

Prevalence of and Associated Factors of Stunting among Adolescents in Tehuledere District, North East Ethiopia, 2017

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Received date: February 22, 2018; Accepted date: March 21, 2018; Published date: March 26, 2018

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Abstract

Background: Increased nutritional needs of adolescents relate to the fact that adolescents gain up much of their adult weight, height and skeletal mass during this period. Under nutrition among adolescents is a major public health problem in developing nations including Ethiopia. Moreover, adolescents have been considered a low risk group and often receive little attention. This study aims to assess the prevalence and associated factors of stunting among adolescents in Tehuledere district, Northeast Ethiopia, 2017

Methods: A school based cross sectional study was conducted among 535 secondary school adolescent age group students from 1st April to 20th April 2017 in Tehuledere district. Systematic random sampling technique was employed for selecting study subjects. A standardized, pre tested and structured self-administered questionnaire was used to collect the data. The outcome variable was measured with standardized anthropometric measurement. Data was entered using Epi info version 7 and analyzed using SPSS version 20 and WHO Anthro Plus soft wares. Crude and adjusted odds ratios with 95% level significance were used to measure the strength of association and statistical significance was declared at p-value less than 0.05.

Results: The overall prevalence of stunting among the adolescents (10-19 years) was 15.5%. After possible potential confounders were controlled; being male (AOR=2.394 95% CI=1.425, 4.022), being in the age group 13-16 (AOR=2.106 95% CI=1.261, 3.516), using unsafe drinking water supply (AOR=3.721 95% CI=1.397, 9.913) and having no latrine facility (AOR=3.311 95% CI=1.569, 6.988) were found significantly associated with stunting at P value <0.05.

Conclusion: The study revealed that prevalence of stunting was still high beside the surplus of food in the study area. Therefore, improving nutritional status of adolescents is imperative through providing comprehensive and routine nutritional assessment and counseling services for adolescents at community, school and health facility levels. Further analytic studies are recommended to identify unexplored underlying causes of stunting among adolescents.

Keywords: Stunting; Adolescents; North east Ethiopia

Abbreviations AOR: Adjusted Odds Ratio; CI: Confidence Interval; COR: Crude Odds Ratio; Ht: Height; NGOs: Non-Governmental Organizations; SPSS: Statistical Package for Social Science; UNICEF: United Nations International Children's Fund; WHO: World Health Organization

Background

Malnutrition is a major public health problem in both developed and developing nations. Adolescents resided in the developing nations are more suffering from under nutrition [1-3].

World Health Organization (WHO) defined Adolescent as the period of life from 10 to 19 years which is characterized by rapid physical growth and maturation. This crucial period needs dietary pattern adjustment as it has vital impact on lifetime nutritional status and health United Nations international Children's Fund (UNICEF)

categorizes the causes of malnutrition into immediate causes, underlying causes, basic causes [4-10].

Adolescents have high nutritional needs and about 40% of death in the developing countries and 70-80% of deaths in the industrialized countries are linked to attitudes and behaviors adapted during adolescence. But different scholar's witness that these segments of the population were received very little attention and were faced a series of serious nutritional challenges. Stunting is one of main nutritional problems affecting adolescent populations. So it is better to invest in the adolescents to improve the health of the population in general [11-16].

In developing countries, the magnitude of stunting among adolescent age groups ranges from 32% to 48% [17,18]. As evidenced by some scholars, it affects females than males and also primarily affects those rural resided adolescents than urban [19,20]. In Ethiopia, the prevalence of stunting among adolescents (10-19 years) ranges from 7.2% to 26.5% [11,21,22].

Several studies conducted across Africa indicated that sex, Age of adolescent, Urban Residence, poor socioeconomic status, lifestyle including alcohol and tobacco use, eating habits, level of physical activity, father educational status and sanitation have been found contributors of stunting [11,23-25].

Even though under nutrition is a major public health problem in developing countries including Ethiopia and different strategies have been tried in the past to alleviate stunting problem, its magnitude is not still reduced in the needed manner. On top of this, adolescents have been considered a low risk group for poor health, nutrition and often receive little attention. This results lack of information regarding the nutritional status of adolescents especially from the developing world [26-29].

