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Stunting and associated factors among school-age children (5–14 years) in Mulo district, Oromia region, Ethiopia

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Abstract

Objective: Stunting continues to be a major public health challenge in developing countries, including Ethiopia. Studies revealed that the extent of stunting among under-5 children in Ethiopia is well studied, but there is a scarcity of data among school-age children. Therefore, this study aimed to assess the magnitude of stunting and associated factors among school-age children in the Mulo district, Ethiopia.

Methods: A community-based cross-sectional study was conducted among 606 school-age children (5–14 years) in Mulo district, Central Ethiopia, from 1 to 30 July 2019. A multistage sampling technique was used to select study participants. The collected data were entered into Epi Info version 7.2.2.16 software and analyzed using SPSS version 21 and World Health Organization AnthroPlus software. Bivariate and backward stepwise multivariable statistical methods were employed to assess stunting and its associated factors. Statistical significant association was declared at a p value of <0.05.

Result: In this study, prevalence of stunting among school-age children was 42.4%. Of which, 144 (23.76%) were males and 113 (18.65%) were females. Age group between 10 and 14 years old, (adjusted odds ratio = 1.896, 95% confidence interval: 1.328–2.708), male sex (adjusted odds ratio = 2.688, 95% confidence interval: 1.892–3.821), increased family size (adjusted odds ratio = 1.711, 95% confidence interval: 1.191–2.458), absence of latrine in the compound (adjusted odds ratio = 2.541, 95% confidence interval: 1.711–3.773), and consuming less than three times per day (adjusted odds ratio = 2.68, 95% confidence interval: 1.375–5.223) were factors significantly associated with stunting.

Conclusion: The study revealed that the prevalence of stunting among school-age children was high. Age, sex, family size, availability of latrine, and meal frequency were factors significantly associated with stunting. Therefore, interventional educations on the importance of timely feeding, a balanced diet, family planning, environmental sanitation, and personal hygiene should be given for the parents/caregivers. In addition, analytic studies are recommended to further assess the causes of stunting among the school-age children in the area.

Keywords

Stunting, school age, anthropometry, Mulo, Ethiopia

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Introduction

Malnutrition is a condition that results from eating a diet that has either inadequate nutrients (undernutrition) or too many nutrients (overnutrition) to the extent that causes health problems.[1] Stunting is one form of malnutrition and is defined as height-for-age Z scores (HAZ) below −2 of the World Health Organization (WHO) growth reference standard. Children who are below −3 SD are considered severely stunted.[2] HAZ reflects linear growth achieved pre- and postnatal, and its deficits indicate long-term, cumulative effects of inadequacies of health, diet, and/or care.[3]

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Stunting is one of the most serious and still one of the challenging public health problems in the world. It is largely invisible in many countries, but affects 165 million children worldwide and 90% of those who live in Africa and Asia, making it a major source of concern in developing countries.[4,5] It is a largely irreversible outcome of inadequate nutrition and repeated bouts of infection during the first 1000 days of a child's life.[3]

Worldwide, approximately 23% of school-age children (5–14 years) were stunted in 2016. Of these, more than 37% suffering from stunting are found concentrated in Eastern Africa.[6]

The Ethiopian Demographic Health Survey (DHS) 2016 data revealed that stunting rates are over 40% in Afar, Amhara, Benishangul-Gumuz, and Dire Dawa with the highest rates in Amhara (46%). Rates in Tigray, Oromia, SNNPR, Gambela, Harar, and Somali region range from 24% to 39%, while Addis Ababa had the lowest rate (15%).[7]

Nutritional deprivation during the school-aged years can further constrain the physical and cognitive development of schoolchildren, possibly limiting their educational achievement and attenuating the impact of educational interventions for social development. It may even directly and indirectly compromise the health and survival of the future generation, as malnourished children approach adolescence and their reproductive years in a nutritionally and educationally disadvantaged position. It is also detrimental to the development of children; they negatively impact health, work capacity, and quality of life across the lifespan.[8]

