


RESEARCH ARTICLE

Effect of maternal employment on child nutritional status in Bale Robe Town, Ethiopia: a comparative cross-sectional analysis

Bezawit Ketema¹, Tafese Bosha¹ and Fentaw Wassie Feleke^{1,2*} 

¹College of Agriculture, Hawassa University, P.O. Box 05, Hawassa, Ethiopia

²College of Health Science, Woldia University, P.O. Box 400, Woldia, Ethiopia

(Received 21 December 2021 – Final revision received 16 March 2022 – Accepted 17 March 2022)

Journal of Nutritional Science (2022), vol. 11, e28, page 1 of 14

doi:10.1017/jns.2022.26

Abstract

Adequate nutrition is essential for early childhood to ensure healthy growth, proper organ formation, and function, a strong immune system, neurological and cognitive development. The main aim of the present study was to assess the effect of maternal employment on nutritional status among children aged 6–23 months in the town of Bale Robe, Ethiopia. A community-based comparative cross-sectional study was conducted on about 597 (293 unemployed and 304 employed) having children aged 6–23-month-old children sampled were employed with a multistage sampling technique. A face-to-face interview was conducted using a structured pretested questionnaire. Descriptive statistics, binary and multivariable logistic regression analyses were used for the statistical analysis. The magnitude of stunting (39.9 %), underweight (39.9 %) and wasting (22.2 %) was greater in 6–23-month-old children born to employed mothers than their counterparts in unemployed ones [stunted (31.3 %), underweight (24.0 %) and wasted (11.8 %)]. Being a girl [AOR 0.31; 95 % CI (0.17, 0.54)] in employed mothers and [AOR 0.29; 95 % CI (0.16, 0.51)] in unemployed people significantly protected stunting. This study demonstrated that the nutritional status of 6–23-month-old children is better among unemployed mothers than among employed mothers. Therefore, concerted efforts may decrease child undernutrition in a study area.

Keywords: Bale Robe: Ethiopia: Infant and young child: Stunting: Underweight: Wasting

Introduction

Child undernutrition is the most prevalent problem in the world, resulted in both children and the nations⁽¹⁾. Adequate nutrition is essential for early childhood to ensure healthy growth, proper organ formation and function, a strong immune system, neurological and cognitive development⁽²⁾. Economic growth and human development require well-nourished populations who can learn new skills, think critically and contribute to their communities⁽³⁾.

Globally, 5.4 million children under five (u-5) died before their 5 years and more than 45 % of these deaths were caused by nutrition-related factors⁽⁴⁾. The sub-Sahara Africa remains

the region with the highest mortality rate for u-5 in the world. For example, 76 deaths/1000 live births⁽⁴⁾.

The impact of nutrition on health throughout the course of human life is very profound and is inextricably linked to early childhood cognitive and social development⁽⁵⁾. The main effects of undernutrition are believed to occur during the first 2 years of human life^(6,7). It is associated with lower educational performance, cognitive deficits and poor economic productivity in adulthood that creates social and economic challenges in disadvantaged communities^(8–10). Malnutrition, in all its forms, is a violation of children's right⁽²⁾.

Abbreviations/acronyms: EBF: Exclusive Breastfeeding; HAZ: Height-for-Age Z-score; MAD: Minimum Acceptable Diet; MDD: Minimum Diet Diversity; MMF: Minimum Meal Frequency; MUAC: Mid-upper arm circumference; MUACAZ: Mid-upper arm circumference-for-age Z-score; PCA: Principal Component Analysis; PI: Principal Investigator; SD: Standard Deviation; SPSS: Statistical Product and Service Solutions; UNICEF: United Nations Children's Fund; WAZ: Weight-for-Age Z-score; WHO: World Health Organization; WHZ: Weight-for-Height Z-Score

* **Corresponding author:** Fentaw Wassie Feleke, email fentawwassie@gmail.com



In Ethiopia, inspiring results in the reduction of the rate of morbidity and mortality of children under 5 years of age, and the initiation of breastfeeding and exclusive breastfeeding (EBF) have made less progress in the past decade^(11,12). Children who are currently breastfed decrease from 85 % among children aged 12–17 months to 76 % among children aged 18–23 months. In particular, 6 % of infants under 6 months of age are not breastfed at all⁽¹¹⁾. This rapid increment of maternal employment has been due to increased household income demand as a result of increased prices of food⁽¹³⁾. However, different research studies reported that children of unemployed mothers were at increased risk of developing wasting⁽¹⁴⁾. An inadequate dietary intake and/or disease leads to wasting, which is often a critical nutrition indicator in children u-5 years of age as it predicts child mortality⁽¹⁵⁾. Many factors can cause malnutrition, most of which are related to poor diet or severe and repeated infections, and maternal education⁽¹⁶⁾. Employed mothers are less likely to practice EBF than the unemployed ones^(12,13,17). And, non-exclusive breastfeeding has a long-term impact, including poor school performance, reduced productivity, and impaired intellectual and social development⁽¹⁸⁾.

The sustainable development goal targets child health with a mission to end preventable deaths of newborns and children aged 1000 days in 2030, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births^(4,9). In addition to household responsibilities, many women are now employed outside the home to earn income for their families⁽¹⁹⁾. However, mothers are not still relieved of their customary domestic duties but rather are double burdened with the job and their domestic responsibilities; as primary parent, caregiver and housekeeper. The combination of employment and childcare for women affects not only the work of the mother but also the quality of childcare^(20,21). The highest prevalence of malnutrition (wasting) occurs in young children (6–23 months); however, the literature is limited in these population groups. There was no study conducted in this study area previously with this topic. Therefore, evidence of the nutritional status of children aged 6–23 months among employed and unemployed mothers is crucial for further actions in the city of Bale Robe, Oromia Region, Ethiopia.

Methodology

Study setting

The present study was conducted in Robe town. This town is located 430 km from Addis Ababa, in the south-east of the country. The altitude is between 2510 and 2800 m above sea level. It receives rain in two seasons, with average downfalls ranging from 800 to 900 mm. The town has three kebeles with total households of 12 883 and a total population of 71 458 (36 015 males and 35 443 females) according to the 2020 projection. Likewise, there are 4452 children aged 6–23 months. In the town, there is one preparatory school, two high schools, thirteen first-cycle primary schools (grades 1–4 elementary school) and thirty-six public and private health facilities.

Study design and period

A community-based comparative cross-sectional study was conducted in April 2020.

Source and study population. The source population for this study was all employed and unemployed mothers who have children aged 6–23 months in the city of Bale Robe. The study population was selected with a simple random group of employed and unemployed mothers from the source population.

Inclusion and exclusion criteria. All employed and unemployed mothers who have children aged 6–23 months and live in Bale Robe were eligible for this study. However, mother–child pairs that were severely sick and chronic patients at the time of the survey were not included in this study.

Sampling

Sample size determination. The sample size was calculated using G* power software 3.1.9.7 considering the prevalence of underweight among employed mother–child dyads P2 6.3 % and unemployed ones P1 16.4⁽²²⁾, design effect 2.0 and 5 % non-response rate. The final sample size was 648 (324 employed and 324 unemployed) (Table 1).

Sampling technique and procedures. A multistage sampling technique was used. Two kebeles (the lowest administrative unit) were selected from the total of three by simple random sampling. The sample frame was prepared after house-to-house listing of households with children aged 6–23 months among employed and unemployed mothers. The study participants were then randomly selected based on the sampling frame. In households with more than one child aged 6–23 months, one was selected using the lottery method (Fig. 1).

Data collection

A semi-structured questionnaire was used to collect data on socio-economic and demographic characteristics, healthcare, infant and young child feeding practices (IYCF). The household food security access scale questionnaire was used to assess the state of household food security. Anthropometric measurements were taken by trained data collectors to avoid intra-observer variation using calibrated equipment and standardised techniques. A recumbent length measurement was taken to the nearest 0.1 cm using the short height measuring board (short productions, Woonsocket, RI, UK) with the subjects shoeless⁽²³⁾. Weight was measured using a UNICEF Seca electronic personal scale (Seca 881U). Women were asked to remove their children's thick cloth during the measurements. The instrument was calibrated before each measurement. The circumference of the middle of the upper arm was measured with a measuring tape to the nearest to 0.1 mm⁽²⁴⁾. The child's age was collected from the mother. It was confirmed using a birth certificate, a vaccination card and local-events calendar^(23,25).



Table 1. The sample size determination by using G* power software 3.1.9.7 of mother–child dyads aged 6–23 months in Bale Robe Town, Ethiopia, 2020 (n 597)

Statistical test: z-test proportions difference between two independent proportion type of power analysis: compute required, sample size, given α , power and effect size

Input parameters		Output parameters	
Tail(s)	Two	Critical z	1.96
Underweight proportion P1 among unemployed mother–child dyads	0.164	Sample size group 1	154
Underweight proportion P2 among employed mother–child dyads	0.063	Sample size group 2	154
α error probability	0.05	Total sample size	308
Power ($1-\beta$ error)	0.80	Actual power	0.80
Allocation ratio N2/N1			

After considering the assumption of design effect 2 and 5 % none response allowance the minimum final sample size was 648 with 324 from employed and 324 unemployed.

