Factors associated with childhood underweight among orphaned preschool children: A community-based analytical cross-sectional study in Southern Ethiopia

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Abstract

Background: Childhood underweight is one of the major public health problems in Ethiopia. In Ethiopia, most of the available evidence is related to the general community children, which had different risk and severity levels than orphan children. Even though under-five orphan children have a higher risk of being underweight, they are the most neglected population.

Objective: The study aims to determine the prevalence and factors associated with childhood underweight among orphaned preschool children in Southern Ethiopia.

Methods: A community-based analytical cross-sectional study was conducted among 367 orphans. The burden of childhood underweight was assessed using World Health Organization standard cutoff points below -2 SD using z-scores. All variables with a p-value of < 0.25 during binary logistic regression analysis were entered into a multivariate logistic regression analysis to identify predictor variables independently associated with underweight at a p-value of 0.05 with 95% CI.

Results: In this study, the prevalence of underweight among orphan children was 27.4%. The main factors associated with underweight were female child (adjusted odds ratio (aOR) = 5.29, 95% confidence interval (CI) (2.83–9.92)), adult food as type of first complementary food (aOR = 2.47; 95% CI (1.24–4.94)), food insecurity (aOR = 1.98; 95% CI (1.23–3.21)), and child age from 24–59 months (aOR = 7.19; 95% CI (3.81–13.60)).

Conclusion: Childhood underweight is a public health problem in the study area. The sex of a child, type of first complementary food, household food security status, and child age were the major predictors of underweight. Therefore, appropriate dietary interventions, nutrition education, and increased food security status of orphan children are highly recommended.

Keywords

Underweight, preschool, orphan children, prevalence, under-five children, Southern Ethiopia

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Introduction

Childhood underweight has become the major public health problem of the global community. It is expressed as the percentage of children aged 0 to 5 years whose weight for age is below −2 SD and −3 SD considered as moderate and severe underweight, respectively, according to the World Health Organization (WHO) Child Growth Standards. Underweight, based on weight-for-age, is recommended as an indicator to assess changes in the magnitude of malnutrition over time.[1–3]

Because of the severity of nutritional problems, nutrition is placed at the heart of Sustainable Development Goals (SDG) and is vital for achieving 12 out of 17 SDGs, the remaining 5 SDGs also in one or another way support improvement in nutrition. Generally, out of the total 242 indicators of SDGs, 56 are highly relevant to nutrition.[4]

Worldwide, malnutrition is categorized as the leading cause of morbidity and mortality among under-five children in developing countries, which contributes more than 50% of all causes of death. Undernourished children had lowered resistance to disease, lower school performance, and many other indicators of poor quality of life. Over 90% of all orphans are not living with a surviving parent that is believed to suffer more from the effects of undernutrition so far.[5–7]

Millions of children have been orphaned in the African continent, of these approximately 12.3 million children have been orphaned in sub-Saharan Africa (SSA), because of the impact of AIDS, conflicts, political instability, and many more reasons. This figure will increase in the next decade as HIV-positive parents become ill and die from AIDS, and vulnerability also keeps increasing because of the above-listed problems.[8,9] Moreover, in SSA, orphan children are more suffering from the impact of undernutrition and more than one-third of countries had a 25% magnitude of underweight.[7,10]

In Ethiopia, around 5.5 million children (6% of the whole population) are categorized as orphans and vulnerable children (OVC), of these 640,802 are maternal orphans, 550,300 paternal orphans, and 304,282 dual orphans.[11] The burden of underweight among these populations ranges from 8.9% to 27.6% in Ethiopia.[12–15] Besides, most of the orphans are given extended family or foster care, and very few are supported by nongovernmental organizations' care centers found in regional cities. Missing parental care and support increased their vulnerability to food insecurity, chronic undernutrition, acute malnutrition, lack of protection, lack of shelter, lack of education, and exposed to physical and sexual abuse in advance.[6,7]

