

Nutritional status and associated factors among primary school students, in Meket Wereda, Ethiopia: comparing schools with feeding and non-feeding program

Yeshalem Mulugeta Demilew (✉ yeshalem_mulugeta@yahoo.com)

Bahir Dar University

Azezu Asres Nigussie

Bahir Dar University

Research article

Keywords: School feeding program, primary school, student, nutritional status

Posted Date: April 22nd, 2020

DOI: <https://doi.org/10.21203/rs.2.12672/v2>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Version of Record: A version of this preprint was published on August 11th, 2020. See the published version at <https://doi.org/10.1186/s40795-020-00358-3>.

Abstract

Background: Though undernutrition affects academic performance significant numbers of Ethiopian school children have undernutrition. To avert nutritional problems the government in collaboration with the world food program has implemented a school feeding program. However, data on the nutritional status of primary school students were scarce in the country. Therefore, this study aimed to compare the nutritional status of primary school students enrolled in schools with school feeding programs and in schools without school feeding programs and to identify associated factors in Meket Woreda.

Methods: A school-based comparative cross-sectional study was conducted among 1,091 students, from April 1-27/2015. The study participants were selected using a multi-stage stratified sampling method. A structured questionnaire was used to collect data. Data entry and analysis were done using SPSS version 20 software. Descriptive statistics and logistic regression analyses were done. Anthropometric data were analyzed using Anthro-plus software.

Results: The prevalence of thinness was 37.5% among students in non school feeding program schools compared with 27.8 % among students in School feeding program schools. Though it wasn't significant after adjusting for the potential confounders, the prevalence of stunting among students who took meals at school was higher (58.5%) compared with students who did not consume meals at school (48.3%).

Students who did not take meal at school [AOR=2.6, 95% CI: (1.8, 3.8)], having uneducated mother [AOR=5.3, 95% CI: (2.2, 12.6)], being a male [AOR=1.9, 95% CI: (1.4, 2.5)], and taking meal once daily [AOR=2.7, 95% CI: (1.6, 3.9)] were positively associated with thinness.

Conclusion: The prevalence of thinness was higher among students in schools did not implement school feeding programs compared to their counterparts. Thus, school meal program should be scaling up into schools in food insecure areas.

Background

School feeding is the provision of meals to students in class or take-home ration to families with children who attend school regularly (1). Appropriately designed school feeding intervention improves the nutritional status of school children who suffer from nutrient gaps. It improves cognitive function, school attendance, academic performance, school enrolment and decreases school dropout rates (2-5).

Many developing countries have implemented School Feeding Programs (SFPs) to prevent malnutrition (3, 4). Because, malnutrition reduces student's attentiveness, concentration, aptitude, attendance rate, school enrolment and academic performance. All these, in turn, have significant adverse effects on their productivity and quality of life during the adulthood period (5-8). Not only malnourished but also well-nourished children who are hungry at school encounter difficulties to concentrate and perform complex tasks in the class (9, 10).

According to studies done in Bangladesh, Jamaica, and Kenya, the nutritional status of students who took meals at school was better than students who did not take meals at school (11-14). However, in Ghana, the nutritional status of students who took meals at school was similar to students who did not take meals at school which was inconsistent with the above study findings (15).

In Ethiopia, undernutrition among school children is a major public health concern. The prevalence of stunting ranges from 41.9% in Arba Minch to 17.1%, in Hararghe zone (16, 17). The magnitude of thinness was 17.9%, in Hararghe zone and 8.0% in Arba Minch (16, 17). The prevalence of undernutrition was high in the region where this study was conducted. According to a study in Gondar Town 46.1% and 9% of primary school students were stunted and wasted, respectively (18).

In the country, a world food program (WFP) sponsored school feeding program was started in 1994, with an initial pilot project in war-affected zones in the Tigray region. So far, the Ethiopian SFP provides school meals for students in six regions of the country (Afar, Amhara, Oromiya, Somali, Tigray and Southern Nations and Nationality Peoples Region). In the country, target areas to implement SFP were woredas (the third-level administrative divisions in the country) with chronic food insecurity, lower school enrolment and higher gender disparity (19).