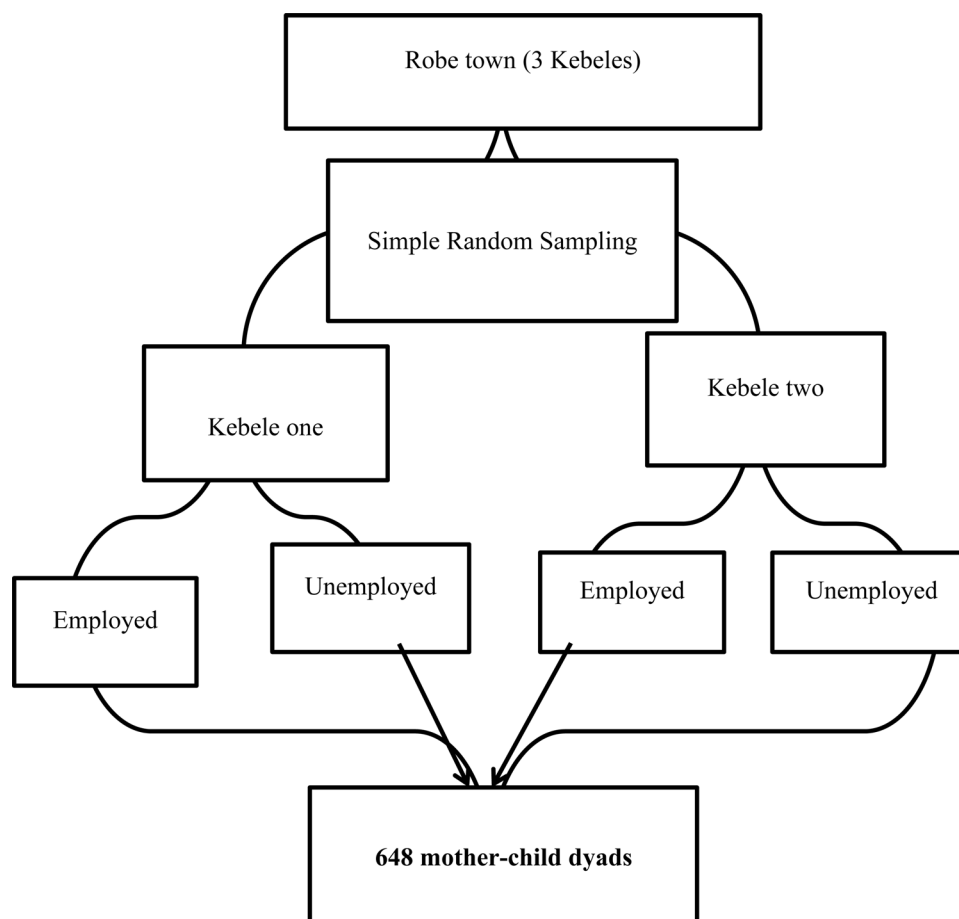


Fig. 1. Sampling procedures for selecting 648 mothers for study in Robe town, 2020.

Data quality assurance

The questionnaire was first developed in English and translated into the local language Afaan Oromo and then translated back to English by language experts to verify its consistency. Data collectors with experience who are fluent in the local language were recruited. The pre-test was conducted by 5 % of the sample size to check the quality of the questionnaire and make appropriate modifications before duplication of the final version on population outside the sampled kebeles.

In order to minimise intra-observer errors, two measurements of height and weight for each child was registered by a single observer, and the third measurement was considered

for those cases where the difference between the two measurements was greater than 0.5 cm or 0.1 kg. The completeness and consistency of the data was checked before the respondent left. Data collection was supervised daily on site by the recruited supervisors and the principal investigator. Extreme values of z-score, >5 or <-5 , were excluded from the analysis.

Data analysis

The data collected was entered into epi data 4.6.2. The data were then exported to SPSS version 25 for analysis. The anthropometric measurements were analysed using WHO Anthro version 3.2.2. The data normality was checked using



the Kolmogorov–Smirnov test. Bivariate and multivariate logistic regression analysis was performed to identify the factors associated with the nutritional status of the children. Model fitness was checked using the Hosmer and Lemeshow goodness-of-fit test ($P > 0.05$). The odds ratio with a 95 % confidence interval was reported to show the strength of the associations between the outcome and predictor variables. The statistical significance was declared at a P -value < 0.05 . Wealth index was assessed using household assets via principal component analysis adopted from^(26,27).

Ethical approval

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects/patients were approved by the Institutional Review Board of Hawassa University (Reference number: HU/IRB/215/20; dated: 13 March 2020). Informed (written) consent was obtained from mothers/caregivers with signature/fingerprint all study subjects. A letter of permission was received from the administrative district and zonal health department.

Operation definition

A child with height/length-for-age (H/LAZ) below -2 standard errors compared with the reference group (Z -score < -2) is considered to be stunted⁽²⁸⁾.

A child with weight-for-age (WAZ) below -2 standard errors compared with the reference group (Z -score < -2) is considered to be underweight⁽²⁸⁾.

A child with weight-for-height/length age (WH/LZ) below -2 standard errors compared with the reference group (Z -score < -2) is considered to be wasted⁽²⁸⁾.

Household food insecurity data. Household food insecurity (HFI) was measured using the Household Food Insecurity Access Scale (HFIA), which has nine questions and is related to the households' experience of food insecurity in the 12 months preceding the survey⁽²⁹⁾. Then, the HFIA prevalence indicators were categorised households into four⁽³⁰⁾ levels of HFI: food secure, mild, moderately and severely food insecure. For the present study, only two levels other Household Food Insecurity Access Scale (food secure and insecure) was used because the sample size for this study was small⁽³¹⁾.

Maternal employment was defined as the mother's report of whether or not she worked for earnings in the past week. A woman was considered to be an 'employed' if she had reported earning income at least three times during the past week whether formal or informal categories, with formal referring to regular wage work, such as governmental or non-governmental organisation employee permanently, and informal referring to street vending, domestic work or vending from a fixed location. A woman who have no permanent work or not having any informal work category is considered as unemployed⁽³²⁾.

The minimum acceptable diet is a composite indicator defined as the proportion of children aged 6–23 months who met both minimum dietary diversity and the minimum meal frequency during the previous 24 h⁽²⁸⁾.

Results

Demographic and socio-economic characteristics

The present study was completed with a response rate of 92.1 %. Nearly 49.0 % and 51.0 % of the mothers were employed and unemployed, respectively. At the time of the survey, the majority 93.3 % of the respondents were cohabiting in a marriage. Of the mothers who participated in the present study, only 16.9 % completed college and higher. Almost 54.0 % of the mothers were from male-headed households. Of the households, 33.0 % were in the poor wealth quintile. Regarding the children, 67.5 % were in the age range of 12–23 months (Table 2).

Child feeding practices and health-seeking behaviours

We found that all children who participated in the present study had breastfed. Of the sampled children, 38.0 % experienced bottle feeding (20.3 % employed and 17.8 % unemployed mothers). Almost half, 47.7 %, of the children were currently being breastfed of which (19.4 % employed and 28.3 % unemployed). Almost 61.0 % of the mothers (35.3 % employed and 22.6 % unemployed) did not continue breastfeeding for up to 1 year (Table 3).

Nutritional status of children aged 6–23 months

There was a significant difference in the nutritional status of children born to employed and unemployed mothers. More specifically, 31.8 % of the children were underweight, with the prevalence tending to be higher in children born to employed mothers. In addition, 16.9 % of them were wasted and 35.5 % stunted. More boys were stunted, wasted and underweight regardless of the unemployment status of their mothers (Figs. 2–7).

Factors influencing nutritional status among children aged 6–23 months

After adjusting for confounders, the age of the child and hand-washing showed significant associations with stunting. More specifically, being a younger mother (AOR 0.32; 95 % CI (0.16, 0.66)) and (AOR 0.32; 95 % CI (0.14, 0.73)), older child (AOR 3.03; 95 % CI (1.24, 7.42)), being a girl (AOR 0.31; 95 % CI (0.17, 0.54)), medium (AOR 0.37; 95 % CI (0.19, 0.71)) and rich (AOR 0.12; 95 % CI (0.06, 0.24)) wealth status, and household food security (AOR 0.42; 95 % CI (0.23, 0.77)) significantly associated for employed mothers while being older child (AOR 5.88; 95 % CI (2.37, 14.58)), girl (AOR 0.29; 95 % CI (0.16, 0.51)), family size (AOR 0.39; 95 % CI (0.22, 0.69)) and critical handwashing practice (AOR 0.31; 95 % CI (0.17, 0.57)) also significantly predicted stunting (Table 4).

**Table 2.** Demographic and socio-economic characteristics of mother–child dyads aged 6–23 months in Bale Robe Town, Ethiopia, 2020 (n 597)

Variables	Maternal employment status				χ^2 P-value
	Employed (n 293)		Unemployed (n 304)		
	Number	(%)	Number	(%)	
Maternal age					
19–24	86	(48.9)	90	(51.1)	0.001
25–29	100	(61.0)	64	(39.0)	
30–34	50	(45.0)	61	(55.0)	
≥35	57	(31.0)	89	(69.0)	
Mean ± SD	(28.5 ± 6.1)		(29.7 ± 6.8)		
Marital status					
Married	272	(48.8)	285	(51.2)	0.654
Divorced/separated	21	(52.5)	19	(47.5)	
Maternal education					
Illiterate	0	(0.0)	86	(100.0)	0.000
Primary school (1–8)	93	(42.5)	126	(57.5)	
Secondary school	105	(55.0)	86	(45.0)	
College and above	95	(94.1)	6	(5.9)	
Paternal education					
Illiterate	26	(34.2)	50	(65.8)	0.000
Primary school (1–8)	43	(32.1)	91	(67.9)	
Secondary school	129	(44.8)	159	(55.2)	
College and above	95	(96.0)	4	(4.0)	
Paternal occupation					
Farmer	88	(34.9)	164	(65.1)	0.000
Private worker	46	(92.0)	4	(8.0)	
Government employee	60	(96.8)	2	(3.2)	
Merchant	96	(42.9)	128	(57.1)	
Others ^a	3	(33.3)	6	(66.7)	
Head of household					
Paternal	139	(42.8)	186	(57.2)	0.003
Maternal	36	(52.9)	32	(47.1)	
Both	118	(57.8)	86	(42.2)	
Wealth status					
Poor	90	(45.7)	107	(54.3)	0.217
Medium	96	(47.5)	106	(52.5)	
Rich	107	(54.0)	91	(46.0)	
Family size					
≤5	200	(61.2)	127	(38.8)	0.000
>5	93	(34.4)	177	(65.6)	
Mean ± SD	(4.9 ± 1.5)		(6.0 ± 1.4)		
Age (months)					
6–8 months	42	(40.0)	63	(60.0)	0.052
9–11 months	51	(57.3)	38	(42.7)	
12–23 months	200	(49.6)	203	(50.4)	
Mean ± SD	(14.5 ± 4.8)		(14.2 ± 5.1)		
Sex of child					
Female	142	(46.6)	163	(53.4)	0.208
Male	151	(51.7)	141	(48.3)	

^aDaily labour, none government employee.

