Prevalence of Stunting and Associated Factors among School Age Children in Primary Schools of Haik Town, South Wollo Zone, North-Eastern Ethiopia, 2017

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Abstract

Background: Under-nutrition is the major public health problem in the developing countries including Ethiopia. This study aimed to investigate the magnitude of stunting and associated factors among school age children.

Methods: A school based cross-sectional study was conducted on 414 school age children in Haiyk town Primary schools, North eastern Ethiopia in May 2017. In this study, Stunting was defined as a child whose height for age Z-scores is below -2SD. Descriptive statistics, bivariate analysis to identify associated factors and multivariable logistic regression analysis were employed to control the effect of potential confounders. Variables with a p-value<0.05 in the multivariable model were identified as predictors of stunting.

Results: The prevalence of stunting among school age children was 44 (11.3%) with Z-scores below-2SD and 83.7% of students were categorized under 16.5-18.5 body mass index. Multivariable logistic regression analysis showed that increased child level of education (AOR 4.028; 95% CI 1.72, 9.42), did not have additional food during study time (AOR 2.12; 95% CI 1.10, 4.12) and use of mixed food (AOR 0.20; 95% CI 0.06, 0.70) have been found significant associated with stunting.

Conclusion: The study revealed that magnitude of stunting among school age children was suboptimal. Therefore, interventions could focus on educating parents on the importance of timely feeding, balanced diet; economize use of the available resources. Further analytic studies should be conducted to investigate the causes of stunting among school children in the study area.

Introduction

Malnutrition is one of the major public health emergency problems of the developed and developing nations but undernutrition in the form of stunting is the primary problem of developing countries. Globally, more than 155 million under five children suffer from stunting. Of these, more than 90% of the world's stunted children live in Africa and Asia. Every year, 3.5 million children die due to malnutrition-related causes [1].

Stunting (low height-for age) is acknowledged as the best indicator for child growth. It indicates chronic under-nutrition and reflects the cumulative effects of under-nutrition and recurrent infections. Stunted children are more likely to repeat grades in school or dropout [2].

In 2016, approximately 23% of school age children (5-14 years) were stunted worldwide. Of these, more than 37% suffering from stunting are found concentrated in Eastern Africa [3]. Studies conducted in different regions of Ethiopia showed that the prevalence of stunting among children ranges from 7.9% to 45.8% [4-12].

School age is the active growing phase of childhood; it represents a dynamic period of physical growth as well as of mental development of the child. Health problems due to miserable nutritional status in school-age children are among the most common causes of low school enrolment, high absenteeism, early dropout and unsatisfactory classroom performance in developing countries including Ethiopia [2,10]. The nutritional status of school aged children impacts their health, cognition and subsequently their educational achievement [4].

Even though different strategies, policies and nutrition programs were tried to solve the malnutrition related problems both at global and national levels, stunting among children is still a public health problem. On the other hand, the interventions and evidences were merely focusing on the nutritional status of under-five children [11,13-15]. On top of this, little attention was given to know the magnitude of stunting among school age children.

Therefore, Studies to address the prevalence and predictors of malnutrition among school age children is highly demanded since the future of the society depends on the childhood nutritional status. However, researches linking stunting to School age have not been conclusive and Most of the researches were also conducted in developed countries. There is only little study having conducted to

assess the magnitude of stunting in school age children. Therefore, this study aimed to generate more information and subsequently to determine the prevalence and associated factors of stunting among school age children in the study district.

Methods and Materials

Study setting and period

The study was conducted in Haik district in May 2017. The district is located in South Wollo zone, Amhara region which is 430 Km away from the capital city, Addis Ababa. The town has 05 kebeles (01 urban and 04 rural) and has a total population of 73,869, of which 19,785 are urban and 54,084 are rural residence [16]. About 96% of the population uses agriculture as means of income. The town is known as tourism site with two lakes (Logo haik and Ardebo) and Haik Stefano's Monastery. The town has one Governmental Health center, 2 private pharmacies, 05 general primary schools, 01 Comprehensive secondary school and 01 preparatory school. The common staple foods in the study area are teff, peas and corn.

