

Undernutrition and Associated Factors Among School Adolescents in Wonago District Gedee Zone South Ethiopia

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Abstract

Background

Adolescence is a life spanning the age range of 10-19 years characterized by remarkable physical and psychological growth and development. One-third of adult weight and more than one-fifth of adult height is gained during this period of life. This make adolescents the key population group highly vulnerable to malnutrition. This study was aimed to assess the level of undernutrition among school adolescents in Wonago district, Gedeo Zone, South Ethiopia.

Methods

A school based cross sectional study was conducted among 443 randomly selected school adolescents of Wonago district. Nutritional status of adolescents was assessed using body mass index for age z-score (BAZ) and height for age z-score. Descriptively, prevalence of thinness and other anthropometric measurements, socio-economic and socio-demographic variables were described. Multivariable logistic regression was conducted to assess the factors associated with adolescents' undernutrition (thinness).

Results

The finding revealed that, 11.6% of the adolescents were undernourished (thin). The likelihood of being undernourished was decreased by 70% for female adolescents, and adolescents whom the source of drinking water was spring were four times at higher risk of malnutrition. The likelihood of being undernourished was decreased by about 85% for adolescents from households with medium wealth status. Adolescents from families achieving food needed for daily consumption through purchasing and adolescents whose the occupation of their father was merchant were also found to have a higher risk of being undernourished. For adolescents whose the occupation of their mother was farmer, the probability of being undernourished was decreased by about 85%.

Conclusions

Significant number of adolescents in this study were found to be malnourished. Sex of the adolescents, parent occupation, household wealth, source of drinking water and source of family food need were significantly associated with the adolescents' nutritional status.

Introduction

Adolescence is a life spanning in the age range of 10–19 years(1) characterized by remarkable physical and psychological growth and development(2, 3). It is the period of transition from childhood and adulthood(1). It is an intense anabolic state where, nearly one-third of adult weight and more than one-fifth of adult height is gained during this period of life(4) and described as a window of opportunity for growth catch up in human life cycle(3). This make adolescence a sensitive period of rapid growth which need adequate nutrition for optimal growth and development(5). There is significant difference in

nutritional recommendation for adolescents from that of adult or child(6) and the consequences of nutritional deficiencies are far reaching among adolescents(7).

Nutrition and physical activity are major determinants of adolescents' energy levels and influence growth and body composition. Inadequate nutrition can delay sexual maturation, slow or stop linear growth, and compromise peak bone mass. Undernutrition among adolescents also compromises cognitive development, which affects learning, concentration, and school performance(8).

In developing countries, adolescents are highly vulnerable to socio-cultural maltreatments, poverty, political turmoil, poor access to education and health service. This factors increases the adolescents vulnerability to nutritional health problems(9). Other factors increasing risk of poor nutrition among adolescents in developing countries include early marriage, which is declining but still common, and low secondary school enrollment, which is widespread(10).

Large number of adolescents in low and middle income countries adversely affected by acute or chronic malnutrition in general and underweight in particular(11). In some countries in Africa and Asia, 10% or higher number of adolescent girls are very thin for their age and height(12), and as many as half of all adolescents are stunted (13). For instance, more than half of adolescent girls and women in Bangladesh consume inadequately diverse diets in 2014 national survey and prevalence of stunting among adolescent girls 10–18 years old range from 23%-32% (10).

Gender norms are leaving girls disproportionately impacted by food insecurity and malnutrition. But significant number of adolescent boys are malnourished as well. Adolescent girls are at higher risk of dropping out of school, marrying, and becoming pregnant—all of which can harm their nutrition and health as well as that of their offspring. Moreover, adolescence marks the last window of opportunity to reverse stunting and this makes adolescents a nutritionally very important segment of population(10). Nutritional disorders in adolescence, including unhealthy weight status and/or nutritional deficiency (e.g., inadequate energy, macronutrient, and/or micronutrient intake), contribute globally to morbidity and mortality and should be area of focus(14).

Compared to other portion of population segment, particularly under five children, the scope and severity of adolescents undernutrition is less clear (15). There is less nutritional data on adolescents though they experience a high burden of malnutrition, especially thinness(10).

Adolescence is a critical point of intervention for current and future health, and intergenerational nutritional health. Responsible health providers should screen adolescents comprehensively for nutritional risk, make timely referrals, and initiate developmentally appropriate interventions(14). Body mass index (BMI) has been recommended for use in screening of adolescents' and adults' nutritional health problems, particularly, thinness, overweight and obesity(16).