Child sex (AOR 0.44; 95 % CI (0.22, 0.87)), being rich (AOR 0.40; 95 % CI (0.18, 0.90)), handwashing at critical times (AOR 0.47; 95 % CI (0.22, 0.97)), MDD (AOR 0.06; 95 % CI (0.01, 0.40)), household food security (AOR 2.94; 95 % CI (1.43, 6.03)) significantly affected with employed mothers having wasted children aged 6–23 months (Table 5).

Medium (AOR 0.35; 95 % CI (0.18, 0.67)) and rich (AOR 0.12; 95 % CI (0.06, 0.25)) socio-economic status and type of feeding (AOR 0.31; 95 % CI (0.12, 0.80)) were associated with unemployed mothers having underweight children aged 6–23

Table 3. Feeding practices of children aged 6–23 months among employed and unemployed mothers in Bale Robe Town, Ethiopia, April 2020 (n 597)

Variables	Employed (n 293)		Unemployed (n 304)		χ^2 P-value
	Number	(%)	Number	(%)	
Feeding type					
Bottle feeding	121	(53.3)	106	(46.7)	0.215
Both	121	(47.6)	133	(52.4)	
Breastfeeding	51	(44.0)	65	(56.0)	
Exclusive breastfeeding					
No	293	(62.6)	175	(37.4)	0.000
Yes	0	(0.0)	129	(100.0)	
Currently breastfeeding					
No	177	(56.7)	135	(43.3)	0.000
Yes	116	(40.7)	169	(59.3)	
Continued breastfeeding at 1 year					
No	211	(57.7)	155	(42.3)	0.000
Yes	82	(35.5)	149	(64.5)	
Plan breastfeeding till 2 years					
No	232	(48.1)	250	(51.9)	0.429
Yes	54	(52.4)	49	(47.6)	
Know a right time to start CF					
No	18	(48.6)	19	(51.4)	0.957
Yes	275	(49.1)	285	(50.9)	
Know the nutritional benefit of CF					
No	8	(50.0)	8	(50.0)	0.940
Yes	285	(49.1)	296	(50.9)	
Know the amount of CF					
No	37	(46.8)	42	(52.3)	0.669
Yes	256	(49.4)	262	(50.6)	
Know thickness/consistency of CF					
No	27	(52.9)	24	(47.1)	0.564
Yes	266	(48.7)	280	(51.3)	
Minimum meal frequency					
Not met	76	(49.0)	79	(51.0)	0.989
Met	217	(49.1)	255	(50.9)	
Minimum diet diversity					
Not met	48	(56.5)	37	(43.5)	0.141
Met		(47.9)		(52.1)	
Minimum acceptable diet					
Not met	115	(51.3)	109	(48.7)	0.392
Met	178	(47.7)	195	(52.3)	
Household food security status					
Insecured	150	(36.9)	256	(63.1)	0.000
Secure	143	(74.9)	58	(25.1)	

months. While older age of the child aged 11–23 months (AOR 3.58; 95 % CI (1.35, 9.47)), being girl (AOR 0.38; 95 % CI (0.21, 0.71)), family size (AOR 0.50; 95 % CI (0.27, 0.94)) and handwashing at critical times (AOR 0.13; 95 % CI (0.06, 0.28)) were associated with unemployed mothers having underweight children aged 6–23 months (Table 6).

Discussion

The present study revealed that 6–23 months of children born to employed mothers had a higher chance of undernutrition (stunting, wasting and underweight) in Bale Robe Town. The present study revealed that more than half (39.9 %) of children of employed mothers were stunted compared to unemployed (31.3 %). Similarly, the chance of a child being underweight is also significantly higher in the case of employed mothers

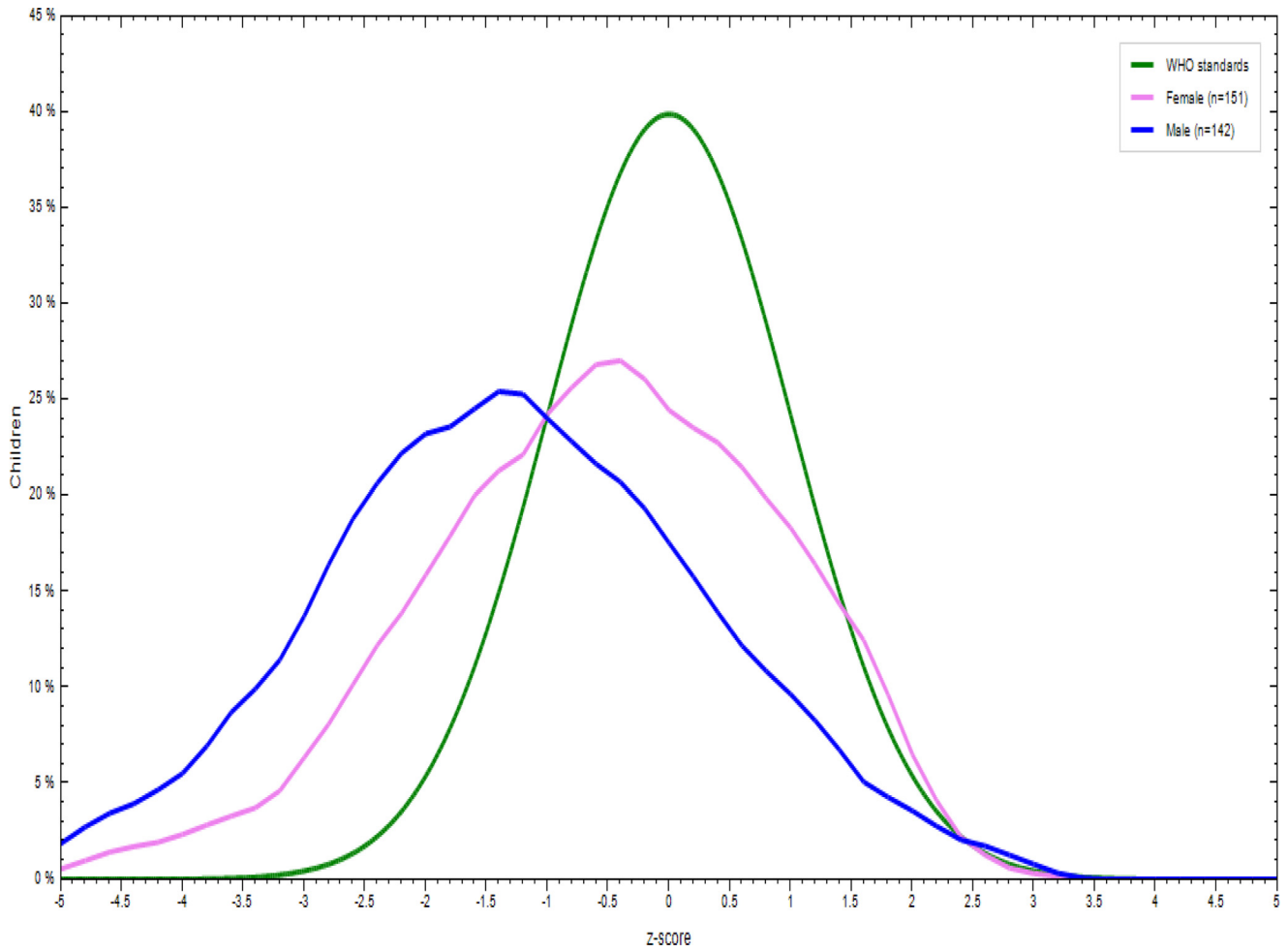


Fig. 2. Sex distribution of children aged 6–23 months from employed mothers' weight-for-length against the WHO standard curve.

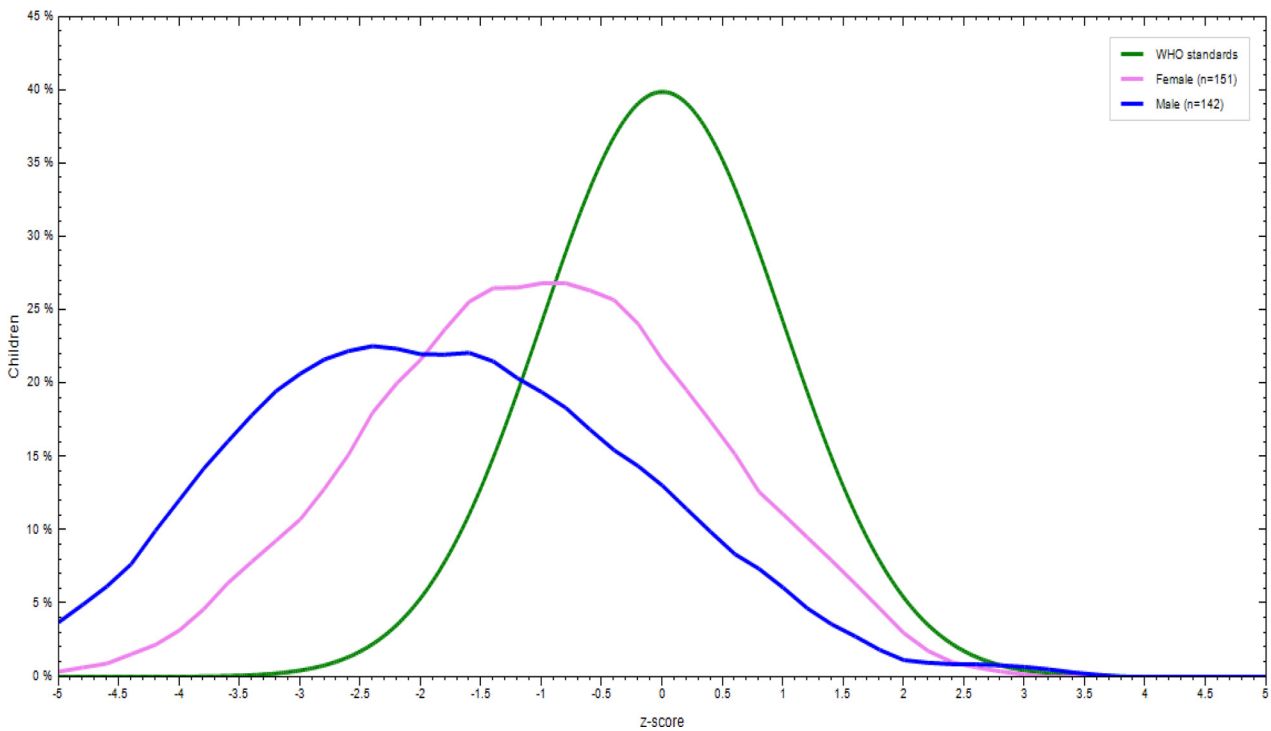


Fig. 3. Sex distribution of children aged 6–23 months from employed mothers' weight-for-age against the WHO standard curve.