For women, stunting in early life was associated with a lower age at first birth and a higher number of pregnancies and children.[9] Stunting is an enormous drain on economic productivity and growth. Economists estimate that stunting can reduce a country's gross domestic product by up to 3%. According to World Bank estimates, a 1% loss in adult height due to childhood stunting is associated with a 1.4% loss in economic productivity.[10] It is estimated that stunted children earn 20% less as adults compared to non-stunted individuals.[11]

Stunted children who experience rapid weight gain after the age of 2 years have an increased risk of becoming overweight or obese later in life. Such weight gain is also associated with a higher risk of coronary heart disease, stroke, hypertension, and type 2 diabetes.[12]

Ethiopia has one of the highest rates of malnutrition in sub-Saharan Africa and faces acute and chronic malnutrition and micronutrient deficiencies. Nutrition deficiencies during the first critical 1000 days (pregnancy to 2 years) put a child at risk of being stunted. This affects 38% of children in Ethiopia.[13]

Although nutrition intervention programs were shown to have the most effect on younger children, nutrition interventions in school-aged children have important health benefits as well. Many researchers have done on the prevalence and associated factors for stunting among under-5 children, and the result showed that it is multi-factorial, and there was a high prevalence rate. However, little is known about the prevalence and associated factors for stunting among school children still in a country, and also school-age children are not always included in national surveys. Data are scarce regarding the prevalence of stunting among school-age children in Ethiopia, including the study area. There is no study conducted in Central Ethiopia. Therefore, this study aimed to assess the magnitude of stunting and associated factors among school-age children in Mulo district, Central Ethiopia.

Methods

Study design, setting, and populations

A community-based cross-sectional study design was conducted. This study was conducted in Mulo district, Oromia Special Zone Surrounding Finfine, Oromia region, Central Ethiopia from 1 to 30 July 2019. Mulo district is located northwest 50 km far from Addis Ababa. The district is bounded in the north by Yaya Gulele district, south by Walmara district, west by Ada Barga district, and east by Sululta district. The 2019 population projection shows that the total population of the district was 48,742 with a male number of 24,566 and a female number of 24,176. A total number of under-5-year-age children was 8008 and estimated under-15-year-age group was 23,206. The district had one urban and eight rural kebeles. There were eight functional health posts and two functional health centers in the district. All school-age children from age 5–14 years who live in Mulo district were the source population. All school-age children from age 5–14 years who live in the selected kebeles were the study population and study unit was all randomly selected school-age children in the selected kebeles of Mulo district. All school-age children from age 5–14 years who live in the selected kebeles of the district were included in the study. School-age children who had difficulty standing steady or straight, children in a wheelchair, seriously ill during data collection, and those who refused were excluded from the study.

Sample size determination and sampling techniques

The sample size was determined using a single population proportion formula with a 95% confidence interval, 5% marginal error, and taking 48.1% prevalence of stunting at Debre Markos Town and Gozamen Woreda.[14] The calculated sample size yields 384. Then, we adjust for a non-response rate of 10% and multiply by the design effect of 1.5 to obtain a final estimate of 633, the sample size used for this study. Mulo district has a total of nine kebeles. A multistage sampling technique was used to select a representative sample of school-age children from the study area. Three kebeles were selected using a simple random

sampling method. This formed the primary sampling unit. By using family folder lists (CHIS Household ID) of the health extension program, the sampling frame was prepared. Then, systematic random sampling technique was applied to select households, which formed a secondary sampling unit. Finally, a simple random sampling technique was applied to select a child from each household. This formed the third sampling unit. For households that had more than one eligible child, the lottery method was used to select one child for the study.

Data collection tools and procedures. The questionnaires were adopted and re-edited from similar studies after a review of available scientific literature.[14–17] A structured questionnaire was prepared first in English and translated into *Afan Oromo* (the local language) for a better understanding of the tool by data collectors and respondents, and then back into English to check its consistency. The final local language version of the questionnaire was used to collect the data. Anthropometric measurement was taken for all selected children aged 5–14 years to assess their nutritional status. A standard UNICEF-aided stadiometer with a movable headpiece was used to measure the height of the studied children. Data were collected by trained four-level IV female rural health extension workers who came from non-selected kebeles and were supervised by two BSc nurses. The data were collected from both parents and children. Socio-demographic and other information was obtained from parents or caregivers. The age of children was obtained from their family/caregiver. To assess the nutritional status of children, height was measured according to the WHO standard procedures. The measurement of height was conducted without shoes and with children keeping their shoulders in a relaxed position, their arms hanging freely and with their heads aligned in the Frankfurt plane. Individual height was measured to the nearest 0.1 cm. The data were collected in a private place.

