is Arba Minch. According to the 2007 census result it has a population of 1,595,570 and of this 794,485 were males and 801,085 were females. There are a total of three hospitals and 68 health centers in the zone.

Sample size determination, and sampling technique

The sample size was calculated using single population proportion formula by considering the prevalence of underweight of under five children from the revised literature [9], margin of error, confidence interval, and non-response rate were assumed to be 45.3%, 5%, 95%, and 10%, respectively.

$$ni = \frac{z\ (\alpha/2)^2 P\ (1-P)}{d^2}$$

Thus, Where: ni=Sample size; Z $(\alpha/2)^2$=Confidence interval; P=Proportion of underweight for under two children (0.453.); d=marginal of error.

$$ni = \frac{(1.96)^2\, 0.453(1-0.453)}{(0.05)^2} = 381$$

Finally, taking 10% non-response rate, the minimum sample size was determined to be 419.

After determination of sample size, Gamo Gofa zone governmental health centers were selected for the study area. In this zone, health centers were clustered into sixty eight. From this cluster of health center, fourteen of them were selected by simple random sampling.

Then based on the number of clients who visited each health centers EPI, and growth monitoring department during the previous one year, the total sample size was proportionally allocated to each selected health center. Similarly, selecting of participants was carried out from Growth monitoring, and EPI department.

Then, interviewing of the mother was carried out in Growth monitoring and EPI department as participant using systematic

sampling methods by considering the 1st comers as starting point, and then every other in the specified department.

Tools for detection of anthropometric measures and assessment of risk for malnutrition

To develop the final version of questionnaire, an individual who has a very good ability of both English and Amharic language translated the English version to Amharic. Another individual with similar ability then translated the final or the agreed Amharic version of the questionnaire back to English with the first to check for any inconsistency or distortion in the meaning of words in the content of instrument. Then height and weight of children for children was measured by health professionals in EPI, and Growth monitoring department. For the interview purpose, twenty four data collectors who are diploma level were selected.

The criteria that were used for the selection of data collectors are; know the Amharic language, and live around the study area. Three investigators were assigned for supervision.

The data collectors were given two days training before actual field work about the aim of study, study procedure, and data collection techniques by investigators. Finally, after the adjustment of the questionnaire, the tool included health, and health related information, household socio-economic status, child feeding practices and anthropometric measurement.

Data quality assurance

Questionnaire was prepared in English and translated to Amharic, and re translated back to English; pretests of tool was done outside the study area; intensive training of data collectors for three day; the collected data was carefully checked for completeness, outlier and missing value as well as consistencies; and supervision of data collectors was made three times/day by the supervisors in order to assure the quality of data.

Data analysis

Data were cleaned, edited, coded and entered into Epi-info version 3.5.1 statistical software package. The statistical analysis was done using SPSS version 20. Frequency distribution for selected variables was performed. The statistical significance and strength of the association between independent variable and an outcome variable was measured by bivariate logistic regression model. From this, a variable P value less than 0.25 was transferred to multivariate logistic regression model to adjust confounder's effects and a p value less than 0.05 was be considered as significantly associated in this model. Finally, the results of the study were presented using tables, figures and texts based on the data obtained.

Ethical Clearance

The study was approved by the Scientific Ethical Review Committee of Arbaminch University, and then ethical clearance was obtained from University, and from Gamo Gofa zone health office. Informed consent was obtained from mothers after explanation of the purpose of the study, and the part they took in the research.

Any involvement of the mothers was after their complete verbal consent. Mothers were told as they would have the right to withdraw from the study at any time during the interview.