Study design

School based quantitative cross-sectional study design was employed to assess prevalence and associated factor of stunting among school age Children in Haik town primary school, South Wollo Zone, North Eastern Ethiopia, 2017.

Sample size determination

A total of 414 sample sizes were determined by using Epi info version 7.0 with 95% confidence interval, the target population were 662 total school children, margin of error 3% and 43% prevalence of stunting among children in rural areas of north Ethiopia.

$$n = \frac{z^2_{\alpha/2} \, p(1-p)}{w^2}$$

n=414

Z value of 1.96 used at 95% CI and margin of error 5% (n=sample size, p=prevalence, w=margin of error (5%).

Sampling procedure

Haik district has a total of 05 kebele (one urban and 04 rural) and one primary school was selected from each kebele with lottery method. The selected schools have a total of 8 sections. The study participants were recruited randomly by using the student's ID number from those who enrolled in the school during that semester.

All children who were in the age range of 5 to 14 years of age and actively attending their school during the study period were included in the study. Children with permanent physical disability (kyophosis, lordosis and scolosis), those children who were seriously ill during the study period and those who were not permanently resident in the study area were excluded from the study.

Data were collected by five BSc nursing students using a pre-tested, structured, and standardized and interviewer administered questionnaire. In this study stunting was assessed by using anthropometric measurements such as middle upper arm circumference (MUAC), height for age, head circumference, and weight of children. The data were collected from both parents and children. The questionnaire was prepared first in English and translated into Amharic (the local language), and then back into English to check its consistency. The final local language version of the questionnaire was used to collect the data.

Study variables

In this study, the dependent variable was stunting among school age children (5-14 years of age). Stunting was defined as children with height for age Z-scores below-2SD. The independent variables were child characteristics (age, sex, educational attending, height, weight, medical conditions), mother's and father's characteristics (educational status, religion, occupation, marital status, and ethnicity), and household characteristics (household head, household income, frequency of feeding, food availability, and family size).

Data quality control

BSc nurses were recruited as data collectors. The data collectors were trained for 2 days on the study instrument, anthropometric measurements, consent form, how to interview and data collection procedures. The questionnaire was pretested, and then the pretest amendments were made accordingly. The supervisors (two health professionals having a master's degree) had checked the day to day activity of data collectors regarding the completion of questionnaires, clarity of responses and proper coding of the responses.

Data management and analysis

The data were checked for completeness and inconsistencies. It was also cleaned, coded and entered on to Epi-Data version 3.1.5, then exported to SPSS 20.0 statistical package for analysis. Univariable logistic regression analysis was performed. The crude odds ratio (COR) with 95% confidence interval was estimated to assess the association between each independent variable and the outcome variable (stunting). Variables with p-value<0.25 in the univariable logistic regression analysis were considered in the multivariable logistic analysis. The Hosmer-Lemes how goodness-of-fit with enter procedure was used to test for model fitness. Adjusted Odds Ratio (AOR) with 95% confidence interval was estimated to assess the strength of the association, and a p-value<0.05 was used to declare the statistical significance in the multivariable analysis. Variables with p-value<0.05 in the multivariable logistic regression analysis were considered as significant and independent predictors of stunting.

Operational definition

Under-nutrition children: Children with any of the three forms of malnutrition (stunting, underweight or wasting).

School age children: A child with age of 5 to 14 years old

Stunting: A child whose height for age Z-scores is below-2SD [6]

Food surplus: Community with adequate amount of food to eat at least three times per day (7 am for breakfast, 12 am for lunch and 6 pm for dinner).

Ethical considerations

The study was approved by Alkan Health Science College, Department of Public health (no approval numbers are given). An

official letter was written from the department to Haik town education Office. The participants enrolled in the study were informed about the study objectives, expected outcomes, benefits and the risks associated with it. A written consent was taken from the participants before the interview. Confidentiality of responses was maintained throughout the study.

