Current Therapeutic Research 93 (2020) 100598

Contents lists available at ScienceDirect

Current Therapeutic Research

journal homepage: www.elsevier.com/locate/curtheres

Determinants of Nutritional Status in School-Aged Children in Mecha, Northwest Ethiopia

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ARTICLE INFO

Article history:
Received 6 December 2019
Accepted 23 July 2020

Key words:
Northwest Ethiopia
nutritional status
school-aged children

ABSTRACT

Background: Globally, about 50 million children younger than age 5 years experience wasting; of these 16 million (2.4%) are severely wasted. In Ethiopia, about 9% of the children are severely underweight, 10% are wasted, and 3% are severely wasted.

Objective: The purpose of this study was to determine the risk factors that could lead to underweight, stunting, and wasting among school-aged children in Mecha, northwest Ethiopia, along with their magnitude.

Methods: A community-based cross-sectional study was conducted in Mecha, northwest Ethiopia from April 1, 2018, to June 15, 2018. The study enrolled 422 school-aged children. A pretested interviewer-administered structured questionnaire was used to collect the data. Binary logistic regression analysis was used for data analysis.

Results: The prevalence of underweight, wasting, and stunting were 5.8%, 10.8%, and 11.6%, respectively. Access to school-based feeding was significantly associated with a lower level of underweight (adjusted odds ratio [AOR] = 0.137; 95% CI, 0.020–0.921), and claimed decreased frequency of feeding during illness was associated with a higher level of wasting (AOR = 3.307; 95% CI, 1.025–10.670). Furthermore, younger age of the child (AOR = 16.721; 95% CI, 3.314–84.357), mother's age between 18 and 45 years (AOR = 3.474; 95% CI, 1.145–10.544), and increased frequency of feeding (AOR = 0.270; 95% CI, 0.098–0.749) were all associated with a lower level of stunting.

Conclusions: In this study, the lack of access to school-based feeding was associated with higher level of underweight, and claimed decreased frequency of feeding during illness was associated with wasting. In addition, older age of the child, increase in mother's age, and decreased frequency of feeding were associated with higher levels of stunting. The associations suggest that increased access to both school-based feeding and frequency of feeding might improve the nutritional status of school-aged Ethiopian children. (*Curr Ther Res Clin Exp*. 2020; 81:XXX–XXX) © 2020 Elsevier HS Journals, Inc.

Background

Malnutrition remains among the most common causes of morbidity and mortality in children worldwide.[1] It contributes to about 45% of all child deaths and makes the children vulnerable to severe diseases.[2]

Based on a World Health Organization 2003 report, malnutrition is responsible, directly or indirectly, for about 60% of the 10.9 million deaths annually among children younger than age 5 years. Well more than two-thirds of these deaths were associated with inappropriate feeding practices during the first year of a child's life.[3]

Globally, 50 million children younger than age 5 years experience wasting, of these 16 million (2.4%) are severely wasted. Almost all wasted children younger than age 5 years live in Asia and Africa.[4] The 2011 Ethiopian Demographic and Health Survey showed that the percentage of children who were stunted was 44%; of these 21% were severely stunted, 29% of the children were underweight, 9% of children were severely underweight, 10% of children were wasted, and 3% were severely wasted.[5]

In Ethiopia, about 400,000 children faced severe malnutrition in 2016, and another 1 million children and 700,000 pregnant and breastfeeding women had to face moderate malnutrition.[2]

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https://doi.org/10.1016/j.curtheres.2020.100598

Overall, substantial progress has been made toward achieving the Millennium Development Goal (MDG).[4] However, the rate of reduction in mortality in children younger than age 5 years was insufficient to reach the MDG target of a two-thirds reduction in the 1990 mortality rate by the year 2015.[2]

It is estimated that there are nearly 20 million severely and acutely malnourished children worldwide.[6]