According to Ethiopia Demographic and Health Survey (EDHS) 2016, undernutrition is still among the most serious public health problems of under-five children faced in Ethiopia, and among them, orphans are considered the riskiest and vulnerable group of the population. In this survey, 24% of under-five children were underweight.[4]

The major factors that associated with underweight of orphan children were inadequate dietary intake, disease conditions, absence or limited child care, sociodemographic variables (low income, lack of education, increased family size, age, and marital status), environmental and hygienic conditions.[1,8,11,15,16]

In Ethiopia, most of the studies are related to the general community of under-five children, which had different risks, predisposing factors, and severity levels than orphan children. Caring for orphan children is one of the intervention strategies of Ethiopia through community-based programs, but it failed to bring the designed impact. Even though under-five orphan children have a higher risk of being underweight, they are the most neglected population in Ethiopia. Besides, Dilla Town lacks information concerning the burden of underweight among under-five orphan children, while this segment of the population is potentially at greater risk of undernutrition due to poor nutrition, less social care, and medical care. Therefore, this study was conducted to determine the burden and potential predictor factors affecting undernutrition among preschool orphaned children in Dilla Town, Southern Ethiopia.

Methods

Study setting and design

The study was done in Dilla Town, Gedeo zone, Southern Ethiopia. The town is located 359 km from Addis Ababa (the capital city of Ethiopia). The town is bordering with Oromia to the west, Sidama Zone to the north, Bule District to the east, and Dilla Zuriya District to the south. It is divided into three sub-cities, namely, Bedecha, Harowolabu, and Sesa, and comprises nine kebeles (the lowest administrative unit in Ethiopia). Its astronomical location is 6°20' North Latitude and 38°13' East Longitude. The total population was 94,189, of which 46,058 (49.9 %) are males and 48,131 (50.1 %) are females. Although the total number of orphans in Dilla town was not known before, according to the complete enumeration carried out for the sake of this study, it was 2895. A community-based analytical cross-sectional study design was employed in this study from 10 December to 18 January 2018.

Study population

All preschool orphan children aged 6–59 months were the source population. The study population for this study were randomly selected, orphan children aged 6–59 months in selected kebeles (the smallest administrative unit in Ethiopia) of Dilla town. Orphan children aged 6–59 months who were severely ill, lived for less than 6 months, and children with immobility precautions like fracture were excluded. The sample size was calculated considering the proportion of underweight (31.7%),[3] 95% confidence interval, and a 5% desired precision, and by adding a 10% nonresponse rate. Accordingly, the calculated sample size for this study was 367.

Sampling technique and procedures

In this study area, to know the total number of preschool orphan children, all kebeles of the town were identified by

name. Then, a complete enumeration was conducted preparing a complete enumeration format for the sake of this study. After a complete enumeration, three kebeles were selected using a lottery method, and the sample size was proportionally allocated for these three selected kebeles. Accordingly, study participants from the three kebeles were identified and a sampling frame was prepared. After that, all under-five orphans with their respective households in the town were selected using a simple random sampling technique for the final study.

Data collection instruments and procedures

To collect the data for this study, a pretested interviewer-administered supplemental questionnaire was used. The data collection instruments were further adapted and modified from various relevant studies that met the aim of the study.[1,3,7,10,15,17] First, the supplemental questionnaire was prepared in English language and translated into Amharic and Gedeaufa (local languages) to obtain necessary information on demographic characteristics, socioeconomic status, immunization status, food security status, sanitation, and hygienic conditions, and feeding practices and child care of preschool orphan children. The respondents of this study were accordingly caregivers for children who lost both their father and mother, mothers for children who lost their father, and fathers for children who lost their mother. Before the actual data collection, the supplemental questionnaire of this study was pretested among 5% (19 children) of preschool orphan children out of the actual study site but with similar nature of the study participants and study site.