Therefore; this study aimed to determine prevalence and associated factors of stunting among adolescents in Ethiopia.

Methods

Study setting and participants

Quantitative cross-sectional study was conducted among secondary school adolescents of Tehuledere District from 1st April to 20th April 2017. The district is located 430 Km away from the capital of Ethiopia, Addis Ababa. The District has three Governmental secondary schools. There is no private secondary school in the District.

The sample size of 535 was determined using Epi Info version 7.2.0.1 and single population proportion formula with the following assumptions: The 95% confidence interval ($Z_{\alpha/2}=1.96$), the type I error (α) is taken to be 4% (0.04), the prevalence (p) of under nutrition among adolescents was taken as 58.3% in Tigray, Northern Ethiopia [11] and an estimated non-response rate was 10%.

The study was conducted in all the three Secondary schools of the Tehuledere district. The sample was proportionally allocated to each school and the students in the adolescent age groups were selected by using systematic random sampling from their registration frame.

Data processing and analysis

A structured questionnaire prepared in English version and translated in to local language Amharic and used to collect data related

to the objectives of the study. The questionnaire covered a range of topics including socio-demographics, economic factors, behavioral factors, dietary habits, health related factors, Anthropometrics, etc. Data was collected by three trained, committed and competent Nurses. Data collectors were supervised by two Health Officers. Data collectors and supervisors were trained on objectives, on how to approach study subjects (humans), on how to utilize and handle tools. Besides, height was measured for all adolescents using a measuring board without wearing shoes in centimeters with a precision of 0.1 cm.

The data was checked for completeness, coded and entered using Epi info version 7.2.0.1 and analyzed using SPSS version 20.0 and WHO Anthro-Plus software's. The binary logistic regression was made to assess the imperative association between stunting and each independent variable with odds ratio and 95% confidence interval (CI). The variables with p-value less than 0.25 were entered into multivariable analysis model. Multivariable analysis was done to control the effect of possible confounders and to see the strength of association between dependent and covariates with the comparison of both crude and adjusted odds ratio with 95% confidence interval. Statistical significance was declared at p-value <0.05.

Results

Socio-Demographic characteristics of participants

From a total of 535 secondary school adolescents who were selected as sample, with 96.26% response rate 515 subjects were involved. Among the study subjects, 238 (46.2%) were males and 277 (53.8%) were females. Of the selected subjects 231 (44.9%) were in the age group 13-16 years and the rest 284 (55.1%) were in the age group 17-19 year with mean age 16.73 years with $SD \pm 1.258$. Majority of respondents were Muslims 395 (76.7%), single 472 (91.6%), live with parents 429 (83.3%), from family size range four to six 372 (72.2%) and from parents with occupation of farmer. Only 21 (4.1%) of participants were with the wealth index of high (Table 1).

Variables	Frequency	Percentage
Socio-Demographic characteristics		
Age group		
13-16	231	44.9
17-19	284	55.1
Sex		
Male	238	46.2
Female	277	53.8
Total	515	100
Grade level		

Grade 9	217	42.2
Grade 10	209	40.6
Grade 11	78	15.1
Grade 12	11	2.1
Religion		
Orthodox Christian	112	21.7
Muslim	395	76.7
Protestant	4	0.8
Catholic	4	0.8
Residence		
Urban	266	51.7
Rural	249	48.3
Marital status		
Married	33	6.4
Divorced/separated	7	1.4
Widowed	3	0.6
Single	472	91.6
Currently living with		
With parent	429	83.3
Other than parent	86	16.7
Family size		
Three and below	69	13.4
Four to six	372	72.2
Seven and above	74	14.4
Sex of head of the household		
Male	422	81.9
Female	93	18.1
Educational status of father		
Illiterate	225	43.7
Primary school	145	28.2
Secondary school	75	14.6
College and above	70	13.6
Educational status of mother		
Illiterate	256	49.7
Primary school	158	30.7
Secondary school	65	12.6

College and above	36	7.0
Father occupation		
Merchant	78	15.1
Employer in government	78	15.1
Employer in NGO	18	3.5
Daily laborer	5	1.0
Farmer	324	62.9
Other	12	2.3
Mother occupation		
Merchant	91	17.7
Employer in government	40	7.8
Employer in NGO	16	3.1
Daily laborer	6	1.2
Farmer	304	59.0
Other	58	11.3
Wealth Index		
Low	286	55.5
Medium	208	40.4
High	21	4.1

Table 1: Socio-demographic characteristics of secondary school Adolescents in Tehuledere District, North- East Ethiopia, 2017.