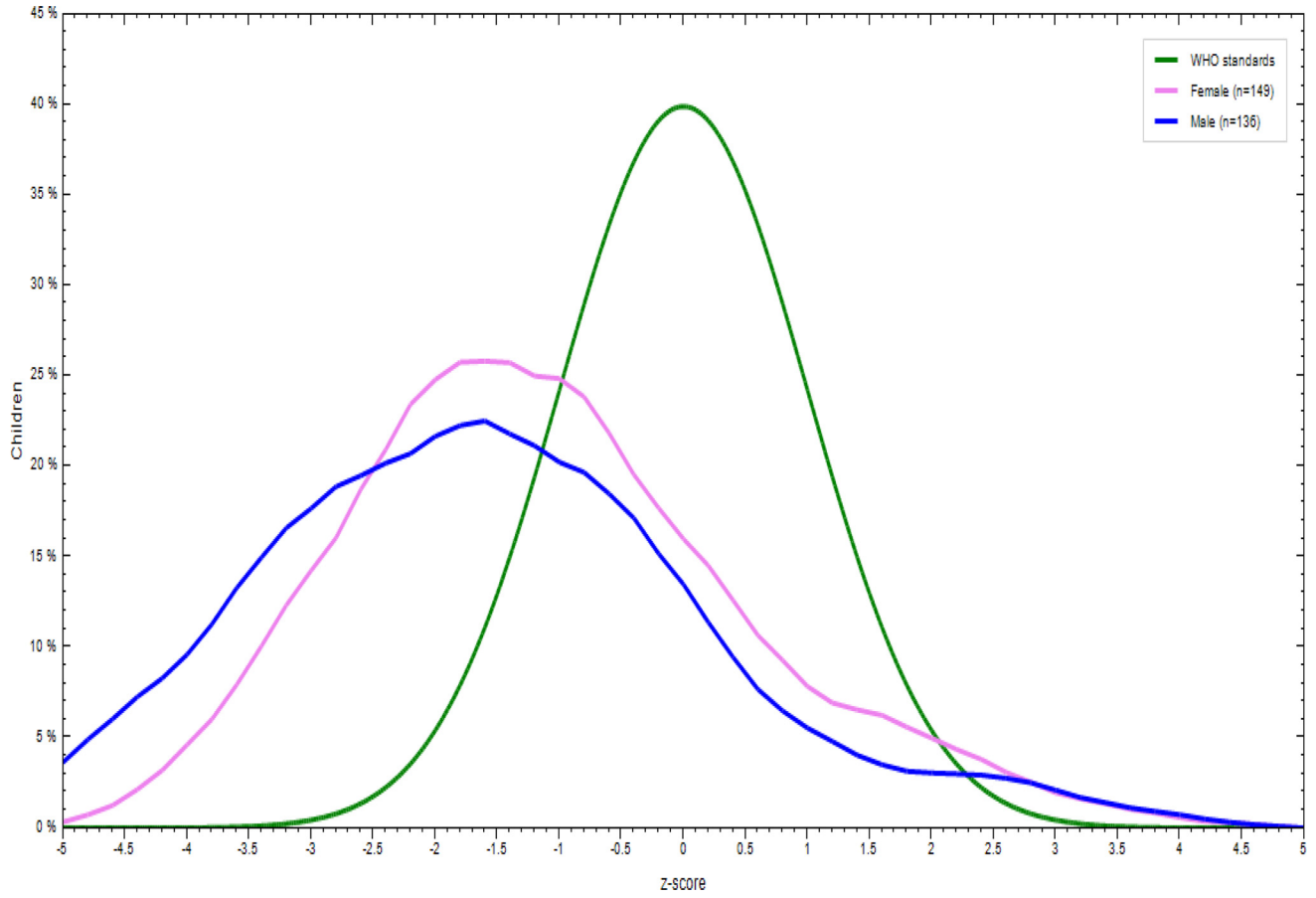


Fig. 4. Sex distribution of children aged 6–23 months from employed mothers' length-for-age against the WHO standard curve.

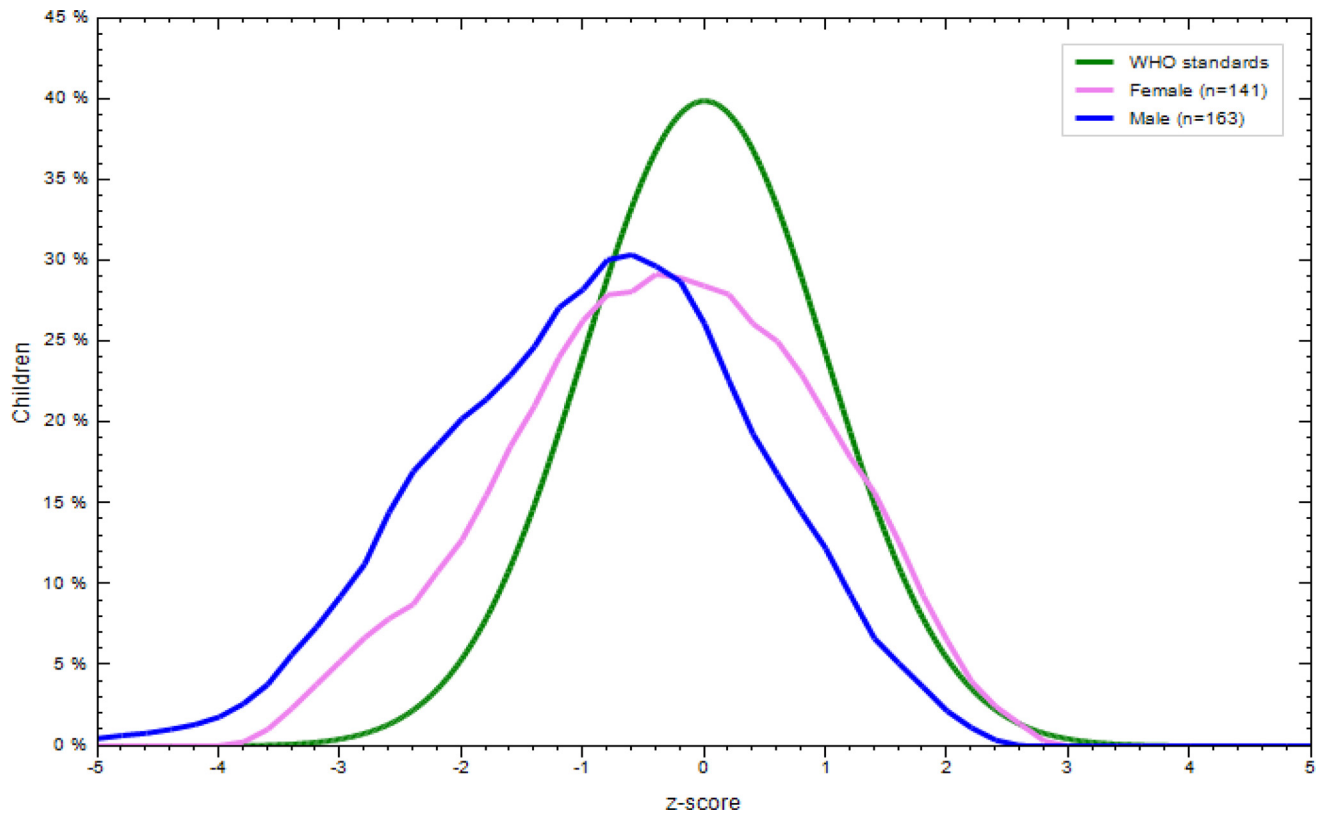


Fig. 5. Sex distribution of children aged 6–23 months from unemployed mothers' weight-for-length against the WHO standard curve.