Children with severe acute malnutrition have a 5 to 20 times higher risk of death compared with well-nourished children.[7] Malnutrition is the result of chronic nutritional and frequent emotional deprivation by caregivers because of poor understanding, poverty, or family problems that render them unable to provide the child with the nutrition and care he or she requires.[8] Malnutrition, with its constituents of protein-energy malnutrition and micronutrient deficiencies, continues to be a major health burden in developing countries. It is globally the most important risk factor for illness and death, with hundreds of millions of young children particularly affected.[2]

To achieve the hunger and malnutrition-related MDGs, we need to address poverty, which is associated with an insecure supply of food and nutrition in the household and family.[9]

However, little information is available on the risk factors for underweight, stunting, and wasting in Mecha, northwest Ethiopia. Therefore, the purpose of this study was to determine the risk factors that could lead to underweight, stunting, and wasting among school-aged children in Mecha, northwest Ethiopia, along with their magnitude.

Ethical clearance was obtained from the Bahir Dar University Institutional Review Board and the Amhara Public Health Institute, and then a support letter was written to the respective institutions. The data collectors informed each parent/guardian who confirmed their willingness to participate by signing an informed consent sheet. Thus, consent was obtained from each parent and confidentiality regarding all provided information was assured. Moreover, personal identifiers were not included in the questionnaire.

Methods

Study settings and period

A community-based cross-sectional study was conducted from April 1 to June 15, 2018, in Mecha, Amhara regional state, Ethiopia. Mecha is among the *woredas* in the Amhara region of Ethiopia with an area of 1481.64 km^2. The *woreda* has a total population of 292,080 comprising 147,611 men and 144,469 women; about 22,677 (7.76%) individuals are urban inhabitants. Mecha has a population density of 197.13 persons per square kilometer, which is greater than the zone average density of 158.25 persons per square kilometer. A total of 66,107 households were counted in this *woreda*, with an average of 4.42 persons per household. Most of the inhabitants are Orthodox Christians. The district has 10 *kebeles* (part of the town divided into smaller subparts for administrative purposes). There is 1 hospital, 1 health center, and 10 health posts in the town.

The sample size was calculated using the single population proportion formula by considering the following assumptions: Proportion = 50% (proportion of malnutrition among school-aged children), margin error = 5%, CI = 95%, and after considering a 10% nonresponse rate, the final sample size obtained was 422. Households with school-aged children were selected using a simple random sampling technique after obtaining the number of households with school-aged children from the local administration (ie, *kebele*) and health extension worker registration book.

From all the 7 *kebeles* in the district, 3 rural *kebeles* were included in the study. Subsequently, the sample from each *kebele* was determined using size proportional allocation. Finally, the households were selected using a lottery method, and a school-aged child within each selected household was considered for the study. If there was more than 1 child of a similar age group in a household, the youngest child was selected for the study.

Data collection tools and procedure

Data were collected by trained nurses using a structured interviewer-administered questionnaire, which was translated into Amharic (local language) from English for data collection purposes. The questionnaire was back translated and pretested for consistency. The data collectors received training about the collection techniques and procedures 1 day before the actual day of collection.

The data were collected by using a structured interviewer-administered questionnaire to assess sociodemographic variables, maternal- and child-related characteristics, environmental determinants, and others variables, including personal behaviors. Finally, anthropometric measurements of the selected school-aged child were performed.

Data quality assurance

All activities during data collection were performed based on a consensus of all the investigators. The structured questionnaire was carefully translated into Amharic from English, back translated, and pretested for consistency. Training and clear instructions were given to the data collectors and supervisors about each module of the questionnaire regarding how to ask the questions and code answers. To ensure data quality, completeness, accuracy, and consistency, all collected data were checked every day by the investigators during the entire data collection period. If there was any error related to clarity, ambiguity, or incompleteness, the misunderstanding was solved immediately before beginning data collection the next day.

Variables of the study

Dependent variables

Underweight, stunting, and wasting.

Independent variables

Socioeconomic variables: food availability, media access, misconceptions, inadequate feeding during illness, inadequate breastfeeding and weaning practices, late initiation of complementary feeding, access to iodized salts, family planning, and number of children; environmental factors: unsanitary living conditions, agricultural patterns; child and maternal factors: age, sex, birth interval, birth size, breastfeeding, educational status, place of delivery and immunization.