Being in transition, adolescents may no longer benefit from the attention and care that usually go to children, but they may not get the protections associated with adulthood either(17). Though there are

considerable attention towards reproductive health issues of adolescents in Ethiopia, the work on nutritional status of adolescents is significantly limited. There is paucity of nutrition related information of adolescent's health and adolescents has been receiving scanty attention due to a misconception which consider adolescents as a low risk group for poor health and nutrition. Hence this study was planned to assess adolescents' nutritional status and its associated factors to contribute for filling the gap in the evidence.

Methods

Study area and period

This study was conducted in Wonago wereda, Gedeo Zone South Ethiopia during April 2018. The study area (Wonago district) is known for its densely populated population distribution characterized by young age(18). In the district there are 23 schools out of which 15 schools were randomly selected for this study.

Study Design: A school based cross sectional study was conducted.

Sample size determination and sampling technique

The sample size for this study was calculated using single population proportion formula for calculating sample size ($Z_{\alpha/2}^2 p (1-p)/d^2$) assuming estimated 50% prevalence (p) of undernutrition (to maximize the possible sample size), a 95% confidence interval and a relative precision (d) of 5%. Based on the above assumptions and assuming 15% non-response rate the total sample size used in this study was 443 adolescents.

To select the schools for this study simple random sampling technique was used and the total sample was proportionally allocated to each schools based on the number of eligible adolescents in the schools. Finally, the each participant from the schools were selected by simple random sampling method using the list of students in the registry of schools.

Data collection personnel and tool

Questionnaires adapted from WHO nutritional survey tools (19) was pretested. Trained health extension workers were used as a data collectors and the overall work was closely supervised by the investigators. Assent was requested from families of participants who are minors and the overall objective and procedure was clearly explained for the participants of the study.

Measurement

Anthropometric assessment: Height and weight was measured based on WHO guideline. Battery powered digital scale was used to measure weight and it was measured to the nearest 0.1 kg. Height was measured to the nearest 0.1 cm using a wooden height-measuring board with a sliding head bar following standard anthropometric techniques(20). BMI for age z-score (BAZ) and height for age z-score

(HAZ) was used as anthropometric indicators. Adolescents with BAZ score less than -2 were classified as thin and those below -2 HAZ score were classified as stunted.

Stool examination: Stool examination was done to assess geo-helminthes infection (strongloides, hookworm stercoralis, ascaris lumbricoides and trichuris trichuria) and Kato-Katz method was used to examine the stool within one hour of staining.

Data analysis

Descriptive analysis was done to present socio-demographic and socio-economic information, nutritional status and feeding practices. Bivariate association was assessed using binary logistic regression analysis and independent association of the explanatory variables with the outcome variable was assessed using multivariable logistic regression based on the adjusted odds ratio (AOR) with their corresponding 95% confidence interval.

Results

Socio-demographic characteristics and nutritional status among adolescents

A total of 424 adolescents were participated in this study and nearly sixty percent (247 adolescents) of the participants were male and 180 (42.4%) of the participants were in the middle period of adolescence period (14–16 years). Two hundred forty eight (58.5%) of the participants were from households with family size of above six members. Nearly 50% (205) of the participants' mothers are illiterate while most of the fathers, 337 (79.4%), are literate. On bivariate analysis, adolescents in the middle adolescence age range, female adolescents, adolescents in grade five and above, adolescents whose their mother is farmer or merchant were more likely to be thin. On the other hand, adolescents whose father is merchant and who live with parents were more likely to be underweight/thin (Table 1).

Table 1

Socio-demographic characteristics of the respondents and prevalence of undernutrition (thinness) among adolescents in Wonago district, Gedeo Zone, Southern Ethiopia, April 2018