Results

Socio demographic profile

A total of 419 under five children were included in the study with a response rate of 100%. The majority of the mothers 156 (37.2), 232 (55.4), 296 (70.6), 412 (98.3%), 110 (26.1%), and 274 (65.4%) were age of 25-29 years, protestant followers, Gamo ethnicity, married, illiterate, and house wives respectively. One hundred fifty six (37.2%) mothers earned a monthly income less than 500 Ethiopian birr, and 90 (21.5%) of the respondent were at the level of very poor wealth index. From the total respondent 211 (50.4%) lived in rural area. Regarding to infant socio demographic profile 201 (50.4%) were below six month age [Table 1].

Variables		Frequency	Percent
Maternal age	15-19 year	28	6.7
	20-24 year	89	21.2
	25-29 year	156	37.2
	30-34 year	103	24.6
	Above 35 year	43	10.3
Marital status	Married	412	98.3
	Not married	7	1.7
Maternal educational status	Non Educated	110	26.3
	Read and write	36	8.6
	Grade 1-6	84	20
	Grade 7-8	62	14.8
	Grade 9-12	65	15.5
	Above 12	62	14.8
Maternal occupational status	Housewife	274	65.4
	Farmer	26	6.2
	Government employee's	44	10.5
	Merchants	56	13.4
	Private gainful work	19	4.5
Monthly income	Below 500	156	37.2
	500-999	36	8.6
	1000-1499	59	14.1
	1500-1999	28	6.7
	2000-2499	39	9.3
	2500-2999	19	4.5
	3000+	82	19.6
Family size	Below three	160	28.7
	5-Mar	335	60
	Above 5	63	11.3

Residence	Urban	211	50.4
	Rural	208	49.6
Wealth index	Very poor	90	21.5
	Poor	93	22.2
	Medium	78	18.6
	Rich	74	17.7
	Very rich	84	20
Age of child	Below six month	203	48.4
	6-12 month	149	35.6
	12-24 month	67	16
Weight of the child	Below 8 kg	313	74.7
	8 and above 8 kg	106	25.3
Sex of child	Male	232	55.4
	Female	187	44.6

Table 1: Socio demographic Profile of the respondents in Gamo Gofa zone, 2015 (n=419).

Anthropometry measurement

The mean Z-score for weight-for-height was 46.3%, for height-for-age was 16.5%, and for weight-for-age was 16.7%. This means, out of the total children, 46.3% were found stunting, underweight 16.5% and wasting, 16.7% [Figure 1].

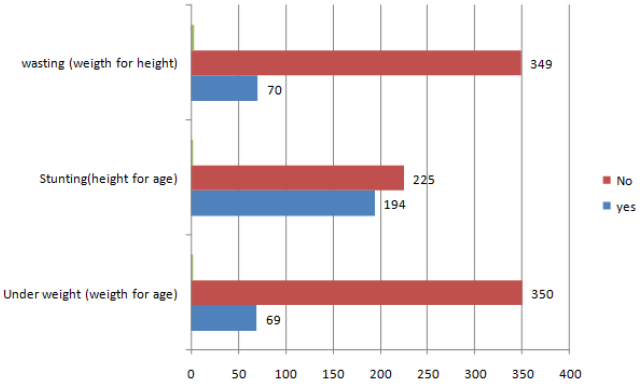

Figure 1: Anthropometry measurement of under two children in Gamo Gofa zone, 2015 (n=419).

Obstetric history and maternal and child health service utilization

Regarding respondents obstetric history, 324 (77.3%) of the respondents got pregnant for one, two or three times. Majority 125 (29.8%) of children were 24 month and above younger than their respective older brother/sister. Three hundred ninety nine (95.8%) children were delivered at term time. Concerning the birth order of the child, 137 (32.7%) children were the first child of the mother. From the total numbers of children, 402 (95.9%) of them were singleton at the time of delivery. Ten (2.5%) of the children had little brother or sister [Table 2].

