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Stunting and thinness in school-attending adolescents in Addis Ababa

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Abstract

Background Adolescent population Global Diet Quality Score (GDQS) is uncommon in low-income settings. Though Global Diet Quality Score is a good measure of dietary diversity, it has not been used in assessing nutritional outcomes among adolescents. Therefore, the aim of this study is to assess school-attending adolescents stunting and thinness status and associations with global diet quality scores in Addis Ababa.

Methods A school-based cross-sectional study was conducted among school-attending adolescents in the age group of 10–14 years in urban settings in Ethiopia. A multi-stage stratified random sampling procedure was used to select schools and students. A total of 1200 adolescents were included in the study. Binary and Multinomial logistic regression analyses were used to determine the predictors of stunting and thinness respectively.

Results The proportion of school-attending adolescents stunting was 8.17% (95% CI: 6.74%,9.85%) and their thinness status 12.66% (95% CI: 10.89%, 14.67%). The overall mean GDQS food groups for Seven days period consumed were 19.99 + 2.81 SD. Male adolescents were 1.95 times more likely to be stunted compared to female adolescents (1.95; 95%CI: 1.11,3.39). Frequent consumption of low-fat dairy increased the risk of thinness, while frequent consumption of citrus fruits and white root tubers decreased the risk of school-attending adolescents' thinness.

Conclusion The proportion of thin or stunted adolescents attending school was high still, about 1 in 10. Stunting and thinness have no association with the overall GDQS. Nutritional interventions need to consider frequent consumption of citrus fruits, low-fat dairy, and white roots and tubers in school adolescents' nutritional programs. Further studies should validate the GDQS for stunting and thinness of school adolescents.

Keywords School adolescents, Thinness, Stunting, Global diet quality score, Ethiopia

Background

Adolescents are vulnerable to malnutrition because of rapid growth and development and their high macro and micronutrient demand [1]. Adolescence is also a window of opportunity for establishing lifelong dietary habits that support nutritional well-being of generations [2]. The burden of malnutrition in developing countries among adolescents is high [3]. In Ethiopia, a significant number of school adolescents are affected by malnutrition [4]. Researches in Addis Ababa showed that 15. 15.9% of school age children are underweight [5]. In Ethiopia, stunting prevalence among school adolescents range from 5–29% [4, 6–8]. Risk factors for stunting include mothers' occupation [7, 8], mothers' education [7], adolescents age [6, 7] and grade [9], dietary diversity score [6], meal frequency [9], and food insecurity status [9]. In addition, in Ethiopia, most adolescents are dependent on their parents. Therefore, parents' education and family income have an influence on adolescent nutritional status [10, 11]. Culturally boys had more free time to participate

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in outdoor physical activities than adolescent girls; which influence their body weight [12].

Studies indicate that thinness prevalence among school adolescent ranges from 4.5–29% [6–8, 13, 14]. In low-income countries, adolescents thinness is influenced by their parents education level [7], age of the adolescent [8, 14], family income [14], dietary diversity score [6], frequency of meal [6] and residency [8]. In addition, exposure of school adolescents to unhealthy food consumption [15] around school environment may have effect on their nutritional status. Adolescents' food choices is based on peer pressure other than nutritional composition and adolescents may perceive either excess weight or thinness as a sign of well-being and attractiveness [16, 17]. The effect is eating disorders during adolescence [18].

Research recommend a need for consistently measured and standardized indicators for dietary diversity [19]. Dietary diversity is one dimension of diet quality. There are different type of dietary quality assessment methods [20, 21]. Global Diet Quality Score (GDQS) is one of the recent methods to capture both under- and overnutrition [22]. The GDQS was designed for non-pregnant, non-lactating women of reproductive age in low- and middle-income countries (LMICs) [23–25]. The method was tested for mothers but has not been tested for adolescents [20, 22, 26, 27]. Focusing on adolescents' populations will benefit present and future generations in terms of health and development.

Dietary diversity practice has an association with underweight for school adolescents [28]. Poor dietary diversity and food variety are directly associated with inadequate micronutrient intake [29]. A review in low- and middle-income countries show that daily consumption of nutritious foods is low for school adolescents. On average, 46% adolescents consume daily meat, 44% fruits, and 37% vegetables [19].

