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Stunting and associated factors among primary school children in Ethiopia: School-based cross-sectional study

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ABSTRACT

Background: Stunting is a common type of undernutrition in schoolchildren, and it has a significant negative impact on academic performance. Stunting refers to a child who is too short for their age. It is the result of chronic or recurring malnutrition. Stunting can have far-reaching consequences that last a lifetime. Malnutrition is still a major public health concern in developing countries, including Ethiopia, with an estimated 118 million people going hungry by 2020. Therefore, this study was intended to assess the prevalence and associated factors of stunting among primary school children.

Methods: A cross-sectional school-based study was conducted in Gedeo Zone, South Ethiopia. A multistage sampling technique was used to get a total of 500 study participants from May 1 to June 30, 2021. Data was collected by using face-to-face interviews with structured questionnaires. It was entered into Epi Data version 3.1 and exported to SPSS version 23 for analysis. Variables with a p value of 0.25 in bivariate analysis were fitted to multivariable analysis. A multivariable logistic regression model with a 95% confidence interval and a P-Value of 0.05 was used.

Results: The study found that 203 (40.6%) of the 500 primary students enrolled were stunted (95% CI: 17–47). Stunting was significantly associated with educational status [AOR 2.49 (95%CI (1.23, 4.06)], dietary diversity [AOR 2.0, (95%CI (1.64, 3.54)], child age [AOR 3.48, (95%CI (2.04, 6.16)], family size [AOR 2.18, (95%CI (2.06, 4.49)], and family type [AOR 2.94, (95%CI (1.84, 4.72)].

Conclusion: More than one-third of elementary school children were stunted. Implementing school health and nutrition initiatives to improve the nutritional status of school-age children in the study area is critical, as is considering a strategy to improve children's wellbeing through cross-cutting child wellbeing strategies, with a

Abbreviations: AOR, Adjusted Odds Ratio; BAZ, Body Mass Index-For-Age; BMI, Body Mass Index; CI, Confidence Interval; CM, centimeters; COR, Crude Odds Ratio; DD, Dietary diversity; EPHI, Ethiopian Public Health Institute; EPIDATA, Epidemiological Data Version; EPIINFO, Epidemiological Information; FANTA, Food and Nutrition Technical Assistance project; HAZ, height-for-age z-score; HFIAS, Household Food Insecurity Access Scale; HHFS, Household Food Security; KM, Kilo Meters; OR, Odds Ratio; SD, Standard Deviation; SNNPR, South Nations Nationalities and Peoples Region; SPSS, Statistical Package for the Social Sciences; USA, United States, of America; VIF, variance inflation factor; WHO, World Health Organization.

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special focus on vulnerable children. It should be considered to empower vulnerable families who are at risk of having a child with stunting to improve children's home environments.

1. Introduction

1.1. Background

Malnutrition is a medical condition caused by a nutrient-deficient or nutrient-rich diet (Younis, Ahmad, & Badpa, 2015). Approximately 821.6 million people worldwide suffer from moderate-to-severe acute malnutrition. Of these, 418 million and 282 million people live in Asia and Africa, respectively. Furthermore, 24.1 percent of these people live in Sub-Saharan Africa, including Ethiopia (Micha et al., 2020). Malnutrition continues to be a serious public health issue in developing countries, including Ethiopia (UNICEF, 2013), with approximately 118 million more people facing hunger in 2020 (Dukhi, 2020; World Health Organization, 2020).

Malnutrition is particularly prevalent among women, adolescents, and children. Even though a child growth and development require a high amount of nutrition, chronic childhood malnutrition has been related to delayed cognitive development and major health issues later in life, decreasing people's quality of life (Unicef, 2018).

Furthermore, malnourished children are more likely to suffer from childhood illnesses such as infections and diarrheal diseases, as well as impaired cognitive development, growth retardation, and a smaller adult stature as a result of low economic productivity and compromised educational achievement, all of which are irreversible later in life (Benson, Bellete, Chanyalew, & Belachew, 2005; Sheehy, Carey, Sharma, & Biadgilign, 2019; World Health Organization, 2019; World Health Organization, 2021).