The data were collected by six data collectors who were diploma nurses and supervised by two health officers. Data collectors and supervisors were given 2 days of training by the principal investigator. The data collection, application of standard procedures, and accuracy of results were supervised and checked daily for its completeness and consistency through strong follow-up by the principal investigator. For anthropometric measurements, the average result has been considered after repeated measurements. The weight of the child was measured to the nearest 0.1 kg using a 25 kg hanging spring scale with light clothes and without shoes.

Variables of the study

The dependent variable of the study was childhood underweight among preschool orphaned children. Whereas the independent variables of the study were demographic factors (age, sex, education, number of children with household, marital status, alive parent, sex of caregiver, age of caregiver, educational status of caregiver, head of a family, status of orphan children, and wealth index), child health care (immunization, sickness), environmental/sanitation-related factors (source of water, amount of water used per day, water storage method, handwashing practice with soap while feeding the child, latrine availability, type of latrine, availability of separated room from the kitchen, and domestic waste disposal system), food insecurity, dietary intake, and child feeding practices (duration of fed breast, age of child started complementary food). During the analysis, an enter method was used to select the variables in the analysis software.[18]

Statistical analysis

Data were entered and cleaned up using EPI-info version 3.5.4. Emergency Nutritional Assessment for Standardized Monitoring & Assessment of Relief & Transition (ENA SMART) 2012 version software was used for anthropometric data management. To summarize the descriptive data, descriptive statistics such as frequency and proportions were used. Logistic regression analysis using SPSS Windows version 20 was done. In the bivariate logistic regression analysis, those variables with a p-value of $\leqslant 0.25$ were further entered into a multivariate logistic regression analysis to identify the independent predictor of underweight and to see the effect of each independent variable on nutritional status explained as underweight at p-value 0.05 with 95% CI.

To see the linear correlation among the independent variables, multicollinearity was checked using standard error (SE). Variables with a standard error of $\geqslant 2$ were dropped from the multivariable analysis. However, none of the variables have multicollinearity in this study. The fitness of the model was tested by Hosmer–Lemeshow's goodness-of-fit test model coefficient which was found to be insignificant.

To analyze and compute the outcome variable, weight-for-age (WAZ) was computed as indicator of child underweight status according to 2006 WHO Standards using Z-score scale = (weight in kg − average value of the reference population)/standard deviation value of the reference population. Underweight was defined as a $WAZ < -2$.[19] Principal component analysis (PCA) was carried out for the reduction of variables involved in wealth index and food security status.

The food insecurity was computed using nine standards questions adapted from the FANTA project.[17] The cumulative score of food insecurity among orphaned children's households was determined by summing the nine items ranged from 0 to 27, and a higher score indicated that the household members experienced more food insecurity. The nine "yes" and "no" questions were coded as "1" and "0," respectively. Then, to obtain the food insecurity status of the household, all "yes" responses were summed up. Furthermore, it was dichotomized as food insecure which was coded as "1" and food secure coded as "0" for analysis.

Operational definitions

Preschool orphan child: A child who is aged 6 to 59 months and whose mother (maternal), father (paternal), or both (dual orphan) have died.

Underweight is the weight for age below minus two standard deviations ($<-2SD$) from the median weight of the WHO reference population.[19]

Food-secure household: Orphan children with households those who experiences none of the food insecurity (access) conditions or just experiences worry, but rarely in the past 4 weeks.[17,20]

Food-insecure household: Orphan children with households those who experience inability of access to sufficient food at all time to lead active and healthy life which includes all stages of food insecurity (mild, moderate and severe).[17,20]

Ethical considerations

The study was ethically approved by the Institution Review Board (IRB) of the College of Health Science, Dilla University. It was approved on 2 December 2018, and numbered with a Ref C/AC/R/D/987/18. And a permission letter for data collection was received from the Dilla town Health Bureau. This study was conducted following the Declaration of Helsinki. The responsible respondent of each study participant was informed about the research objectives, methods, and techniques in detail and informed consent was taken. And then the written and signed consent was obtained from each study participant's parents. Confidentiality was maintained as appropriate. As a value-adding consideration, nutrition education was given to study participant mothers/caregivers.

