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Research Article

Stunting and its Associated Factors among Children 0-59 Months of Age in Rural Ethiopia: Analysis of 2019 Ethiopian Mini Demographic and Health Survey Data

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ABSTRACT

The prevalence of under nutrition is very high in developing countries like Ethiopia especially among women and 0-59 months children. Stunting alone affected an estimated 149.2 million under five children globally in 2020. Stunting is chronic nutritional problem that was characterized by a shorter height for age compared to other children of their age. The aim of this study was to assess the determinant factors of stunting among children 0-59 months of age in rural Ethiopia. The data were obtained from the 2019 Ethiopia Mini Demographic and Health Survey and 3991 under five year rural children were considered in this study. Multivariable binary logistic regression model was used to identify the determinants of rural child stunting. Goodness-of-fit of the model was evaluated by using the Hosmer and Lemeshow test statistic (*chi-square*=8.855, p-value=0.355). The prevalence of stunting was 40.4% in rural Ethiopia. Among factors considered in the study maternal age, region, educational level of mother, source of drinking water, type of toilet facility, wealth index of households, type of delivery, child gender, child age and weight of child were significantly associated with stunting in rural Ethiopia. Stunting among 0-59 months children was public health problems in rural Ethiopia. Improving maternal education, improving the economic status of households, using improved toilet facility and source of drinking water was recommended.

Keywords: Binary logistic regression; Stunting; Children; Ethiopia

INTRODUCTION

Food insecurity, hunger and chronic under nutrition remain critical issues in world. Under nutrition is a cause of childhood illness, disease and disability among children of low income countries. Although problems related to poor nutrition affect the entire population, children are more vulnerable because of their unique physiology and socioeconomic characteristics. Undernourished children are victims of various deficiency states such as night blindness, anemia, iodine deficiency disorder, mental retardation, reduced economic potential, delayed cognitive development, and educational achievement, along with the increased risk of metabolic syndrome and poor birth outcomes [1,2]. Globally, child malnutrition related factors contribute to approximately 35% of child deaths and 11% of the total global disease burden. Child malnutrition remains a persistent problem resulting in substantial increases in overall morbidity and mortality in developing countries [3]. Macronutrient and micronutrient deficiencies are common during childhood with stunting, wasting, and underweight being the most common nutritional problems affecting millions of children worldwide [4,5].

Stunting is a sign of chronic under nutrition that reflects failure to receive adequate nutrition over a long period of time. Height for age, therefore, represents the long-term effects of malnutrition in a population and is not sensitive to recent short term changes in dietary intake. The height for age index provides an indicator of linear growth retardation and cumulative growth deficits in children. According to World Health Organization, children with height-to-age z-score below minus two standard deviation (−2SD) from the median WHO reference population are short for their age (stunted) and those children with z-score indices between -2 SD and -3 SD were classified as moderately

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stunted while children z-score below minus three standard deviation (-3SD) are considered to be severely stunted [6].

MATERIALS AND METHODS

Stunting is a global nutritional challenge that disproportionately affects developing nations. In 2020, about 149.2 million under five children were suffered from stunting globally. Southern Asia has the highest stunting prevalence (48.3%) than any sub-region in the world. The prevalence of stunting among under-five children is 41.5% in Africa [7,8]. Pooled prevalence of stunting among under-five children in East Africa was 33.3% [9]. In order to alleviate this problem World Health Organization has been planned to reduce the prevalence of stunting by 40% up to the year 2025 [10].

Child death was significantly reduced to 41 deaths per 1,000 live births in 2016 globally. In Ethiopia, under five year children were accounted for about 15.2 million of the total population. It has planned to reduce children's mortality to less than 20 deaths per 1,000 live births in 2035 mainly by reducing under nutrition. But under five year children in Ethiopia were mostly affected by under nutrition [11,12]. Malnutrition is the underlying cause of 57% of child deaths in Ethiopia, with highest rate of stunting [13]. The prevalence of stunting was 40.4% in rural Ethiopia. Great regional variations persist across region with Tigray (48.4%), Afar (42.2%) and Amhara (41.5%) were more severely affected, while Addis Ababa (15%) and Gambela (17.3%) have the lowest rates [14].