Meket Woreda is one of the food insecure woredas in North Wollo Zone. In the woreda, SFP was implemented in 1995. Due to limited support from the donors, SFP was implemented in five schools with high school dropout rates and transport access. The program provides 120 gram fortified blended food with 6gram vegetable oil and 3gram iodized salts. The meal was served for the students in the form of porridge, once a day, on the school days.

Research-based information regarding the nutritional status of Ethiopian children who took meals at school was limited. Thus, this study was designed to compare the nutritional status of students who took meals at school and those who did not take meals at school and identify factors associated with undernutrition.

Methods

Study area

The study was conducted in Meket Woreda, Ethiopia. According to the 2007 Central Statistics Agency report, the woreda has a total population of 226, 644. From which, 112,246 are females. The woreda was identified as one of the most drought-affected and food insecure woreda in the Amhara Region. According to the woreda education bureau report, in the woreda, there are 50 full-cycle primary schools with 51,869 students. Of these, the SFP was implemented in 5 schools with 5,079 students.

Study design and population

A school-based comparative cross-sectional study was conducted among primary school students, from April 1-27/2015. All full-cycle primary school students in the woreda were the source population. Students

in selected schools during the study period were the study population. In the study area, the school meals were given to the students starting from grade one. Students from grade four and above (students who took school meals three or more years) were included in this study. Similarly, students from grade four and above were also included in schools had no school feeding program. Students who transferred from other schools and not available during the data collection period were excluded from the study.

Sample size, sampling procedure, and data collection

The required sample size of the study was calculated using two population proportion formulas considering the following assumptions: a 95% confidence level and 80% power, 50% proportion of undernutrition among students who did not take meals at school and 40% proportion of undernutrition among students who took meals at school since there was no previous study. The population allocation ratio is 1:2; the design effect of 2 and 10% non-response rate was added. The final sample size was 1176. Of these, 392 students were from schools had no SFP and 784 students were from schools had SFP.

The study participants were selected using a multi-stage stratified sampling method. Using a list of kebeles (the smallest administrative unite in Ethiopia) as a sampling frame, 12 kebeles were selected from 45 kebeles in the woreda by simple random sampling (SRS) technique (lottery method). Next, schools in selected kebeles were stratified as the SFP schools have and non SFP schools.

In selected kebeles, there were 12 schools (8 schools without SFP and 4 schools with SFP). Two schools with SFP and four schools without SFP were selected by the SRS technique using the list of schools in selected kebeles as a sampling frame. The calculated sample size was allocated to the selected schools based on proportion to the size of the students from each school. Finally, using the school registration logbook as a sampling frame, students were selected by the SRS technique. The interview with students' mothers was conducted in the school compound considering privacy.

Data were collected by the Amharic version (local language) structured interviewer-administered questionnaire. The questionnaire was taken from similar literature (20) and it included socio-demographic characteristics, environmental hygiene, and feeding practice related questions. Feeding practice was assessed using a 24hour recall method. Eight diploma and two BSc nurses were recruited as data collectors and supervisors, respectively.

The weight and height of the students were measured using SECA Germany weighing Scale and stadiometer, respectively. During weight measurement, weighing scales were calibrated each day prior to the actual data collection using a known weight material. Weight was measured to the nearest 0.1kg using a digital scale. The scale was adjusted before weighing every student by setting it to zero. The students were lightly dressed during having the weight taken.

Height was measured to the nearest 0.1 cm. During taking height, each student stood keeping normal anatomical position without shoes and heels, buttock, shoulder, and back of the head touched measuring

board. Then, the headpiece of the measuring board touched the top of the head. For both weight and height, two readings were recorded and the computed averages were used in the analysis.

The z-score values for BMI-for-age and height for age were calculated using WHO Anthro-Plus software. Calculated z-scores of BMI-for-age and height for age were used to classify thinness and stunting using the new WHO 2007 reference value, respectively.

Operational definition

School feeding program (SFP) participants- are students who took meals at school.

School feeding program (SFP) non- participants- are students who did not take meals at the school.