School-age children are in the active growing stage of their development. The child is going through a period of rapid physical and mental development. According to available scientific research, health problems caused by poor nutritional status in primary school-aged children are among the leading causes of low school enrolment, high absenteeism, poor classroom performance, and early school dropout (Best, Neufingerl, Van Geel, van den Briel, & Osendarp, 2010; Sinurat, Sembiring, Azlin, Faranita, & Pratita, 2018; Srivastava, Mahmood, Srivastava, Shrotriya, & Kumar, 2012).

Nutritional status is a major environmental factor that can affect the academic performance of schoolchildren (UNICEF, 2014). Stunting is one of the most common forms of undernutrition among schoolchildren, and it has a significant negative impact on academic performance (Best et al., 2010; Smith & Haddad, 2000). A child who is too short for his or her age is said to be stunted.

Stunting is the failure to grow physically and mentally as a result of chronic or recurring malnutrition. Stunting can have far-reaching consequences that can last a lifetime. The prevalence of stunting malnutrition in the country is directly related to the contribution of malnourished children to educational waste (Sinurat et al., 2018; UNICEF, 2013).

Underachievement among school-age children has become more frustrating than ever in recent years. Academic underachievement continues to be a major source of concern for students, parents, educators, and communities. Medical problems, emotional problems, psychiatric disorders, below-average intelligence, attention deficit, hyperactivity disorder, specific learning disabilities, poor socio-cultural home environment, environmental causes, and malnutrition are just a few of the reasons children underperform in school (Admasie, Ali, & Kumie, 2013; UNICEF, 2014).

In addition, stunting in school-aged children can also lead to decreased bone density, decreased productivity, delayed maturation, later-life brain development, poor school performance, impaired immune systems, poorer cognitive development, deficiencies in muscular strength, and reduced work capacity. Stunting has been linked to long-term consequences such as lower academic and intellectual achievement(Best et al., 2010; Sinurat et al., 2018; Smith & Haddad, 2000).

Globally, in 2020, more than 149.2 million children were stunted. The majority (61.4 million children) of this occurred in Africa. The number of children with stunting is declining in all regions except Africa. In sub-Saharan Africa, the absolute number of stunted children was 22.1 million in 2020 (Sheehy et al., 2019; World Health Organization, 2019; World Health Organization, 2021).

According to available scientific studies, family size, parental education level, ethnicity, parental occupation, and family income are some of the primary causes of stunted children (Admasie et al., 2013; Benson et al., 2005; Best et al., 2010; Srivastava et al., 2012). Undernutrition in Ethiopia is mainly caused by a lack of care for vulnerable portions of the population, inadequate environmental cleanliness, limited health services, and household food instability. These are the basic nutritional determinants, and they are intricately related (Abebe, Geleto, Sena, & Hailu, 2017; Admasie et al., 2013; Benson et al., 2005).

School-aged children are frequently excluded from health and nutrition surveys and surveillance in Ethiopia. There is a notable lack of data on the nutritional status of children in this age group. The vast majority of research is focused on malnutrition in children under the age of five, particularly in developing countries. Therefore, this study aimed to assess the prevalence and associated factors of stunting among primary school children. This may be useful for communities, governmental and non-governmental organizations, program managers, and stakeholders in identifying specific strategies to improve children's nutrition, particularly primary school children. It can have a significant impact on reducing child mortality and morbidity.

2. Methods and materials

2.1. Study area, population, period and design

A school-based cross-sectional study was conducted in Gedeo Zone, South Ethiopia, from May 1 to June 30, 2021. In the zone, there are six districts, two city administrations, 31 urban and 133 rural kebeles (the smallest administrative units), one university, one teacher's education college, and 241 primary and secondary schools. All randomly selected school children aged 6–14 years who attended primary schools in the selected districts of the zone were included in the study. Children whose ages were unknown and those who were seriously ill and had physical deformities of limbs and spines were excluded from this study due to measurement difficulties.

2.2. Sample size determination, sampling techniques and procedure

The sample size was determined by using a single population proportion formula (n = (Z/2)2p (1p)/d2) with the assumption of a 95% confidence interval, a margin of error of 5%, and a prevalence of stunting (20.6%) in the study conducted in the southeast part of Ethiopia (Abebe et al., 2017). The sample size was then multiplied by 2 to account for the design effect, and for a possible nonresponse rate during the study, the sample size was increased by 10% to: **n = 527**.