Dietary habits of adolescents

Majority of the households 456 (88.5%) used sorghum and the sources of food for the households were own product 209 (40.6%) and

purchase 164 (31.8%). Dietary Diversity Score of 295 (57.3%) adolescents were low (1&2). Regarding House Hold Food security only some of Houses 18 (3.5%) was very low food secured (Table 2).

Dietary habit items	Frequency	Percentage
Staple food item for the household		
Teff	31	6.0
Sorghum	456	88.5
Barley	28	5.4
Common source of food for the household		
Own product	209	40.6
Purchase	164	31.8
Both own product and purchase	142	27.6
Dietary Diversity Score		
Low (1 & 2)	295	57.3
Medium (3-5)	220	42.7
Food Security		

very low FS (8 & 9)	18	3.5
Low FS (4-7)	216	41.9
marginal FS (0-3)	281	54.6

Table 2: Descriptive Statistics on Dietary Habits secondary school Adolescents in Tehuledere District, North- East Ethiopia, 2017.

Health history and sanitation of respondents

The result about health history of the respondents showed that majority of the respondents 492 (95.5%) and 369 (71.7%) did not have previous history of any chronic diseases and any type of acute illness in period of last 1 month respectively. The result further indicated that the major source of water for majority of the respondents 436 (84.7%)

was pipe water which is chlorinated and considered to be safe in Ethiopian context while only 3 (0.6%) were used river water. Majority of the respondents 468 (90.9%) had latrine in their house and large number of the respondents 429 (83.3%) washed their hands always after toilet use but only six (1.2%) respondents never washed their hands after toilet at all (Table 3).

Health and sanitation related variables	Frequency	Percentage
Ever have had chronic diseases like TB, HIV, etc		
No	492	95.5
Yes	23	4.5
Ever had fever, cough, diarrhea or any acute illness in the period of last 1 month		
No	369	71.7
Yes	146	28.3
Source of drinking water		
Pipe	436	84.7
Spring	52	10.1
Others	27	5.2
Have latrine in the house		
No	47	9.1
Yes	468	90.9
Wash hands after toilet use		
Always	429	83.3
Sometimes	80	15.5
Not at all	6	1.2

Table 3: Descriptive Statistics on Health history and health status of secondary school Adolescents in Tehuledere District, North-East Ethiopia, 2017.

Prevalence of stunting

The overall prevalence of stunting among the study participants was 80 (15.5%). On sex basis segregation; 47 (9.1%) males and 33 (6.4%) females were stunted (Table 4).

Variables	Category of variables	Frequency	Percentage
Stunting	Ht/age Z-score \geq -2SD	435	84.5
	Ht/age Z-score $<$ -2SD	80	15.5

Segregated by sex	Male	47	9.1
	Female	33	6.4
Segregated by Age	13-16	45	8.7
	17-19	35	6.8

Table 4: Prevalence and segregation of stunting by sex and age of participants in Tehuledere District, North-East Ethiopia, 2017.

Factors associated with stunting

In order to identify major factors that have associations with under nutrition bivariate and multivariate logistic regression analysis were executed by taking Stunting of respondents as dependent variable and some explanatory variables as independent.

The results of this study showed that students sex, students age, source of safe drinking water, having latrine facility, and hand wash after toilet were found associated with stunting in the bivariate analysis at P value <0.25. However, the result of the multivariate analysis indicated that hand wash after toilet had no significant association with stunting.

The result of the multivariate analysis showed that male students were 2.4 times more likely to be stunted compared to female students

[AOR 2.394; 95% CI 1.425, 4.022]. The odds of being stunted was 2.1 times higher among students that were under age category 13-16 years than those students who were under the age category 17-19 years [AOR 2.106; 95% CI 1.261, 3.516].

