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Prevalence of Underweight and its Determinant Factors of under Two Children in a Rural Area of Western Ethiopia

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Abstract
Background: Malnutrition in children is one of the most serious public health problem in Ethiopia and the highest in the world. Therefore, the objective of the study was to measure the prevalence of underweight and to study the selected factors associated with underweight among children under two years of age residing in a rural area of Western Ethiopia. **Methods:** A community based cross sectional study was employed from March to April 2014. A total of 593 mothers of under two children using a pre-tested, structured, interviewer administered questionnaire consisting of socio-demographic factors, maternal characteristics, feeding practices and anthropometric measurement was used to gather data. WHO Anthro software version 2.02, SPSS software version 20 was used to perform descriptive statistics, bivariate and multivariable logistic regression analyses.**Results:** The prevalence of underweight among under two children was 8.9%. The prevalence of underweight among children under the age of one year was 15.1%. Males (9.7%) were more malnourished than females (8.2%). As compared with children in the age group less than six months, the risk of underweight was about 2.6 times higher for children in age groups over one year (AOR=2.62; 95%CI=1.09, 6.33). **Conclusion:** The burden of underweight was low and some important determinant factors for underweight were age of child, birth weight, frequency of breastfeeding, health information after delivery and vitamin A-rich fruits/vegetables. Thus, efforts should be made to improve the antenatal care services, emphasis on maternal nutrition and the importance of proper infant and young child feeding practices for reducing malnutrition among under-two children.
Key words: Children, Determinant factors, Prevalence, Underweight, West Ethiopia

Introduction

Children constitute the most vulnerable segment of any community. Their nutritional status is a sensitive indicator of community health and nutrition. Under-nutrition among them is one of the greatest public health problems in developing countries. Attempts to reduce child mortality in developing countries through selective primary health care have focused primarily on the prevention and control of specific infectious diseases, with less effort being directed to improving children's underlying nutritional status (1).

Malnutrition continues to be a major public health problem in developing countries. It is the most important risk factor for the burden of disease causing about 300, 000 deaths per year directly and indirectly responsible for more than half of all deaths in children (2-5). Malnutrition at the early stages of life can lower child resistance to infections, increase child morbidity and mortality, and decrease mental development and cognitive achievement and nutritional status is the best global indicator of well-being in children (6-7).

Reducing malnutrition among children under the age of five remains a huge challenge in developing countries of the World. An estimated 230 million under-five children are believed to be chronically malnourished in developing countries (8). Similarly, about 54% of deaths among children of this age group are believed to be associated with malnutrition in developing countries (9). In Sub-Saharan Africa, 41% of under-five children are malnourished and deaths from malnutrition are increasing on daily basis in the region (9).

The country has the second highest rate of malnutrition in Sub-Saharan Africa (10). Malnutrition in children is one of the most serious public health problem in Ethiopia and the highest in the world (11-14). According to the 2011 DHS of Ethiopia, the prevalence of underweight was 29% at national level. Oromia region of Ethiopia prevalence of child malnutrition indicated that 26% are underweight with 7.8% severe underweight, 9.7% of the children are wasted (2.8 % severe wasting) and 41.4 % of the children are stunted with 18% sever stunting (15). Malnutrition is widespread in Ethiopia, especially in the rural areas. This is partly occurs primarily because of inadequate food intake and poor dietary diversity. The root causes of malnutrition in the country include endemic food shortages in many parts of the country, a limited variety of food to choose from, and widespread poverty—which has made it difficult for most families to access the food they need. Other factors contributing to malnutrition include the disease burden, use of unsafe water, poor sanitation, inappropriate infant and young child feeding practices, low uptake of primary health services and low levels of maternal education. Malnutrition

is one of the leading causes of morbidity and mortality in children under five years of age in Ethiopia.

The prevalence of malnutrition in Ethiopia is relatively well documented, but not specific to the regions, localities and residence so far. It is also vary among regions, localities and residence and limited data is available in study area. Study conduct in other districts is not addressing the main associated factors of malnutrition.