Global efforts had been made to reduce the number of children with stunting to 87 million by 2030. Similarly, policy and national nutrition programmatic efforts have been made in Ethiopia to tackle the continuing challenge of stunting [15]. Ethiopia has planned to reduce children's mortality to less than 20 deaths per 1,000 live births in 2035 and targeted to end stunting among children under age 2 by 2030. Even though, the prevalence of stunting has decreased from 51% in 2005 to 37% in 2019 through continued efforts, childhood stunting remains at a high level and continues to be a serious public health problem in rural part of the country and the progress to reduce malnutrition remains slow. The studies also revealed that the prevalence of stunting among less than five year of children was high in rural area Ethiopia (40.4% stunted and 12.4% severely stunted) [16].

Previous studies on stunting among under-five children revealed that the causes of stunting are multi factorial such as parental, socio-demographic, and economic status, as well as cultural practices and environmental and other health related variables. Studies indicated that commonly reported predictors of stunting among under-five children include residence, educational status of the mother, type of toilet facility, source of drinking water, child gender, child age, child weight, duration of breastfeeding, wealth status, media exposure, maternal education, age of the mother, type of pregnancy, husband education, lack of sanitation, antenatal care visit during pregnancy, place of delivery, health care access, women decision making autonomy, childhood illness, congenital diseases, maternal Body Mass Index (BMI), birth order and family size [17-22].

To achieve the goals of accelerated stunting reduction, identifying the potential determinants of chronic under nutrition is a vital step. Despite many studies conducted at national and regional levels, the prevalence and determinants of stunting in rural area have been insufficiently emphasized, which makes interventions difficult in such areas. Therefore, this study investigated the prevalence and determinant factors contributing of stunting among children less than five years of age in rural areas of Ethiopia.

Outcome variable

The outcome variable was stunting among children aged 0-59 months in rural Ethiopia. Children with a height for age measurement of <-2 standard score from the median of the reference population were considered to be short for their age (stunted) and children with a measurement of standard score units were considered as not stunted. The response variable for the i^{th} child is represented by a random variable Y_i measured as a dichotomous variable with possible values Y_i=1, if the child was stunted and Y_i=0 if a child was not stunted.

$$Y_i = \begin{cases} 0, \text{ Normal if } z\text{-scorre} \geq -2 \text{ from the median of the WHO standards} \\ 1, \text{ stunted if } z\text{- score} < -2 \text{ from the median of the WHO standards} \end{cases}$$

The independent variables included in this study were maternal age, region, educational level of mother's, source of drinking water, time to get water source, type of toilet facility, religion, wealth index of households, type of birth, place of delivery, gender of the child, age of the child in month and weight of child.

Data source and sampling procedures

The data was collected from March 21, 2019 to June 28, 2019 based on a nationally representative sample on demographic and health indicators of all household members with specific emphasis on maternal and child health issues by Ethiopian public health institute in collaboration with the central statistical agency and the federal ministry of health. The sample was selected using a stratified two-stage cluster design. Enumeration areas from the 2019 population and housing census sample frame were the sampling units for the first stage. In the first stage, a total of 305 enumeration areas (93 in urban and 212 in rural areas) were selected with probability proportional to size and with independent selection in each sampling stratum. In the second stage of selection, a fixed number of 30 households per cluster were selected with an equal probability systematic selection from the newly created household listing.

Five questionnaires were utilized in the 2019 Ethiopian mini demographic and health survey; household questionnaire, woman's questionnaire, anthropometry questionnaire, health facility questionnaire and the fieldworker's questionnaire. In all selected households, height and weight measurements were collected from children age 0-59 months in the anthropometry questionnaire, and women age 15-49 were interviewed using the woman's questionnaire. The data set was available at the demographic and health survey website.