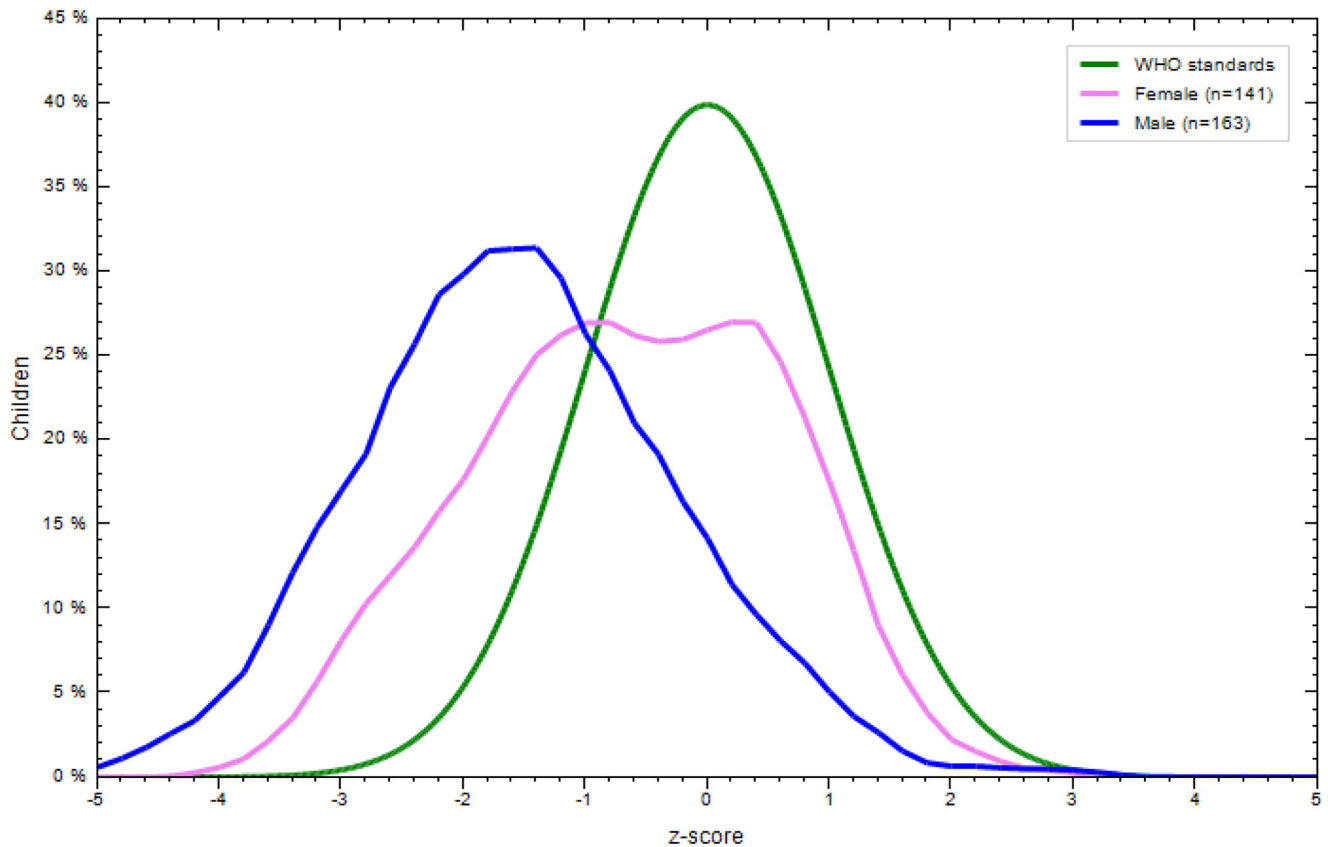


Fig. 6. Sex distribution of children aged 6–23 months from unemployed mothers' weight-for-age against the WHO standard curve.

(39.9%) than in their counterparts belonging to unemployed ones (24.0%). In the same way, wasting is lower among children of unemployed mothers (11.8%) than among employed ones (22.2%). This could happen because mothers cannot provide the care the child needs, which in return can lead to infections and malnutrition due to the effect of access to water, sanitation and handwashing facilities in Ethiopia⁽³³⁾. Furthermore, malnourished children will suffer from poor physical and cognitive development, as well as low school performance. A previous research study in Adama city reported supportive findings on stunting (33.8%), underweight (12.6%) and wasting (8.3%)⁽³⁴⁾. Furthermore, our finding is consistent with previous reports on the effect of maternal employment on child nutritional status in Sodo town, Wolayta, Southern Ethiopia⁽²²⁾, and Nigeria⁽³⁵⁾ and Sri Lanka from abroad⁽³⁶⁾. Furthermore, the prevalence of wasting and underweight in the present study area is comparable with the ones reported from Nigeria⁽³⁷⁾.

Employed younger maternal age with children aged 6–23 months was predictor of child stunting compared to their counterparts. This finding is evidently supported by a study conducted in Ghana reported that children of teenage mothers, compared to those of adult mothers, were eight times more likely to be stunted, three times more likely to be wasted and thirteen times more likely to be underweight after adjusting for potential confounders⁽³⁸⁾. This could also be due to the association of maternal health literacy with early childhood nutritional status which is evidenced in India⁽³⁹⁾ and maternal depression in Pakistan⁽⁴⁰⁾.

The result of multivariate analysis showed that the probability of being stunted was 63% protective among children from rich families compared to those from poor families. This finding is consistent with studies revealed in Ethiopia, Sri Lanka and Tanzania^(41–45). The possible explanation might be related to the negative effect of poor socio-economic status on access to household food, health service utilisation, availability of improved water sources and sanitation facilities⁽⁴²⁾.

The odds of stunting were higher among children aged 12–23 months compared to those aged 6–11 months for employed and unemployed mothers. The odds of being underweight were also higher among children aged 12–23 months for unemployed mothers compared to 6–11 months. This is consistent with the finding from Dabat district, Northern Ethiopia⁽⁴²⁾. Furthermore, the present result agrees with that of the Central African Republic in which poor growth of children was correlated with the old age of children⁽⁴⁶⁾. This could also be evidenced by maternal undernutrition⁽⁴⁷⁾.

The present study demonstrated that being a boy is associated with stunting (for both employed and unemployed mothers), underweight (employed mothers) and waste (unemployed mothers). This result is different from the one reported from Ethiopia such as Somali Region⁽⁴⁸⁾ and West Guji Oromia region⁽⁴⁹⁾, Egypt⁽⁵⁰⁾, Pakistan⁽⁵¹⁾ and South Asia⁽⁵²⁾. This could be attributable to male patriotism in some communities where girls are less socially and nutritionally favoured. The present study was in line with studies conducted in Ethiopia such as Mekelle City, Tehuledere

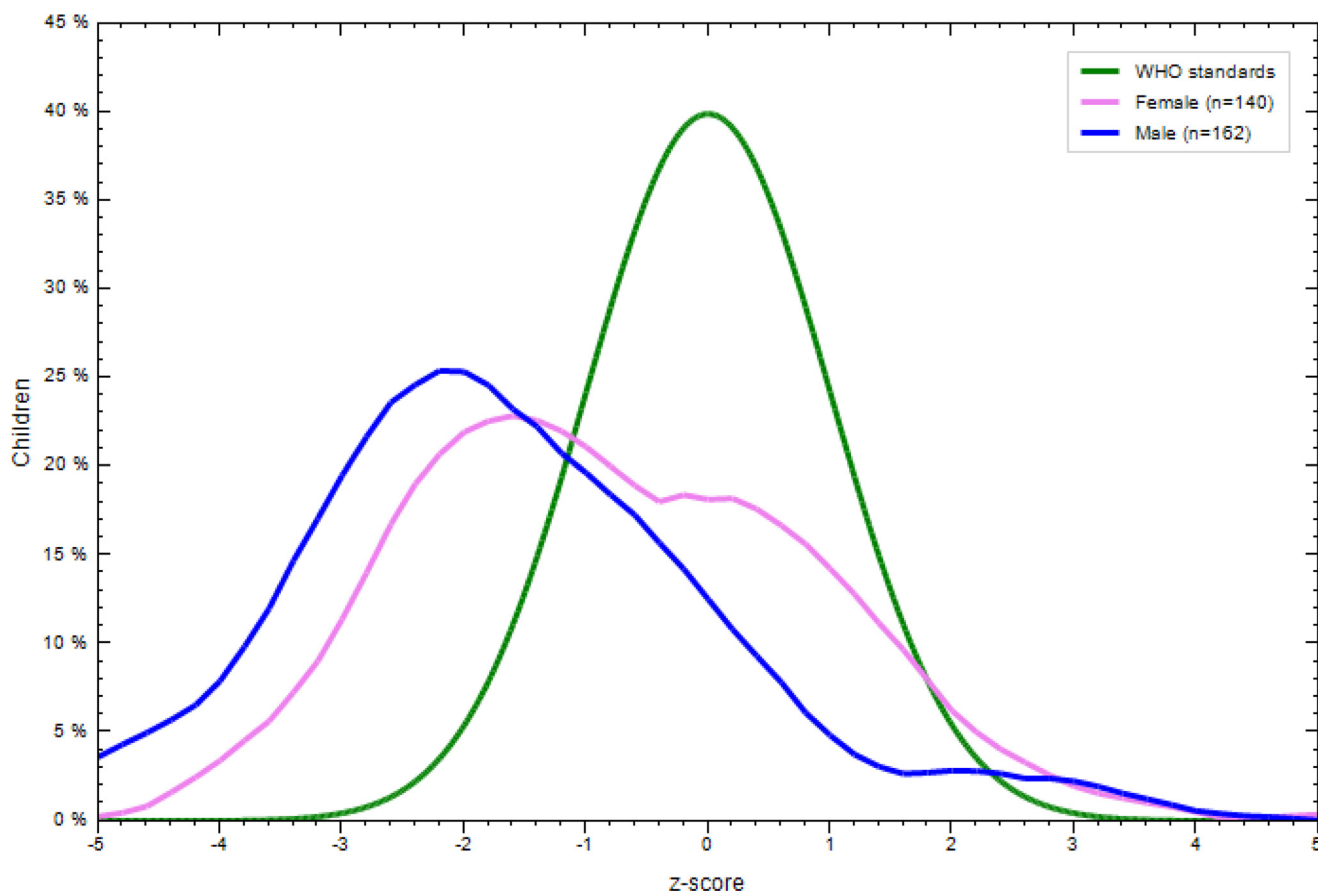


Fig. 7. Sex distribution of children aged 6–23 months from unemployed mothers' length-for-age against the WHO standard curve.

district⁽⁵³⁾, Jimma⁽⁵⁴⁾, Chiro town⁽⁵⁵⁾ and Wukro town⁽⁵⁶⁾ which confirmed that males were more affected due to thinness than girls. This variable includes several African countries including Pakistan⁽⁵⁷⁾. This could be due to the variation in maturation time in boys and girls, for which girls reached maturation earlier than boys.