Variables	variables Category	Frequency (%)	Prevalence of undernutrition			p-value
			%	COR	95%CI	
Age	Early adolescence (10–13)	173 (40.8)	17.3	1	Reference	0.006
	Middle adolescence (14–16)	180 (42.4)	6.7	0.34	0.17,0.69	
	Late adolescence (17–19)	71 (16.7)	9.8	0.52	0.22,1.25	
	Mean age	13.9 ± 2.3				
Sex	Male	247 (58.3)	15.4	1	Reference	0.004
	Female	177(41.7)	6.2	0.36	0.18,0.73	
Grade level of respondent	Four grade and below	101(23.8)	23.8	1		< 0.001
	Five to eight grade	286(67.5)	8.0	0.28	0.15,0.53	
	Nine grade and above	37(8.7)	5.4	0.18	0.41,0.82	
Mother education	Illiterate	205 (48.3)	12.2	1	Reference	0.031
	Primary	180 (42.5)	8.3	0.66	0.33,1.28	
	High school and above	39 (9.2)	23.1	2.16	0.92,5.08	
Father education	Illiterate	87 (20.5)	10.3	1	Reference	0.814
	Primary education	255(60.1)	11.4	1.11	0.50,2.45	
	High school and above	82(19.3)	13.4	1.34	0.53,3.43	
Mother occupation	Housewife	210(49.8)	17.1	1	Reference	0.005
	Farmer	73(17.3)	4.1	0.21	0.06,0.69	
	Merchant	102(24.2)	7.8	0.41	0.18,0.92	
	Other	37(8.7)	5.4	0.28	0.06,1.20	
Father occupation	Government employee	90(21.4)	7.8	1	Reference	0.004
	Farmer	213(50.7)	8.5	1.10	0.44,2.72	
	Merchant	91(21.7)	22.0	3.34	1.34,8.36	
	Other	26(6.2)	15.4	2.16	0.58,8.03	

Family size	Six and below	176 (41.5)	14.2	1	Reference	0.151
	Above six	248 (58.5)	9.7	0.65	0.36,1.18	
Live with parents	Yes	381(90.7)	10.2	1	Reference	0.004
	No	39(9.3)	25.6	3.02	1.37,6.67	
Wealth index	Low	133 (32.8)	6.8	1.46	0.71,3.03	0.118
	Middle	138 (34.0)	14.5	0.63	0.26,1.50	0.118
	High	135 (33.2)	10.4	1	Reference	

With regard to feeding practices and nutritional status, 116 (27.4%) of the respondents reported that their usual daily meal frequency was two times or below. For half of the respondents (214 adolescents), their family produces/cultivates the food needed for household daily consumption. In the school of 245 (57.8%) adolescent, there is a regular feeding program for the last six months. On bivariate analysis, adolescents whose daily meal frequency was above two and whose their family achieve food need through purchase/aid were at higher risk of being underweight. In this study, 11.6% (CI: 8.55–14.65%) were underweight/thin (BAZ < -2) and 14.6% (CI: 11.24–17.96%) of adolescents were stunted (HAZ < -2). There were no adolescents that were overweight. From stool examination result, about sixty percent of the adolescents have stool parasites (Table 2).

Table 2

Nutritional and environmental variables and their association with undernutrition among adolescents in Wonago district, Gedeo Zone, Southern Ethiopia, April 2018

Variables	variables Category	Frequency (%)	Prevalence of undernutrition			
			%	COR	95%CI	P-Value
Daily meal frequency	Two times or below	116 (27.4)	6.0	1.00	Reference	0.029
	Three times and above	308 (72.6)	13.6	2.46	1.07–5.64	
Sources of Family food need	Grow their own	214 (50.5)	7.0	1	Reference	< 0.001
	Purchase/aid	210 (49.5)	16.2	2.56	1.35,4.86	
School feeding	Yes	245 (57.8)	10.6	1	Reference	0.477
	No	179 (42.2)	12.8	2.56	1.35,4.86	
Drinking water source	Tap water	291(69.8)	9.6	1	Reference	0.114
	Wells	64(15.3)	15.6	1.74	0.80,3.79	
	Spring	62(14.9)	17.7	2.03	0.95,4.33	
Stool parasites	Yes	249 (58.5)	10.7	1	Reference	0.141
	No	175 (41.5)	14.3	1.56	0.86,2.84	
Latrine	Yes	353(16.7)	91.6	1	Reference	
	No	71(83.3)	8.4	0.66	0.27,1.63	
HAZ	≥-2	362 (85.4)				
	<-2	62 (14.6)	-	-	-	
BAZ	≥-2	375 (88.4)				
	<-2	49 (11.6)	-	-	-	
BAZ: Body mass index-for age z-score HAZ: Height-for-age z-score						

Factors associated with undernutrition among school adolescents

After controlling for confounders using multivariable logistic regression, sex of the adolescents, source of drinking water, mother occupation, father occupation, household wealth and family food need source were significantly associated with undernutrition among adolescents. Accordingly, the likelihood of being undernourished was decreased by 70% for female adolescents compared to male adolescents [AOR: 0.30,