Results

Socio-demographic characteristics of participants

A total of 388 parent-children pairs were included in the study with the response rate of 93.7%. Majority of the study participants were Amhara ethnicity (82.5%), the age of the majority children ranges from 12 to 14 years, female children accounts 51%, nearly half of the respondents were orthodox religion followers (46.4%), the household monthly income ranges from 1000-2500 ETB, 65.2% of respondents were using own product source of food and the majority of parents were farmers (Table 1).

Variables		Frequency	Percentage
Age of child	5-8	109	28.1
	9-11	103	26.5
	12-14	176	45.4
	Total	388	100
Sex of child	Female	190	49
	Male	198	51
	Total	388	100
Educational Level of child	1-4	186	47.9
	5-8	202	52.1
	Total	388	100
Religion	Orthodox	180	46
	Muslim	169	43
	Catholic	7	1.8
	Protestant	4	1
	Other	1	0.3
	Total	388	100
Family Size	Less than 6	309	79.6
	6 and above	79	20.4
	Total	388	100
Occupation of Father	Merchant	124	31.9
	Government Employee	77	19.8
	Employee in NGO	18	4.6
	Daily Worker	22	5.6
	Farmer	144	37.1
	Other	3	0.7
	Total	388	100
Occupation Of Mother	Merchant	76	19.6
	Employee in GOV.	57	14.7
	Employee in NGO	12	3.1
	Daily Worker	14	3.7
	Farmer	91	23.5
	Other	138	35.6
	Total	388	100
Educational Status (Father)	Illiterate	112	28
	Primary Education	98	25.2
	Secondary Education	115	29.6
	College And Above	63	16.2
	Total	388	100
Educational Status (Mother)	Illiterate	131	33.7
	Primary Education	99	25.5
	Secondary Education	124	31.9
	College and Above	34	8.7
	Total	388	100
Monthly income (birr)	1000-2500	135	34.8
	2600-3500	118	30.4
	3600-5000	90	23.2
	5000 and above	45	11.6
	Total	388	100
Ethnicity	Amhara	320	82.5
	Tigray	44	11.3
	Oromia	20	5.2
	Others	4	1
	Total	388	100

Table 1: Socio demographic characteristics of school age children, Tehuledere primary school, Haik District, South Wollo Zone, North East Ethiopia, June 2017.

Feeding habit of respondents

Of the total 388 respondents, 320 (82.6%) were eating three and more times per day but the rest 68 (17.4%) respondents were eating less than three times per day (Table 2).

Variables		Frequency	Percentage
Feeding habit per day	One time	1	0.3
	Two times	67	17.1
	Three times	229	59
	Four & above	91	23.6
	Total	388	100
Staple food item for the household	Teff	200	51.8
	Sorghum	80	20.2
	Barley	108	28
	Total	388	100
Common source of food for the household	Own product	253	65.2
	Purchase	105	27.1
	Mixed source	30	7.7
	Total	388	100

Table 2: the feeding habit of the study subjects per day, Haik district, Tehuledere Primary school, South Wollo Zone, North Eastern Ethiopia, June 2017.

Medical conditions and sanitation practice of respondents

The study found that 265 (68.2%) and 227 (58.5%) of the respondents did not have previous history of chronic illnesses and acute illness in the last 1 month respectively. Majority of the respondents 235 (60.5%) were using pipe water as a source of drinking water but 302 (77.8%) of respondents had no modern latrine in their house and more than 50% of them never washed their hands after visiting toilet (Table 3).