Variables		Frequency	Percent
Number of pregnancy	Below three	324	77.3
	5-Mar	73	17.4
	Above 5	22	5.3
After last child when was this child delivered?	Bellow 12 month	44	10.5
	12-24 month	125	29.8
	Above 24 month	112	26.7
Birth Status of the child	Term	399	95.8
	Preterm and post term	20	4.2
Birth order of the child	1st	137	32.7
	2nd	118	28.2
	3rd	76	18.1
	4th and above	88	21
Status of fetus	Singleton	402	95.9
	Twin	17	4.1
Did you delivered other child after the delivery of this child?	Yes	10	2.4

	No	409	97.6
Antenatal utilization	Yes	398	95
	No	21	5
Level of utilization	One	2	0.5
	Two	19	4.5
	Three	65	15.5
	Four and above	312	74.5
Initial Time of bathing the child after delivery	Within 24 hours	120	28.6
	After 24 hours	299	71.4
Did the child take PNC	Yes	248	59.2
	No	171	40.8
Zink supplementation	Yes	96	22.9
	No	323	77.1
Vit A supplementation	Yes	178	42.5
	No	241	57.5
Did child have history of disease?	Yes	87	20.8
	No	332	79.2
Types of children' problem	URTI	34	8.1
	Others (diarrhea and malaria	53	12.6

Table 2: Distribution of obstetric history, and MCH care utilization of respondents in Gamo Gofa zone, 2015 (n=419).

Of the total respondents, 398 (95%) utilized antenatal care service in health facilities (hospitals, health centers, and health posts). Among ANC service users, majority 312 (74.5%) utilized ANC service four times during pregnancy time. One hundred twenty (28.6%) children were bathed within 24 hours of delivery. Two hundred forty eight (59.2%) mothers used postnatal services after the delivery of the child. As to child care utilization, 152 (36.2%) of children were fully vaccinated [Figure 2], and ninety six (22.9%), and 178 (42.5%) of children utilized zinc, and vitamin A respectively. Eighty seven (20.8%) of children had history of diseases like upper respiratory tract (8.1) and others (12.6) [Table 2].

Child feeding practice

Four hundred ten mothers gave breast milk for their child. Among these mothers, 356 (85%) of them had initiated breastfeeding within the first hour of the infant's birth.

EBF was practiced by 72.5% of mothers. Two hundred two (42.8%) children had had started receiving complementary foods.

One hundred ninety two (45%) of them started complementary feeding before six month of age. Seventy four (17.7%) mothers gave complementary foods by using bottles.

From all children started complementary feeding, only thirty five (8.4%) of children were gained formula foods [Table 3].

Factors associated with underweight in less than two years children

Multiple logistic regressions showed that, educational status, monthly income, providing breast milk at any time, child age and duration of exclusive feeding were significantly associated with underweight.

In these regard, children from mothers attending above grade 12 were less likely under weight as compared with children from non educated mothers [AOR=0.344,(CI 95%: 0.123, 0.669)].

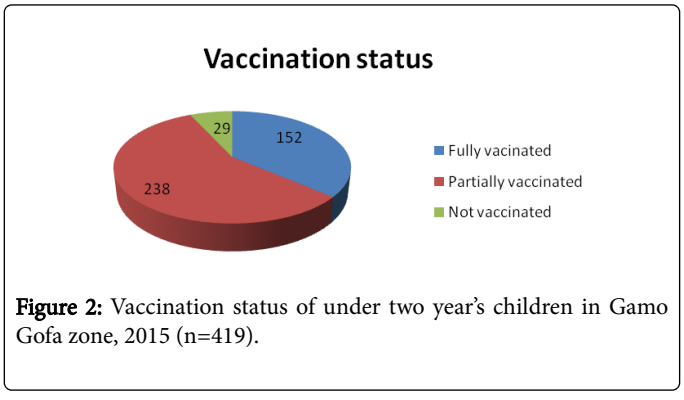

Figure 2: Vaccination status of under two year's children in Gamo Gofa zone, 2015 (n=419).