Students from households that used unsafe water supply as main source of water supply were almost 3.7 times more likely to be at risk of being stunted than students from households that used safe water supply for human consumption [AOR 3.721; 95% CI 1.397, 9.913].

The likelihood of being stunted was also found to be 3.3 times higher among students who do not have latrine facility than students who have a latrine facility [AOR 3.311; 95% CI 1.569, 6.988] (Table 5).

Explanatory Variables	Nutritional status		Crude (95% CI)	Adjusted (95% CI)
	Stunted	Normal		
Age				
13-16 years	45 (8.7%)	187 (36.3%)	1.721 (1.064, 1.279)*	2.106 (1.261, 3.516)**
17-19 years	35 (6.8%)	248 (48.2%)	1	1
Sex				
Male	47 (9.1%)	191 (37.1%)	1.819 (1.122, 2.951)	2.394 (1.425, 4.022)**
Female	33 (6.4%)	244 (47.4%)	1	1
Source of drinking water				
Safe source	75 (16.4%)	362 (70.3%)	1	1
Unsafe source	5 (1%)	73 (14.2%)	3.025 (1.182, 7.740)*	3.721 (1.397, 9.913)*
Have latrine				
Yes	75 (14.6%)	400 (77.7%)	1	1
No	5 (1%)	35 (6.8%)	2.584 (1.313, 5.086)**	3.311 (1.569, 6.988)**
Hand wash after toilet				
Always	63 (12.2%)	370 (71.8%)	1	
Sometimes	16 (3.1%)	60 (11.7%)	0.478 (0.269, 0.851)*	
Never at all	1(0.2%)	5(1%)	0.797(0.092, 6.945)	
*P-value less than 0.05 **P-value less than 0.01				

Table 5: Factors associated Stunting among Secondary school adolescents in Tehuledere District, North-East Ethiopia, 2017.

Discussion

This study was conducted to assess the prevalence and associated factors of Stunting among secondary school adolescents in Tehuledere District, Amhara Regional State, North-East Ethiopia.

The prevalence of stunting among the study participants was 15.5% which is similar to the result of the Study conducted in Jimma zone Adolescents, Southwest Ethiopia (16%) [22] and Mongolia (15.6%) [29]. The prevalence of stunting in this study was higher compared to the study conducted among Addis Ababa secondary school adolescents (7.2%) [21]. The possible reasons for the discrepancy might be mainly due to socioeconomic status discrepancy and small sample size in this study.

However, the prevalence of stunting was lower than the study conducted in Tigray, northern Ethiopia (26.5%) [11] and the study conducted in Bangladesh (42%) [29]. The discrepancy might be due to seasonal variation, socioeconomic variability, and geographical characteristics of study area.

In order to identify major factors that have association with stunting bivariate and multivariate logistic regression analysis were executed by taking stunting of respondents as dependent variable and some explanatory variables as independent.

Regarding associated factors of stunting, the result of the multivariate analysis indicated that students sex, students age, source of safe drinking water and having latrine facility were significantly associated with stunting at P value <0.05.

The result of this study showed that male students were 2.4 times more likely to be stunted compared to female students. Consistent with this study result, a study done in Chiro Town, West Hararge, indicated that one factor associated with stunting were being male (AOR=3.91 CI=1.7, 8.98) [25].

Unlike to the result of this study, one study done in Bangladesh reflected as the prevalence of stunting was high in females than males. It was estimated to be 43.1% among boys and 50.3% among girls [20]. These differences may be in part due to variations in sample size as compared with present study.

Based on this study result age was also found to be strong predictor of stunting at P values <0.05. That is, students in age group 13-16 were 2.1 times more likely to be stunted compared to students in the age category 17-19 years. In other words, the risk of being stunted decreased in older adolescents than younger adolescents. In line with the present study finding of other previous study showed that age was strong predictor of stunting ($r^2=0.88$, $p<0.01$) [11]. In contrast, other study showed that the prevalence of stunting is increased with adolescents age [29]. This might be due to variations related with sample size and related issues.