Height-for-age at ≤ -3 SD, ≤ -2 SD and > -2 SD of the median value of the WHO international growth reference were defined as severely stunted, stunted and not stunted, respectively.

BMI-for-age at ≤ -3 SD, ≤ -2 SD, between $+1$ SD and > -2 SD, between $>+1$ SD and $+2$ SD and $>+2$ SD of the median value of the WHO international growth reference were defined as severely thin, thinness, normal, overweight and obesity, respectively(21).

Data Quality Control

Using trained data collectors and supervisors, pre-testing the questionnaire and checking the weighing scale for functionality were measures taken to assure the quality of data. Moreover, the collected data were reviewed and errors were returned to the data collectors for correction on a daily base. Supervisors and investigators closely supervised the data collection procedure.

Data processing and analysis

Data were entered and analyzed using SPSS version 20 software. The nutritional status of the students was compared. Bivariate and multivariable logistic regressions were done to identify factors associated with stunting and thinness. Hosmer-Lemeshow Goodness-of-fit-test

was done to check model fitness. Correlation between independent variables was checked using the Pearson Correlation Coefficient. The model was built with backward elimination. The crude Odds ratio was done and p-value ≤ 0.2 was taken as a cut-off point to select variables for the final model. Age was controlled during the multivariable logistic regression analysis. The adjusted Odds ratio was computed to determine the strength of association and control confounders. The p-value of less than 0.05 was considered statistically significant.

Ethical approval

The study was approved by the Ethical Review Board of Bahir Dar University. A letter of permission was taken from zonal and woreda health bureaus as well as the school administrators. Since it causes less

than minimum risk, verbal consent was taken from parents and assent was taken from students. Privacy and confidentiality were maintained throughout the study period by excluding personal identifiers from the data collection tools.

Results

Socio-demographic characteristics of the students and their parents

A total of 1,091 primary school students were recruited in the study, with a response rate of 92.8%. Of which 65.8% (n =718) of them were from schools had SFP and 34.2 % (n = 373) of the study participants were from schools had no SFP. The mean (\pm SD) age of the respondents from schools had SFP and had no SFP were 12.12 (\pm 1.36) years and 12.73 (\pm 1.46) years, respectively (Table1).

The majority, 686(95.5%) of respondents from schools had SFP and 369(98.9%) of students from schools had no SFP were orthodox Christian followers. Almost all, 700(97.5%) of the study participants from schools had SFP and 370(99.2%) of students from schools had no SFP were Amhara in their ethnicity. In both groups, eighty one percent of students live with their both biological parents. Regarding their mothers, 636(88.6%) of students' mothers from schools had SFP and 343(92.0%) of students' mothers from schools without SFP had no formal education (Table 1).

Table 1 Socio-demographic characteristics of the primary school students and their parents, Meket Woreda, April 2015 (n=1091)

Variables	SFP schools =718	Non SFP schools =373	P-value
Age in years			
10-12	476(66.3)	174(46.7)	0.001
13-14	200(27.9)	153(41.0)	
≥15	42(5.8)	46(12.3)	
Sex			
Male	364(50.7)	176(47.2)	0.30
Female	354(49.3)	197(52.8)	
Religion			
Orthodox	686(95.5)	369(98.9)	0.005
Muslim	32(4.5)	4(1.1)	
Ethnicity			
Amhara	700(97.5)	370(99.2)	0.87
Agew	18(2.5)	3(0.8)	
Mother's Education			
Have no formal education	636(88.6)	343(92.0)	0.10
Have formal education	82(11.4)	30(8.0)	
Father's Education			
Have no formal education	626(87.2)	241(64.6)	0.001
Have formal education	92(12.8)	132(35.4)	
Mother's occupation			
Housewife	640(89.1)	266(71.3)	0.001
Daily laborer	38(5.3)	6(1.6)	
Petty trader	40(5.6)	101(27.1)	
Father's occupation			
Farmer	578(80.5)	336(90.1)	0.001
Petty trader	94(13.1)	30(8.0)	
Daily laborer	46(6.4)	7(1.9)	
Marital status of their mothers			
Married	638(88.9)	333(89.3)	0.96
Divorced	72(10.0)	30(8.0)	
Never married	8(1.1)	10(2.7)	
Currently living with			
Both biological parents	582(81.1)	301(80.7)	0.65
Their mothers	84(11.7)	49(13.1)	
Their grand parents	52(7.2)	23(6.2)	
Residence			
Urban	72(10.0)	31(8.3)	0.417
Rural	646(90.0)	342(91.7)	
Family size			
≤5	250(34.8)	84(22.5)	0.001
5-6	320(44.6)	215(57.6)	
>6	148(20.6)	74(19.9)	
Possession of Television			
Yes	90(12.5)	8(2.1)	<0.001
No	628(87.5)	365(97.9)	
Possession of Radio			
Yes	136(18.9)	31(8.3)	<0.001
No	582(81.1)	342(91.7)	