CI: 0.12, 0.77]. Adolescents whose the source of drinking water was spring were more than four times at higher risk of malnutrition [AOR: 4.63, CI: 1.48, 14.43]. The likelihood of being undernourished was decreased by about 85% for adolescents from households with medium wealth [OR: 0.16, CI: 0.41, 0.65] compared to those from highest households. Adolescents from families who achieve their food need through purchasing [OR: 3.33, CI: 1.55, 7.18] and adolescents whose the occupation of their father was merchant [OR: 5.95, CI: 1.30, 27.22] were also found to have a higher risk of being undernourished. For adolescents whose the occupation of their mother was farmer, the probability of being undernourished was decreased by about 85% [OR: 0.14, CI: **0.41**, 0.65] compared to those of housewife (Table 3).

Table 3
Determinants of undernutrition among school adolescents in Wonago district, Gedee Zone, Southern Ethiopia, April 2018

No.	Variables		Frequency	Under nutrition (BAZ< -2)		
				Prevalence	AOR	95% CI
1.	Age category	Early adolescence	173 (40.8)	17.3	1	Reference
		Middle adolescence	180 (42.4)	6.7	0.45	0.14, 1.40
		Late adolescence	71 (16.7)	9.8	1.63	0.45, 5.91
2.	Sex	Male	247 (58.3)	15.4	1	Reference
		Female	177(41.7)	6.2	0.30	0.12, 0.77
3.	Grade level	Four grade and below	101(23.8)	23.8	1	Reference
		Five to eight grade	286(67.5)	8.0	1.13	0.37, 3.50
		Nine grade and above	37(8.7)	5.4	0.60	0.08, 4.37
4.	Live with parents	Yes	381(90.7)	10.2	1	Reference
		No	39(9.3)	25.6	4.08	1.02, 16.23
5.	Family size	≤ 6	176 (41.5)	14.2	1	Reference
		> 6	248 (58.5)	9.7	0.71	0.29,1.74
6.	Meal frequency	Two times or below	116 (27.4)	6.0	1	Reference
		Three time or above	308 (72.6)	13.6	1.54	0.56, 4.25
7.	Drinking water source	Tap water	291(69.8)	9.6	1	Reference
		Wells	64(15.3)	15.6	2.70	0.76, 9.62
		Spring	62(14.9)	17.7	4.63	1.48, 14.43
8.	Stool parasite	Yes	249 (58.5)	10.7	1	Reference
		No	175 (41.5)	14.3	2.06	0.89, 4.77
9.	Wealth status	Low	133 (32.8)	6.8	1.65	0.62,4.37
		Medium	138 (34.0)	14.5	0.16	0.41, 0.65
		High	135 (33.2)	10.4	1	Reference

10.	Family food need	Grow their own	214 (50.5)	7.0	1	Reference
		Purchase/aid	210 (49.5)	16.2	3.33	1.55, 7.18
11.	Mother occupation	Housewife	210(49.8)	17.1	1	Reference
		Farmer	73(17.3)	4.1	0.14	0.03, 0.70
		Merchant	102(24.2)	7.8	1.46	0.47, 4.57
		Other	37(8.7)	5.4	0.99	0.16, 6.30
12.	Father occupation	Government employee	90(21.4)	7.8	1	Reference
		Farmer	213(50.7)	8.5	1.61	0.37, 7.03
		Merchant	91(21.7)	22.0	5.95	1.30, 27.22
		Other	26(6.2)	15.4	6.12	0.60, 69.96

Discussion

Eradication of underweight/thinness resulting from insufficient energy intake is expected to be a current and future challenge of global nutrition policy(21). Adolescents constitute a nutritionally critically important group for several reasons, including their high requirements for growth, their eating patterns, and their susceptibility to environmental influences. However, there is a dearth of data on adolescent's nutritional status(22).

In this study, considerable number of adolescents were found to be stunted where nearly twelve percent of them were underweight. The finding of this study is comparable with the previous report from national nutrition baseline survey report for the NNP of Ethiopia which was 14%(23). Complying finding was also obtained from study conducted among female adolescents from northern Ethiopia, 13.6%(24). Similar finding was found from eastern Sudan where 13.7% of adolescent girls were stunted(25) and from study conducted in Aligarh, Uttar Pradesh, India, 14.6% of adolescent boys were found to be stunted(26).