This study designed to assess the prevalence of underweight and its determinant factors among children aged 0-24 months. Study based information regarding child malnutrition from the study communities is lacking and it has not been conducted in the study area yet. Information on prevalence of underweight and its determinant factors of under two children are urgently needed for prioritizing, designing and initiating intervention programs aimed at improving child nutrition. The process for priority setting should start with the assessment and analysis of the situation that children face in their environment. This study was carried out to provide information regarding the feeding practices, underweight and its determinant factors of under two children in the study area. Therefore, the result of the study was benefit policy maker by providing appropriate information in order to create appropriate infant and young child feeding policy.

Methods and materials

Study design, setting and population

The study used a community-based cross-sectional survey design and data were collected from children between the ages of birth-24 months in the three rural districts community of East Wollega Zone, Western Ethiopia (Arjo Jimma, Sibu Sire and Arjo Gudetu), from April to May, 2014. East Wollega Zone is located at about 331kms West of Addis Ababa. The study area has a total population of 1,230,402; out of this 615,641 are females. Eighty six percent of the population leaves in rural areas (1,061,120) (16). The Zone was divided into 21 *woredas* (administrative districts). Source population was all mothers who had infants and young children aged less than 24 months at the time of the survey who were residing in the rural community of East Wollega Zone. Study population was sampled women with their children aged 0 to 23 months residing in the rural community of East Wollega Zone.

Sample size determination

A sample size of 597 children was calculated using a single population proportion formula with a 95% confidence level, 5% margin of error, 38% prevalence of underweight in rural communities of Tigray region, Ethiopia (17), a design effect of 1.5 (de*n) and by considering a non-response rate of 10%.

Study sampling and selection of subjects

A two stage cluster sampling technique was used for selecting the study sample. The three districts found in East Wollega zone were used to select the study areas. In the first stage, three districts were randomly selected based on probability proportional to size from each zone. In the second stage, four kebeles (it is the lowest administrative unit in Ethiopia) were randomly selected from each district. In each cluster/kebele census was conducted to identify households with less than 24 months children. One's households with under two years children were identified, the calculated sample size was allocated proportionally for each cluster. After that, simple random sampling was used to select the required number of children. The youngest child from the household in the restricted age group was taken as an index child. Eligibility criteria were selected mothers who have permanent residence in the study area having apparently healthy children from 0 to 23 months old. An exclusion criterion was a child with evidence of physical impairment (such as physical defects or a grossly deformed), mental impairment and edematous conditions.

Data collection

Socio-demographic information

Seven trained female Bachelor of Science (BSc) Nurses fluent in the local language (Afan oromo) administered the pre-tested questionnaire to selected mothers with their children in their own respective homes. The questionnaire was used to assess the socio-demographic characteristics, maternal characteristics and the feeding patterns of the children.

Dietary intake assessment

Data on dietary diversity was assessed using the questionnaire. Dietary diversity score (DDS) was collected and calculated as the sum of the number of different food groups consumed by the mother in the 24 hours prior to the assessment. The dietary diversity score (DDS) was calculated by giving a score of "1" for those who consumed the food item and a score of "0" for those who did not consume the food item over the past 24 hours. The DDS was also ranked and divided into three subgroups (tertiles): six & over (high), 3-5 (medium) and less than 3 (low) food groups consumed in the previous day. According to USAID a total of eight food groups were considered in this study i.e. (1) grains, roots and tubers, (2) vitamin A-rich fruits and vegetables, (3) other fruits and vegetables, (4) meat, poultry and fish, (5) eggs, (6) pulses, legumes and nuts, (7) milk and milk products and (8) foods cooked in oil/fat/butter and sweet drinks/foods (18).

A structured interviewer administered questionnaire was used to collect data related to the objectives of the study. The questionnaire covered a range of topics including socio-economic and demographic data on: educational status, religion, ethnicity, occupation, household family sizes, wealth index, sex of child, age of child were collected through face-to-face interview of child's mother/caregiver. Age of the child was calculated both from the child's date of birth and date of interview, since the year of birth is frequently reported incorrectly. In events where birth dates are not recorded or known with certainty, the mother/caregiver were probed for the approximate date of birth based on a local events calendar. The age was calculated using precise day by subtracting the date of birth from the date of data collection (19).

Anthropometric measurement

Weight of each child was measured using standardized and calibrated equipment. Weight of the children was measured to the nearest 0.1 kg on Salter scale (spring balance, Hanover Germany) (20). For weight measurement, study subjects removed their shoes, removed their jackets and wore light clothing. Triplicate measurement of weight was taken at the same day from each study subject using calibrated equipments and standardized techniques (20). To avoid variability/inter examiner error among the data collectors, anthropometric measurement was taken by the principal investigator.