Have no formal education=respondents who did not attained any schooling, have formal education=respondent attained primary and above education, Petty trader= were respondents who sell goods on the street

Dietary intake, hygiene and sanitation of the primary school students

The proportions of students who took more than one meal (97.8%Vs94.4%) and wash their hands with soap (30.9%Vs14.5%) were higher among SFP schools compared to non SFP schools. The number of students who took other foodstuffs with Shero was higher in non SFP schools 253(67.8%) compared to SFP schools 126(17.5%). The proportion of students who used latrine (91.2%Vs57.9%) and drunk pipe/protected spring water (49.3%Vs10.6%) were also higher in non SFP schools than SFP schools.

Table 2 Dietary intake, hygiene and sanitation of the primary school students, Meket Woreda, April 2015 (n=1091)

Variables	SFP schools =718	Non SFP schools =373	P-value
Frequency of food intake at home per 24hour			
1times	16(2.2)	21(5.6)	0.006
>1times	702(97.8)	352(94.4)	
Frequent diet the child take at home			
Shero	592(82.5)	120(32.2)	<0.001
Shero, kik, meat, vegetable and milk	126(17.5)	253(67.8)	
Source of drinking water			
River/spring	642(89.4)	189(50,7)	<0.001
Pipe/protected spring	76(10.6)	184(49.3)	
Use latrine			
Yes	416(57.9)	340(91.2)	<0.001
No	302(42.1)	33(8.8)	
The child wash his/her hands with soap before eating			
Yes	222(30.9)	54(14.5)	<0.001
No	496(69.1)	319(85.5)	

Nutritional status of primary school students

The prevalence of thinness was higher among students who did not take meals at school 140(37.6%) than students who took meals at school 200(27.8%). The proportions of students with severe thinness were 70(9.7%) and 32(8.6%) in schools having SFP and in schools did not have SFP, respectively. On the other hand, the magnitude of stunting was higher among students in schools having SFP 420(58.5%) compared with students in schools did not have SFP 180 (48.3%). The prevalence of severely stunted students was 160(22.3%) among students who took meals at school compared with students who did not take meals at school 68(18.2%).

Factors associated with stunting in primary school children

In the bivariate logistic regression analysis not taking a meal at school, having a mother with no formal education, living in a household did not use a latrine, taking Shero at home frequently, drinking river or spring water, taking a meal once per day at home, being in Agew ethnic group and males were statistically associated with stunting (Table 3).

After controlling age, in the multivariable logistic regression analysis, taking meals at school was not associated with stunting. Being in the Agew ethnic group, taking Shero at home frequently, having a mother with no formal education, being male, drinking river or spring water and taking a meal once daily at home had a statistically significant association with stunting (Table 3).