The level of adolescent underweight in this study is lower than a findings from different parts of India. From study conducted in Wardha, India 53.8% of the adolescents were found to be thin and 50.7% adolescents were stunted(27). Correspondingly, studies from West Bengal, India identified 48.3% prevalence(28, 29). This could be due to the difference in the study population and study area. However, the finding of this study is higher than the 6.4% finding from study conducted on nutritional status of in-school adolescents in Ibadan, Nigeria(30). Likewise, study from Brazil found lower prevalence (7%) of underweight among adolescents in the study area(31).

Regarding factors associated with underweight/thinness in this study, sex of the adolescents, source of drinking water, mother occupation, father occupation, household wealth and family food need source

were significantly associated with underweight/thinness among adolescents. From the finding female adolescents were less likely to be underweight compared to male adolescents. This finding complies with the finding from Ibadan, Nigeria where male adolescents were at higher risk of being underweight (30). Similarly study from Indian National Nutrition Monitoring Bureau identified males to be at a higher risk of undernutrition compared to females(32). This could be due to the fact that, female adolescents in developing countries may have better access to food because they always do domestic works and they may not miss the meals. In addition, most of the time adolescent males have heavier labor work than females in developing country.

Among family socio-demographic characteristics maternal working status was associated with underweight. In this regard, adolescents whom their mothers were farmers were less likely to be underweight compared to those who were housewife. Mothers who are engaged in routine income generation of the family could have significant effect on the nutritional status of adolescents. Particularly, women who are farmers increases the family productivity and family food sources. On the other hand adolescents whom their fathers are merchants were about six times more likely to be underweight. This may be due to difference in educational status of the fathers where fathers who are government employee were more educated compared to merchant fathers. They could have more information about nutritious food that are important for children health. For instance, in study from Brazil, maternal schooling was negatively associated with the probability of being thin(31).

Adolescents whom their source of drinking water is spring were four times more likely to be underweight compared to those whom the source was tap water. This could be possibly due to higher risk of repetitive infection from contaminated water for those who use spring water as a drinking water and most of the households do not treat the water used as drinking water. In addition adolescents of families who purchase the food needed for daily consumption were more likely to be underweight compared to those who produce by their own. This might be associated with the more access to variety and amount of food source for adolescents of families who produce by their own.

On the other hand, adolescents from households with medium economic status were less likely to be underweight compared to those from higher economic status. This finding is relatively contrary to the usual findings of the studies on factors associated with nutritional status(27, 33, 34). The reason why adolescents in the middle economic status were less likely to be underweight in this study could be due to the difference in nutritionally important characteristics among the population in the middle and higher economic status. Families in the higher economic status in this study area were mostly merchants and less educated compared to those who are in the middle economic status who are who are mostly government employees and more educated. In addition most of those in the middle economic status were farmers and their main source of food for consumption for such families is producing by their own. In this study adolescents of families who produce the food they consume by their own were less likely to be underweight.

In this study we have tried to assess the nutritional status of adolescents and associated factors in which there are scanty of evidences with respect to this research area. We have tried to identify important risk factors for adolescents' malnutrition in the study area. Nevertheless there are important limitations of this study. Considerable limitations of this study are small sample size and exclusion of out of school adolescents which could have be in different scenario.

In general Significant number of adolescents in this study were found to be underweight and female adolescents, adolescents using spring water for drinking, adolescents whose their mother was unemployed and those whose their family achieve food need through purchase were at higher risk of underweight. Responsible stakeholders working on nutrition programs should give due consideration for adolescents particularly in developing countries. Further studies with stronger design should be conducted to determine the nutritional status and its determinants

List Of Abbreviations

AOR- Adjusted Odds Ratio

BAZ- Z –Score for BMI for age

BMI- Body Mass Index

CI: Confidence Interval

COR- Crude Odds Ratio

CSA- Central Statistical Agency

HAZ- Z score for height for age

NNP: National Nutrition Program

WHO- World Health Organization

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from Institutional Review Board of Dilla University College of Health Sciences and Medicine. Written informed consent was also obtained from the parent of each students and the purpose of the study was deeply explained for the study subjects. Confidentiality of the information obtained was assured and privacy of the respondents was also maintained.

Consent for publication

Not applicable

Availability of data and material

The data underlying this study is readily available from Dryad public repository with the following link DOI <https://doi.org/10.5061/dryad.9s4mw6mcp>

Competing interests

There is no any competing of interest among authors or anyone else.

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Authors' contributions

MF conceived the idea, analyzed, interpreted and prepared manuscript. RH and AA participated on analysis/result writing, interpretation and preparation of manuscript. All of the authors have read and approved the manuscript.

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