Data quality control

The tool was pretested on 32 children and their families or caregiver (5% of sample size) in non-selected kebele (Mulo Fale kebele). The final version of the questionnaire was translated into local language (*Afan Oromo*) and again translated back to English to check the consistency. Training was given for data collectors and supervisors on the data collection instrument, anthropometric measurements, consent form, how to interview, and data collection procedures for 1 day.

Measurements was taken and recorded by two well-trained data collectors, and one of them was to help position the child correctly to the instruments while the other records the measurements. During data collection, data collectors have taken two separate height measurements for a child and average value was reported. Data collectors ensured the scale reading exactly at zero. The supervisors (two BSc nurses) have checked the day-to-day activity of data collectors regarding the completion of questionnaires, clarity of responses, and proper coding of the responses. During data processing, the data were also be checked, coded and entered properly, and cleaned appropriately.

Variables

Dependent variable: Stunting (Yes/No).
Independent variables are as follows:

Socio-demographic and economic factors: age, sex, religion, ethnicity, income, educational status, occupation, place of residence (being rural or urban), and family size.

Health factors: acute and chronic illness.

Household factors: household food security and feeding habit.

Hygiene and environmental factors: personal hygiene, availability of latrine, water source, and sanitation.

Statistical analysis

The data were checked for completeness and inconsistencies. It was cleaned, coded, and entered into EpiInfo version 7 and then exported to SPSS version 21 and WHO AnthroPlus version 1.0.4 (5–19 years) software for analysis. Descriptive analysis was calculated and the results were presented in percentages and number of distributions of the respondents by socio-demographic factors, environmental factors, health care factors, and dietary factors. Bivariable and multivariable logistic regression analyses were used to identify the associated factors using backward variable selection techniques. All variables that were associated with stunting in bivariable analysis with a p value of 0.25 or less were considered as a candidate in multivariable logistic models. The crude odds ratio (COR) and adjusted odds ratio (AOR) together with their corresponding 95% confidence intervals were computed and interpreted accordingly. The Hosmer–Lemeshow goodness of fit was used to test for model fitness. Statistically significant association was declared at a p value of less than 0.05.

Operational definitions

Stunting: Children who have height-for-age below −2 SD of the median of the standard curve (WHO reference population).[2]

School age: Age of children between 5 and 14 years.

Anthropometric measurements: The nutritional status measurement method for children to identify whether they are stunted or not.

Improved water source: Water from public tap, piped water, and protected spring and protected dug walls.

Ethical considerations

Ethical clearance with a reference number of 0282/K.373/11 on date 5/10/2011 E.C was obtained from Institutional Research Board of the Adama Hospital Medical College. Permission to undertake this study was obtained from the Mulo District Administration. Informed written consent was obtained from parents or caregivers. Participants were informed about the importance of the study, necessity of their contribution, risk, benefit, confidentiality, and right to discontinuation at any time. Codes were given to the study participants in order to keep their confidentiality.

Results

Socio-demographic and economic characteristics of the study participants

A total of 606 children and their parents or caregivers were enrolled in the study with the response rate of 95.7%. Of the total respondents, 261 (43.1%) were males and 345 (56.9%) were females. The age for the majority of the children (55.1%) ranges from 10 to 14 years, and most (77.7%) of them lived in rural areas. Majority of respondents were orthodox religion followers (92.4%), Oromo ethnicity (94.2%), earn below 1000 ETB on monthly basis (57.6%), and had family size which was greater than or equal to five (60.6%). Concerning educational status, 369 (60.9%) of mothers and 337 (55.6%) of fathers were illiterate. Only 1.5% of males and 1.5% of females attended college and above by their education. Regarding their occupation, about half (50.7%) of mothers and 42.1% of fathers were merchants. Majority of fathers (55%) and 26.2% of mothers were farmers and 21.5% of mothers were housewives (Table 1). A total of 144 (23.76%) were males and 113 (18.65%) were females. Concerning age, about 93 (15.34%) of children in age category of 5–9 years had stunting and 164 (27.06%) of children within 10–14 years were stunted (Table 2).