A multistage sampling method was used to select 527 study participants. Initially, out of six districts in the zone, three districts were selected by using simple random sampling techniques (lottery method). From a total of 23 primary schools in the selected districts, nine out of eleven, three out of seven, and two out of five primary schools were selected by using lottery methods from Bule district, Wenago district, and Yirgachefe district, respectively. There were a total of 3718 students enrolled in the selected primary schools. Of those, the Bule district had 1689, the Wenago district had 827, and the Yirgachefe district had 1202 people. The final sample size was then allocated proportionally to each primary school based on the number of students enrolled. As a result, 239 students from the Bule district, 117 students from Wenago, and 171 students from Yirgachefe were selected to participate. Following the construction of the sample frame and the collection of a list of students from their school (students' roster), study participants were recruited from each specified school using a simple random sampling procedure employing a computer-generated random number. After the students were chosen, the directors, children, and health extension workers invited their parents to attend at their respective schools on the day of the assessment to provide the necessary information.

2.3. Data collection methods and procedures

A standard tool was adapted from the Ethiopian Public Health Institute (EPHI). It was written in English, translated into Amharic and Gedieo-uffa, and then back-translated into English by an independent translator for consistency. There are six sections to the questionnaire (socio-demographic characteristics; food consumption patterns; dietary diversity; dieting habits; household food security status; and measurement of the children's nutritional status). A pretest was conducted with 10% of the total participants (57 school students) in Gongua (a town near to the Gedio zone). The questionnaire was evaluated during the pretest for clarity, readability, comprehensiveness, accuracy, and optimal time for completing the interview. Based on the pretest results, the optimal time to complete the interview and the readability of the items were updated and revised.

The socio-demographic characteristics, food consumption patterns, dietary diversity, dieting habits, and household food security data were collected from their parents in each respective school of children through face-to-face interviews with a pretested structured questionnaire in open and closed quiet places without anyone other than their parents and lasted 30 to 40 min. The data was gathered by eight data collectors and four supervisors, all of whom held a BSc in clinical nursing. Data collectors and supervisors were given two days of training on the study's objectives, data collection processes, data collection instruments, and physical measurements.

2.4. Measurements

Household food insecurity was assessed by using a standard questionnaire (It has nine-items) developed by Food and Nutrition Technical Assistance Project (FANTA) (Herrador et al., 2014).

This tool has been validated and used in developing countries (Degarege, Degarege, & Animut, 2015). The response options of the HHFS questionnaire were; "never", "rarely", "sometimes", and "often". The food secure households were considered when the respondents replied that "never" or "rarely" worried them that their households would not have enough food. On the other hand, mildly food insecure households were defined as those where the households sometimes or often worried about not having enough food and/or were unable to eat favorite foods and/or rarely ate a more monotonous diet than desired. Households that reported that they rarely or sometimes ate more monotonous diets than desired, sometimes or often, and/or had started to cut back on quantity by reducing the size of meals or number of meals were coded as moderately food insecure (Mitchell, 2000).

Food consumption patterns and dietary diversity (DDS) were assessed using a modified version of the Helen Keller International FFQ and a 24-h dietary recall, respectively (Wuehler & Coulibaly, 2011).

A food frequency questionnaire was developed that included food items that were commonly consumed in the study area, such as legumes, cereals, meat, vegetables, eggs, dairy products, fruits, sweet foods made with sugar, honey, oil, fat, or butter, fish and seafoods, and any other foods, such as condiments.

A dietary diversity score (the number of food groups consumed by the child in the 24 h preceding the survey) was used as a proxy for dietary diversity assessment (Sheehy et al., 2019). Based on WHO guidelines, the dietary diversity score was calculated and divided into two categories: adequate or inadequate dietary diversity (i.e., consumption of 4 or 4 food groups) within the seven food groups in 24 h.

The ages and heights of the children were recorded in accordance with WHO recommendations to create anthropometric variables (Wolde & Belachew, 2019). All measurements were taken on school grounds.