Ethical Issues: The data were downloaded and used after the purpose of the analysis was communicated with measure DHS. The original data were collected in confirmation with international and national ethical guidelines. Ethical clearance for the survey was provided by the ethiopian public health institute review board, the national research ethics review committee at the ministry of science and technology, the institutional review board of ICF Macro international, and the united states center for disease control and prevention. The Ethiopian demographic and health survey ensured the principle of respondent's protection and prevention from unnecessary risk. Verbal informed consent was obtained from participants before data collection began. Participants were informed of their anthropometric measurements (weight, height and edema screening).

Data analysis: Data analysis was done by SPSS for windows version 22.0. Frequencies, percentage, mean and standard deviation were used for the descriptive analysis. Pearson *chi-square* test was applied to know explanatory variable having a strong association with stunting status of 0-59 months children. Variables significantly associated with stunting (P<0.05) were then entered into binary logistic regression analysis. Independent sample t-test and one way Analysis of Variance (ANOVA) with Bonferroni post hoc test were applied to compare mean Height For Age Z-Score (HAZ), across different categories of the independent variables. Binary logistic regression was employed to explore relationship between dependent variable (stunting status) and potential predictors. Variables were entered into the model using the "enter" method. During the analysis, the fitness and statistical assumptions of the model were checked. The adequacy of the fitted model was checked for possible presence and treatment of outliers, and influential cases. Hosmer and Lemeshow statistic (*chi-square*=8.855, p-value=0.355) was used to assess the fitness of the model. P value of 0.05 was taken as the level of significance.

RESULTS

A total of 3991 rural children aged from 0 to 59 months were included to this study. The average age of study participant was 29.05 (95% CI: 28.55-29.59) months with standard deviation of 17.3 months. Likewise, the average height and weight of rural children were 82.76 (95% CI: 82.35-83.18) centimeters and 10.69 (95% CI: 10.6:10.8) kilograms with standard deviation of 13.73 centimeters and 3.18 kilograms respectively. The average age of mother was 28.8 (95% CI: 28.6, 29.02) with standard deviation of 6.53 years (Table 1).

Table 1: Cross-tabulation of the outcome variable *vs.* the covariates in children of age 0-59 months using 2019 EDHS dataset.

Variable	Category	Not stunted (%)	Stunted (%)	Total (%)	*Chi-Square*	df	P-value
Mother's age	15-19	459 (53.2)	404 (46.8)	863 (21.6)	20.604	3	0
	20-29	994 (62.5)	596 (37.5)	1590 (39.8)			
	30-39	656 (60.1)	435 (39.9)	1091 (27.3)			
	40-49	270 (60.4)	177 (39.6)	447 (11.2)			
Region	Tigray	210 (47.8)	229 (52.2)	439 (11)	81.482	9	0
	Afar	267 (56.3)	207 (43.7)	474 (11.9)			
	Amhara	224 (54.1)	190 (45.9)	414 (10.4)			
	Oromia	341 (60.9)	219 (39.1)	560 (14)			
	Somali	312 (68.7)	142 (31.3)	454 (11.4)			
	Begumuz	230 (58.5)	163(41.5)	393 (9.8)			
	SNNPR	328 (60.9)	211 (39.1)	539 (13.5)			
	Gambela	227 (75.2)	75 (24.8	302 (7.60			
	Harari	116 (55)	95 (45)	211 (5.3)			
	Dire Dawa	124 (60.5)	81 (39.5)	205 (5.1)			
Educational level	No education	1277 (57.4)	947 (42.6)	2224 (55.7)	42.075	3	0
	Primary	836 (60.1)	556 (39.9)	1392 (34.9)			