Environmental and hygiene conditions of study participants

A majority of the respondents, 406 (67%), were using improved source of drinking water. About 451 (74.4%) of them had latrine in their compound and more than 75% of the children washed their hands after using the toilet and before meal (Table 3).

Feeding habit and household status of study participants

For majority of the respondents (78.4%), sources of food for the households were mixed sources (own product and purchase), while 19.1% purchase from market and only 2.5% were used their own product. Of the total children, 506 (83.5%) were eating their breakfast every day and about 560 (92.4%) were eating three and more times per day. But the rest, 46 (7.6%), of the respondents were eating less than three times per day. In this study 78.5% of children did not get additional food during study time, but only 21.5% got during study. Regarding household food security, only 36.1% households were food-secure, while majority (63.9%) of them were food-insecure (Table 4).

Medical conditions of study participants

Regarding the health history of the respondents, about 2.1% of children had previous history of chronic diseases and 8.1% children had acute illness in the last 2 weeks.

Anthropometric measurement of school-age children

Of the total 606 respondents, 257 (42.4%) (95% CI: 38.3–46.4) were stunted (Figures 1–3).

Factors associated with stunting

Socio-demographic and economic factors. According to bivariable analysis, age of children, sex of children, residence, family size, monthly income, mother occupation, mother education, and father education were significantly associated with stunting at a p value of $\leqslant 0.25$. After adjusting of confounder variables in the multivariate analysis, child age, sex of the child, and family size were the only factors significantly associated with stunting at a p value of <0.05. Children whose age group was between 10 and 14 years old were 89.6% (AOR = 1.89, 95% confidence interval (CI): 1.33–2.71) more likely to be stunted than the age group between 5 and 9 years old. Male children were 2.69 times (AOR = 2.68, 95% CI: 1.89–3.82) more likely to be stunted compared to female children. Regarding the family size, children from family members greater or equal to five were 71.1% (AOR = 1.71, 95% CI: 1.19–2.46) more likely to be stunted than whose family members less than five.

Environmental factors. Among environmental factors, sources of water and latrine availability in compound showed a significant association in the bivariate analysis. After adjusting of confounder variables in the multivariate analysis, only latrine availability was significantly associated with stunting. The chance of being stunted was found to be 2.54 times (AOR = 2.54, 95% CI: 1.71–3.77) higher among children who do not have latrine facility compared to children who have a latrine facility.

Feeding habit. At bivariate level, meal frequency was significantly associated with stunting at a p value of $\leqslant 0.25$. After

Table 1. Socio-demographic and economic characteristics of study participants in Mulo district, Oromia Special Zone Surrounding Finfine, Ethiopia, July 2019 (n = 606).

Variables	Category	Frequency	Percent
Age	5–9	272	44.9
	10–14	334	55.1
Sex	Male	261	43.1
	Female	345	56.9
Child education level	None	153	25.2
	1–4	355	58.6
	5–8	98	16.2
Residence	Urban	135	22.3
	Rural	471	77.7
Religion	Orthodox	560	92.4
	Muslim	6	1
	Protestant	40	6.6
Family size	<5	239	39.4
	⩾5	367	60.6
Ethnicity	Oromo	571	94.2
	Amhara	35	5.8
Income	<1000	349	57.6
	1000–2000	161	26.6
	⩾2000	96	15.8
Mother occupation	Farmer	159	26.2
	Merchant	307	50.7
	Government employee	10	1.7
	Housewife	130	21.5
Father occupation	Farmer	333	55
	Merchant	255	42.1
	Government employee	10	1.7
	Daily worker	8	1.3
Mother education	No education	369	60.9
	Primary	210	34.7
	Secondary	18	3
	College and above	9	1.5
Father education	No education	337	55.6
	Primary	232	38.3
	Secondary	28	4.6
	College and above	9	1.5

Table 2. Age- and gender-wise prevalence of stunting among school-age children in Mulo district, Oromia Special Zone Surrounding Finfine, Ethiopia, July 2019 (n = 606).