Results

Sociodemographic characteristics of the respondents

In this study, a total of 361 preschool orphan children were participated, making a response rate of 100%. Of these, 189 (52.4%) were female by sex, 202 (56%) were maternal orphan children, 160 (44.3%) were in the age category 48–59 months with a mean age of 42.55 months, 292 (80.9%) were in a household who had the number of under-five children greater or equal to two, and 140 (38.8%) of orphan children caregiver have not attended any formal education (Table 1). Besides, the details of the sociodemographic characteristics of participants have been described elsewhere in an earlier study from the same research project.[21]

Based on the sex of children, 80 (22.2%) of female and 20 (5.5%) of male children were developed underweight making 100 (27.7%) in total (Figure 1).

Sanitation and hygiene characteristics

In this study, the source of water for orphan children was public stand, 229 (63.4%), and followed by pipe water, 119 (33.0%). The amount of water used per day > 15 L was 326

Table 1. Sociodemographic characteristics of respondents in Southern Ethiopia, 2018 (n = 361).

Variables	Category	Frequency	%
Sex of a child	Male	172	47.6
	Female	189	52.4
Status of orphans children	Double orphans	67	18.6
	Maternal orphans	202	56.0
	Paternal orphans	92	25.5
Age of a child in a month	6–11	1	0.3
	12–23	17	4.7
	24–35	96	26.6
	36–47	87	24.1
	48–59	160	44.3
Number of under-five children in household	<2	292	80.9
	≥2	69	19.1
Sex of a caregiver	Male	19	5.3
	Female	342	94.7
Age of a caregiver	18–49	302	83.7
	≥50	59	16.3
Head of a family	Mother	112	31.0
	Father	233	64.5
	Other[a]	16	4.5
Education status of a caregiver	No formal education	140	38.8
	Grade 1–8	106	29.4
	Grade 9–12	76	21.1
	Above grade 12	39	10.8

[a]Firstborn, uncles, aunts, in-laws.

(90.3%) of households. The majority of the households, 344 (95.3%), used containers as a means of water storage. Approximately 98.6% of the household had a trend of handwashing with soap while feeding a child. About 93.9% of the households had a latrine facility, of these pit latrine accounts 49.6% followed by 36.0% of Vertically integrated liquid (VIL) (Table 2).

Household food security characteristics

Worrying about not having enough food, did not eat, preferred food, eating just a few foods, and eating food that you preferred not to eat due to lack of resources were the most frequently occurred variables during household food security status analysis. Of these, 86 (23.82%) were food insecure (Table 3).

Prevalence and associated factors of underweight

In the present study, more than a quarter (27.4%) of preschool orphan children were affected by the high prevalence of underweight. After adjusting for all possible confounders in the multivariate analysis, the sex of a child, the type of first complementary food, food-insecure household, and child age were the independent predictor of underweight (Table 4).
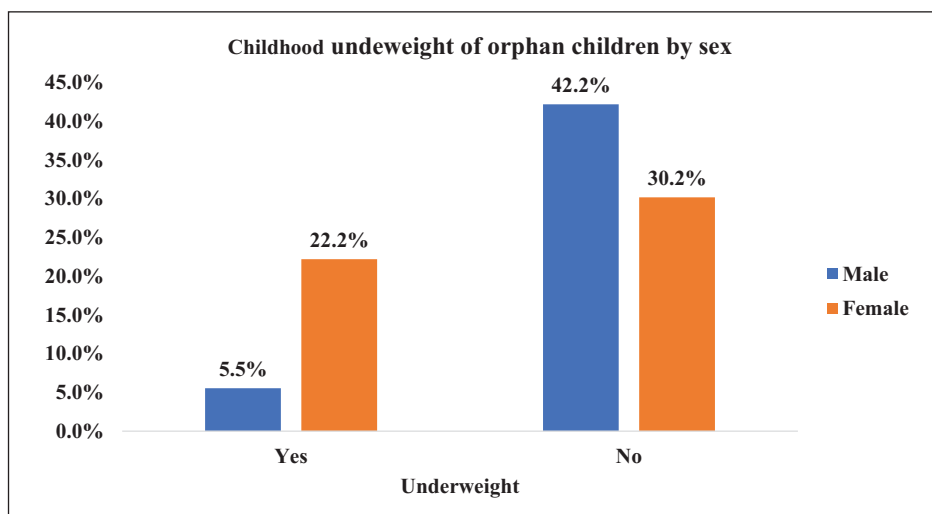
Figure 1. Underweight status of children by sex category in Southern Ethiopia, 2018 (n = 361).