Data quality management

Five percent (5%) pre-test of questionnaires was done on 18 children in a similar area, which was not included in the study and some modifications were made on the basis of the findings. Measurement of weight was taken in duplicate on each child. All the anthropometric measurement was taken by trained seven Bachelor of Science (BSc) degree holders in Nursing. They were trained by nutritionist to measure children's weight and how to apply a questionnaire to the child's mother or care taker. Data collection was supervised by nutritionist (the principal investigator). Weight scale was calibrated to zero level with no object on it and placed in level surface before measurement was performed. Continuous checkup of scales was carried out for their reliability. The principal investigator supervised and reviewed every questionnaire for completeness and logical consistency and made corrections on the spot.

Data analysis

First, the data were checked for completeness, coded and entered in to a computer. Statistical analysis was carried out using SPSS for windows version 20.0 (SPSS Inc.). The z-score values for WAZ of children generated with WHO child growth standards using WHO Anthro 2009 program, version 3.2.2 (19). Continuous variables were checked for normality using the Kolmogorov-Smirnove test, scatter plots and histograms. Hosmer-Leme show test was performed for model fitness and multicollinearity also checked using variance inflation factor and correlation coefficients. Those variables that were not normally distributed were transformed log into logarithmic scale. Descriptive summaries using frequencies and proportions were used to present the study results. To investigate the socio-economic and demographic factors affecting the malnourished of the children, logistic regression was used. Significant variables observed in the bivariate analysis were subsequently included in to the multivariate analysis. P-values less than 0.05 were considered as significant. To evaluate the association between underweight and predictor variables, both crude odds ratio (COR) and adjusted odds ratio (AOR) with 95% confidence interval were reported.

Ethical Consideration

Ethical clearance was obtained from Wollega University, College of Medical and Health Sciences and the research was done in conformity with the ethical guidelines approved by the Institutional Review Board (IRB) of Wollega University. Supporting letter was written by Wollega University to concerned institutions to get institutional consent and official permission. All the information obtained from the respondent was remained anonymous and confidential. Informed consent and/or assent were obtained from each study participant.

Operational definitions

Dietary Intake: the amount of energy, nutrients or anti-nutrients available in the food consumed by the children.
Lactating mother: mother who is currently feeding breast milk for her infant/child.
Individual Diet Diversity Score (DDS): is the sum of food groups eaten in a specified reference period, serves as a proxy of nutrient adequacy of an individual's diet.
Wealth index: it was developed based on the ownership of fixed assets including radio/tape, television, table/chair, refrigerator, sofa, watch, motorcycle, mobile/telephone and others using factors analyses. The wealth index was then rank divided into tertiles.
Anthropometry: measurement of the variation of physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition by weight-for-age, height-for-age and weight-for-height.
Underweight: refers to a deficit and is defined as underweight below the -2 SD from the WHO reference of the median of the growth standard curve. A severely underweight was diagnosed if it was below -3 SD (21).
Family size: refers total number of people living in a house during the study period.
Permanent Residents: lactating women with children who live in the study area for more than six months.

Results

Descriptive findings

Socio-demographic characteristics of the participants

Five hundred ninety three mothers having children less than two years of age participated in the interview making the response rate 99.33%. Two hundred ninety nine (50.4%) of the children were males. The median age of the mother and the child were 25 years and 10 months, respectively. Majorities of mothers of the children were from Oromo ethnic group (91.1%), 36.9 % of the mothers have completed primary school, over half of the mothers were housewives, 54.6% were Muslim by religion and majority (41.1%) of the study participants were from medium wealth index/ socioeconomic status (SES) **(Table 1).**

Table 1: Socio-economic demographic characteristics of mothers of children under two years of age in rural areas of East Wollega Zone, 2014