Studies in other developing countries also claimed that stunting was less common in early childhood as they were on breastfeeding^(42,58); however, because of inappropriate complementary feeding practice and higher nutritional demand, the risk of impaired linear growth increases as the child's age advances⁽⁵⁹⁾. For example, employed mothers stopped breastfeeding and introduced supplements and breast milk substitutes earlier than unemployed ones in Uganda, USA and France^(60–62). A possible explanation for this is that, apart from household responsibilities, mothers are employed outside their home to earn income for their families⁽¹⁹⁾ and this, in turn, makes them too busy to provide adequate time for their child feeding and caring. Therefore, children born to employed mothers face suboptimal breastfeeding, and earlier introduction of complementary feeding, and receive less social care. However, the employment of mothers has increased rapidly due to an increased demand for household income as a result of increased prices of food⁽¹³⁾. Hygiene and sanitation practices could have a significant contribution to preventing child infection, which is the second wing of the immediate causes of child malnutrition^(63,64).

Furthermore, the present study found that food insecurity in households in children born to employed mothers was associated with stunting and underweight. These results are consistent with the previous ones from East Badawacho district⁽⁶⁵⁾, Butajira⁽⁶⁶⁾ and Dabat⁽⁶⁷⁾ of Ethiopia. Furthermore, children of employed mothers from poor households were more likely to be stunted, and underweight⁽⁶⁸⁾. This is supported by studies from Hossana town, Ethiopia⁽⁶⁹⁾, Tanzania⁽⁷⁰⁾, and Northern Ghana⁽⁷¹⁾, and Nepal^(72,73). This could be because household food insecurity and child undernutrition are critical problems in the present study setting. Socio-demographic factors, poor childcare practices, infection and food insecurity had a positive association with children undernutrition⁽⁷⁴⁾.

Strengths and limitations of the study

The study is mentioned as first baseline for the study locality. However, there may be recall bias in child feeding practices. Furthermore, there could be a social desirability bias in terms of the socio-economic status of the respondents.

Conclusion

The present study showed that the nutritional status of 6–23-month-old children is better among unemployed mothers than among employed mothers. Furthermore, this



Table 4. Predictors of childhood stunting in Bale Robe Town, Ethiopia, 2020 (n 597)

Variables	Employed (n 293)			Unemployed (n 304)			P-value	COR (95 % CI)	AOR (95 % CI)	P-value	COR (95 % CI)	AOR (95 % CI)	P-value
	Not stunted	Stunted		Not stunted	Stunted								
Maternal age													
19–24	43	43	1	59	31	1	0.80(0.40–1.60)	1	0.76(0.35–1.67)	0.496			
25–29	68	32	0.47(0.26–0.85)	45	19	0.32(0.16–0.66)	0.234	0.62(0.30–1.28)	0.70(0.30–1.60)	0.391			
30–34	26	24	0.92(0.46–1.85)	46	15	0.59(0.24–1.41)	0.007	0.97(0.52–1.80)	0.96(0.47–1.95)	0.905			
≥35	39	18	0.46(0.23–0.93)	59	30	0.32(0.14–0.73)							
Age (months)													
6–8	33	9	1	56	7	1	2.13(0.71–6.45)	1	1.78(0.54–5.85)	0.344			
9–11	32	19	2.18(0.86–5.52)	30	8	1.88(0.63–5.55)	0.015	5.20(2.26–1.99)	5.88(2.37–14.58)	0.000			
12–23	111	89	2.94(1.34–6.47)	123	80	3.03(1.24–7.42)							
Sex													
Male	72	79	1	80	61	1	0.35(.21–0.57)	1	0.29(0.16–0.51)	0.000			
Female	104	38	0.33(0.20–0.54)	129	34	0.31(0.17–0.54)							
Family size													
<5	118	82	1	77	50	1	0.53(0.32–0.86)	1	0.39(0.22–0.69)	0.001			
≥5	58	35	0.87(0.52–1.44)	132	45	1.06(0.56–2.02)							
Wealth status													
Poor	34	56	1	71	36	1	0.40(0.22–0.72)	1	0.99(0.51–1.95)	0.987			
Medium	58	38	0.40(0.22–0.72)	75	31	0.37(0.19–0.71)	0.000	0.86(0.48–1.60)	0.93(0.47–1.86)	0.841			
Rich	84	23	0.17(0.09–0.31)	63	28	0.12(0.06–0.24)							
Critical handwashing time													
Unmet	29	29	1	102	70	1	0.60(0.34–1.07)	1	0.31(0.17–0.57)	0.000			
Met	147	88	0.60(0.34–1.07)	107	25	0.71(0.34–1.47)							
Minimum diet diversity													
Unmet	18	30	1	28	9	1	0.47(0.19–1.16)	1	1.48(0.67–3.27)	0.187			
Met	158	87	0.33(0.17–0.63)	181	86	0.47(0.19–1.16)							
Minimum acceptable diet													
No	59	56	1	75	34	1	0.55(0.34–0.89)	1	0.76(0.39–1.46)	0.424			
Yes	117	61	0.55(0.34–0.89)	134	61	0.68(0.33–1.42)							
Household food security status													
Secured	81	62	1	29	19	1	0.42(0.23–0.77)	1	0.78(0.38–1.60)	0.492			
Insecure	85	55	0.76(0.47–1.21)	180	76	0.64(0.34–1.22)							

**Table 5.** Predictors of childhood wasting in Bale Robe Town, Ethiopia, 2020 (n 597)

Variables	Employed		P-value	AOR (95% CI)	COR (95% CI)	AOR (95% CI)	Unemployed		P-value	AOR (95% CI)	COR (95% CI)	P-value
	Not wasted	Wasted					Not wasted	Wasted				
Maternal age												
19–24	67	19		1	1	1	82	8		1	1	0.307
25–29	77	23	0.748	1.14(0.50–2.61)	1.05(0.53–2.10)	1.71(0.61–4.81)	54	10	0.748	1.90(0.71–5.11)	1.71(0.61–4.81)	0.307
30–34	39	11	0.220	0.51(0.18–1.49)	1.00(0.43–2.31)	0.64(0.18–2.31)	57	4	0.220	0.72(0.21–2.50)	0.64(0.18–2.31)	0.494
≥35	45	12	0.956	1.03(0.39–2.71)	1.06(0.42–2.13)	1.51(0.57–3.99)	75	14	0.956	1.91(0.76–4.82)	1.51(0.57–3.99)	0.406
Sex												
Male	108	43		1	1	1	119	22		1	1	0.061
Female	120	22	0.017	0.44(0.22–0.87)	0.46(0.26–0.82)	0.49(0.23–1.03)	149	14	0.017	0.51(0.25–1.04)	0.49(0.23–1.03)	0.061
Family size												
<5	152	48		1	1	1	116	11		1	1	0.189
≥5	76	17	0.349	0.69(0.32–1.50)	0.71(0.38–1.31)	1.70(0.77–3.73)	152	25	0.349	1.73(0.82–3.67)	1.70(0.77–3.73)	0.189
Wealth status												
Poor	60	30		1	1	1	93	14		1	1	0.202
Medium	76	20	0.108	0.53(0.24–1.15)	0.06(0.27–1.02)	0.53(0.20–1.41)	99	7	0.108	0.47(0.18–1.22)	0.53(0.20–1.41)	0.202
Rich	92	15	0.027	0.40(0.18–0.90)	0.002(0.16–0.66)	1.64(0.71–3.81)	76	15	0.027	1.31(0.60–2.89)	1.64(0.71–3.81)	0.249
Handwashing at critical times												
No	33	25		1	1	1	146	26		1	1	0.056
Yes	195	40	0.042	0.47(0.22–0.97)	0.46(0.21–0.99)	0.45(0.20–1.02)	122	10	0.042	0.27(0.15–0.50)	0.45(0.20–1.02)	0.056
Minimum meal frequency												
Unmet	54	22		1	1	1	69	10		1	1	0.956
Met	174	43	0.099	0.19(0.03–1.37)	0.61(0.33–0.10)	1.07(0.11–10.76)	199	26	0.099	0.90(0.41–1.97)	1.07(0.11–10.76)	0.956
Minimum diet diversity												
Unmet	20	28		1	1	1	31	6		1	1	0.706
Met	208	37	0.004	0.06(0.01–0.40)	0.13(0.07–0.25)	1.59(0.14–17.83)	237	30	0.004	0.65(0.25–1.70)	1.59(0.14–17.83)	0.706
Minimum acceptable diet												
Unmet	72	43		1	1	1	94	15		1	1	0.660
Met	156	22	0.296	3.14(0.37–26.84)	0.25(0.13–0.42)	0.56(0.04–7.39)	174	21	0.296	0.76(0.037–1.54)	0.56(0.04–7.39)	0.660
Household food security status												
Secure	128	15		1	1	1	39	19		1	1	0.174
Insecure	100	50	0.003	2.94(1.43–6.03)	4.27(1.74–5.79)	2.21(0.70–6.94)	229	17	0.003	6.56(0.53–7.63)	2.21(0.70–6.94)	0.174



Table 6. Predictors of childhood underweight in Bale Robe Town, Ethiopia, 2020 (n 597)