	Secondary	217 (66.8)	108 (33.2)	325 (8.1)			
	Higher	49 (98)	1 (2)	50 (1.3)			
Drinking water	Improved	1378 (61.2)	873 (38.8)	2251 (56.4)	5.546	1	0.019
	Unimproved	1001 (57.5)	739 (42.5)	1740 (43.6)			
Time to get water	<30 minutes	1124 (62.6)	671 (37.4)	1795 (45)	12.27	1	0
	30 minutes	1255 (57.1)	941 (42.9)	2196 (55)			
Toilet facility	Improved	314 (63.2)	183 (36.8)	497 (12.5)	3.005	1	0.043
	Unimproved	2065 (59.1)	1429 (40.9)	3494 (87.5)			
Religion	Orthodox	797 (54.9)	655 (45.1)	1452 (36.4)	22.823	3	0
	Protestant	644 (61.5)	403 (38.5)	1047 (26)			
	Muslim	681 (62)	417 (38)	1098 (27.5)			
	Other	257 (65.2)	137 (34.8)	394 (9.9)			
Wealth index	Poorest	910 (57.4)	675 (42.6)	1585 (39.7)	17.816	4	0.001
	Poorer	528 (59.4)	361 (40.6)	889 (22.3)			
	Middle	422 (58.8)	296 (41.2)	718 (18)			
	Richer	359 (62.5)	215 (37.5)	574 (14.4)			
	Richest	160 (71.1)	65 (28.9)	225 (5.6)			
Type of birth	Single birth	2341 (60)	1561 (40)	3902 (97.8)	10.814	1	0.001
	Multiple	38 (42.7)	51 (57.3)	89 (2.2)			
Child gender	Male	1176 (57.4)	873 (42.6)	2049 (51.3)	8.583	1	0.003
	Female	1203 (61.9)	739 (38.1)	1942 (48.7)			
Place of delivery	Home	1457 (60.8)	938 (39.2)	2395 (60)	3.739	1	0.033
	Institution	922 (57.8)	674 (42.2)	1596 (40)			
Child age	0-5 months	357 (54.9)	293 (45.1)	650 (16.3)	13.155	3	0.004
	6-11 months	353 (58.9)	246 (41.1)	599 (15)			
	12-23 months	783 (58.7)	552 (41.3)	1335 (33.5)			
	24-59 months	886 (63)	521 (37)	1407 (35.3)			
Child weight	<9.1 Kg	534 (56.6)	409(43.4)	943 (23.6)	158.959	3	0
	9.1 Kg-11.1 Kg	394 (52.7)	354 (47.3)	748 (18.7)			
	11.2 Kg-13.3 Kg	621 (51.9)	575 (48.1)	1196 (30)			
	>13.3 Kg	830 (75.2)	274 (24.8)	1104 (27.7)			

About 55.7% of interviewed mothers had no education and only 1.3% of them attended higher education. About 39.7% of children were in the poorest wealth index and only 5.6% of them were from richest wealth index households. About 16.3% of children were found between 0 to 5 months and 35.3%) were found between 24-59 months. More than half (51.3%) were males. About 23.6% of children were weighting less than 9.1 kg and 27.7% of children weights greater than 13.3 kg. About 40% of children were delivered from mothers of 20-29 years and 11% from mother aged 40-49 years age. Majority of under five year children were from rural areas of Oromia (14%) followed by Afar (11.9) and Somali (11.4) and 5.1% were from Dire Dawa. More than half (56.4%) used improved source of drinking water and only 12.5% used improved toilet facility.

The overall prevalence of stunting in less than five year children was 40.4% in rural Ethiopia. The prevalence of stunting was 42.6% among male children and 38.1% among females. The prevalence of moderate and severe stunting was 28% and 12.4% respectively. About 46.8% of 0-59 month's children delivered from 15-19 year aged of mothers were stunted. There is a regional variation in prevalence of stunting. The proportion of children who were stunted is highest in Tigray (52.2%) and Amhara (45.9%), and lowest in Gambela (24.8%) followed by Somali region (31.5%). About 42.6% of children whose mother had no formal education and 2% of children whose mother had higher education were stunted respectively. About 42.5% and 40.9% of stunted children used unimproved source of drinking water and unimproved toilet facility. 42.6% of males and 38.1% of females were stunted. Regarding child age, 45%, 41% and 41% and 37% of 0-5 months, 6-11 months, and 12-23 months and 24-59 months were stunted respectively.