Variables (n=593)		Frequency (%)
Age of child in months	1-5	152(25.6)
	6-11	181(30.5
	12-23	260(43.8)
Sex of child	Male	299(50.4)
	Female	294(49.6)
Age of mothers in years	15-19	55(9.3)
	20-24	224(37.8)
	25-29	174(29.3)
	30-34	91(15.3)
	35+	49(8.3)
Family size	1-5	464 (78.2)
	>5	129 (21.8)
	Mean family size	**5**
Paternal Educational status	Illiterate	97(16.4)
	Primary complete	205(34.6)
	Secondary complete	136(22.9)
	Above secondary	155(26.1)
Maternal Educational status	Illiterate	160(27)
	Primary complete	219(36.9)
	Secondary complete	113(19.1)
	Above secondary	101(17)
Occupation (mothers)	Housewife	309(52.1)
	Government employee	75(12.6)
	Farmer	18(13.7)
	Merchant	110(18.5)
	Others*	18(3)
Ethnicity	Oromo	540(91.1)
	Amahara	41(6.9)
	Guraghe	10(1.7)
	Others**	2(0.3)
Religion	Orthodox	236(39.8)
	Protestant	236(39.8)
	Muslim	324(54.6)
	Others***	6(1)
Wealth index of Household		
Poor		182(30.7)
Medium		244(41.1)
High		167(28.2)

*=student, daily laborer, ** = Shinasha, Wolaita ***=catholic, Adventist

Birth order, birth weight and feeding practices

On average about three children were ever born to a mother and of these 42% were born second and third, 38.1 % were born first, 19.1% were born fourth, fifth and sixth, and 0.8% were born seventh and above when categorized in their birth order.

Mothers were also asked if their baby's weight were measured at birth and 60% of the mothers reported the baby's weight were measured at birth of which majority (96.6%) reported their baby's weight greater than or equal to 2500grams.

The study participants were witnessed that majority of the children 569(96%) were ever breastfed at some point in the past and those who reported as breast fed to their baby in last 24 hours were asked the frequency of breast feeding in the last night and day time. Majority of the mothers (64%) introduced complementary food to the feeding of their child at six months and about 14% of the mothers introduced complementary food at age earlier than six months **(Table 2).**

Table 2: Birth order, birth weight and feeding pattern of children under two years of age in rural areas of East Wollega Zone, 2014

Variables (n=593)		Frequency (%)
Birth order	1	226(38.1)
	2-3	249(42)
	4-6	113(19.1)
	≥7	5(0.8)
Mean of children ever born to a mother		**2.31**
Is your baby weighted at birth? (n=593)	Yes	356(60)
	No	237(40)
Birth weight of baby at birth (n=355)		
	<2500grams	12(3.4)
	≥2500grams	344(96.6)
Ever breastfeeding		
Yes		569(96.0)
No		24 (4.0)
Age started complementary foods		
<6 months		81(13.7)
At 6months		378(63.7)
Yet not started		134(22.6)

Dietary intakes of the study participants

The dietary diversity calculated from food groups reported by mothers to have been consumed by the child in the previous 24 hours. The mean (±SD) intake of dietary diversity score was 15.67 (±2.89). Large proportion (39.4%) of the study participants were categorized in the lowest dietary diversity score (DDS), while 30.8% and 29.8% were categorized in the medium and high dietary diversity score, respectively.

Majority of the study participants 63.6% consumed cereal based foods (made of teff, wheat, sorghum, millet, and barley). About 34.9% of the study participants reported that they consumed legumes, pulses/nuts prior to the survey and a few them 10.5% of the study subjects consumed foods cooked with oil, fat or butter in the previous 24 hours. Vitamin A-rich fruits and vegetables and other fruits and vegetables were consumed by 39.1% and 39.3% of the study participants, respectively. Among animal products, milk and milk products were consumed by 40% of the study subjects where as egg, MPF (meat, poultry & fish) were consumed by 47.6% and 15.9%, respectively **(Table 3).**

Table 3: Proportion of children 6-23 months old who consumed different food groups in the last 24 hours preceding the survey in rural areas of East Wollega Zone, 2014

Food groups (n=593)		Frequency	Per cent (%)
Foods from grains, roots and tubers		377	63.6
Vitamin A-rich fruits and vegetables		232	39.1
Other fruits and vegetables		233	39.3
MPF*		94	15.9
Eggs		282	47.6
Food made from pulses, legumes and nuts		210	34.9
Milk and milk products		237	40
Foods cooked with oil/fat or butter		62	10.5
DDS Low		164	39.4
Medium		128	30.8
High		124	29.8
Children diet diversity score	mean ± SD	15.7 ± 2.9	