Table 3 Factors associated with stunting among the primary school children, Meket Woreda, 2015

Variables	Stunting		COR (95%CI)	AOR (95%CI)
	Stunted(n=600)	Not stunted (n=491)		
Ethnicity				
Amhara	583(97.2)	487(99.2)	1.00	1.00
Agew	17(2.8)	4(0.8)	3.5(1.1,10.6)	3.9(1.2,12.3)
Educational status of the mother				
Have no formal education	555(92.5)	424(86.4)	1.9(1.3,2.9)	2.1(1.4,3.3)
Have formal education	45(7.5)	67(13.6)	1.00	1.00
Drinking water				
Pipe or protected	117(19.5)	143(29.1)	1.00	1.00
River and unprotected spring	483(80.5)	348(70.9)	1.6(1.2,2.2)	1.5(1.1,2.1)
Frequency of food intake at home per 24hrs				
1 times	28(4.7)	9(1.8)	2.6(1.2,5.6)	2.6(1.2,5.9)
>=2 times	572(95.3)	482(98.2)	1.00	1.00
Take meal at school				
Yes	420(70.0)	298(60.7)	1.5(1.1,1.9)	
No	180(30.0)	193(39.3)	1.00	
Sex of students				
Male	335(55.8)	205(41.8)	1.7(1.3,2.2)	1.6(1.3,2.1)
Female	265 (44.2)	286(58.2)	1.00	1.00
Family use latrine				
Yes	391(65.2)	365(74.3)	1.00	
No	209(34.8)	126(25.7)	1.5(1.1,2.0)	
Frequent diet the child take at home				
Shero	431(71.8)	281(57.2)	1.9(1.4,2.4)	1.7(1.3,2.3)
Shero, kik, meat, vegetable and milk	169(28.2)	210(42.8)	1.00	1.00

AOR =Adjusted Odds Ratio; COR=Crude Odds Ratio; 95%CI=ninety five percent confidence interval, Shero=stew made from legume flour, kik= split legumes stew

Factors associated with thinness in primary school children

In the bivariate logistic regression analysis having a mother and father with no formal education, being a male, taking Shero frequently at home, living in the household didn't have radio and television, having married and housewife mother, being a rural residence, taking a meal once daily at home, students who did not take meals at school and wash their hands before eating were statistically associated with thinness (Table 4).

After controlling for age, in the multivariable logistic regression analysis students who did not take meals at school were 2.6 times at a higher risk to develop thinness than their counterparts [AOR=2.6, 95% CI: (1.8, 3.8)]. Having mother had no formal education,

being male, taking a meal once a day at home, taking Shero frequently at home, living in a household have no radio and having a housewife mother were independent predictors of thinness (Table 4).

Table 4 factors associated with thinness of the primary school children, Meket Woreda, 2015

Variables	Thinness		COR (95%CI)	AOR (95%CI)
	Thin(n=340)	Not thin (n=751)		
Take meal at school				
Yes	200(58.8)	518(69.0)	1.00	1.00
No	140(41.2)	233(31.0)	1.5(1.1,2.0)	2.6(1.8,3.8)
Educational status of the mother				
Have no formal education	334(98.2)	645(85.9)	9.1(3.9,21.0)	5.3(2.2,12.6)
Have formal education	6(1.8)	106(14.1)	1.00	1.00
Possession of television				
Yes	10(2.9)	88(11.7)	1.00	
No	330(97.1)	663(88.3)	4.3(2.2,8.5)	
Possession of radio				
Yes	31(9.1)	136 (18.1)	1.00	1.00
No	309(90.9)	615(81.9)	2.2(1.4,3.3)	1.7(1.1,2.7)
Sex of students				
Male	208(61.2)	332(44.2)	1.9(1.5,2.5)	1.9(1.4,2.5)
Female	132(38.8)	419(55.8)	1.00	1.00
Educational status of the father				
Have no formal education	294(86.5)	573(76.3)	1.9(1.3,2.8)	
Have formal education	46(13.5)	178(23.7)	1.00	
Occupational status of the mother				
Housewife	330(97.1)	646(86.0)	5.3(2.7,10.3)	3.1(1.5,6.4)
Daily laborer and petty trader	10(2.9)	105(14.0)	1.00	
Frequent diet the child take at home				
Shero	255(75.0)	457(60.9)	1.9(1.4,2.5)	2.7(1.6,3.9)
Shero, kik, meat, vegetable and milk	85(25.0)	294(39.1)	1.00	1.00
Frequency of food intake at home /24hrs				
1 times	23(6.8)	14(1.9)	3.8(1.9,7.5)	3.5(1.6,7.6)
-->=2 times	317(93.2)	737(98.1)	1.00	1.00
The child wash his/her hand with soap before eating				
Yes	60(17.6)	216(28.8)	1.00	
No	280(82.4)	535(71.2)	1.8(1.3,2.5)	
Marital status of the mother				
Married	314(92.4)	657(87.5)	1.7(1.1,2.7)	
Divorced, never married	26(7.6)	94(12.5)	1.00	
Residence				
Urban	21(6.2)	82(10.9)	1.00	
Rural	319(93.8)	669(89.1)	1.8(1.1,3.0)	