Height: Height was measured without shoes and in a standing position. Using a Tanita HR-200 stadiometer, each child's height was measured in the Frankfurt position (head, shoulders, buttocks, knees, and heel touching the vertical board) to the nearest 0.1 cm. The height was measured three times, and the average value was recorded.

Height-for-age (HAZ) was used to assess SAC's growth and nutritional status (World Health Organization, 2019). The WHO Anthro Plus 1.0.4 software tool was used to generate the Z scores for these nutritional parameters.

Stunting was defined as a height-for-age z-score (HAZ) of two standard deviations (2 SD) or less below the mean of a reference standard (Status, 1995).

Age: Initially, the parents were asked for their children's age in completed years. Data collectors then used birth certificates or immunization cards to verify the child's age.

2.5. Data analysis

The data was double-checked for accuracy, revised, and coded. The data was entered into Epi Data version 3.1 software before being exported to SPSS version 23.0 statistical software for analysis. The ANTHRO PLUS software was used to compute the Z score value for height-for-age (Wolde & Belachew, 2019). Descriptive statistics such as mean, median, frequency, and percentage were utilized. Bivariate logistic regression analysis was used to identify candidate variables for multivariable logistic regression. Variables with a P-value of <0.25 were regressed using multivariable logistic regression. Multivariable analysis was used to identify the factors that are independently associated with the outcome variable. The adjusted odds ratio (AOR), 95 percent confidence interval, and P-value less than or equal to 0.05 were used to determine a statistically significant association with the outcome variable. Model fitness was assessed by using the Hosmer and Lemeshow test. Multi-collinearity was checked by using the variance inflation factor (VIF) and the tolerance test. The VIF value was <2, and the tolerance test value was greater than 0.1, which was within the normal range. This study's findings were presented in text, charts, and tables.

3.

3.1. Socio-demographic characteristics of study participants

This study included 500 primary school children and their mothers or caregivers, with a response rate of 94.9 percent. From a total of 500 children, 319 (63.8%) were found to be between the ages of 10–14 years, while the remaining 181 (36.2%) were found to be between the ages of 6–9 years, with the mean and + SD ages of children being 10 and + 2, respectively. Almost half 258 (51.6%) of the children who took part in the study were male. Of the total number of participants, 407 (81.4%) were protestants, while 60 (6.0%) were orthodox. The majority of mothers or caregivers, 159 (31.18%) could not read or write. Furthermore, 406 (81.2%) of the children were born into a monogamous family, while the remaining 94 (18.8%) were born into a polygamous family, as shown in Table 1.

Table 1
Socio-demographic characteristics of school children and their families in the selected primary schools in Gedeo zone, South, Ethiopia, 2021.

Variables	Category	Frequency	Percentage
Age of child (in year)	6–9	181	36.2
	10–14	**319**	**63.8**
Child sex	**Male**	**258**	**51.6**
	Female	242	48.4
Grade	**1–4**	**293**	**58.6**
	5–8	207	41.4
Religion of parent/care giver	**Protestant**	**407**	**81.4**
	Orthodox	60	6.0
	Muslim	30	12.0
	Others	3	0.6
Educational status of mothers/care takers	**Illiterate**	**159**	**31.8**
	Primary level	131	26.2
	Secondary level	136	27.2
	College and above	74	14.8
Educational status of father	Illiterate	60	12.0
	Primary level	109	21.8
	Secondary level	112	22.4
	College and above	**156**	**31.2**
Occupation of mother/ care giver	**Housewife**	**221**	**44.2**
	Governmental employee	94	18.8
	Nongovernmental employee	15	3.0
	Daily laborer	20	4.0
	Private/merchant	129	25.8
Occupation of father	Farmer	96	19.2
	Governmental employee	**151**	**30.2**
	Nongovernmental employee	52	10.4
	Merchant	91	18.2
	Daily laborer	31	6.2
	Others	19	3.8
Family size	≤4	57	11.4
	≥5	**443**	**88.6**
Income	<1000	141	28.2
	1000–2000	**209**	**41.8**
	≥2000	150	30.0
Household food security status	Food secured	100	20.0
	Food in-secured	**400**	**80.0**
Residence area	**Urban**	**290**	**58.0**
	Rural	210	42.0
Type of family	**Monogamy**	**406**	**81.2**
	Polygamy	94	18.8