Pearson *chi-square* test was applied to know explanatory variable having a strong association with stunting status of children. Test of association was carried out using the Pearson *chi-square* at 5% level of significance. The bivariate association between stunting status of children and independent variables shown in Table 1 indicates that stunting status was strongly associated with maternal age, region, educational level of mother's, source of drinking water, time to get water source, type of toilet facility, religion, wealth index of households, type of birth, place of delivery, gender of the child, age of the child in month and weight of child.

Independent sample t-test and one way analysis of variance test were applied to compare mean height for age z-score across different categories of the independent variables. The result on Table 2 indicates that the height for age z-score for different categories of the independent variables. Average height for age z-score of under five children were not equal for different categories of source of drinking water, type of toilet facility, gender of children, place of delivery, mother's age, educational level of mothers, wealth index of household of children, child age and children's weight.

Table 2: Independent sample t-test and one way analysis of variance for height-for-age z-score for different categories of the independent variables.

Variable	Category	Frequency	Mean	Std. Deviation	95% CI		T or F value	ANOVA or t-test
Drinking water	Improved	2251	-1.51	1.521	-1.57	-1.45	2.08	0.038
	Unimproved	1740	-1.61	1.608	-1.69	-1.54		
Toilet facility	Improved	497	-1.44	1.452	-1.58	-1.32	1.701	0.089
	Unimproved	3494	-1.57	1.574	-1.62	-1.52		
Child gender	Male	2049	-1.61	1.602	-1.65	-1.58	-2.45	0.014
	Female	1942	-1.49	1.512	-1.53	-1.46		
Delivery place	Home	2395	-1.55	1.601	-1.58	-1.53	0.157	0.008
	Institution	1596	-1.56	1.497	-1.6	-1.52		
Mother's age	15-19	650	-1.47	1.712	-1.81	-1.68	3.838	0.009
	20-29	599	-1.42	1.647	-1.52	-1.43		
	30-39	1335	-1.65	1.537	-1.58	-1.47		
	40-49	1407	-1.57	1.463	-1.64	-1.45		
Educational level	No education	2224	-1.63	1.611	-1.66	-1.6	9.181	0
	Primary	1392	-1.53	1.499	-1.58	-1.48		

	Secondary	325	-1.25	1.487	-1.37	-1.14		
	Higher	50	-0.87	0.773	-1.05	-0.67		
Wealth index	Richest	1585	-1.59	1.709	-1.63	-1.54	4.422	0.001
	Richer	889	-1.63	1.526	-1.69	-1.57		
	Middle	718	-1.56	1.471	-1.63	-1.49		
	Poorer	574	-1.5	1.362	-1.58	-1.42		
	Poorest	225	-1.16	1.262	-1.3	-1.04		
Child age	0-5 months	650	-1.47	1.712	-1.55	-1.38	3.838	0.009
	6-11 months	599	-1.42	1.647	-1.5	-1.33		
	12-23 months	1335	-1.65	1.537	-1.69	-1.59		
	24-59 months	1407	-1.57	1.463	-1.62	-1.52		
Child's weight	<9.1 Kg	943	-1.6	1.802	-1.66	-1.53	59.828	0
	9.2 Kg-11.1 Kg	748	-1.82	1.582	-1.89	-1.75		
	11.2 Kg-13.3 Kg	1196	-1.82	1.406	-1.87	-1.77		
	>13.3 Kg	1104	-1.05	1.348	-1.1	-1		

Determinants of stunting

Multivariable binary logistic regression model was used to identify factors associated with 0-59 month age rural children in Ethiopia. The result in Table 3 revealed that maternal age, region, educational level of mother, source of drinking water, type of toilet facility, wealth index, type of birth, child gender, child age in month, and weight of child were significantly related with stunting status of rural children. However, religion, place of delivery, and time to get water source were not significantly related with stunting status of 0-59 month's age rural children in Ethiopia.

The odd ratio (95% CI) of stunting among rural children whose mothers age is in between 20-29 years, 30-39 years, 40-49 years were 0.785 (OR: 0.785, 95% CI: 0.651-0.948), 0.859 (OR: 0.859, 95% CI: 0.703-1.05) and 0.742 (OR: 0.742, 95% CI: 0.58-0.95) times less compared to children whose mother were in between 15-19 years old. This indicates that 0-59 months children whose mother has an age between 20-29, 30-39, 40-49 were 21.5%, 14.1% and 25.8% less likely stunted respectively compared to children whose mother is 15-19 years old.