MPF* = Meat, poultry and fish

Prevalence of child malnutrition (underweight) in the study area

The mean and standard deviations (± SD) of the WAZ score of children under two based on WHO growth standard is -0.27 (±1.18) **(Figure 1).**

As can be seen in Table 4, the percentage of underweight children (<-2 SD Z-score, weight for age). In this study, 8.9 percent of the children were underweight. The sex specific prevalence of underweight in boys was 9.7% while in girls was 8.2%. The age specific prevalence of underweight in age groups 1-5 months was 4.6% and 10.5% in age groups 6-11 months while 10.4% was found among 12-23 months in the study area **(Table 4; Figure 1 & 2).**

Table 4: Prevalence of underweight by overall, sex and age groups among children under 24 months old in East Wollega Zone, 2014

Variables (n=593)	Underweight (<-2 SD)	Not-underweight (≥-2 SD)
	No. (%)	No. (%)
Overall	53 (8.9)	540 (91.1)
Sex		
Boys	29 (9.7)	270 (90.3)
Girls	24 (8.2)	270 (91.8)
Age (months)		
1-5	7 (4.6)	145 (95.4)
6-11	19 (10.5)	162 (89.5)
12-23	27 (10.4)	233 (89.6)

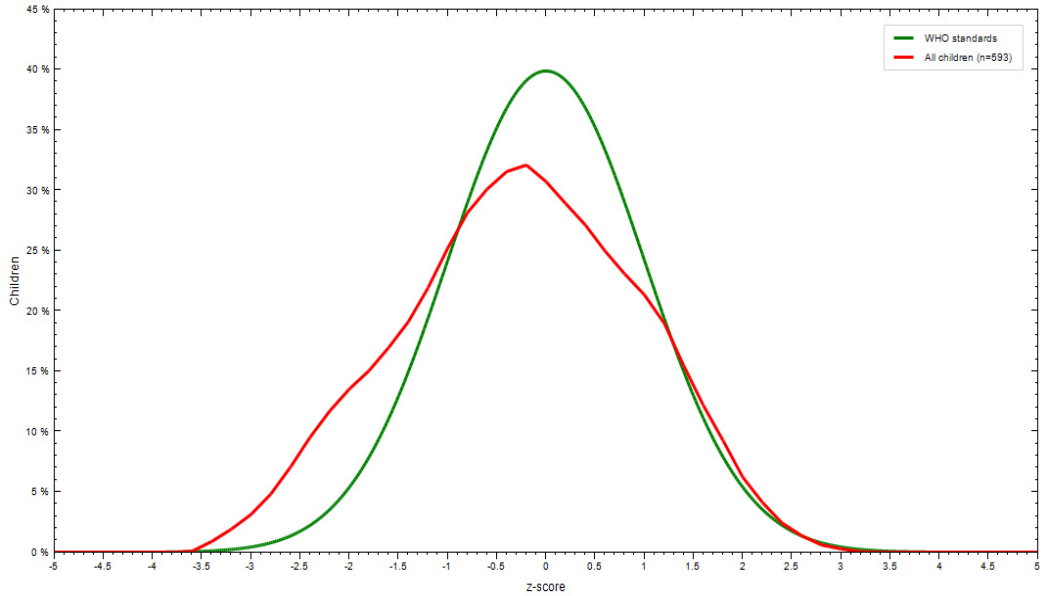

Figure 1: Weight for age z score of children in East Wollega zone, 2014

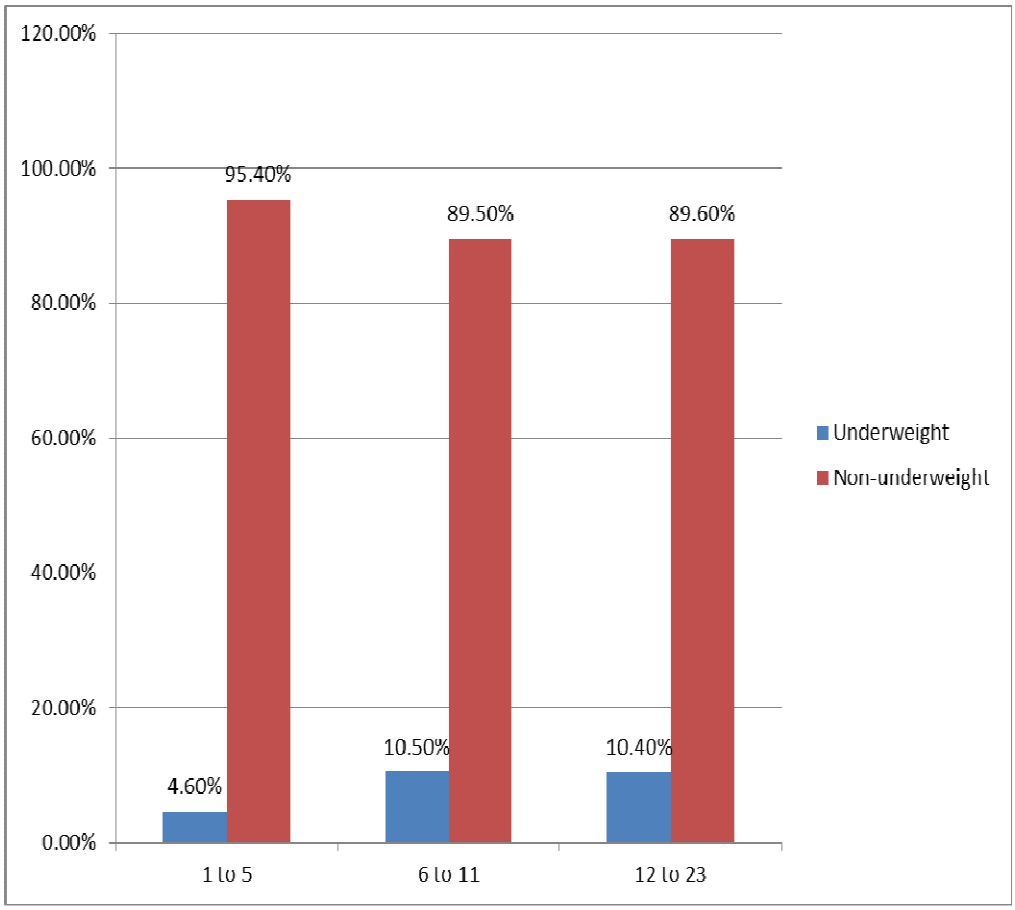

Figure 2: Prevalence of underweight by age among children aged under 24 months in East Wollega zone, 2014

Determinants of child malnutrition (underweight)