Operational definitions

Underweight, stunted, or wasted

If weight-for-height, height-for-age, and weight-for age, respectively, was more than 2 SDs from the reference population based on the World Health Organziation multicenter growth reference chart.

Food availability

The level of food security in the household along with the diversity in the available foods that was measured by the household food access scale and food diversity questionnaires, respectively.

Media access

The availability of sources of information like radio, television, and newspapers in the household.

Misconception

The mother's beliefs regarding fruits and vegetables being important foods for keeping the child healthy because most of the community used only *injera* (local food) for breakfast, lunch, and dinner.

Sanitary living conditions

Whether a household has a standardized latrine with handwashing equipment and access to clean and safe water as reported by the study participants.

Immunization status

Child immunization status, including vitamin A administration based on the national vaccination schedule. Status was confirmed by asking the mother and checking the child's immunization card.

Data analysis

The collected data was entered and cleaned using EpiData version 3.1 (EpiData Association, Odense, Denmark) and exported to the Statistical Package for Social Sciences software version 21 (IBM-SPSS Inc, Armonk, NY) for analysis. Both descriptive and inferential statistics were used to analyze the data. Binary logistic regression was performed to examine the association of each independent variable with the outcome variables underweight, stunting, and wasting. The results were presented as odds ratio (OR) and 95% CI. Statistical significance was defined as $P < 0.05$.

Table 1
Sociodemographic distribution of rural school-aged children in Mecha, northwest Ethiopia, 2018 (n = 396).

Variable	Response	Frequency	%
Sex of child	Male	190	47.5
	Female	206	52.5
Age of child, y	6–8	176	44.4
	9–10	115	29.0
	11–12	105	26.5
No. of children	1–2	150	37.9
	3–4	179	45.2
	≥5	67	16.9
Birth order of the child	First	110	27.8
	Second and above	286	72.2
Age of mother, y	18–45	369	93.2
	46–60	27	6.8
Religion	Orthodox Christian	340	85.9
	Muslim	47	11.9
	Protestant	9	2.3
Ethnicity	Amhra	393	99.2
	Others	3	0.8
Level of education	Educated	83	21
	Uneducated	313	79
Mother occupation	Employed	44	11.1
	Farmer	73	18.4
	Unemployed	279	70.5
Marital status	Married	335	84.6
	Unmarried	61	15.4
Husband's level of education	Educated	109	31.8
	Uneducated	234	68.2
Husband's occupation	Employed	45	13.1
	Unemployed	298	86.9
Farming land	Yes	241	60.9
	No	155	39.1
Irrigation user	Yes	145	36.6
	No	251	63.4
Average monthly income	<1000	87	22.0
	1001–2000	137	34.6
	>2001	172	43.4
Access to information	Access to information	320	81.0
	No access information	75	19.0

Results

Sociodemographic characteristics

A total of 392 mothers with their children agreed to participate in this study, which amounted to a response rate of 92.5%. Boys accounted for 206 (52.5%) of the children, 176 (44.4%) were within the age group of 6 to 8 years, and more than one-fourth (27.8%) of the children were first in the birth order. With regard to mothers, the majority (93.2%) were aged between 18 and 45 years and 85.9% of the mothers were Orthodox Christian. Nearly half (45.2%) of the mothers had between 3 and 4 children, and only 83 (21%) mothers were educated. Regarding their occupation, most (89.9%) of the mothers were farmers. Additionally, 84.6% of the mothers were married. Among the husbands, nearly one-third (31.8) were educated, about 45 (13.1%) were employed, and 241 (60.9) possessed farming land, and out of these, 145 (36.6%) used irrigation for farming. The average household income of the families was between 1001 and 2000 Ethiopian Birr (EB) per month. More than three-fourths of (81.0%) the households had access to information (Table 1).