Region was significantly associated with stunting status. The odds ratio (95% CI) of stunted children in Harari and Dire Dawa were not significantly different from under five rural children living in Tigray regional state. Under five rural children in Afar (OR: 0.623, 95% CI: 0.459-0.845), Amhara (OR: 0.671, 95% CI: 0.502-0.896), Oromia (OR: 0.558, 95% CI: 0.416-0.75), Somali (OR: 0.358, 95% CI: 0.251-0.512), Benishangul Gumuz (OR: 0.593, 95% CI: 0.430-0.818), SNNPR (OR: 0.566, 95% CI: 0.412-0.778) and Gambela (OR: 0.295, 95% CI: 0.202-0.432) had lower risk of stunting than under five rural children in Tigray region. This indicates that compared with rural 0-59 months children in Tigray region, the risk of stunting was decreased by 37.7%, 32.9%, 42.2%, 64.2%, 4.7%, 43.4% and 70.5%, less than five year children living in rural Afar, Amhara, Oromia, and Somali, Benishangul Gumuz, SNNPR and Gambela regions respectively.

The odds ratio (95% CI) for under five year children whose mothers attended primary, secondary and tertiary education compared to children whose mother did not attend education were 0.875, (OR: 0.875, 95% CI: 0.751-1.018), 0.696 (OR: 0.696, 95% CI: 0.530-0.95) and 0.029 (OR:0.029; 95% CI: 0.004-0.213) respectively. The risk of stunting among rural children whose mothers attended primary education was 0.875 times less compared to children whose mother did not attend education. The risk of stunting among children whose mothers attended secondary and higher education were 0.696 and 0.029 times less compared to children whose mother did not attend education respectively.

Being female decreases the risk of stunting. The risk of stunting among female children were 0.787 (OR: 0.787, 95% CI: 0.688-0.90) times lower compared to male 0-59 months children. Wealth index is computed depending on ownership of selected assets like televisions and bicycles, materials used for housing construction, types of water source and sanitation

facilities. The odds ratio (95% CI) for under five year children living in households with poor, middle, rich and richest economic status compared children living in households with poorest economic status were 0.797 (OR: 0.797, 95% CI: 0.654-0.971), 0.839 (OR: 0.839, 95% CI: 0.675-1.043), 0.713 (OR: 0.713, 95% CI: 0.558-0.910) and 0.464 (OR: 0.464, 95% CI: 0.32-0.673) respectively. That is, under five year children who were born from poor, middle, rich and richest economic status were 0.797, 0.839, 0.713 and 0.464 times less likely stunted than children living in households with poorest economic status respectively. In this study, being a twin increased the odds of stunting among 0-9 age children in rural Ethiopia. Children of multiple birth was 1.938 times (OR=1.938, 95% CI 1.24–3.03) more likely to be stunted as compared to their counterpart.

Table 3: Multivariable analysis of variables included in the final model of children age between 6 months and 59 months included in 2019 EDHS.