As can be seen in Table 5, the multivariate logistic regression analysis identified age of the child, birth weight, advice/health information after delivery, frequency of breastfeeding and vitamin A-rich fruits and vegetables as determinants of underweight among rural children. However, the bivariate analysis showed a positive association between underweight and the availability of safe drinking water supply for child, the significance of this variable

disappear in the multivariate model (COR=1.86; 95%CI=1.05, 3.29).

Children in the age group 1-5 months were found to be at higher odds of underweight as compared with children in the age group 12-23 months. As compared with children in the age group 1-5 months, the risk of underweight was about 2.6 times higher for children in all age groups over one year (AOR=2.62; 95%CI=1.09, 6.33).

Low birth weight children were about 2.4 times more likely to be underweight as compared to those high birth weight children (AOR=2.41; 95%CI=1.11, 5.23).

Likewise multivariable analysis identified that lack of exposure to advice/health information on breastfeeding and complementary feeding after delivery was important predictor of underweight. Those mothers who did not given advice/health information on breastfeeding and complementary feeding after delivery from health personnel were about 2.5 times more likely to be underweight as compared to those mothers who given health information (AOR=2.53; 95%CI=1.09, 5.87). Similarly frequency of breastfeeding had a significant association with underweight of the children, i.e., women who had frequency of breastfeeding of less than 8 times per 24 hours were 2.5 times more likely to be malnourished (underweight) than those who had more than or equal to 8 times (AOR=2.52; 95%CI=1.03, 6.16).