Variables		Frequency	Percent
Has your child ever breastfed?	Yes	410	97.9
	No	9	2.1
Starting time for breast feeding	Within one hour	356	85
	After one hour	54	12.9
Types of breast feeding	EBF	305	72.8
	Predominantly breast feeding	41	9.8
	Partially breast feeding	64	15.3
Give the child breast milk at any time	Yes	389	92.8
	No	21	5
Providing food before initiation of breast feeding	Yes	19	4.5
	No	400	95.5
What type of food	Milk	3	0.7
	Water	19	2.6
Providing of food within three day	Yes	19	4.5
	No	400	95.5
What types of food	Milk	3	0.7
	Water	16	2.6
Feeding by using bottle	Yes	74	17.7
	No	345	82.3
Start complementary feeding	Yes	202	48.2
	No	217	51.8
When the children start complementary feeding?	Before six month	192	45.8
	At six month, and above	10	2.4
Give your child any formula food	Yes	35	8.4
	No	384	91.6

Table 3: Feeding practice of under two years children in Gamo Gofa zone, 2015 (n=419).

Children from family with monthly income of 3000 and above birr were less likely under weight as compared with a family who earned below 500 birr [AOR=0.974(CI 95%:0.263, 0.605)]. Child didn't get breast milk at any time was five times underweight as compared with child who got breast milk at any time [AOR=4.723, (CI 95%1.193, 18.696)].

Underweight was more likely among children in the age group of 6-12 month and 12-24 months [AOR=3.494, (CI 95%: 1.471, 8.301)] and [AOR=1.734, (CI 95%: 1.123, 3.892)] as compared to age group of 0-6 months. Children with EBF duration for below six month were 4 times more likely underweight [AOR=3.685, (CI 95%: 1.389, 34.917)] as compared to duration of EBF for more than 12 months [Table 4].

Variables	Category	Number (%)	COR(95% CI)	AOR(95%CI)
Maternal educational status	Non Educated	110(26.3)	1	1
	Read and write	36(8.6)	1.156(0.451, 2.963)	1.399(0.414, 4.730)
	Grade 1-6	84(20)	1.395(0.672, 2.898)	1.007(0.386, 2.628)

	Grade 7-8	62(14.8)	1.884(0.790, 4.494)	0.535(0.154, 1.861)
	Grade 9-12	65(15.5)	4.256(1.405, 12.890)	1.449(0.328, 6.398)
	above 12	62(14.8)	0.463(0.235, 0.526) *	0.499(0.136, 0.833) *
Average monthly income	Below 500	156(37.2)	1	1
	500-999	36(8.6)	0.821(0.306, 2.200)	0.599(0.188, 1.912)
	1000-1499	59(14.1)	0.528(0.249, 1.118)	1.318(0.110, 5.921)
	1500-1999	28(6.7)	0.985(0.312, 3.113)	0.294(0.062, 1.407)
	2000-2499	39(9.3)	0.418(0.182, 0.959)	0.169(0.047, 1.607)
	2500+	19(4.5)	0.876(0.236, 3.255)	0.427(0.078, 2.321)
	3000+	82(19.6)	0.332(0.583, 0.943) *	0.974(0.263, 0.605) *
Residences	Urban	211(50.4)	1.494(0.887, 2.518)	1.045(0.433, 2.521)
	Rural	208(49.6)	1	1
Time of first child bathing	Within 24 hour	120(28.6)	1	1
	After 24 hours	299(71.4)	0.450(0.264, 0.767)	1.651(0.835, 3.261)
Providing of breast milk at any time	Yes	389(92.8)	1	1
	No	21(5)	2.742(1.062, 7.076) *	4.723(1.193, 18.696) *
Child age	Below six month	203(48.4)	1	1
	6-12 month	149(35.6)	3.735(1.892, 7.373) *	3.494(1.471, 8.301) *
	12-24 month	67(16)	2.160(1.108, 4.210) *	1.734(1.702, 3.892) *
Duration of exclusive breast feeding	Below six month	278(66.3)	1	1
	6-12 month	13(3.1)	8.750(1.365, 56.081) * *	3.685(1.389, 34.917) *
	12-12 month	5(1.2)	7.188(1.169, 44.184)	1.857(0.199, 17.331)