3.2. Child health status, dieting habits, and sanitation practices

More than half 317 (63.4%) of them reported “Encet” as the most common locally made food, followed by 175 (35.0%) who reported “Enjera.” Approximately 458 (91.6%) participants ate less than three times per day. Furthermore, nearly two hundred twenty-six (45.2%) of the students skipped their mealtimes. Only 185 (37.0%) of the children met the minimum dietary diversity requirement per 24 h. The majority of them (89.6 %) had improved water sources. In the two weeks preceding the survey, nearly one in every two children (57.6 %) had an illness or infection. More than half of the children, 268 (53.6%), had a functional latrine at their residential. Approximately 255 (51.0%) of them had the habit of washing their hands before eating, while 449 (89.8%) had the habit of washing their hands after meals, as shown in Table 2.

3.3. Prevalence of stunting among primary school children

Of a total of 500 primary students, 203 (40.6%) (95% CI: 17–47) of the participants were stunted, while the rest 297 (59.4%) were not stunted, as seen in Fig. 1.

Table 2
Child health status, dieting habits, and sanitation practices of study participants in Gedeo zone, South, Ethiopia, 2021.

Variable	Category	Frequency	Percentage
Frequency of meal	greater than3	42	8.4
	≤3	**458**	**91.6**
Habits of washing before going to meal	yes	226	45.2
	no	**274**	**54.8**
Staple food	Enjera	175	35.0
	Encet	**317**	**63.4**
	Others	8	1.6
Child DDS	**Inadequate**	**315**	**63.0**
	Adequate	185	37.0
Ever skipped one or more meals/day	yes	226	45.2
	no	**274**	**54.8**
Illness/ infection in the last two weeks prior to the survey	**yes**	**288**	**57.6**
	no	212	42.4
Availability of functional latrine at home	yes	232	46.4
	no	**268**	**53.6**
Presence of hand washing facility in school	yes	12	2.4
	no	**488**	**97.6**
Distance from students’ home to school	**<30mints**	**287**	**57.4**
	≥30mints	213	42.6
Water source	**improved**	**448**	**89.6**
	Unimproved	52	10.4
Hand washing habit before meal	**yes**	**255**	**51.0**
	no	245	49.0
Hand washing habit after meal	**yes**	449	89.8
	no	51	10.2

3.4. Factors associated with stunting among school-age children

In the bivariate logistic regression analysis, age (in years), grade, mother’s education, marital status, staple food, frequency of meals per day, dietary diversity, family type, illness in the last two weeks, and family size were the candidate variables for multivariable analysis. Whereas in multivariable logistic regression, educational status [AOR 2.49, (95%CI (1.23, 4.06))], dietary diversity [AOR 2.0, (95%CI (1.64,3.54), child age [AOR 3.48 (95%CI (2.04,6.16)], family size [AOR 2.18, (95%CI (2.06, 4.49))] and family type [AOR 2.94, (95%CI (1.84,4.72))] were significantly associated with stunting among school-age children, **as see** Table 3**.**

According to this study, the educational status of mothers had a statistically significant association with the stunted development of children. Children born from mothers who couldn’t read and write were 2.4 times more likely to be stunted than those born from their mothers who had had a formal education [AOR 2.49 (95%CI (1.23, 4.06)].

The odds of being stunted among children who were consuming inadequate dietary diversity were 2.0 times more likely to be stunted than those who consumed adequate dietary diversity [AOR 2.0 (95%CI (1.64, 3.54))].

Moreover, children who had an age group of 10–14 years were 3.4 times more likely to be stunted than those who had an age group of 6–9 years [AOR 3.48 (95%CI (2.04, 6.16))].

Children born into families that had five or more children were 2.1 times more likely to be stunted than those who had four or fewer children [AOR 2.18 (95%CI (,2.06, 4.49))].

The odds of being stunted among children born into polygamy families were 2.9 times higher than those who were born into monogamous families [AOR 2.94 (95%CI 1.84, 4.72))].