Those children who consumed vitamin A-rich fruits and vegetables were 67% times less likely to be underweight (AOR=0.33; 95%CI=0.14, 0.73). But, nutritional status of study participants had no significant association with maternal education, sex of child, family size, maternal age, ever breastfeeding, introduction of complementary foods, wealth index of household and dietary diversity score **(Table 5).**

Table 5: Multivariable logistic regression analysis predicting the likelihood of a child in rural areas of East Wollega Zone to be underweight, 2014

Variables	Nutritional status		95% CL	
	Underweight	Not-Underweight	COR	AOR
	No (%)	No (%)		
Age of the child (in months)				
1-5	7(4.6)	145(95.4)	2.4(1.02-5.65) *	2.62(1.09-6.33)*
6-11	19(10.5)	162(89.5)	0.99(0.53-1.84)	1.01(0.53-1.92)
12-23	27(10.4)	233(89.6)	1.00	1.00
Birth weight/BW				
<2500 grams	25(7)	331(93)	1.77(1.01-3.13) *	2.41(1.11-5.23) *
≥2500 grams	28(11.8)	209(88.2)	1.00	1.00
Wealth index				
Low	12(6.6)	170(93.4)	1.50(0.69-3.27)	-----
Medium	25(10.2)	219(89.8)	0.93(0.48-1.79)	-----
High	16(9.6)	151(90.4)	1.00	
Advise/health information on breastfeeding and complementary feeding after delivery				
Yes	36(7.3)	460(92.7)	1.00	1.00
No	17(17.5)	80(82.5)	2.72(1.46-.5.07)*	2.53(1.09-.5.87)*
Frequenct of breastfeeding				
<8times/24 hrs	8(17.8)	37(82.2)	0.40(0.18- 0.92)*	2.52(1.03- 6.16)*
≥8times/24 hrs	42(8)	482(92)	1.00	1.00
Consumed vitamin A-rich fruits and vegetables				
Yes	31(13.4)	201(86.6)	0.37(0.18- 0.78) *	0.33(0.14- 0.73)*
No	10(5.4)	175(94.6)	1.00	1.00
Source of water supply				
Unprotected	22(6.7)	307(10.7)	1.86(1.05- 3.29)*	1.27(0.59- 2.72)
Protected	31(11.7)	233(88.3)	1.00	1.00
Dietarys divesrity score				
Low	18(11)	146(89)	0.71(0.32-1.60)	-----
Medium	13(10.2)	115(89.8)	0.78(0.33-1.84)	-----
High	10(8.1)	114(91.9)	1.00	

Significant at p-value < 0.05 1.00= reference group

Discussion

This paper presents data on the prevalence of underweight and its determinant factors with underweight among under two years old children in rural part of Western Ethiopia. The prevalence of underweight in this study was 8.9%. This prevalence rate of malnutrition indicated that the under two children of this study area was in a lower compared to malnutrition reported by a number of other studies. The prevalence of underweight was much lower than the national figure (29%) (15) and others studies conducted in developing countries. A study conducted in a rural community of Osun state, Nigeria revealed that the prevalence rate of underweight was 23.1% and also prevalence in Kwara State, Nigeria results indicate that 22.0% underweight (22, 23). Study done in Bangladesh prevalence of underweight was 40% (24). The finding also revealed that prevalence of malnutrition higher than a cross-sectional comparative study conducted in Belahara VDC of Dhankuta district in Nepal located in South Asia, the prevalence of underweight was 27% (25). According to research conducted in pre-school children in a rural area of western Kenya reveled that, the prevalence of underweight 20% (26).

A cross-sectional study conducted in Hidabu Abote district, North Shewa Ethiopia, Oromia Regional State showed that the prevalence of underweight was 30.9% (27). Similarly in a rural locality called Gumbrit (Ethiopia), the prevalence of underweight was 28.5% (28). Study done at Beta-Israel community revealed that, the prevalence of underweight was 14.6% (29). A community based cross-sectional survey conducted West Gojam zone of Ethiopia revealed that 49.2 % children were found to be underweight (30). The cross sectional survey conducted rural communities of Tigray region, Ethiopia also revealed that, the levels of underweight 38.3% (27). A cross sectional study conducted in Aynalem village in Tigray region, the prevalence of underweight was 43.1% (31). According to research conducted in Gimbi district Oromia region indicated that, 23.5 % underweight (32). A community-based cross-sectional study conducted in rural kebeles of Haramaya district revealed that, the prevalence of underweight was 36.6% (33) and 43.6% underweight in Hawassa district (37). This difference could be explained by the higher proportions of medium socio-economic status (41.1%) people residing in this study area. However, the prevalence of malnutrition is almost twice as high as in this finding as compared to study conducted in Mongolia, the prevalence of underweight was 4.7% (34). This might be due to difference in study area, health service delivery and seasonal variation.