Table 4: Determinates of underweight in under two years children in Gamo Gofa zone, 2015 (n=419).*Statistically significant at p<0.05, **statistically significant at p<0.00

Factors associated with wasting in under two years children

Factors for wasting of under two children were status of child, time of bathing of child, and age of child. The analysis showed that twin children were 2 times more likely to be wasted as compared to singleton children [AOR=1.666, (CI 95%: 1.448, 6.198)]. Bathing of child after 24 hours was less likely wasted as compared with children who bathed within 24 h [AOR=0.510, (CI 95%: 0.285, 0.914)]. Wasting was three times more likely among children in the age group 12-24 months [AOR=2.421, (CI 95%: 1.910, 6.443)] as compared to age group of 0-6 months [Table 5].

Variables	Category	Number (%)	COR (95% CI)	AOR (95%CI)
Maternal educational status	Non Educated	110(26.3)	1	1
	Read and write	36(8.6)	1.463(508,4.212)	1.133(.341, 3.771)
	Grade 1-6	84(20)	0.865(.427, 1.752)	0.553(0.238, 1.285)
	Grade 7-8	62(14.8)	1.390(.593, 3.257)	0.452(0.153, 1.331)
	Grade 9-12	65(15.5)	1.955(.781, 4.892)	0.582(0.176, 1.921)
	Above 12	62(14.8)	1.227(.537, 2.806)	0.374(0.111, 1.268)
Residence	Urban	11(50.4)	1.654(.981,2.788)	1.267(0.632, 2.541)

	Rural	208(49.6)	1	1
Antenatal care utilization	Yes	398(95)	1	1
	No	21(5)	3.335(1.327, 8.38)	2.361(0.815, 6.839)
Child vaccination Starting of complementary feeding	Yes	23(5.5)	1	1
	No	396(94.5)	2.742(1.223, 4.147)	1.666(0.448, 6.198)
	Yes	202(48.20)	1	1
	No	217(51.8)	0.606(0.360, 1.019)	1.233(.535, 2.841)
Time of first child bathing	Within 24 hours	120(28.6)	1	1
	After 24 hours	299(71.4)	0.498(0.472,0.938)*	0.510(0.285,0.914)*
Providing of breast milk based on demand	Yes	389(92.8)	1	1
	No	21(5)	2.151(.803, 5.762)	1.699(0.510, 5.663)
Status of the child	Singleton	402(95.9)	1	1
	Twin	17(4.1)	2.881(1.028, 8.069) *	1.666(1.448, 6.198) *
Child age	Below six month	203(48.4)	1	1
	6-12 month	149(35.6)	2.646(1.313, 5.333) **	2.421(1.910, 6.443)*
	12-24 month	67(16)	1.349(.683, 2.664)	1.157(0.555, 2.413)

Table 5: Determinates of wasting in under two years children in Gamo Gofa zone, 2015(n=419).*Statistically significant at p<0.05, **Statistically significant at p<0.00.

Factors associated with stunting in under two years children

After adjustment for all potential confounders in this study, there is evidence of an association between child sex with stunting of children as figured by [AOR=0.655, (CI 95%: 0.438, 0.980)] [Table 6].