Table 2. Sanitation and hygiene characteristics of the study participants in Southern Ethiopia (n = 361).

Variables	Categories	Frequency	%
Water source	Pipe	119	33.0
	Public stand	229	63.4
	Protected spring/well	13	3.6
Water amount used in a day	⩽15 L	35	9.7
	>15 L	326	90.3
Water storage method	Pot	17	4.7
	Container	344	95.3
Handwashing with soap while feeding			
	No	5	1.4
	Yes	356	98.6
Latrine availability	Absent	22	6.1
	Present	339	93.9
Type of latrine	Pit latrine	179	49.6
	Vertically integrated liquid	130	36.0
	Water carriage type	24	6.6
	Other	6	1.7
Waste disposal system	Pit	113	31.3
	Open space	21	5.8
	Municipality service	227	62.9
A separate room used for the kitchen			
	Absent	317	87.8
	Present	44	12.2

Female preschool orphan children were more than five times more likely to have underweight than male preschool orphan children (adjusted odds ratio (aOR) = 5.29, 95% confidence interval (CI) (2.83–9.92)). The odds of having underweight was 2.47 (aOR = 2.4, 95% CI (1.24–4.94)) times more common among children who consumed adult meals as first complementary food compared with children who consumed porridge as the first complementary food (Table 4).

Preschool children who had food-insecure households were nearly two times more likely to have underweight compared with children who had food-secure households (aOR = 1.98, 95% CI (1.23–3.21)). The odds of underweight was seven times more common among preschool orphan children who were in the category of age range from 24 to 59 months when compared with their counterparts (0–23 months) (aOR = 7.2, 95% CI (3.80–13.60)) (Table 4).

Discussion

In this study, the prevalence of underweight among preschool orphan children in the study area was 27.4%. The present study also examined the necessary information on sociodemographic characteristics, socioeconomic status, immunization status, food security status, sanitation and hygienic conditions, feeding practices, and child care of preschool orphan children. Accordingly, the sex of a child, the type of first complementary food, food-insecure households, and child age were predictors of being underweight among these populations.

This result was a bit higher than the studies done among the orphan and vulnerable children in India (18.2%),[15] Malawi (24.6%),[22] and from the regional prevalence of Ethiopia in Tigray (23%), Oromia (22.5%), SNNPR (21.1%), Gambella (19.4%), Harar (20%), and Addis Ababa (5%).[16] However, the burden of underweight in the present study was found to be a bit lower than studies conducted among similar age groups in South Asia (29.3%),[23] sub-Saharan Africa (28.8%),[24] and the regional prevalence of Ethiopia in Afar (36.2%), Somali (28.7%), and Benishangul Gumuz (34.3%).[16] This might be due to the difference in study segments, study period, socioeconomic characteristics, health service delivery, and study participants. Another possible variation might be due to the involvement of special segments of the study subject who are on care and support.

Table 3. Responses related to household food security characteristics in Southern Ethiopia, 2018 (n = 361).