Age	5 years	6 years	7 years	8 years	9 years	10 years	11 years	12 years	13 years	14 years	Total
Number of stunted children	19	18	17	23	16	33	44	35	30	22	257
Stunting (%)	3.13	2.97	2.8	3.79	2.64	5.44	7.26	5.77	4.95	3.63	42.4
Gender			Male				Female				
Number of stunted children			144				113				257
Stunting (%)			23.76				18.65				42.4

adjusting of confounder variables in the multivariate analysis, it is significantly associated with stunting at a p value of <0.05. Children who consumed less than three times per day were 2.68 times (AOR = 2.68, 95% CI: 1.37–5.22) more likely to be stunted than children consumed greater than or equal to three times per day (Table 5).

Table 3. Environmental and hygiene conditions of study participants in Mulo district, Oromia Special Zone Surrounding Finfine, Ethiopia, July 2019 (n = 606).

Variables	Category	Frequency	Percent
Source of water	Improved	406	67
	Unimproved	200	33
Latrine availability	Yes	451	74.4
	No	155	25.6
Wash hands after toilet	Yes	456	75.2
	No	150	24.8
Wash hands before meal	Yes	458	75.6
	No	148	24.4

Table 4. Feeding habit and household status of study participants in Mulo district, Oromia Special Zone Surrounding Finfine, Ethiopia, July 2019 (n = 606).

Variables	Category	Frequency	Percent
Source of food	Own product	15	2.5
	Purchase	116	19.1
	Mixed	475	78.4
Take breakfast everyday	Yes	506	83.5
	No	100	16.5
Daily meal frequency	<3	46	7.6
	⩾3	560	92.4
Additional food/snack	Yes	257	42.4
	No	349	57.6
Additional food during study time	Yes	130	21.5
	No	476	78.5
HHF status	Secure	219	36.1
	Insecure	387	63.9

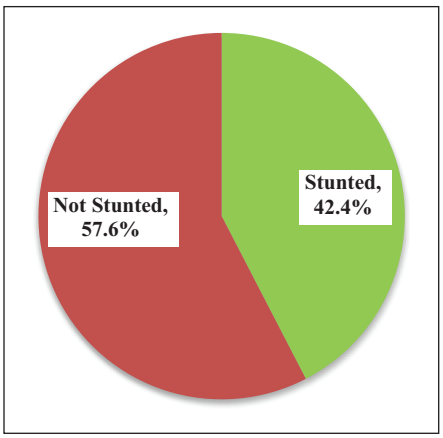

Figure 1. Prevalence of stunting among school-age children in Mulo district, Oromia Special Zone Surrounding Finfine, Ethiopia, July 2019 (n = 606).

Discussion

The aim of this study was to assess the prevalence and factors associated with stunting among school-age children in Mulo district. The prevalence of stunting among the school-age children (5–14 years) in this study was in line with study conducted in Obafemi Owode, Nigeria (40.3%); Arba Minch Health and Demographic Surveillance Site, Southern Ethiopia (41.9%); Aman sub-town, south-west Ethiopia (40.2%); and Fogera and Libo Kemkem districts, north Ethiopia (39.8%).[13,15,18,19]

However, the prevalence in this study was lower than the prevalence reported from Nkwanta district, Ghana (50.3%);[20] Humbo district, Southern Ethiopia (57%);[16] and Debre Markos Town and Gozamen Woreda, East Gojjam Zone, Amhara Regional State, Ethiopia (48.1%).[14]

When compared with the result from China (11.68%),[21] India (18.5%),[22] and Pakistan (8%),[23] the prevalence of stunting in this study was much higher. The prevalence we found in this study was also higher than the findings reported from different parts of Ethiopia; Dale woreda, Southern Ethiopia (25.6%);[17] Fogera district, Northwest Ethiopia (30.7%);[24] and report by national School Health and Nutrition (SHN) survey, Ethiopia (23%).[25] It is also much higher than the result from Kersa (8.9%),[26] Bahir Dar (18.3%),[27] and Addis Ababa (19.6%).[28]

These differences might be due health policy, socioeconomic status, living condition, inappropriate child feeding practices, and child health care.