Variables	Employed			Unemployed			P-value	COR (95% CI)	AOR (95% CI)	COR (95% CI)	AOR (95% CI)	P-Value
	Not underweight	Underweight	Underweight	Not underweight	Underweight	Underweight						
Maternal age												
19–24	50	36	1	65	25	1	0.216	1	1	0.87(0.42–1.80)	1	0.633
25–29	65	35	0.75(0.41–1.35)	48	16	0.64(0.32–1.30)	0.831	0.81(0.35–1.90)	0.81(0.35–1.90)	0.49(0.19–1.24)	0.49(0.19–1.24)	0.133
30–34	24	26	1.51(0.75–3.03)	51	10	1.10(0.46–2.62)	0.306	0.74(0.34–1.60)	0.74(0.34–1.60)			0.44
≥35	37	20	0.75(0.38–1.50)	67	22	0.66(0.29–1.47)						
Age of child (months)												
6–8	25	17	1	57	6	1	0.589	1	1	2.15(0.66–6.95)	1	0.757
9–11	29	22	1.12(0.49–2.56)	31	7	0.77(0.29–2.20)	0.225	3.58(1.35–9.47)	3.58(1.35–9.47)			0.010
12–23	122	78	0.94(0.48–1.85)	143	60	0.62(0.29–2.02)						
Sex of child												
Male	81	70	1	96	45	1	0.049	0.38(0.21–0.71)	0.38(0.21–0.71)			0.002
Female	95	47	0.57(0.36–0.92)	135	28	0.62(0.28–1.35)						
Family size												
Less than five	120	80	1	91	36	1	0.564	0.50(0.27–0.94)	0.50(0.27–0.94)			0.03
Five and above	56	37	0.99(0.60–1.64)	140	37	1.21(0.63–2.31)						
Wealth status												
Poor	31	59	1	80	27	1	0.002	0.97(0.46–2.06)	0.97(0.46–2.06)			0.947
Medium	59	37	0.33(0.18–0.60)	84	22	0.35(0.18–0.67)	0.000	1.40(0.67–2.94)	1.40(0.67–2.94)			0.375
Rich	86	21	0.13(0.07–0.25)	67	24	0.12(0.06–0.25)						
Handwashing at critical times												
No	27	31	1	110	62	1	0.000	0.13(0.06–0.28)	0.13(0.06–0.28)			0.000
Yes	149	86	0.50(0.28–0.90)	121	11	0.66(0.32–1.37)						
Feeding type												
Bottle feeding	72	49	1	82	24	1	0.469	1.59(0.81–3.12)	1.59(0.81–3.12)			0.195
Both	67	54	1.18(0.71–1.97)	85	38	1.25(0.69–2.28)	0.015	0.76(0.29–2.00)	0.76(0.29–2.00)			0.180
Breastfeeding	37	14	0.56(0.27–1.14)	54	11	0.31(0.12–0.80)						
Minimum meal frequency												
Unmet	40	36	1	59	20	1	0.573	3.41(0.31–38.18)	3.41(0.31–38.18)			0.320
Met	136	81	0.66(0.39–1.12)	172	53	0.56(0.08–4.18)						
Minimum diet diversity												
Unmet	15	33	1	28	9	1	0.058	2.15(0.19–23.84)	2.15(0.19–23.84)			0.533
Met	161	84	0.24(0.12–0.46)	203	64	0.15(0.02–1.06)						
Minimum acceptable diet												
Unmet	53	62	1	81	28	1	0.796	0.30(0.02–3.77)	0.30(0.02–3.77)			0.349
Met	123	55	0.38(0.24–0.62)	150	45	1.33(0.16–11.26)						
Household food security status												
Secure	93	50	1	37	11	1	0.640	1.79(0.79–4.09)	1.79(0.79–4.09)			0.164
Insecure	83	67	1.50(0.94–2.40)	194	62	1.08(0.52–2.23)						



demonstrated that poverty had an effect on stunting, wasting and underweight in children born from employed mothers. In addition, being a boy was significantly associated with stunting and wasting among employed mothers while underweight among unemployed once. Concerted efforts could reduce the number of children under 6 months of age undernutrition in the study location.

Acknowledgements

We express our deepest gratitude to Hawassa University, School of Nutrition, Food Science, and Technology for smooth cooperation during this study. Also, our thanks go to the study participants, data collectors, supervisors and language translators.

A self-sponsored project.

The data sets analysed during the present study are available from the corresponding author upon reasonable request.

B. K.: conceiving the study and data collection. B. K. and T. B.: study design. B. K., T. B. and F. W. F.: data analysis, interpretation of results, drafting and review of the manuscript. All authors read and approved the final manuscript.

The authors declare no conflict of interest.

References

- De Onis M, Frongillo EA & Blössner M (2000) Is malnutrition declining? An analysis of changes in levels of child malnutrition since 1980. *Bull World Health Organ* **78**, 1222–33.
- United Nations Children's Fund (UNICEF) (2020) Nutrition, for every child: UNICEF nutrition strategy 2020–2030. UNICEF, New York: United Nations Children's Fund.
- Wardlaw T. Levels & Trends in Child Malnutrition. UNICEF-WHO-The World Bank joint child malnutrition estimates, 1–9.
- UNICEF/WHO/World Bank Group Joint Child Malnutrition Estimates (2018) *Levels and Trends in Child Malnutrition*. New York, Geneva and Washington (DC): United Nations Children's Fund, World Health Organization and the World Bank Group. Global and Regional Aggregates Are for the Year.
- Marriott BP, White A, Hadden L, *et al.* (2013) World Health Organization (WHO) infant and young child feeding indicators: associations with growth measures in 14 low-income countries. *Matern Child Nutr* **8**, 354–370.
- De Onis M, Dewey KG, Borghi E, *et al.* (2013) *The World Health Organization's Global Target for Reducing Childhood Stunting by 2025: Rationale and Proposed Actions*. Switzerland: Wiley Online Library. World Health organization global stunting reduction target, 1–21.
- Asnakew T, Abuye C & Taye H (2020) Effect of maternal employment on the nutritional status of infants and children 6 to 23 months of age in Kolfe-Keraniyo Sub-city, Addis Ababa, Ethiopia. *Ethiop J Public Health Nutr* **4**, 1–8.
- Zakria NM, Tengku Ismail TA, Wan Mansor WNA, *et al.* (2019) Validation of infant and young child feeding questionnaire for the assessment of knowledge, attitudes and practices among child care providers: the IYCF-CCPQ. *Int J Environ Res Public Health* **16**, 1–18.
- World Health Organization, United Nations Children's Fund, World Bank Group (2018) *Nurturing Care for Early Childhood Development: A Framework for Helping Children Survive and Thrive to Transform Health and Human Potential*. Geneva: World Health Organization. Report No.: Licence: CC BY-NC-SA 3.0 IGO.
- Franke RH & Barrett GV (1975) The economic implications of malnutrition: Comment. *Econ Dev Cult Change* **23**, 341–350.
- Ethiopian Public Health Institute (EPHI) [Ethiopia] and ICF (2019) *Ethiopia Mini Demographic and Health Survey 2019: Key Indicators*. Rockville, MD: EPHI and ICF.
- Haile D, Belachew T, Berhanu G, *et al.* (2015) Complementary feeding practices and associated factors among HIV positive mothers in Southern Ethiopia. *J Health, Popul Nutr* **34**, 5.
- Mekuanint T, Lakew A & Netsanet F (2014) Exclusive breastfeeding and maternal employment in Ethiopia: a comparative cross-sectional study. *Int J Nutr Food Sci* **3**, 497–503.
- Tessema M, Belachew T & Ersino G (2013) Feeding patterns and stunting during early childhood in rural communities of Sidama, South Ethiopia. *Pan Afr Med J* **14**, 1–13.
- Global Breastfeeding Collective: UNICEF, WHO (2017) *Global breastfeeding scorecard*.
- Imdad A, Yakoob MY & Bhutta ZA (2011) Impact of maternal education about complementary feeding and provision of complementary foods on child growth in developing countries. *BMC Public Health* **11**, S25-S.
- Das N, Chattopadhyay D, Chakraborty S, *et al.* (2013) Infant and young child feeding perceptions and practices among mothers in a rural area of West Bengal, India. *Ann Med Health Sci Res* **3**, 370–375.
- Downs SM, Sackey J, Kalaj J, *et al.* (2019) An mHealth voice messaging intervention to improve infant and young child feeding practices in Senegal. *Matern Child Nutr* **15**, e12825.
- Tampah-Naah AM, Kumi-Kyereme A & Amo-Adjei J (2019) Maternal challenges of exclusive breastfeeding and complementary feeding in Ghana. *PLoS ONE* **14**, e0215285.
- Das A, Chatterjee R, Karthick M, *et al.* (2016) The influence of seasonality and community-based health worker provided counselling on exclusive breastfeeding - findings from a cross-sectional survey in India. *PLoS ONE* **11**, e0161186.
- Engebreetsen IM, Nankabirwa V, Doherty T, *et al.* (2014) Early infant feeding practices in three African countries: the PROMISE-EBF trial promoting exclusive breastfeeding by peer counsellors. *Int Breastfeed J* **9**, 1–11.
- Eshete H, Abebe Y, Loha E, *et al.* (2017) Nutritional status and effect of maternal employment among children aged 6–59 months in Wolayta Sodo Town, Southern Ethiopia: a cross-sectional study. *Ethiop J Health Sci* **27**, 155–162.
- WHO (2010) *Nutrition Landscape Information System (NLIS) Country Profile Indicators: Interpretation Guide*. World Health Organization.
- WHO (2016) *Global Physical Activity Questionnaire (GPAQ) Analysis Guide*. p. 23.
- Young M, Wolfheim C, Marsh DR, *et al.* (2012) World Health Organization/United Nations Children's Fund joint statement on integrated community case management: an equity-focused strategy to improve access to essential treatment services for children. *Am J Trop Med Hyg* **87**, 6–10.
- Agency CCS (2016) *Ethiopian Demographic and Health Survey Report, Ethiopia, Addis Ababa*.
- Feleke FW, Adole AA & Bezabih AM (2017) Utilization of growth monitoring and promotion services and associated factors among under two years of age children in Southern Ethiopia. *PLoS ONE* **12**, e0177502.
- World Health Organization (2006) *WHO Child Growth Standards: Length/Height-for-Age, Weight-for-Age, Weight-for-Length, Weight-for-Height and Body Mass Index-for-Age: Methods and Development*. World Health Organization.
- Coates J, Swindale A & Bilinsky P (2007) *Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide: Version 3*.
- Acharya J, van Teijlingen E, Murphy J, *et al.* (2015) Study on nutritional problems in preschool aged children of Kaski district of Nepal. *J Multidiscip Res Healthc* **1**, 97–118.
- FAO I, UNICEF, WFP and WHO (2020) *The State of Food Security and Nutrition in the World 2020, Transforming Food Systems for Affordable Healthy Diets*. Rome: FAO. doi:10.4060/ca9692en.
- Lamontagne JF, Engle PL & Zeitlin MF (1998) Maternal employment, child care, and nutritional status of 12–18-month-old children in Managua, Nicaragua. *Soc Sci Med* **46**, 403–414.