Variables	Categories	Frequency	%
Worry about not having enough food	Never	38	10.5
	Rarely	223	61.8
	Sometimes	46	12.7
	Often	54	15.0
Not eat preferred food	Never	31	8.6
	Rarely	197	54.6
	Sometimes	62	17.2
	Often	71	19.7
Eat just a few foods	Never	27	7.5
	Rarely	216	59.8
	Sometimes	76	21.1
	Often	4	11.6
Eat food preferred not to eat	Never	55	15.2
	Rarely	179	49.6
	Sometimes	71	19.7
	Often	56	15.5
Eat smaller due to lack of food	Never	55	15.2
	Rarely	179	49.6
	Sometimes	71	19.7
	Often	56	15.5
Eat fewer due to lack of food	Never	36	10.0
	Rarely	224	62.0
	Sometimes	59	16.3
	Often	42	11.6
No food at all	Never	129	35.7
	Rarely	161	44.6
	Sometimes	57	15.8
	Often	14	3.9
Sleep hungry	Never	82	22.7
	Rarely	189	52.4
	Sometimes	59	16.3
	Often	31	8.6
The whole day eat nothing	Never	156	43.2
	Rarely	141	39.1
	Sometimes	52	14.4
	Often	12	3.3
Food security status	Secure	275	76.18
	Insecure	86	23.82

The prevalence of underweight was found to be relatively consistent with the regional prevalence of Ethiopia in Amhara (28.4%), Gondar city (27.8%), and Dire Dawa Town (26.2%), respectively.[16,25] This might be due to similarities in socio-economic characteristics and age categories of the study participants.

As to the finding of this result, the odds of being underweight for female under-five orphans was more than five folds higher than male under-five orphans. This might be due to gender bias in caregiving. Therefore, this implies that balanced care among male and female orphans is also one of the concerns. Regarding the first complementary feeding, there was a significant association between the first complementary feeding and underweight. The risk of being underweight for under-five orphans who consumed adult meals as the first complementary food was nearly three times higher than under-five orphans who consumed porridge as the first complementary food. This might be due to the physiologic incompetence of orphans' guts to tolerate adult meals and end up underweight secondary to infection and nutritional quality.

The under-five orphans whose caregivers were in the category of the food-insecure household were almost two times prone to being underweight than orphans who live in food secured. This could be due to the economic reason that household food insecurity is increased among households' orphans live. It has also been demonstrated that orphaned children in sub-Saharan Africa tend to have a greater risk of undernutrition compared with nonorphans.[24]

The odds of underweight for under-five orphans who were in the category of age range from 24 to 47 months was more than seven times higher than under-five orphans who were in the category of the age range 6–23 months and 48–59 months. The finding of the study is almost identical to the EDHS, 2016, and a study conducted on nutritional status of under five years in Gondar city referring age group 24–35 months. This might be due to the late initiation of complementary feeding and poor knowledge on how to feed young children.[16,25] This implies that awareness creation on feeding and age-related interventions is one of the concerns.

Regarding the limitations of the study, some of the questions needs recalling the previous events like food insecurity (before 1 month), dietary practice (before 24 hour), and feeding practice. To minimize these limitations, probing about the events were done. Furthermore, reporting and social desirability biases are other limitations. Similarly, to minimize these biases, asking in a private setting were done. Some variation between different data collectors in anthropometric was another limitation. This limitation was overcome by extensive training, validation of the measurement instruments daily before measurements, and using experienced measurers.

Conclusion

The study revealed that the prevalence of underweight is high among under-five orphans in Dilla town. Sex of a child, first complementary feeding, household food security status, and child age were factors that were associated with being underweight. Therefore, nutritional interventions like nutrition education and counseling should be given focusing on preschool orphaned children, especially female children since they are future pregnant to avoid intergenerational malnutrition. To improve the knowledge of the first complementary feeding of the household/caregiver of preschool orphan children, a well-designed nutrition behavior change communication should be provided.

Table 4. Bivariate and multivariate logistic regression analysis of factors associated with underweight among preschool orphans in Southern Ethiopia, 2018 (n = 361).