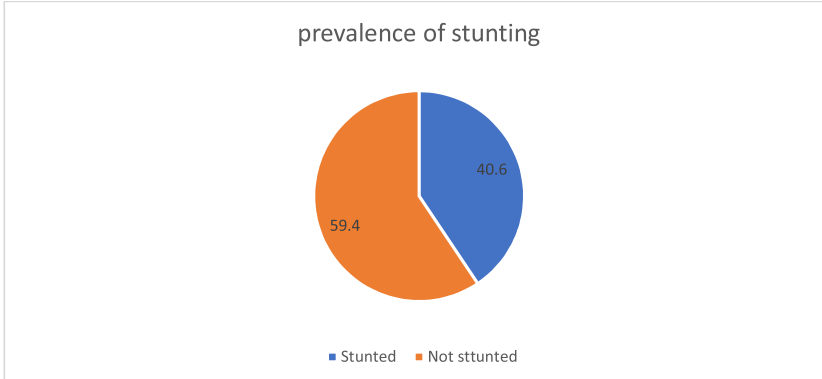

Fig. 1. Prevalence of stunting among primary school-age children in Gedeo zone, South, Ethiopia, 2021.

Table 3
Factors associated with stunting among school-age children (n = 500), Gedeo zone, Southern Ethiopia, 2021.

Risk factors	categories	Stunting Yes	No	COR (95% CI)	AOR (95% CI)	P value
Age (years)	6–9	34	147	1	1	
	10–14	169	150	4.87 (3.24, 8.29) *	3.48 (2.04,6.16)	0.01
Grade	1–4	99	194	1		
	5–8	104	103	1.95 (1.19, 2.62) **		
Mother education	Illiterate	82	77	3.086 (1.85, 3.90) *	2.49 (1.23, 4.06)	0.01
	Elementary	56	75	2.17 (1.77, 3.25) *	2.19 (1.17, 3.91)	0.03
	Secondary	46	90	1.472 (1.56, 2.65) *	1.39 (1.07, 2.86)	0.04
	College	19	55	1	1	
Type of family	Monogamy	144	262	1	1	
	Polygamy	59	35	3.06 (2.75,6.21) *	2.94 (1.84,4.72)	0.01
Staple food	Enjera	41	134	1		
	Encet	101	216	1.52 (1.03, 2.33) **		
	Other	2	6	1.08 (0.51, 1.60)		
dietary diversity	Adequate	54	121	1	1	
	Inadequate	149	166	2.01(1.79,3.81) *	2.0 (1.64,3.54)	0.03
Meal frequency	<3	16	26	0.92 (0.96, 128) **		
	greater than3	187	271	1		
Illness in the last two weeks	Yes	126	172	1.28 (1.46, 2.03) **		
	No	77	135	1		
Family size	≤4	14	43	1	1	
	≥5	189	254	2.28 (1.61, 5.17) *	2.18 (2.06, 4.49)	0.03

Not: *= $p < 0.05$, ** = $p < 0.01$, a = adjusted model, Note: AOR = Adjusted Odds Ratio; CI = Confidence Interval, COR = Crude Odds Ratio.

4. Discussion

4.1. Prevalence of stunting

The nutritional status of schoolchildren is critical for improving their health and academic performance through appropriate intervention strategies. However, 40.6% of children were stunted in this study. This means that more than one-third of schoolchildren in this age group did not have access to adequate nutrition in the study area. This may make children more prone to disease and infection and impede their mental and physical development, making them more likely to be stunted and less likely to reach their full height and cognitive potential than normal children.(Coffey, Deaton, Drèze, Spears, & Tarozzi, 2013). This study was remarkably similar to other studies conducted in northwestern Ethiopia (37.9%) (Lisanu Mazengia & Andargie Biks, 2018) and Beirut where 41.9% of children were stunted (SHAAR & SHAAR, 1993). Furthermore, a study conducted in East Gojam, Ethiopia, discovered that 48.1 percent of students were stunted (Zelellw, Gebreigziabher, Alene, Negatie, & Kasahune, 2014), which was consistent with the current study. This could be due to the study participants' similar socioeconomic backgrounds. It is likely to share some of the culture's foods.