Discussion

In this study, the prevalence of thinness was higher among students who did not take meals at school than students who took meals at school. After adjusted for the potential confounders also, taking a meal at school had a positive significant association with thinness. This finding was similar to the study findings in Western Kenya and Ghana (22-24) . The possible explanation is that students who took meals at school might have a higher probability of meeting their nutrient requirements than students who did not take meals at school.

On the other hand, this finding was not consistent with the study finding in Ghana (20). This discrepancy might be due to the difference in the quality and quantity of school meals. Moreover, this could be explained by the difference in income and knowledge of parents on nutrition and child care between Ethiopia and Ghana.

Though it wasn't significant after adjusting for the potential confounders, the prevalence of stunting was higher among students who took meals at school compared with students who did not take meals at school. This finding was similar to the study finding in Ghana (20). This might be due to the reason that students who participated in the SFP were more likely to be stunted starting from the first thousand days of life. Provision of nutrition supplement at school beyond the period of maximum growth may not be effective to recover from growth faltering because school age may be too old to experience catch-up growth.

This finding was not in agreement with the study finding in Western Kenya and Ghana (22, 23). This discrepancy might be due to differences in enrolment criteria of school feeding programs between Ethiopia and other countries. The quality and quantity of school meals may also differ between countries. Furthermore, it might be due to the difference in home background, nutrition and child care practice of parents between Ethiopia and other countries.

Students who had a housewife mother were more likely to be thin than students who had daily laborer or petty trader mother. This finding was supported by the study findings in central India and Okolobiri (25, 26). The possible explanation might be working mothers are more likely to have income and decision making power to purchase health service and food items.

The likelihood of both stunting and thinness was higher among boys compared to girls. Similar findings were reported from Jamaica, India and Sri Lanka (7, 9, 25). The reason might be due to high nutrient requirement of boys than girls. The Odds of having thinness was higher among the students whose family had no radio compared to their counterparts. This finding was supported by the previous study finding in Ethiopia (27). Families who had radio were more likely to get nutrition and child care related information through media than those who did not have a radio.

Students who had uneducated mothers and frequently took only Shero at home were more likely to develop stunting and thinned than their counterparts. This finding was supported by the study findings in Ethiopia, Egypt, Kenya, Bangladesh and India (11, 14, 25, 28, 29). In Egypt and Kenya (13, 28) students who took variety of foods were less likely to develop undernutrition. The reason for this might be the likelihood of students who took variety of foods to meet nutrient requirements than students who regularly take monotonous diets. Educated mothers have higher probability of being knowledgeable about feeding practice and health-seeking behavior. In this study, students in Agew ethnic group were more likely to be stunted than students in the Amhara ethnic group. This might be due to the poor socioeconomic status of their parents.

Strength and limitation: Comparative nature of this study among students who took meal at school and who did not take meal at school could be the strength of this study. However, the following limitations should be considered during interpreting the results. There may be an error in reporting children's age and dietary intake. Though we have tried to control for potential confounders there may be residual confounders from unmeasured variables. The nutrient and energy content of school meal were not assessed in this study.

Conclusions

The prevalence of thinness was higher among students who did not take meals at school than students who took meals at school. Though it was not significant after controlling potential confounders, the prevalence of stunting was higher among students in SFP schools than students in non SFP schools. Factors associated with stunting were being Agew in ethnicity, having uneducated mother, drinking river water, taking meal once a day at home, being a male, and taking Shero frequently at home. Whereas, students who did not take meal at school, have no radio, having uneducated mother, having housewife mother, taking meal once a day at home, being a male, and taking Shero frequently at home were positively associated with thinness.