This study showed that the age of children was significantly associated with stunting. Older children were more likely to be stunted than the younger age group. Children within the age group of 10–14 were 89.6% more likely to be stunted than those within 5–9 years. A study in India[29] among school-age children showed a similar relationship between age and stunting. This result is also concurrent with studies done in different parts of Ethiopia and other developing countries.[30–34] This could probably be because older children are in the transition life stage to adolescence when several unique challenges, including an increased body requirement for nutritional need, were observed, and also they are more physically active and participate in different activities in the school as well as at home that may lose a greater amount of energy.[35,36] In addition, stunting in school-age children could be related to exposure to poor nutrition during early childhood while recently there is expansion of maternal and childcare practice that may decrease the prevalence for younger children.

In this study, stunting was common among males than females. In this finding, males were stunted 2.68 times higher than females which was in line with the studies conducted in other parts of Ethiopia,[13,17,33] India,[22] and Sir Lanka.[37] This could be because males' growth and development are more influenced by environmental and nutritional stress than females and thus making males more likely to be affected by chronic undernutrition.[38]

In contradiction to this study, one study done in Bangladesh reflected as the prevalence of stunting was high

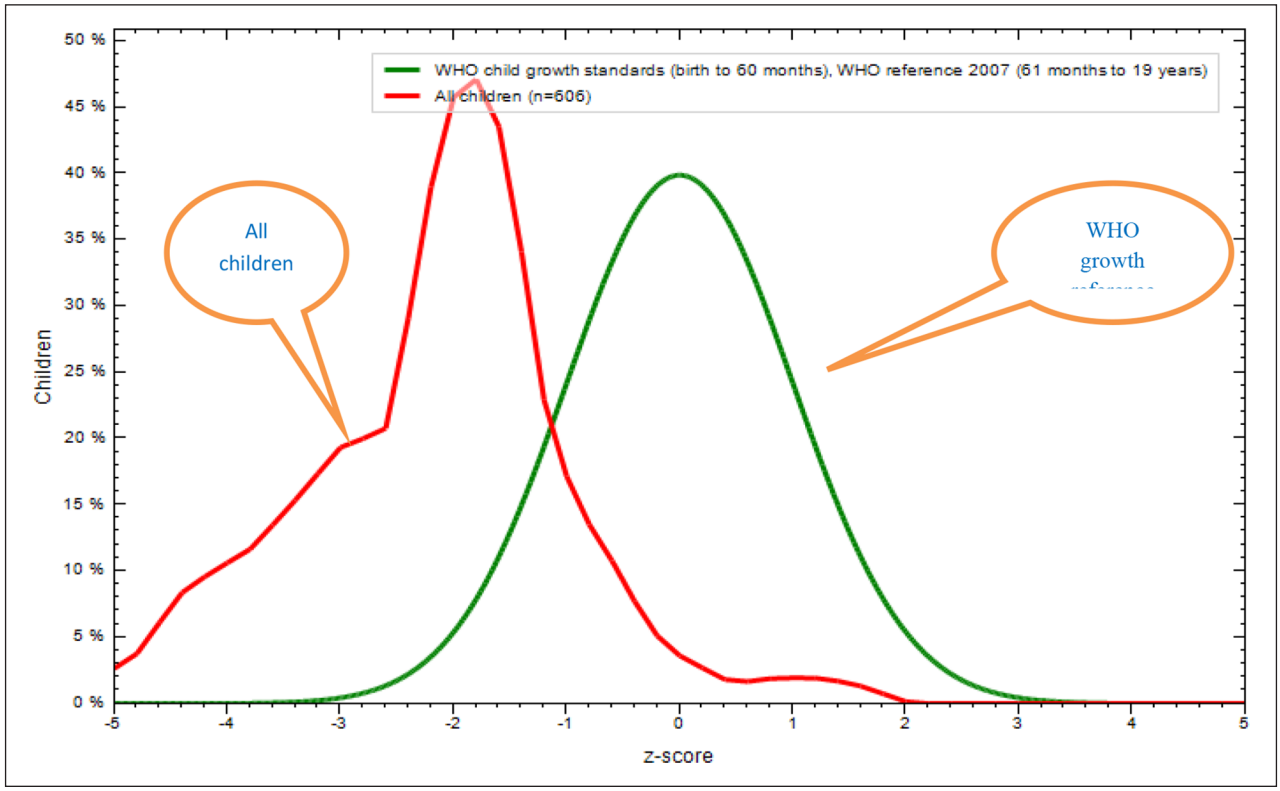

Figure 2. Height-for-age Z score (HAZ) of school-age children in Mulo district, July 2019, with WHO growth reference 2007.

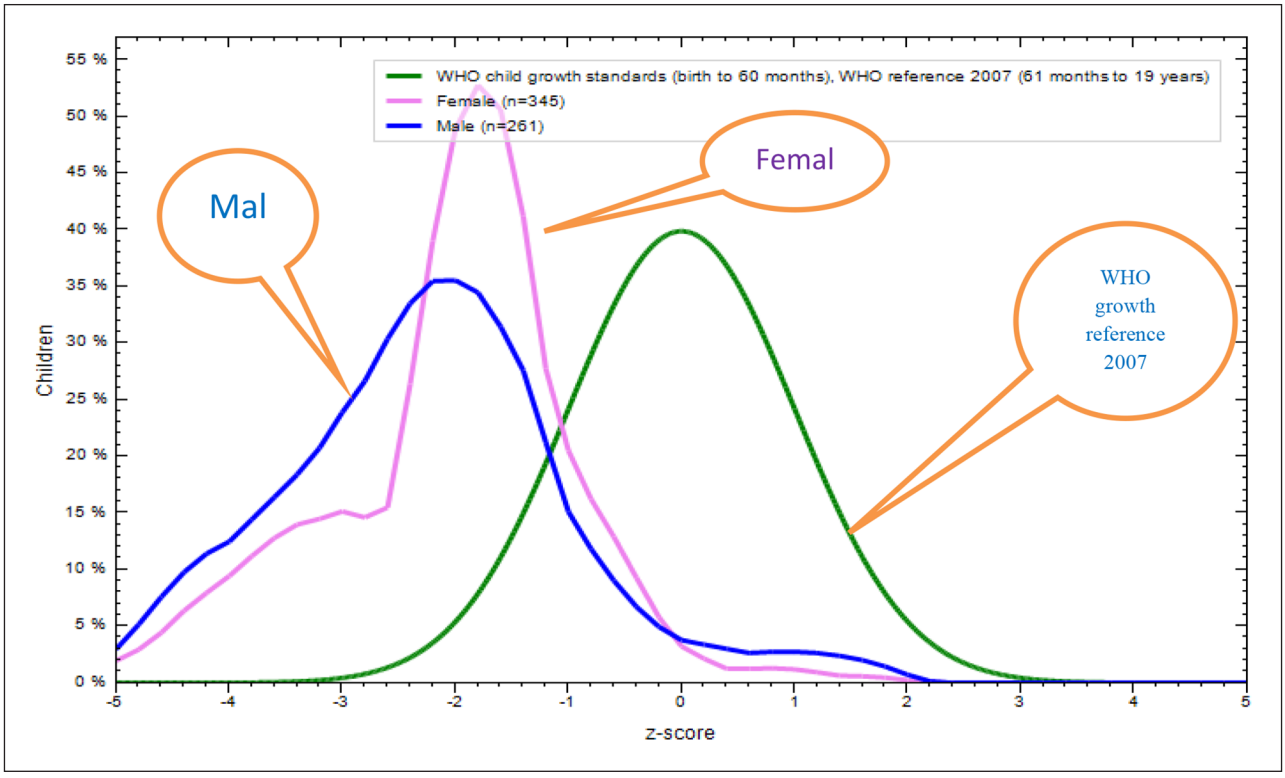

Figure 3. Height-for-age Z score (HAZ) of school-age children by sex in Mulo district, July 2019, with WHO growth reference 2007.