However, the current study's findings were lower than the study done in southern Ethiopia at Welayita Sodo, which found that the majority of children aged 6 to 12 were stunted (57 percent). (Bogale, Bala, Tadesse, & Asamoah, 2018). This difference could be explained by variation in the study area; the prior study included only rural populations in the district, whereas the current study included randomly selected participants, including urban children. Furthermore, the finding of this study was higher than that of the study conducted in Lagos, Nigeria, which demonstrated that only 17.4% of children in this age group were stunted. This could be explained by the fact that adolescents were included in the previous study (conducted in Nigeria). This study is also higher than the study conducted in eastern Ethiopia, where only 8.9% of children were stunted (Mesfin, Berhane, & Worku, 2015). This disparity may be explained by the presence of social instability as a result of conflict among the societies in this study area, which may force society to displace by leaving their property elsewhere. It could be a refugee camp or a relative's home, where getting daily food is difficult, resulting in hunger. Furthermore, the dominance of a specific cultural food known as "ENSET," whose nutritional value is unknown in the current study area, could explain it.

This study's findings are also higher than those of previous studies in China (A. Tariku et al., 2019) and Mexico (Monarrez-Espino, Martinez, Martínez, & Greiner, 2004) where only 11.68% and 22.3 percent of children were stunted, respectively. The socioeconomic status of the participants may explain why the current study was higher than previous studies. Since Ethiopia is a developing country, The current study was also higher than previous studies done in West Bengal and North

Sumatera, Indonesia, where stunting affected 23.0 percent and 32.8 percent of schoolchildren, respectively (Bose & Bisai, 2008; Lestari, Fujiati, Keumalasari, & Daulay, 2018). The disparity could be explained by the individuals' socioeconomic and cultural backgrounds, and the study's setting could also be a contributing factor.

This figure is also lower than that of a Pakistan study, which discovered that only 8% of children were stunted. The disparity may be due to socioeconomic and cultural differences between the two countries. It could also be due to the age group studied, as the previous study's children were all between the ages of 6 and 12. One of the reasons for the higher findings in this study could be that there is a link between age and stunting (Mushtaq et al., 2011).

4.2. Factors associated with stunting

Stunting due to poor nutritional status is associated with a variety of variables. According to this study, stunting is significantly associated with family type, age, dietary diversity, educational status of mothers or caregivers, and family size.

The age of children was significantly related to stunting in the current study. Children aged 10 to 14 years were four times more likely to be stunted than those aged 6 to 9 years. Similar results were found in a study of Pakistani primary school children, as well as in studies in Nigeria and Ghana (Darteh, Acquah, & Kumi-Kyereme, 2014; Mushtaq et al., 2011; Senbanjo, Oshikoya, Odusanya, & Njokanma, 2011) and the study conducted in northern Ethiopia (Getaneh, Melku, Geta, Melak, & Hunegnaw, 2019; E. Z. Tariku, Abebe, Melketsedik, & Gutema, 2018; Mitchell, 2000; Monarrez-Espino, Martinez, Martínez, & Greiner, 2004).

The similarity indicates that nutritional status in developing countries does not change over time, and neither does the constant pattern of stunting as children's ages change. It could also be explained that as children get older, their bodies' need for nutrients grows without an increase in nutrient supply, especially if they come from a low-income family (Shrimpton et al., 2001).

According to the current study, a school child from a polygamous family is more likely to be stunted than a child from a monogamous family. This implies that children from polygamous families are more likely to be stunted than their heterosexual counterparts (Morley, Bicknell, & Woodland, 1968) and Nigeria (Senbanjo et al., 2011). Polygamy is a common family setting in Ethiopia, with this type of family being most prevalent in the south (about 16 percent of the families were polygamous). The Gedio zone is one of the most common zones for this type of family setting (Tesfay, 2017). In a polygamous family, those from the lower socioeconomic group are particularly vulnerable. It usually has a larger population than monogamous (Afesha, 2016; Tekile, Woya, & Basha, 2019). With the persistent poverty and adverse economic conditions that exist within polygamous families, most women face financial hardships because additional families share the already existing resources (Tesfay, 2017). As a result, a child from a polygamous family is more likely to be stunted than a child from a monogamous family.