Variable	Underweight		cOR (95% CI)	aOR (95% CI)
	Yes (%)	No (%)		
Sex of child				
Male	20 (11.63)	152 (88.37)	1	1
Female	80 (42.33)	109 (57.67)	5.58 (3.23–9.65)**	**5.29 (2.83–9.93)**
Alive parent				
No one	26 (38.81)	41 (61.19)	1.542 (1.07–3.21)**	1.08 (0.62–1.89)
Mom/Dad	74 (25.17)	220 (74.83)	1	1
Caregivers' sex				
Male	8 (42.11)	11 (57.89)	1.56 (0.07–2.73)*	1.61 (0.48–5.45)
Female	92 (26.90)	250 (73.10)	1	1
Water source				
Pipe	27 (22.69)	92 (77.31)	0.85 (0.55–1.31)*	0.47 (0.14–1.55)
Pub. Stand	68 (29.69)	161(70.31)	0.60 (0.69–1.88)*	0.67 (0.13–2.14)
Pro. Spring	5 (38.46)	8 (61.54)	1	1
Handwashing with soap while feeding a child				
Yes	97 (27.25)	259(72.75)	1	1
No	3 (60.00)	2(40.00)	2.20 (1.05–4.59)*	0.47(0.06–3.74)
Duration breastfed				
0-6 month	56 (31.29)	123 (68.71)	1.29 (0.92–1.81)*	1.71 (0.64–4.54)
>6 month	44 (24.18)	138 (75.82)	1	1
Type of first complementary food				
Milk	28 (29.79)	66 (70.21)	0.76 (0.48–1.21)*	1.33 (0.77–2.27)
Adult food	18 (40.91)	26 (59.09)	1.22 (0.87–1.69)*	**2.47 (1.24–4.94)***
Porridge	54 (24.22)	169 (75.78)	1	1
Vaccinated				
Yes	78 (26.80)	213 (73.20)	1	1
No	18 (36.00)	32 (64.00)	1.46 (1.65–7.76)*	2.25 (0.65–7.76)
Not known	4 (20.00)	16 (80.00)	1.34 (0.54–3.28)*	1.46 (0.46–4.52)
Wealth index				
Poor	40 (32.5)	83 (67.48)	0.91 (0.80–1.04)*	1.58 (0.89–2.79)
Medium	32 (27.1)	86 (72.88)	0.71 (0.43–1.18)*	1.22 (0.68–2.19)
Rich	28 (23.3)	92 (76.67)	1	1
Household food security status				
Food secure	69 (33.70)	126 (66.30)	1	1
Food insecure	17 (21.67)	149 (78.33)	1.83 (1.14–2.94)*	**1.98 (1.23–3.21)***
Child age				
0-23 months	18 (10.11)	160 (89.89)	1	1
24-59 months	82 (44.81)	101 (55.19)	7.22 (4.09–12.73)**	**7.19 (3.80–13.60)**

cOR: crude odds ratio; CI: confidence interval; aOR: adjusted odds ratio.
*p-value < 0.25 in the bivariate analysis. **p-value ≤ 0.05 in the multivariate analysis. The bold text in the above table is easily to pic the significant variables and further to provide emphasis for readers.

Moreover, preschool orphan children's nutrition issues have to be the central issue of the food and nutrition policy of Ethiopia to save future generations. In addition, it has to be given great attention for the reduction of food insecurity status of households with a caregiver of preschool orphaned children through income-generating and asset building activities at national, zonal, and district level. Besides, a community-based nutrition program targeting preschool orphan children should be established to tackle childhood underweight among these populations at the individual and community level at large.

Author contributions

AT was involved in the design, data collection, and article writing. ATW, BR, YC, TE, ABM, AM, and LG were involved in data

analysis, preparing, and editing of the article. Finally, all authors read and approved the final draft of the article.

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Supplemental material

Supplemental material for this article is available online.

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