Variables	Category	Number (%)	COR(95% CI)	AOR(95%CI)
Maternal educational status	Non Educated	110(26.3)	1	1
	Read and write	36(8.6)	0.575(0.269, 1.228)	0.693(0.302, 1.591)
	Grade 1-6	84(20)	0.958(0.539, 1.703)	1.035(0.538, 1.993)
	Grade 7-8	62(14.8)	0.674(0.360, 1.260)	0.770(.358, 1.654)
	Grade 9-12	65(15.5)	1.012(0.543, 1.884)	1.166(0.529, 2.571)
	Above 12	62(14.8)	0.632(0.338, 1.182)	0.824(0.359, 1.893)
Sex of child	Male	232(55.4)	0.716(0.485, 0.955) **	0.655(0.438, 0.980) *
	Female	187(44.6)	1	1
Status of child	Term	399(95.23)	0.481(0.181, 1.277)	0.441(0.158, 1.226)
	Pre and post term	20(4.77)	1	1
Time of bathing newborn	Within 24 hours	120(28.6)	1.827(0.181, 2.827)	1.710(0.083, 2.701)
	After 24 hours	299(71.4)	1	1
Child vaccination	Yes	23(5.5)	0.557(0.254, 1.221)	1.760(0.770, 4.022)

	No	396(94.5)	1	1
Zinc supplementation	Yes	96(22.91)	0.740(0.469, 1.168)	0.713(0.439, 1.158)
	No	323(77.09)	1	1

Table 6: Determinates of stunting in under two years children in Gamo Gofa zone, 2015(n=419).*Statistically significant at p<0.05, **statistically significant at p<0.00.

Discussion

The overall prevalence of child malnutrition was 16.5%, underweight, stunting, 46.3% and wasting, 16.7%. The prevalence of underweight in this study was lower as compared with EDHS 2011 (29%), Amhara region (28.5%), Tigray region [38.3%], and Western Kenya [30%] [8,10-13]. This difference may be due to the attribution of season. The data of this study was collected in January 30, April 30 2015 when most rural areas didn't face shortage of food during this season. Moreover, stunting of the children in this study (46.3%) was slightly similar with the national report of EDHS 2011 (51%), and western Kenya [47%] [8,13], and it was lower than study conducted in Tigray region (56.6%) [9]. The possible reason for this stunting prevalence difference might be due to socio demographic, setting and sampling technique variation in which the data collection of this study was carried out in different ethics group in health care setup but the other studies were conducted in community. The proportion of wasting in different studies ranges from 10-14.8% [6,11,14] which is nearly similar with the finding of this study [16.7%]. However level of wasting in this finding was higher than study done in western Kenya [7%] [13]. The possible reason for this difference might be due to socio demographic profile, setting and sampling technique variation in which the data collection of this study was carried out in different ethics group in health care setup but the other studies were conducted in community.

Multivariate logistic regressions showed that educational status, monthly income, providing milk at any time, child age and duration of exclusive feeding were significantly associated with underweight of children. Moreover, status of child, time of bathing of newborn, and age of child were significantly associated with stunting. And, the sex of the child was significantly associated with wasting.

The mother's educational status above grade 12 had preventive relationship with underweight as compared with non-educated mother. This result is in line with a report from EDHS, 2011 and in Tigray region. However our finding is contradict with as study done in Amhara region [10]. This might be due to the fact that educational status has a direct impact on practicing of prevention aspect of disease as well as lower fertility and more child-centered caring practices. Similarly, children's families with monthly income of 3000+ Ethi-birr were less likely underweight as compared to monthly income of blow 500+ Ethi-birr. This result was in line with the study conducted in Ref. [15-17]. The reason for this can be economic well-being/monthly income at the household level determine availability of better food, more hygienic living conditions, and better access to health services in affecting the health and nutritional status of children. As the same fashion, as the age of the children increased there to be underweight, and wasting in this study which was similar with study conducted in Tigray region, western Kenya and other area studies [6,10,13,17-22]. This may be explained by the fact that foods for weaning are typically introduced to children in the older age group, thus increasing their exposure to infections and susceptibility to illness. This tendency, coupled with inappropriate or inadequate feeding practices, may contribute to faltering nutritional status among children in these age groups.