This study also found that source of water supply had association with stunting. Students from households that used unsafe water supply as main source of water supply were almost four times more likely to be at risk of being stunted than students from households that used safe water supply for human consumption. This finding is similar to study conducted western Kenya that showed more children who drank water that was not consistently treated in households were stunted [30]. Therefore, diarrhea and water borne diseases caused by unsafe drinking water at households' level might increase the prevalence of malnutrition directly or indirectly.

This study further depicted that the presence of latrine facility in the household had negative association with stunting. In this study finding the likelihood of being stunted was found to be 3.3 times higher among students who do not have latrine facility than students who have a latrine facility in their house. Supporting this finding one previous study showed that lack of latrine facilities was also a predictor of stunting ($r^2=0.06$, $p=0.02$) in Adolescents [11].

Conclusions

The study revealed that prevalence of stunting was still high beside the surplus of food in the study area. After adjustment; being female, being in the age group 13-16 years, using unsafe source of drinking water and have no latrine facility were found the significant predictors of stunting. Therefore, improving nutritional status of adolescents is imperative through providing comprehensive and routine nutritional assessment and counseling services for adolescents at community, school and health facility levels. Further analytic studies are recommended to identify unexplored underlying causes of stunting among adolescents.

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from University of Gondar, institute of public health and Permission letter was obtained from Tehuledere District administration office, Education Office and schools. The School leaders, Teachers and students were informed about the objective of the study. Informed consent was obtained from adolescents in the age group 18-19 years and for those participants aged <18 years, assent was obtained from their parent/legal guardians. Finally, the data was collected from the study participants with the assurances of confidentiality, right to refuse at any time and right to ask any questions related to the study when the occasion arises. The entire information that was obtained from each participant remained anonymous and confidential.

Consent for publication

Not applicable since it is original work of the authors.

Availability of data and material

If the reviewers need more information, the reviewers can contact the corresponding author without any hesitations.

Competing Interests

The authors declared as there is no conflict of interest.

Funding

Not applicable

Authors' Contributions

All authors conceived and designed the study. YM and DT supervised the data collection.

YM and AW performed the data analysis, interpretation of data and drafted the manuscript.

AW, YM and DT had interpreted and critically reviewed the manuscript.

All authors read and approved the final manuscript.

Acknowledgements

The authors would like to thank University of Gondar, Institute of Public Health, Tehuledere District Education Office, and secondary schools for giving the required information. Also authors forward their deepest gratitude to study participants. The authors would like to acknowledge who were involved directly or indirectly in the accomplishment of this study.