Dietary diversity is a significant risk factor for stunting. Children from low-nutritional-diversity families were more likely to have stunted growth than their peers. Dietary diversity is an important component of children's diet quality; eating a wider variety of foods and food groups is linked to higher dietary nutritional adequacy (Rah et al., 2010). A similar finding in Iran and India (Hooshmand & Udipi, 2013). Similar findings were found in Cambodia and Indonesia, where a diverse diet was associated with a reduction in stunting (Darapheak, Takano, Kizuki, Nakamura, & Seino, 2013; Mahmudiono, Sumarmi, & Rosenkranz, 2017). It could be explained by the fact that lack of diversity is a particularly severe problem among poor populations in the developing world, where diets are predominantly based on starchy staples with few or no animal products and only seasonal fruits and vegetables (Arimond & Ruel, 2004; Doustmohammadian et al., 2020). Everyone requires a range of foods to live a healthy life and meet basic nutrient requirements. Diverse diets may provide essential micronutrients as well as adequate energy. The majority of the micronutrients we require come from our daily diet, so eating a well-balanced diet rich in a variety of foods is essential. Due to a wide range of health issues and the rising prevalence of diet-related chronic diseases, dietary diversity is critical to preventing chronic disease, including stunting in children (Popkin, 2009).

In this study, educational status was significantly associated with child stunting, with a child whose mother could not read or write being more likely to be stunted than a child whose mother had a college education. The findings of this study were similar to the studies conducted in Ethiopia (Berhanu, Mekonnen, & Sisay, 2018), Nigeria (Senbanjo et al., 2011), Indonesia, and China (Jiang et al., 2015; Lestari et al., 2018). It is common for a literate mother to use scarce resources more wisely for the child's wellbeing than an illiterate mother with greater resources, as this wise use of resources helps to save for the future in case of drought, conflict, and/or loss of property or scarce resources, or a greater role of educated mothers in following the appropriate plan in making a greater share of household resources available to children (Kunwar & Pillai, 2002). It could also be due to the fact that women's education has an impact on their children's nutritional status as household health and nutrition providers (Arya & Devi, 1991). Educated mothers may also have greater decision-making ability and confidence at home and be more productive in improving their family's and children's nutritional status (Bairagi, 1980).

Stunting is strongly related to family size. In line with the findings of the Ethiopian study (Berhanu et al., 2018). This finding is consistent with research from Vietnam and Ghana, where children from families with more than two children are more likely to be stunted than children from families with fewer than two children (Beal et al., 2019; Darteh et al., 2014). Food scarcity increases with family size, especially in families with a fixed income source. The large family size would imply a lower amount of food available for each family member in comparison with smaller families with the same economic power. It could also be explained by the spread of infection or disease in this type of family due to the crowded nature of the environment with people, creating a favorable environment for disease transmission from a family member to a child, which could result in childhood malnutrition (Lisanu Mazengia & Andargie Biks, 2018).

4.3. Limitations of the study

The main limitation of this study was its cross-sectional design, which does not allow for cause-and-effect relationships. Furthermore, excluding children with physical deformities of limbs, spine, diseases, and mental defects from this study may have resulted in some selection bias.

5. Conclusions and recommendations

More than one-third of the children in elementary school were stunted in this study. A variety of factors have been linked to stunting as a result of poor nutritional status. Stunting was found to be significantly influenced by family type, child age, dietary diversity, mothers' or caregivers' educational status, and family size. The study's findings indicate the importance of stakeholder participation because this group of the population (children) is vulnerable to various problems related to parental dependency to meet their nutritional needs, and the wellbeing of society is most improved when investments are made in children. As a result, it is critical to implement school health and nutrition initiatives to improve the nutritional status of school-age children in the study area, as well as to consider a strategy to improve children's wellbeing through cross-cutting child wellbeing strategies with a special focus on vulnerable children. Empower vulnerable families (polygamous families, large families, and a lack of nutritional diversity) with stunted children to improve their children's home environments by assisting their parents in increasing their income and gaining access to local resources.

Consent for publication

Not applicable.

6. Availability of data and materials

All data included in this manuscript can be accessed from the corresponding author upon request through the email address.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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