Provision of breast milk at any time to child was less likely risk for underweight as compared with its counterpart. This can be occurred due to the provision of breast milk fulfilled very high nutrient needs per unit body weight of infants and young children because of the rapid rate of growth and development during the first two years of life. Breast milk can make a substantial contribution to the total nutrient intake of children between 6 and 24 months of age, particularly for protein and many of the vitamins. In the same fashion, children with EBF duration for below six month were more likely underweight as compared to duration of EBF for more than 12 months.

The analysis showed that twin children were more likely to be wasted as compared to singleton children. This possibly contribute to effect of twin child on infant and child survival by increasing (1) behavioral effects associated with competition between siblings (e.g., competition for parental time or material resources among twin siblings), (2) the inability (or lack of desire) to give a child adequate attention if his or her birth came together; and (3) disease transmission among twin siblings. On the same corner, the child bathed after 24 hours was less likely stunted as compared with children who bathed within 24 h. This can be due bathing of child after 24 hours has an input in reduction of hypoglycemia and hypothermia which in turn have a devastating effect on the health status of the infant. This is occurred due to the neonate skin is very sensitive, thin and fragile, immaturity of the epidermal barrier reduces the defense against the excessive proliferation of microbes and makes the skin more vulnerable to loss of fluids and electrolytes intern leads to malnutrition.

After adjustment for all potential confounders, there was evidence of an association between child sex and stunting in which being male was preventive for stunting as compared with its counterpart. This finding was incongruent with the study conducted in northern Ethiopia, the report of EDHS, 2011, Western Kenya, and other studies [10,13,17,19-22]. The cause of this discrepancy is not well established in the literature, even if there is a belief that boys are more influenced by environmental stress than girls. The reason for this difference can be gender bias health seeking behavior of the family for giving higher priority for male children than female in the study area.

Limitations

Recall bias was more likely since women were asked for majority of events which have already happened within the past prior to this study irrespective of the consideration of recent events. Cause effect relationship of nutritional status and its predictors was not assessed due to nature of cross-sectional study.

Conclusion

The overall prevalence of child underweight was 16.5%, stunting, 46.3% and wasting, 16.7%. This finding indicated that there was lower level of underweight, and wasting, and high level of stunting of children as compared with other findings. The nutritional status of the child was determined by different predictors. Multivariate logistic regressions showed that educational status, monthly income, providing of breast at milk any time, child age and duration of exclusive feeding were determinates of underweight of children. Moreover, status of child, time of bathing of child, and age of child were the predictors of wasting, and also the sex of the child and time of bathing of newborn were decisive factor for stunting. Therefore, the study concludes that no single factor affected nutritional status, rather many factor were interwoven to affect the occurrence of poor nutritional status in those age group children in this settings.

Recommendation

Based on the findings of this study, the following recommendations were forwarded

Policy and program level

Federal MOH should be closely monitor nutritional status of the child which was one basic component of millennium development goal strategy to decrease child mortality. The woreda health office should work with community leader, Idirs, women developmental army, woreda women's and child affairs office and other influential persons to facilitate the appropriate feeding style for children.

Health worker

Health extension and Health worker should provide information and counseling the benefit breast feeding child at any time in need of child at community level in general at family as well as individual level in particular.

NGO and other stakeholders

Woreda women affair and child office and administration should work on women education related to the time of bathing of newborn immediately after birth by general community orientation and informal (peer) education.

Researcher: Large scale study on malnutrition of children by using longitudinal study at the community level should be conducted.

Abbreviations used

EDHS-Ethiopian Demographic and Health Survey

EPI- Expanded Program of Immunization Moderate Acute Malnutrition

EBF-Exclusive Breast feeding

Competing interests

The authors declare that they have no competing interests.

Authors' Contributions

YW designed the study, collected and analyzed the data, and wrote the manuscript. AY participated in revision of the manuscript and data analysis as well as conceived the study and reviewed the draft manuscript. Both authors read and approved the final manuscript.

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