Health, nutrition, and other related characteristics

Out of the total 392 mothers, 346 (87.4%) attended antenatal care follow-up during their pregnancy, and 249 (62.9%) completed antitetanus immunization, whereas nearly two-thirds (65.7%) of mothers took additional food during pregnancy. A majority of the mothers (89.5%) breastfed their children, and among these, more than two-thirds (70.7%) practiced exclusive breastfeeding. Three-fourths (75.8%) of mothers used family planning to space births.

Among the children, nearly two-thirds (66.2%) completed their immunizations, and about 216 (54.5%) took vitamin A up to age 5 years. The majority (83.3%) of children were in school, and among them, 180 (54.2%) were in grade 3 and above. However, nearly one-third (29.3%) of the children were engaged in work, and among them, more than half (54.3%) worked for more than 3 hours.

Most (76.3%) children had a history of illness: pneumonia (28.1%), diarrhea (46.0%), measles (5.6%), malaria (7.3%), and others (12.9%). About 166 (41.9%) children had diarrheal morbidity in the past 1 year. More than half (59.2%) of children received additional feeding during illness. Majority (94.4%) of the children ate breakfast regularly, and more than two-thirds (70.5%) ate 4 meals or more per day.

Although most (72.7%) mothers had access to child nutrition education, 59 (14.9%) mothers reported shortage of water for cooking. The majority (75.3%) of mothers used piped water for cooking. With regard to personal hygiene, more than half of mothers (57.8%) regularly washed their hands and two-thirds (66.9%) cut their nails regularly. Additionally, 229 (57.8%) mothers used iodized salt in their food. However, only 162 (40.9%) mothers had access to a modern latrine with handwashing facilities (Table 2).

Factors associated with malnutrition

First, the independent variables were tested using bivariate analysis to see their association with the outcome variables of underweight, wasting, and stunting (Tables 3–5).

Based on the results of the bivariate analysis, the factors associated with weight-for-age were breastfeeding, child's work engagement, access to information, duration of work engagement, access to school-based feeding, and use of boiled water.

Table 2
Maternal related characteristics distribution of rural school-aged children in Mecha, northwest Ethiopia, 2018 (n = 396).

Antenatal care follow-up	Yes	346	87.4
	No	50	12.6
Tetanus toxoid immunization status	Completed	249	62.9
	Incomplete	108	27.3
	Not vaccinated	39	9.8
Additional feeding during pregnancy	Yes	260	65.7
	No	136	34.3
Place of delivery	Health facility	333	84.1
	Home	63	15.9
History of breastfeeding	Yes	390	98.5
	No	6	1.5
Exclusive breastfeeding	Yes	280	70.7
	No	116	29.3
Children immunization status	Completed	262	66.2
	Not completed	111	28.0
	Not vaccinated	23	5.8
Vitamin A supplementation	Yes	216	54.5
	Not completed	150	37.9
	No	30	7.6
Ever used of family planning methods	Yes	300	75.8
	No	96	24.2
Is the child in school	Yes	330	83.3
	No	66	16.7
Level/grade of education	1-2	152	45.8
	≥3	180	54.2
Is child engaged in work	Yes	116	29.3
	No	280	70.7
If engaged in work for how many hours	1-3	53	45.7
	>3	63	54.3
How can your child get feeding if he engages in work for more than 3 h	Yes	69	59.0
	No	48	41.0
Does the child have history of illness	Yes	302	76.3
	No	94	23.7
Type of illness	Pneumonia	85	28.1
	Diarrhea	139	46.0
	Measles	17	5.6
	Malaria	22	7.3
	Others/specify	39	12.9
Does the child have diarrheal morbidity in the past 1 y	Yes	166	41.9
	No	230	58.1
Does the child have diarrheal morbidity in the last 2 wk	Yes	28	7.1
	No	368	92.9
What type feeding does child get during illnesses	Regular family dish	161	40.8
	Additional feeding	234	59.2
Does the child eat breakfast regularly	Yes	374	94.4
	No	22	5.6
Frequency of eating per day	≥4	279	70.5
	1–3	117	29.5
Access to child nutrition education	Yes	288	72.7
	No	108	27.3
Water shortage for cooking	Yes	59	14.9
	No	337	85.1
Type of water used for cooking	Pipe	298	75.3
	Dam water river/follow	98	24.7
Boiling water for serving a child	Yes	18	4.5
	No	378	95.5
Do you regularly keep your child hygiene	Yes	332	83.8
	No/pipe	64	16.2
Regular handwashing	Yes	229	57.8
	No	167	42.2
Nail cutting	Yes	265	66.9
	Only mine	102	25.8
	No	29	7.3
Type of salt used for cooking	Iodized	229	57.8
	Normal/dish salt	167	42.2
Type cooking fuel	Wood	345	87.1
	Petroleum gas	10	2.5
	Electricity	41	10.4
Type of toilet	Modern latrine	162	40.9
	Temporary toilet/open	234	59.1