33. Bekele T, Rahman B & Rawstorne P (2020) The effect of access to water, sanitation and handwashing facilities on child growth indicators: evidence from the Ethiopia demographic and health survey 2016. *PLoS ONE* **15**, e0239313.
34. Wondafrash M, Admassu B, Bayissa Z, *et al.* (2017) Comparative study on nutritional status of under five children with employment status of mothers in Adama Town, Central Ethiopia. *Matern Pediatr Nutr* **3**. doi:10.4172/2472-1182.1000117; Page 2 of 8 Volume 3• Issue 1• 1000117 *Matern Pediatr Nutr*, an open access journal ISSN: 2472-1182 Women's participation in the work force in developing countries has been increasing steadily over the last several decades. Ethiopia, the proportion of women currently employed rises from. 2017;27.
35. Udoh EE & Amodu OK (2016) Complementary feeding practices among mothers and nutritional status of infants in Akpabuyo Area, Cross River State Nigeria. *SpringerPlus* **5**, 2073.
36. Ubeysekara NH, Jayathissa R & Wijesinghe CJ (2015) Nutritional status and associated feeding practices among children aged 6–24 months in a selected community in Sri Lanka: a cross sectional study. *Eur J Preventive Med* **3**, 15–23.
37. Akombi BJ, Agho KE, Merom D, *et al.* (2017) Multilevel analysis of factors associated with wasting and underweight among children under-five years in Nigeria. *Nutrients* **9**, 44.
38. Wemakor A, Garti H, Azongo T, *et al.* (2018) Young maternal age is a risk factor for child undernutrition in Tamale Metropolis, Ghana. *BMC Res Notes* **11**, 1–5.
39. Johri M, Subramanian S, Kone GK, *et al.* (2016) Maternal health literacy is associated with early childhood nutritional status in India. *J Nutr* **146**, 1402–1410.
40. Saeed Q, Shah N, Inam S, *et al.* (2017) Maternal depressive symptoms and child nutritional status: a cross-sectional study in socially disadvantaged Pakistani community. *J Child Health Care* **21**, 331–342.
41. Getaneh T, Assefa A & Tadesse Z (1998) Protein-energy malnutrition in urban children: prevalence and determinants. *Ethiop Med J* **36**, 153–166.
42. Derso T, Tariku A, Biks GA, *et al.* (2017) Stunting, wasting and associated factors among children aged 6–24 months in Dabat health and demographic surveillance system site: a community based cross-sectional study in Ethiopia. *BMC Pediatr* **17**, 1–9.
43. Kandeepan K, Balakumar S & Arasaratnam V (2016) Nutritional status and food insecurity among the children in northern Sri Lanka. *Procedia Food Sci* **6**, 220–224.
44. Debela BL, Gehrke E & Qaim M (2021) Links between maternal employment and child nutrition in rural Tanzania. *Am J Agric Econ* **103**, 812–830.
45. Abu Salem ME, ALshazaly HM, Ibrahim RA, *et al.* (2021) The impact of maternal employment on health of children under two years old. *Egypt J Occup Med* **45**, 81–96.
46. Adeladza A (2009) The influence of socio-economic and nutritional characteristics on child growth in Kwale District of Kenya. *Afr J Food Agric Nutr Dev* **9**, 1–21.
47. Mishu AA, Chowdhury S, Bipasha MS, *et al.* (2020) Maternal nutritional status as determinants of child malnutrition under age 5 in Bangladesh: a multivariate approach. *Int J Manag* **11**, 1–9.
48. Fekadu Y, Mesfin A, Haile D, *et al.* (2015) Factors associated with nutritional status of infants and young children in Somali region, Ethiopia: a cross-sectional study. *BMC Public Health* **15**, 846.
49. Afework E, Mengesha S & Wachamo D (2021) Stunting and associated factors among under-five-age children in West Guji Zone, Oromia, Ethiopia. *J Nutr Metab* **2021**, 1–8.
50. Rashad AS & Sharaf MF (2019) Does maternal employment affect child nutrition status? New evidence from Egypt. *Oxf Dev Stud* **47**, 48–62.
51. Di Cesare M, Bhatti Z, Soofi SB, *et al.* (2015) Geographical and socioeconomic inequalities in women and children's nutritional status in Pakistan in 2011: an analysis of data from a nationally representative survey. *Lancet Global Health* **3**, e229–e239.
52. Harding KL, Aguayo VM & Webb P (2018) Factors associated with wasting among children under five years old in South Asia: implications for action. *PLoS ONE* **13**, e0198749.
53. Woday A, Member Y & Tsegaye D (2018) Prevalence of and associated factors of stunting among adolescents in Tehuledere District, North East Ethiopia, 2017. *J Clin Cell Immunol* **9**, 546.
54. Assefa H, Belachew T & Negash L (2013) Socioeconomic factors associated with underweight and stunting among adolescents of Jimma Zone, south west Ethiopia: a cross-sectional study. *Int Sch Res Notices* **2013**, 1–8.
55. Damie T, Wondafrash M & Teklehaymanot A (2015) Nutritional status and associated factors among school adolescent in Chiro Town, West Hararge, Ethiopia. *Gaziantep Med J* **21**, 32–42.
56. Melaku YA, Zello GA, Gill TK, *et al.* (2015) Prevalence and factors associated with stunting and thinness among adolescent students in northern Ethiopia: a comparison to World Health Organization standards. *Arab Public Health* **73**, 1–11.
57. Ahmad D, Afzal M & Imtiaza A (2020) Effect of socioeconomic factors on malnutrition among children in Pakistan. *Future Business J* **6**, 1–11.
58. Thiombiano-Coulibaly N, Rocquelin G, Eymard-Duvernay S, *et al.* (2004) Effects of early extra fluid and food intake on breast milk consumption and infant nutritional status at 5 months of age in an urban and a rural area of Burkina Faso. *Eur J Clin Nutr* **58**, 80–89.
59. Ricci JA & Becker S (1996) Risk factors for wasting and stunting among children in Metro Cebu, Philippines. *Am J Clin Nutr* **63**, 966–975.
60. Hawkins MAW, Colaizzi J, Rhoades-Kerswill S, *et al.* (2019) Earlier onset of maternal excess adiposity associated with shorter exclusive breastfeeding duration. *J Hum Lact* **35**, 292–300.
61. Jaillette E, Girault C, Brunin G, *et al.* (2016) French intensive care society, international congress – réanimation 2016. *Ann Intensive Care* **6**, 50.
62. Nankinga O, Kwagala B & Walakira EJ (2019) Maternal employment and child nutritional status in Uganda. *PLoS ONE* **14**, e0226720.
63. Kwami CS, Godfrey S, Gavilan H, *et al.* (2019) Water, sanitation, and hygiene: linkages with stunting in rural Ethiopia. *Int J Environ Res Public Health* **16**, 3793.
64. Ademas A, Adane M, Keleb A, *et al.* (2021) Water, sanitation, and hygiene as a priority intervention for stunting in under-five children in northwest Ethiopia: a community-based cross-sectional study. *Ital J Pediatr* **47**, 1–11.
65. Betebo B, Ejajo T, Alemseged F, *et al.* (2017) Household food insecurity and its association with nutritional status of children 6–59 months of age in east Badawacho District, south Ethiopia. *J Environ Public Health* **2017**, 1–18.
66. Medhin G, Hanlon C, Dewey M, *et al.* (2010) Prevalence and predictors of undernutrition among infants aged six and twelve months in Butajira, Ethiopia: the P-MaMiE birth cohort. *BMC Public Health* **10**, 27.
67. Derso T, Tariku A, Biks GA, *et al.* (2017) Stunting, wasting and associated factors among children aged 6–24 months in Dabat health and demographic surveillance system site: a community based cross-sectional study in Ethiopia. *BMC Pediatr* **17**, 96.
68. Banerjee S, SubirBiswas, Roy S, *et al.* (2021) Nutritional and immunization status of under-five children of India and Bangladesh. *BMC Nutr* **7**, 77.
69. Moges B, Feleke A, Meseret S, *et al.* (2015) Magnitude of stunting and associated factors among 6–59 months old children in Hossana town, Southern Ethiopia. *J Clin Res Bioeth* **6**, 1.
70. Victor R, Baines SK, Agho KE, *et al.* (2014) Factors associated with inappropriate complementary feeding practices among children aged 6–23 months in Tanzania. *Matern Child Nutr* **10**, 545–561.
71. Saaka M, Wemakor A, Abizari A-R, *et al.* (2015) How well do WHO complementary feeding indicators relate to nutritional status of children aged 6–23 months in rural northern Ghana? *BMC Public Health* **15**, 1157.
72. Osei A, Pandey P, Spiro D, *et al.* (2010) Household food insecurity and nutritional status of children aged 6 to 23 months in Kailali District of Nepal. *Food Nutr Bull* **31**, 483–494.
73. Singh A, Singh A & Ram F (2014) Household food insecurity and nutritional status of children and women in Nepal. *Food Nutr Bull* **35**, 3–11.
74. Mulu E & Mengistie B (2017) Household food insecurity and its association with nutritional status of under five children in Sekela district, Western Ethiopia: a comparative cross-sectional study. *BMC Nutr* **3**, 1–9.