Thus, the school meal program should be scaling up into schools in food insecure areas. Education needs to be given in improving the frequency and diversity of food at home by giving emphasis to illiterate and housewife mothers. Further study should be conducted starting from the window of opportunity and assessing nutrient and energy content of school meal.

Abbreviations

AOR-Adjusted Odds Ratio

BSC-Bachelor Science

BMI-Body Mass Index

COR-Crude Odds Ratio

SFP- School Feeding Program

WFP-World Food Program

Declarations

Ethical approval: The study was approved by Ethical Review Board of Bahir Dar University. Letter of permission was taken from zonal and woreda health bureaus as well as the school administrators. Since it causes less than minimum risk, verbal consent was taken from parents and assent was taken from students. Privacy and confidentiality were maintained throughout the study period by excluding personal identifiers from the data collection tools.

Consent for publication: Not applicable

Availability of data and materials: All the data related to this research are available in the text and tables

Competing interests: the authors declare that they have no competing interests

Funding: This research was funded by Bahir Dar University

Authors' contributions: YMD: Conceived and designed the study, conducted statistical analysis and result interpretation, prepared the manuscript. The author read and approved the manuscript. AAN: Conceived and designed the study, conduct data analysis and result interpretation, prepared the manuscript. The author read and approved the manuscript.

Acknowledgements

The authors are indebted to Bahir Dar University for financial support. We would like to thank the study participants for their participation. We would like to express our gratitude to the data collectors and supervisors for their time and full commitment.

Authors' information

YMD: BSC, MPH; PhD follow, working in Bahir Dar University, College of Medicine and Health Sciences, Bahir Dar, Ethiopia. AAN: BSC, MSC in Midwifery; working in Bahir Dar University, College of Medicine and Health Sciences, Bahir Dar, Ethiopia.

References

1. Aliyar R, Gelli A, Hamdani SH. A review of nutritional guidelines and menu compositions for school feeding programs in 12 countries. *Frontiers in public health*. 2015;3:148.
2. Bundy DA, Drake LJ, Burbano C. School food, politics and child health. *Public health nutrition*. 2013;16(6):1012-9.

3. Acham H, Kikafunda JK, Oluka S, Malde MK, Tylleskar T. Height, weight, body mass index and learning achievement in Kumi district, East of Uganda. *Sci Res Essay*. 2008;3(1):1-8.
4. Kolawole EB, Udeh DO. Correlation analysis between body height and academic performance of Ekiti state primary school pupils in mathematics scholastic aptitude test. *Universal Journal of Education and General Studies*. 2012;1(4):84-7.
5. Mhurchu CN, Turley M, Gorton D, Jiang Y, Michie J, Maddison R, et al. Effects of a free school breakfast programme on school attendance, achievement, psychosocial function, and nutrition: a stepped wedge cluster randomised trial. *BMC Public Health*. 2010;10(1):738.
6. Abotsi AK. Expectations of school feeding programme: Impact on school enrolment, attendance and academic performance in elementary Ghanaian schools. Abotsi AK (2013) "Expectations of School Feeding Programme: Impact on School Enrolment, Attendance and Academic Performance in Elementary Ghanaian Schools" *British Journal of Education, Society & Behavioural Science*. 2013;3(1):76-92.
7. Sarma M, Wijesinghe D, Sivananthawerl T. The effects of nutritional status on educational performance of primary school children in the plantation sector in Nuwara Eliya Educational Zone. *Trop Agric Res*. 2013;24(3):14-203.
8. Chinyoka K. Impact of poor nutrition on the Academic Performance of Grade Seven learners: A case of Zimbabwe. *children*. 2014;4(3).
9. Simeon DT, Grantham-McGregor S. Effects of missing breakfast on the cognitive functions of school children of differing nutritional status. *The American journal of clinical nutrition*. 1989;49(4):646-53.
10. Powell CA, Walker SP, Chang SM, Grantham-McGregor SM. Nutrition and education: a randomized trial of the effects of breakfast in rural primary school children. *The American journal of clinical nutrition*. 1998;68(4):873-9.
11. Ahmed AU. Impact of feeding children in school: Evidence from Bangladesh. Washington, DC: International Food Policy Research Institute. 2004.
12. Grantham-McGregor SM, Chang S, Walker SP. Evaluation of school feeding programs: some Jamaican examples. *The American journal of clinical nutrition*. 1998;67(4):785S-9S.
13. Mwaniki E, Makokha A. Nutrition status and associated factors among children in public primary schools in Dagoretti, Nairobi, Kenya. *African health sciences*. 2013;13(1):38-46.
14. Neervoort F, von Rosenstiel I, Bongers K, Demetriades M, Shacola M, Wolffers I. Effect of a school feeding programme on nutritional status and anaemia in an urban slum: a preliminary evaluation in Kenya. *Journal of tropical pediatrics*. 2013;59(3):165-74.
15. Danquah A, Amoah A, Steiner-Asiedu M, Opare-Obisaw C. Nutritional status of participating and non-participating pupils in the Ghana School Feeding Programme. *Journal of Food Research*. 2012;1(3):263.
16. Tariku EZ, Abebe GA, Melketsedik ZA, Gutema BT. Prevalence and factors associated with stunting and thinness among school-age children in Arba Minch Health and Demographic Surveillance Site, Southern Ethiopia. *PloS one*. 2018;13(11).