346 is frequency and 87.4 is percent.

Table 3
Distribution of weight for age among rural school age children in Mecha, northwest Ethiopia, 2018 (n = 396).

Variable	Weight for age					
	Response	Normal*	Underweight*	COR (95% CI)	AOR (95% CI)	*P* value
Breastfeeding	Yes	273	16	5.687 (0.560–57.796)		
	No	3	1	1		
Children work engagement	Yes	64	8	0.340 (0.126–0.916)		
	No	212	9	1		
Access to information	Yes	228	11	2.646 (0.932–7.509)		
	No	47	6	1		
Duration of work engagement	1–3 h	29	6	0.276 (0.052–1.473)		
	4 h	35	2	1		
School feeding	Yes	32	7	0.139 (.016–1.190)	**0.137 (0.020–0.921)**	0.041
	No	33	1	1		
Water boiling	Yes	10	2	0.282 (.057–1.403)		
	No	266	15	1		

AOR = adjusted odds ratio; COR = crude odds ratio.
* Values are presented as n (%).

Table 4
Distribution of body mass index for age among urban school age children in Mecha, northwest Ethiopia, 2018 (n = 396).

Variable	Body mass index for age					
	Response	Normal*	Malnutrition*	COR (95% CI)	AOR (95% CI)	*P* value
Sex	Male	161	27	0.599 (.321–1.118)		
	Female	189	19	1		
Breastfeeding	Yes	348	42	16.571 (2.95–93.22)		
	No	2	4	1		
Access to information	Yes	286	34	1.602 (0.786–3.267)		
	No	63	12	1		
Duration of child's work	≤3 h	43	10	0.453 (0.153–1.342)		
	>3 h	57	6	1		
Diet diversity	Low	44	10	0.518 (0.240–1.116)		
	Good	306	36	1		
Frequency of feeding during illness	Additional	142	26		**1**	
	Normal	208	20	1.904 (1.024–3.543)	**3.307 (1.025–10.670)**	0.045

AOR = adjusted odds ratio; COR = crude odds ratio.
* Values are presented as n (%).

Table 5
Distribution of height for age among rural school age children in Mecha, northwest Ethiopia, 2018 (n = 396).

Variable	Height for age					
	Response	Normal*	Stunted*	COR (95% CI)	AOR (95% CI)	*P* value
Irrigation	Yes	126	19	0.669 (.351–1.276)		
	No	228	23	1		
Place of labor	Health institution	301	32	1.775 (.824–3.824)		
	Home	53	10	1		
Diarrheal infection	Yes	143	23	0.560 (.294–1.066)		
	No	211	19	1		
Child age, y	6–8	174	2	19.333 (4.602–81.220)	**16.721 (3.314–84.357)**	0.001
	9–12	180	40	1	**1**	
Mother age, y	20–45	334	35	3.340 (1.320–8.453)	**3.474 (1.145–10.544)**	0.028
	≥46	20	7	1	1	
Mother education	Educated	78	5	2.091 (0.795–5.501)		
	Uneducated	276	37	1		
Occupation	Employed	43	1	5.669 (0.760–42.274)		
	Farmer	311	41	1		
Husband job	Employed	54	2	5.669 (0.760–42.274)		
	Farmer	290	39	1		
Marital status	Married	298	39	0.393 (0.117–1.313)		
	Unmarried	58	3	1		
Level of child education	1–2	144	8	3.316 (1.463–7.514)		
	3+	152	28	1		
Type of salt	Iodized	209	20	1.586 (.835–3.012)		
	Noniodized	145	22	1		
Frequency feeding	1-3	245	33	0.613(.284, 1.325)	**0.270 (0.098, 0.749)**	0.012
	4 and above	109	9	1		

AOR = adjusted odds ratio; COR = crude odds ratio.
* Values are presented as n (%).