Variables		Frequency	Percentage
Chronic diseases (TB, HIV, DM, Cardiac and HTN)	Yes	123	31.8
	No	265	68.2
	Total	388	100
Acute illnesses (fever, cough, diarrhea, measles, pneumonia..)	Yes	161	41.5
	No	227	58.5
	Total	388	100
Source of drinking water	Pipe water	235	60.5
	Spring	103	26.5
	River water	50	12
	Total	388	100
Modern latrine	Yes	86	22.2
	No	302	77.8
	Total	388	100
Wash hands after toilet use	Yes	197	50.7
	No	191	50.3
	Total	388	100

Table 3: The medical conditions and sanitation practice of the respondents in the last 1 month, Haik district, Tehuledere Primary school, South Wollo Zone, North Eastern Ethiopia, June 2017.

Substance use among parents

In this study, 6.7%, 13%, 8.5% of respondents have history of drinking alcohol, chewing chat and smoking cigarettes respectively (Table 4).

Substance Use Behavior		Frequency	Percentage
Drinking alcohol	Yes	26	6.7
	No	362	93.3
	Total	388	100
Chewing Chat	Yes	51	13.1
	No	337	86.9
	Total	388	100
Smoke cigarette	Yes	33	8.5
	No	355	91.5
	Total	388	100

Table 4: Substance use among parents of Hayik primary school students, Haik town, South Wollo Zone, North Eastern Ethiopia, June 2017.

Anthropometric measurement of students

Of the total 388 respondents, 44 (11.4%) of students were stunted and majority of students (83.7%) categorized between 16.4-18.4 BMI (Table 5).

Variable		Frequency	Percentage
Body Mass Index (BMI)	<16.4	26	6.7
	16.5-18.4	325	83.7
	18.5-24.9	37	9.5
	Total	388	100
Stunting status	Not-stunted (≥ -2SD)	344	88.6
	Stunted (< -2SD)	44	11.4

	Total	388	100

Table 5: Prevalence of stunting among School age children in Hayik General primary school students, Haik district, North Eastern Ethiopia, June 2017.

Factors associated with stunting

The binary logistic regression analysis of the dependent variable with each independent variable revealed that age of students (COR 3.39; 95% CI 1.36, 8.45), father educational status (COR 3.96; 95% CI 1.12, 13.95), students grade level (COR 4.39; 95% CI 1.90, 10.11), source of food for the household (COR 3.78; 95% CI 1.12, 12.71), and additional food during study time (COR 1.92; 95% CI 1.02,3.61) were significantly associated with stunting at P value<0.25. Moreover, the result of the multivariable logistic regression analysis showed that students increased level of education, using mixed source of food for the household and unable to have additional food during study were the only factors significantly associated with stunting at P value<0.05 (Table 6).

Nutritional status				
Explanatory Variables	Stunted N (%)	Not stunted N (%)	Crude (95% CI)	Adjusted (95% CI)
Age				
5-8 years	6 (1.5%)	103 (26.5%)	1	1
9-11 years	9 (2.3%)	94 (24.2%)	1.644 (0.5644.793)	0.839 (0.256,2.751)
12-16 years	29 (7.5%)	147 (37.9%)	3.387 (1.357,8.451)*	0.897 (0.070,11.554)
Child level of Grade				
1-4	7 (1.8%)	156 (40.2%)	1	1
5-8	37 (1.5%)	188 (48.5%)	4.386 (1.902,10.112)**	4.028 (1.722,9.419)**
Educational status (father)				
Illiterate	11 (2.8%)	101 (26.0%)	2.178 (0.584,8.121)	1.098 (0.250,4.830)
Primary	11 (2.8%)	87 (22.4%)	2.529 (0.677,9.450)	1.652 (0.412,6.616)
Secondary	19 (4.9%)	96 (24.7%)	3.958 (1.123,13.950)*	2.4 (0.630,9.140)
College and above	3 (0.8%)	60 (50.5%)	1	1
Source of food for the household (mixed food)				
Own product	34 (8.8%)	195 (50.3%)	1	1
Purchase	7 (1.8%)	84 (21.6%)	3.778 (1.123,12.711)*	0.56 (0.232,1.347)
Both	3 (0.8%)	65 (16.8%)	1.806 (0.449,7.254)	0.20 (0.058,0.695)*
Got additional food during study time				
Yes	21 (5.4%)	219 (56.4%)	1	1
No	23 (5.9%)	125 (32.2%)	1.919 (1.021,3.607)*	2.117 (1.091,4.107)*
* P-value less than 0.05 ; ** P-value less than 0.01				

Table 6: Factors associated with stunting among School age children in Hayik primary school, Hayik town, South Wollo, North Eastern Ethiopia, 2017.