Variable	Category	B	S.E.	Wald	Df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Mother's age	15-19			8.443	3	0.038			
	20-29	-0.241	0.096	6.336	1	0.012	0.785	0.651	0.948
	30-39	-0.151	0.102	2.191	1	0.039	0.859	0.703	1.05
	40-49	-0.298	0.126	5.608	1	0.018	0.742	0.58	0.95
Region	Tigray			65.276	9	0			
	Afar	-0.473	0.156	9.24	1	0.002	0.623	0.459	0.845
	Amhara	-0.399	0.148	7.293	1	0.007	0.671	0.502	0.896
	Oromia	-0.583	0.15	15.021	1	0	0.558	0.416	0.75
	Somali	-1.03	0.182	31.685	1	0	0.358	0.251	0.512
	Benishangul	-0.523	0.164	10.172	1	0.001	0.593	0.43	0.818
	SNNPR	-0.569	0.162	12.275	1	0	0.566	0.412	0.778
	Gambela	-1.22	0.194	39.598	1	0	0.295	0.202	0.432
	Harari	0.012	0.205	0.003	1	0.955	1.012	0.676	1.513
	Dire Dawa	-0.356	0.209	2.889	1	0.089	0.701	0.465	1.056
Educational level	No education			19.144	3	0			
	Primary	-0.134	0.078	2.974	1	0.045	0.875	0.751	1.018
	Secondary	-0.362	0.139	6.755	1	0.009	0.696	0.53	0.915
	Higher	-3.54	1.02	12.113	1	0.001	0.029	0.004	0.213
Drinking water	Improved								
	Unimproved	0.18	0.076	5.649	1	0.017	1.197	1.032	1.388
Time to get to water	<30 minutes								
	30 minutes	-0.179	0.075	5.667	1	0.136	0.836	0.721	0.969

Toilet facility	Improved								
	Unimproved	0.165	0.11	2.223	1	0.017	1.179	0.95	1.464
Religion	Orthodox			2.99	3	0.393			
	Protestant	0.06	0.108	0.304	1	0.581	1.062	0.858	1.313
	Muslim	-0.128	0.112	1.306	1	0.253	0.88	0.706	1.096
	Other	-0.072	0.146	0.246	1	0.62	0.93	0.699	1.238
Wealth index	Poorest			18.781	4	0.001			
	Poorer	-0.227	0.101	5.065	1	0.024	0.797	0.654	0.971
	Middle	-0.175	0.111	2.503	1	0.014	0.839	0.675	1.043
	Richer	-0.339	0.125	7.367	1	0.007	0.713	0.558	0.91
	Richest	-0.769	0.19	16.403	1	0	0.464	0.32	0.673
Delivery type	Single								
	Twin	0.662	0.228	8.442	1	0.004	1.938	1.24	3.029
Child gender	Male								
	Female	-0.239	0.068	12.22	1	0	0.787	0.688	0.9
Delivery place	Home								
	Institution	0.135	0.079	2.964	1	0.085	1.145	0.981	1.335
Child age in month	0-5			8.126	3	0.043			
	06-Nov	-0.326	0.121	7.25	1	0.007	0.721	0.569	0.915
	Dec-23	-0.229	0.104	4.888	1	0.027	0.795	0.649	0.974
	24-59	-0.16	0.108	2.198	1	0.038	0.852	0.689	1.053
Child weight in kg	<9.1								
	9.2-11.1	-0.51	0.355	2.065	1	0	0.6	0.299	1.204
	11.2-13.3	-0.81	0.325	6.225	1	0	0.445	0.235	0.841
	>13.3	-0.41	0.322	1.619	1	0	0.664	0.353	1.247
	Constant	-5.95	1.36	19.274	1	0	0.003	0	0.037

The hazard ratio (95% CI) for rural under five year children who used unimproved source of drinking water and unimproved toilet facility were 1.197 (1.032-1.388) and 1.179 (0.95-1.464) compared to under five rural children who used improved source of drinking water and improved toilet facility respectively. The risk of stunting for less than five year children who did not have improved source of drinking water is 1.197 times higher than children who have improved source of drinking water. Fewer than five children who do not have improved toilet facility were 1.179 times more likely stunted compared to rural children who had improved toilet facility.

Age and weight of the child during the interview were factors associated with rural child stunting. The odds ratio (95% CI) for under five year children whose age were 6-11 months, 12-23 months and 24-59 months compared to children less than 5 months were 0.721 (OR: 0.721, 95% CI: 0.569-0.915), 0.795 (OR: 0.795, 95% CI: 0.649-0.974) and 0.852 (OR: 0.852; 95%

CI: 0.689-1.053) respectively. This indicates that under five year children whose age were 6-11 months, 12-23 months and 24-59 months were 0.721,0.795 and 0.852 times less likely stunted compared with children less than 5 months respectively. Similarly, The odds ratio (95% CI) for under five year children whose weight were 9.2 kg-11.1 kg, 11.2 kg-13.3 kg and greater than 13.3 kg compared to children less than 9.1 kg were 0.600 (OR: 0.60, 95% CI: 0.299-1.204), 0.445 (OR: 0.445, 95% CI: 0.235-0.841) and 0.664 (OR: 0.664, 95% CI: 0.353-1.247) respectively. This study revealed that 0-59 months children who weighs 9.2 kg-11.1 kg, 11.2 kg-13.3 kg and greater than 13.3 kg were 0.600, 0.445 and 0.664 times less likely stunted compared to children weighting less than 9.1 kg.