17. Mitiku H, Admassu D, Teklemariam Z, Weldegebreal F, Nigusse A. Nutritional status of school children in eastern Hararghe administrative zone, eastern Ethiopia. *Journal of Public Health*. 2019;27(1):111-8.
18. Getaneh Z, Melku M, Geta M, Melak T, Hunegnaw MT. Prevalence and determinants of stunting and wasting among public primary school children in Gondar town, northwest, Ethiopia. *BMC pediatrics*. 2019;19(1):207.
19. Haile G, Poppe R, Frölich M. School meals programme in Ethiopia: a mixed-methods based impact study. Final evaluation report, Addis Ababa: United Nations World Food Programme. 2011.
20. Prince AK, Laar A. Nutritional status of school-age children in the Nkwanta south district-Volta region of Ghana. *European Scientific Journal*. 2014;10(30).
21. Onis Md, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. *Bulletin of the World health Organization*. 2007;85:660-7.
22. Musamali B, Walingo MK, Mbagaya GM. Impact of school lunch programmes on nutritional status of children in Vihiga district, Western Kenya. *African Journal of Food, Agriculture, Nutrition and Development*. 2007;7(6).
23. Kwabla MP, Gyan C, Zotor F. Nutritional status of in-school children and its associated factors in Denkyemba District, eastern region, Ghana: comparing schools with feeding and non-school feeding policies. *Nutrition journal*. 2018;17(1):8.
24. Walingo MK, Musamali B. Nutrient intake and nutritional status indicators of participant and nonparticipant pupils of a parent-supported school lunch program in Kenya. *Journal of nutrition education and behavior*. 2008;40(5):298-304.
25. Gupta M, Borle A, Chhari N, Gupta S. Nutritional Status Assessment using WHO zscores (BMI for Age) in Children Aged 6-15 years–A Study from Central India. *Natl J Community Med*. 2015;6(1):92-7.
26. Boma GO, Anthony IP, George MD, Abaiola E, Andrew F, Daniel MD, et al. Nutritional Status of Children in Rural setting. *IOSR J Dent Med Sci*. 2014;13(1):41-7.
27. Mekonnen H, Tadesse T, Kisi T. Malnutrition and its correlates among rural primary school children of Fogera District, Northwest Ethiopia. *Journal of Nutritional Disorders and Therapy S*. 2013;12:2161-0509.
28. Abdelaziz SB, Youssef MRL, Sedrak AS, Labib JR. Nutritional status and dietary habits of school children in Beni-Suef governorate, Egypt. *Food and Nutrition Sciences*. 2015;6(01):54.
29. Wolde M, Berhan Y, Chala A. Determinants of underweight, stunting and wasting among schoolchildren. *BMC Public Health*. 2015;15(1):8.