Discussion

The aim of this study was to assess the prevalence and associated factors of stunting among school age children in primary schools of Hayik town. The prevalence of stunting among the school age children (5-14 years) in this study was 11.4% which is lower than prevalence of stunting among school age children in Adama City, Oromia region, Ethiopia (15.6%) [4], the prevalence of stunting among under-five children in rural areas of Ethiopia (40%) [5], prevalence of stunting among children in Yemen (62.6%) [17], stunting among children in Bure district East Gojjam(24.9%) [6], Fogera and Libo Kemkem District, north Ethiopia was (42.7%) [18]. The discrepancy may be due to the surplus of food in the study area.

But the prevalence of stunting among school age children is higher than the study conducted in Eastern Ethiopia (8.9%) [11], whereas the prevalence of stunting in Ethiopia revealed by Meta-analysis of EDHS of Sub-Saharan was 8.7% [8]. The discrepancy might be due to sample size, socioeconomic and difference in study design.

The finding of this study revealed that inappropriate child feeding practice was strongly associated with stunting. Those students who were not eating additional foods during studying were 2.1 times more likely to be stunted compared with those who were eating additional foods during their home study. This is similar with meta-analysis conducted in 2017 [7], study conducted in Mozambique [19], the study conducted in Machakel district, north Ethiopia [20], case control study conducted in Shashogo district [21], and study conducted in North Wollo Zone, Ethiopia. This is due to high energy demand of human brain beyond other catabolic demand of human body.

Stunting was also found to be associated with increased level of education. Students from Grade 5-8 were 4 times more likely to be stunted than students under grade five. Even though there are no other studies supporting this finding, this may be due to age difference and the stunting is one of the chronic features of under nutrition. On the other hand, as age increases the students' engagement with laborious works to help their parents also increase. On the other way those children whose age is below 5 years; they might get adequate care by their families due to their early age. These may predispose to stunting.

Mothers of children during gestation or lactation were not faced any infection, malnutrition and it was not considered as cofounders in this study. Regarding with the factors like sleep condition, gender bias and meal time were not associated with stunting in this study. Protein ratio was not done but we used questionnaires (interviewing) technique to assess stunting.

In this study, using mixed source of food at household level was found protective for stunting but no other study supporting this finding. This might be due to variety of foods as preventive for stunting because it might have more protein diet in the mixed food type.

The study could have the following limitations. Firstly, it was difficult to establish a cause-effect relationship. Secondly, the information obtained from parents might be subject to recall bias. Finally, the study also shares the limitation of cross sectional study design. However, due attention was given to the study procedures, including the process of training, and close supervision throughout the field activities.

Conclusion

The study revealed that prevalence of stunting among school age children is still high despite of surplus food in the study area. Increasing age of children, increased level of education and unable to feed during study time were the identified risk factor for stunting but use mixed source of food was preventive for stunting. Therefore, interventions could focus on educating mothers the importance of timely feeding, balanced diet; economize use of the available resources. Further analytic studies should be conducted to investigate the under lying causes of stunting among school age children in the study area.

Competing Interests

All authors declare that they have no competing interests

Authors' Contributions

All authors conceived and designed the study. SK, HC and DT supervised the data collection. YM and AW performed the data analysis, interpretation of data and drafted the manuscript. AW, YM and DT assisted in data interpretation and critically reviewed the manuscript. All authors read and approved the final manuscript.

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