References

1. DeOnis M, Blossner M, Borghi E (2012) Prevalence and trends of stunting among pre-school children. *Public Health Nutr* 15: 142–148.
2. De Onis M, Onyango A, Borghi E, Siyam A, Blossner M, et al. (2012) Worldwide implementation of the WHO Child Growth Standards. *Public Health Nutr* 15: 1603-1610.
3. Beegum RM (2001) Prevalence of malnutrition among adolescent girls, A case study in Kalliyoorpanchayat.
4. United Nations Children's Fund (UNICEF) (2013) Strategy for improved nutrition of children and women in developing countries 1991 Accessed.
5. Ghai OP, Gupta P, Paul VK (2004) *Essential Paediatrics*, 6th ed ed. CBS Publishers and Distributors, editor.
6. Ahmad H, Liaqat P, Paracha PI, Qayyum A, Uppal AM (2009) Assessment of Nutritional Status of Adolescents versus Eating Practices in Islamabad City. *Pak J Nutr* 8: 1304-1308.
7. Meseret Y (2008) *Anthropometric Assessment of Adolescent Malnutrition in Elementary and Secondary Schools of Ambo Town, West Shewa Zone, Oromia Region, Ethiopia*, [MPH thesis]: Addis Ababa University.
8. Deshmukh P, Gupta S, Bharambe M, Dongre M, Kaur S, et al. (2006) Nutritional Status of Adolescents in Rural Wardha. *Indian J Pediatr* 73: 139-141.
9. United Nations Food and Population Agency /UNFPA (2008) State of the World population.
10. United Nations Food and Population Agency (2012) State of the World population.
11. Afework M, Fitsum H, Barbara S, Gideon K, Vincent L, et al. (2009) Nutritional Status of Adolescent Girls from Rural Communities of Tigray, Northern Ethiopia. *Ethiop J Health Dev* 23: 5-11.
12. Anyika J, Uwaegbute A, Olojede A, Nwamarah J (2009) Nutrient Intakes of Adolescent Girls in Secondary Schools and Universities in Abia State of Nigeria. *Pak J Nutr* 8: 1596-1602.
13. Kalhan M, Vashisht B, kumar V, Sharma S (2010) Nutritional Status of adolescent girls of rural Haryana. *J Epidemiol* 8: 67-75.
14. Carvalho IH, Francescantonio M, Neutzling M, Taddei A (2009) Risk factors for overweight and obesity in adolescents of a Brazilian university, a case-control study. *Nutr Hosp* 24: 17-24.
15. WHO (2009) WHO anthroplus manual. Department of Nutrition for Health and Development, editor, Geneva, Switzerland.
16. Radu E, Ciotaru LO (2007) Adolescent Malnutrition from Anthropological Perspective. *Med Anthropol* 10: 1-8.
17. Olumakaiye MF (2008) Prevalence of underweight among adolescents in Osun state, Nigeria.
18. Omidvar S, Karn S, Shafiee S, Singh RB, Tokunaga M, et al. (2013) Proatherogenic Risk Factors and Under-Nutrition among Adolescents in South East Asia: When to Eat and What to Eat? *World Heart J* 5: 4.
19. Vashist BM, Joyti, Goel MK (2009) Nutritional Status of Adolescents in Rural and Urban. *Health and Population: Perspectives and Issues* 32: 190-197.
20. Rahman MA, Karim R (2014) Prevalence of Stunting and Thinness among Adolescents in Rural Area of Bangladesh. *J Asian Scientific Research* 4: 39-46.
21. Gebreyohannes Y, Shiferaw S, Demtsu B, Bugssa G (2014) Nutritional Status of Adolescents in Selected Government and Private Secondary Schools of Addis Ababa, Ethiopia. *Int J Nutr Food Sci* 3: 504-514.
22. Assefa H, Belachew T, Negash L (2013) Socioeconomic Factors Associated with Underweight and Stunting among Adolescents of Jimma Zone, South West Ethiopia. *ISRN Public Health* 1: 7.
23. Olumakaiye MF (2008) Prevalence of underweight: a matter of concern among adolescents in Osun state, Nigeria. *Pak J Nutr* 7: 503-508.
24. Keino SJ (2014) Determinants of stunting and overweight among young children and adolescents in Sub-Saharan Africa. *Food Nutr Bull* 35: 167-178.
25. Damie TD, Wondafrash M, Nigussie A (2013) Nutritional status and associated factors among school adolescents in Chiro Town, West Hararge, Ethiopia.
26. Zeleke A (2007) Prevalence of childhood and adolescent overweight and obesity among elementary school students in Addis Ababa: double burden of malnutrition in Ethiopia. Addis Ababa University Libraries Electronic Thesis and Dissertations.
27. Assis AM, Prado MS, Barreto ML, Reis MG, Conceição Pinheiro SM, et al. (2004) Childhood stunting in Northeast Brazil: the role of Schistosoma mansoni infection and inadequate dietary intake. *Eur J Clin Nutr* 58: 1022-1029.
28. Soekarjo DD1, Pee Sd Sd, Kusin JA, Schreurs WH, Schultink W, et al. (2004) Effectiveness of weekly vitamin A (10000 IU) and iron (60 mg) supplementation for adolescent boys and girls through schools in rural and urban East Java, Indonesia. *Eur J Clin Nutr* 58: 927-937.
29. Lopez MA, Martos FC (2004) Iron availability: An updated review. *Int J Food Sc Nutr* 55: 597-606.
30. Emily B, Fidelis W, Robert CB (2002) Prevalence and Predictors of Underweight, Stunting, and Wasting among Children Aged 5 and Under in Western Kenya. *J Trop Pediatr* 50: 260-269.