Regarding associated factors of underweight, analysis of this study indicated that age of child was found to be statistically significantly associated with underweight ($P<0.05$). In this study, the prevalence of underweight was higher among the infants (15.1%) than other age groups (10.4%).

The present study indicated that the odds for children age group less than six months were about 2.6 times more likely to be underweight than children age greater than or equal to twelve months (AOR=2.62; 95%CI=1.09, 6.33). Support to the present finding, study conducted in Kwara State, Nigeria, malnutrition were significant associated age of child (23). Similarly study conducted at Beta-Israel show that the main contributing factors for under-five malnutrition were found to be child's age (29). Study conducted by Bayesian Approach in Ethiopia, the main predictor of children nutritional status was age of child (35). Study conducted in rural Tigray region, underweight associated with child age (17). The prevalence of underweight was also significantly associated with the age group of children in Aynalem village in Tigray region. Both highest prevalence of underweight was observed among the age group of 12-24 months whereas the lowest prevalence of underweight was observed among the age 0-6 months age group (31).

The present findings also showed that, low birth weight (LBW) children were about 2.4 times more likely to be underweight as compared to high birth weight children (AOR=2.41; 95%CI=1.11, 5.23). In present study low birth weight children were found to be malnourished and showed significant statistical association ($p<0.05$). This is in line with a previous study from Ludhiana reporting the prevalence of underweight was observed being significantly higher ($p=0.024$) in LBW children (36). The effect of low birth weight in children might be due to their disadvantage in utero or might have been mediated through recurrent infant illness episodes [38].

In this study, lack of exposure to advice/health information on breastfeeding and complementary feeding after delivery was important predictor of underweight ($p<0.05$). Those mothers who did not given advice/health information on breastfeeding and complementary feeding after delivery from health personnel were about 2.5 times more likely to be underweight as compared to those mothers who given health information (AOR=2.53; 95%CI=1.09, 5.87). Similarly frequency of breastfeeding had a significant association with underweight of the children ($p<0.05$), i.e., women who had frequency of breastfeeding of less than 8 times per 24 hours were 2.5 times more likely to be malnourished (underweight) than those who had more than or equal to 8 times (AOR=2.52; 95%CI=1.03, 6.16). Those children who consumed vitamin A-rich fruits and vegetables were 67% times less likely to be underweight (AOR=0.33; 95%CI=0.14, 0.73).

Infant and child feeding practices are major determinants of the risks of malnutrition. Optimal infant feeding

practices include exclusive breastfeeding for six months of age and complementary feeding introduction of complementary foods at six months. But, the feeding practices were not found to be associated with underweight in present study which is in contrast to the present knowledge of the condition. Since it was statistically not significant, the absence of association might be due to chance.

Major strengths of this study were the community based approach and random selection of the study households. This may made generalization possible to the study communities as an attempt was made to identify randomized households and women with their children from the study communities. In this study also used wealth index to assess socioeconomic status of household since underestimation and overestimation of monthly income. The seasonal variation of food availability that will have an effect on dietary diversity intake was not considered due to the cross sectional nature of the study. Furthermore, it was difficult to establish a cause-effect relationship between the dependent variable (underweight) and the independent variables though association was observed.

Conclusions

In this current study showed although the prevalence of child malnutrition (underweight) among under two children in the study area was lower than some reported elsewhere, multivariable logistic regression analysis shows that the significant determinants of underweight were age of child, low birth weight, frequency of breastfeeding (<8 times), lack of advice/health information after delivery on breastfeeding/complementary feeding and vitamin A-rich fruits and vegetables. Thus, efforts should be made to improve the antenatal care (ANC) services, emphasis on maternal nutrition and the importance of proper infant and young child feeding practices for reducing malnutrition among under-two children.

Competing interests

Author declares that he has no competing interests.

Author's contributions

TW has designed the study and created the survey instrument, performed the data collection, performed the statistical analysis and served as the lead author of the manuscript. The author read and approved the final manuscript.

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