Table 5. Bivariate and multivariate logistic regression of factors associated with stunting among school-age children in Mulo district, Oromia Special Zone Surrounding Finfine, Ethiopia, July 2019 (n = 606).

Variables	Stunting status		COR (95% CI)	AOR (95% CI)
	Not stunted N (%)	Stunted N (%)		
Age				
5–9	179	93	1	
10–14	170	164	1.85 (1.33–2.58)	1.89 (1.323–2.71)***
Sex				
Male	117	144	2.53 (1.81–3.52)	2.69 (1.89–3.82)***
Female	232	113	1	
Family size				
<5	160	79	1	
⩾5	189	178	1.91 (1.36–2.67)	1.71 (1.19–2.46)**
Latrine availability				
Yes	286	165	1	
No	63	92	2.53 (1.74–3.67)	2.54 (1.71–3.77)***
Meal frequency per day				
<3	17	29	2.48 (1.33–4.63)	2.68 (1.37–5.22)**
⩾3	332	228	1	

AOR: adjusted odds ratio; COR: crude odds ratio; CI: confidence interval; N: number.
**p < 0.01; ***p < 0.001.

in females than males. It was indicated to be 43.1% among boys and 50.3% among girls.[39] This discrepancy might be due to the differences in family setups, gender bias, and parental preferences for male children in that society.

Children from households with larger family members were also associated with higher odds of stunting. In this study, those children from family size greater or equal to five members were 71.1% more likely to be stunted than those from households with less than five members. Similar findings have been indicated in other parts of the country and the world. As the number of household members increase, the level of childcare and dietary intake will decrease especially for families with inadequate food.[13,27,40–44]

According to this study, meal frequency per day was significantly associated with stunting. Children who had a meal frequency less than three times per day were 2.68 times to be stunted than who had three or more times per day. The finding was supported by study in Addis Ababa, Ethiopia and Bahir Dar, Ethiopia.[27,28] A large number of household members could contribute to low levels of childcare and dietary intake.

This study further depicted that the presence of latrine facility in the household had negative association with stunting. In this study, finding the likelihood of being stunted was found to be 2.54 times higher among children who do not have latrine facility than children who have a latrine facility in their house. This study finding was concurrent with similar study from Uganda[45] and Ethiopia.[46,47]

Limitation of the study

Different factors affecting child stunting were studied; however, some variables such as dietary diversity and 24-h recall dietary data were not studied. There were limitations associated with using cross-sectional data; as in every cross-sectional study, conclusions related to cause and effect could not be drawn. Since we interviewed there would social desirability bias. Self-reported data were relied upon, which has the likelihood to be subject to recall bias in measuring household food security status.

Conclusion and recommendation

This study revealed that the prevalence of stunting among school-age children was high. Therefore, interventions could focus on educating parents on the importance of timely feeding, balanced diet, family planning, environmental sanitation, and personal hygiene. Further analytic studies should be conducted to investigate the causes of stunting among school-age children in the study area.

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Author contributions

A.B., S.G., G.A. involved in conceptualization of the study, participated in its design, and analyzed the finding. A.B. and G.M. performed the result writing. A.B. involved in analyzing the finding. G.M. involved in writing the manuscript. All authors read and approved the final manuscript.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Ethical clearance with a reference number of 0282/K.373/11 on date 5/10/2011 E.C was obtained from Institutional Research Board of the Adama Hospital Medical College. Permission to undertake this study was obtained from the Mulo District Administration.

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Informed consent

Informed written consent was obtained from parents or caregivers. Participants was informed about the importance of the study, necessity of their contribution, risk, benefit, confidentiality, and right to discontinuation at any time. Codes were given to the study participants in order to keep their confidentiality.

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Supplemental material

Supplemental material for this article is available online.

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