Furthermore, the factors associated with body mass index (BMI)-for-age were sex, breastfeeding, access to information, work duration of the child, diet diversity, and claimed frequency of serving food during illness, whereas the factors associated with height-for-age were irrigation, place of labor, diarrheal infection, age of the child, mother's age, mother's education, occupation, husband's job, marital status, child's education level, type of salt, and frequency of feeding.

Variables that were found to be associated with the outcome variables in the bivariate analysis were subsequently tested in the multivariate analysis. The final factor associated with weight-for-age after performing multivariate analysis was access to school-based feeding. In case of BMI-for-age, the significantly associated final factor was claimed increased frequency of serving food during illness, whereas increasing age of the child, younger maternal age, and claimed increased frequency of feeding were the final associated factors with height-for-age.

In this study, access to food in the school was associated with weight-for-age (underweight). A school-aged child who received school-based feeding had almost 68 times higher weight-for-age than a child who did not receive it (adjusted OR [AOR] = 0.137; 95% CI, 0.020–0.921).

Similarly, claimed increased frequency of feeding during illness was associated with a lower BMI-for-age (ie, wasting). Moreover, school-aged children who received additional feeding during illness had almost 3 times higher BMI-for-age than those who did not receive additional feeding (AOR = 3.307; 95% CI, 1.025-10.670).

In case of height-for-age (ie, stunting), the age of the child was among the significant factors associated with stunting. Younger school-aged children who were between aged 6 and 8 years had almost 17 times higher height-for-age than children between ages 9 and 12 years (AOR = 16.721; 95% CI, 3.314–84.357).

Furthermore, the age of the mother was associated with the level of stunting. Mothers in the age group of 18 to 45 years were almost 3 times more likely to have a normal height-for-age child than mothers aged 46 years and older (AOR = 3.474; 95% CI, 1.145–10.544).

In contrast, claimed increased frequency of feeding was associated with a lower level of stunting. School-aged children who received more than 4 meals daily were 83% times more likely to have a normal height-for-age than those who received <3 meals (AOR = 0.270; 95% CI, 0.098–0.749).

Discussion

This study revealed that the prevalence of underweight children in Mecha, northwest Ethiopia, was 5.8%. This is lower than the prevalence reported by studies in Bangladesh (48%),[10] Oromiya, Ethiopia (30.9%),[11] Uganda (24.1%),[12] and Kenya (14.9%),[13] This may be due to differences in the sociocultural, economic, and health-related variables between the study area and the above referenced places. Another possible reason may be the better food security and diversity in the study area, which is directly related to the increased weight of the children. In addition, irrigation farming is prevalent in the study area and therefore, most households cultivate food crops throughout the year.

The prevalence of low BMI-for-age (ie, wasting) was 10.8%. This result is consistent with studies conducted in Oromiya, Ethiopia,[11] in Uganda,[12] Afghanistan,[14] and Kenya.[13] This may be due to the current government's attention toward maternal and child health programs and extensive nutrition education, resulting in an increase in the knowledge and perception of mothers, making them feed their children a relatively healthy and balanced diet that in turn leads to improved nutritional status and health of the children.

The prevalence of stunting was 11.6% in the study area. Although this is relatively lower than the results of studies conducted in Oromiya, Ethiopia (47.6%),[11] and in Uganda (23.8%),[12] Kenya (30.2%),[13] and in Abeokuta, southwest Nigeria (17.4%),[15] it is still a high prevalence. The differences might be due to variations between the study areas with respect to the direct causes of stunting, including differences in the level of adequate nutrition (not eating enough or eating foods that lack growth-promoting nutrients), recurrent infections, and chronic diseases that cause poor nutrient intake, absorption, or utilization of foods. Other possible reasons might be a lack of care and stimulation needed for child development or possibly a genetic predisposition for short stature that requires further investigation.