DISCUSSION

The prevalence of stunting and associated factors among children 0-59 months in rural Ethiopia was assessed in this study. The prevalence of stunting among 0-59 months of children in rural Ethiopia was 40.4%. This finding is in line with studies conducted in northern Ethiopia 39.3%, in East and West Gojjam of Ethiopia 37.5%, Bangladesh (39.3%) and Tanzania (35.5%). Maternal age, region, educational level of mother, source of drinking water, time type of toilet facility, wealth index, type of birth, child gender, child age in month, and weight of child were factors significantly associated with stunting among 0-59 months of rural children in Ethiopia. However, religion, to get water source and place of delivery were not statistically significant at 5% level of significance.

Educational level of the mother showed a significant relationship with stunting among under-five rural children. Children whose mothers had primary and above educational level were significantly less likely stunted compared to children whose mothers had never attended formal education. This finding was consistent with the study conducted in Ethiopia and Bangladesh and Tanzania this is because that education capable mothers to practice nutritional and other related behaviors that prevent stunting.

Gender of a child showed significant association with stunting. Stunting was more prevalent among boys than girls. This was similar with the study in Ethiopia, Pakistan and Nigeria. This might be boys are more vulnerable to health inequalities than their female counterparts in the same age groups.

Household wealth index was significantly associated with stunting status of the under five children. Children from households who had lowest wealth quintile were affected by stunting than those children from households of highest wealth quintile. Children age 0-59 months whose family had middle wealth quintile were less likely to be affected by stunting than children whose family had lowest wealth quintile. Similarly children from households who had highest wealth quintile were less likely to be affected by stunting compared to children from lowest wealth quintile family. This finding was similar to other studies. This is due to the fact that increased income improves dietary diversity, which in turn improves nutrient intake and nutritional status of the children and the mother.

This study also found that source of water supply had association with stunting. Fewer than five children from households that used unimproved source of drinking water were more likely stunted than fewer than five children from households that used improved water supply. This finding is similar to study conducted North East Ethiopia and Western Kenya that showed more children who drank water that was not consistently treated in households were stunted. Therefore, diarrhea and diseases caused by unsafe drinking water might increase the prevalence of stunting directly or indirectly. The finding of this study also indicates that the likelihood stunted was found to be higher among under five children who do not had unimproved toilet facility compared to under five children who have improved toilet facility. This finding was consistent with previous study conducted in Ethiopia in sub-Saharan Africa and in Cambodia. This is because those children become more affected by environmental contamination that increases the risk of infection and leads to diarrheal illness which in turn deteriorates nutritional status of children.

In this study, being a twin increased the odds of stunting among 0-59 age children in rural Ethiopia. Children of multiple births were more likely to be stunted as compared to their counterpart. This finding is in line with studies done in Ethiopia and Cambodia. Child aged 6-11 months and 12-23 months were significantly correlated with stunting status. Children aged 6-11 months and 12-23 months was less likely stunted compared with children less than 0-5 months. This study was in line with. This could be due to the fact that stunting is a chronic malnutrition and is commonly manifested after long-term nutritional deprivation.

CONCLUSION

The prevalence of stunting was still high in Ethiopia. The determinants of stunting in rural Ethiopia were maternal age, region, educational level of mother, source of drinking water, time to get water source, type of toilet facility, wealth index, type of birth, child gender, child age and weight of child. Strategies should be developed for reducing stunting in rural Ethiopia. Improving livelihoods of children is essential to get a better health care and reduce child stunting.

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CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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