In this study, access to school-based feeding was found to be a significant factor associated with weight-for-age (ie, underweight). A school-aged child who received school feeding had an almost 86% increased likelihood of being normal weight-for-age. This result is similar to a book review of work and food[16] and a study in India.[17] This may be due to the fact that rural school-aged children are mostly in school for more hours (usually >6 hours) and also far from their home, which may predispose them to starvation. Therefore, serving food at school significantly decreased the number of underweight children, even if school-based feeding in this age group is not enough to achieve the expected weight gain in the children.

On the other hand, a claimed increased frequency of serving food during illness was associated with BMI-for-age. School-aged children who received additional feeding during illness were almost 3 times more likely to have a normal BMI-for-age than those who did not receive additional feeding**.** This finding is consistent with research studies conducted in Nigeria, where malnutrition is common due to infection,[18] in Kenya,[13] in tribal preschool children,[19] and in other studies.[20] This could be due to a substantial physiological disturbance in the body during an illness that requires additional compensatory feeding. Additional feeding to a child during an illness may encourage his or her appetite for food and this could in turn lead to an intake of diverse food types that may improve the child's health.

With regard to height-for-age (ie, stunting), age of the child was associated with the level of stunting. School-aged children who were between ages 6 and 8 years were almost 17 times more likely to have a normal height-for-age than children aged between 9 and 12 years. This result is similar to studies conducted in Oromiya, Ethiopia,[11] in Afghanistan,[14] in India,[21] among tea garden workers of Assam, India,[22] and in Addis Ababa, Ethiopia.[23] This may be attributed to the fact that younger children may not be fully involved with work and school and therefore spend most of their time at home, which increases their chances of getting a frequent and diversified feeding.

Furthermore, the age of the mother was a determinant factor for stunting and mothers in the age group of 18 to 45 years were almost 3 times more likely to have a normal height-for-age child than mothers aged 46 years and older. This finding is consistent with studies conducted in Addis Ababa, Ethiopia,[23] and Tehran, Iran.[24] This could be related to the higher energy levels and health-seeking behavior of the mother with regard to her children in the younger age group. Additionally, the income of the mothers was higher in the 18 to 45 years age group because a majority of them were working.

Claimed frequency of feeding was also associated with the level of stunting. School-aged children who received more than 4 meals daily were 83% times more likely to have a normal height for age than those who received <3 meals**.** This result is consistent with studies reported from Afghanistan,[14] Addis Ababa, Ethiopia,[23] Nyambe district, Kenya,[25] Nairobi, Kenya,[13] and another study in Ethiopia.[26] This may be attributed to the fact that in the study area, there is a trend of eating 3 times per day. An increase in the frequency of feeding helps the child gets enough energy and protein for growth and development to achieve his or her expected height.

Conclusions

This study revealed that the prevalence of underweight children living in Mecha woreda, Amhara regional state, Ethiopia, was 5.8%, whereas prevalence of low BMI-for-age and stunting were 10.8% and 11.6%, respectively. The significant factor associated with weight-for-age was access to school-based feeding, and for BMI-for-age the associated factor was a claimed increased frequency of serving food during illness. An increase in the age of the child, younger age of the mother, and a claimed increase in the frequency of feeding were the final factors associated with height for age. The associations found suggest that increased access to both school-based feeding and frequency of feeding might improve the nutritional status of school-aged Ethiopian children.

Declaration of Competing Interest

The authors have indicated that they have no conflicts of interest regarding the content of this article.

The authors TT contributed to the design of this study. TT and AB collected, analyzed, and interpreted data; drafted the manuscript for important intellectual content. Both authors reviewed and revised the draft further and approved the final version for submission.

Acknowledgment

This study received financial support for data collection from the Bahir Dar University, Mecha Field, and Demographic Health Survey center.

The authors thank the librarian staff, study participants, data collectors, and supervisors for their cooperation during the study.

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