Although there are improvements in nutritional problem in Ethiopia [30], the government is still off-track to achieve nutritional targets at 2025 [31]. This may help to develop nutrition plans for health and development program for this age group among national priorities. Therefore, school adolescent nutritional status assessment is very important. The aim of this study is to assess stunting and thinness in school-attending adolescents in Addis Ababa.

Methods

Design and setting

A cross-sectional study was conducted among school-attending adolescents aged 10–14 years. The study was conducted in Addis Ababa, the capital city of Ethiopia. Administratively the city is divided in to 10 sub-cities. Addis Ababa is the largest and one of the fastest growing cities in the continent. A total of 223 primary government school exists in the city. The survey was conducted from May to June 2019 in 20 primary schools. Schools in sub-cities such as Addis Ketema, Akaky Kaliti, Arada, Bole, Gullele, Kirkos, Kolfe Keraino, Lideta, Nifas Silk-Lafto, and Yeka were included.

Participants

Sample size was calculated assuming stunting prevalence of 7.2% [32], level of significance 2%, design effect of 1.5, 20 school clusters and 10% non-response rate. A total of 1078 sample size was calculated to get adequate power to answer our objective. While we have taken all 1200 students collected information to the project to acquire adequate precise information from the available data. A multi-stage stratified random sampling procedure was used to select schools and students. First, randomly two government schools were selected from each sub-city. A total of 20 schools were included in the study. From each selected school, randomly 15 students enrolled whose age were 10–14 years old from each of the grades 5–8. A total of 60 students per school were enrolled to the study. An updated student roster was used as a sampling frame to select students. A total of 1,200 school-attending adolescents were included in the study.

Variables measurement

Outcome's definitions

Stunting and thinness were assessed according to WHO definition for adolescent. Height was measured in meters to the nearest centimetre. Weight was measured using portable standing digital scale. Measurements were transformed into height-for-age z-scores based on sex and age in year using WHO Anthro-Plus software [33]. Height-for-age z-scores were categorized according to WHO stunting cut-offs (Stunted: <− 2SD; Not stunted: ≥ −2 SD) [34]. Thinness was defined as adolescents with BMI-for-age with Z-score < −2 SD from the median value of WHO's 2006 reference data [34].

Predictors definitions

In the study the primary exposures of interest were school adolescents Global Diet Quality Score (GDQS). Adolescents were asked food groups consumed in the reference for the past one-week period. Points were assigned for consumption of food groups based three classifications: never or 1/wk, 2–4/wk and 5–7/wk or >1/day. Points for each food group were then summed to give an overall score. Global Diet Quality Score were recorded based on the past 7 days for 25 GDQS food groups. GDQS was classified in to two GDQS sub-metrics, such as GDQS positive (GDQS+) sub-metric and the GDQS negative (GDQS−) sub-metric diet quality outcomes [22, 26].

Healthy food group The GDQS + is the total score across the 16 healthy GDQS food groups, with a possible range of 0 to 32. Healthy food groups are; Dark green leafy vegetables, Cruciferous vegetables, Deep orange tubers, Deep orange vegetables, Deep orange fruits, other vegetables, Citrus fruits, other fruits, Legumes, Nuts and seeds, Poultry and game meat, Fish and shellfish, Whole grains, Liquid oils, Low-fat dairy, Eggs. The mean GDQS + expressed the adolescent population healthy diet quality [22].

Unhealthy food group The GDQS − is the total score across the 7 unhealthy GDQS food groups and the 2 GDQS food groups that are unhealthy when consumed in excessive amounts, with a possible range of 0 to 17. Unhealthy food groups are; White roots and tubers, red meat, refined grains and baked goods, Processed meat, Sugar-sweetened beverages, Sweets and ice cream, High-fat dairy, Juice, and Purchased deep fried foods. The mean GDQS- expressed the adolescent population unhealthy diet quality [22].

Overall GDQS The overall GDQS is a sum of the points across all 25 GDQS food groups. The GDQS has a possible range of 0 to 49. A GDQS ≥ 23 is associated with a low risk of nutrient inadequacy, scores ≥ 15 and < 23 indicate moderate risk, and scores < 15 indicate high risk [22].

Dietary Diversity Score (DDS) was calculated based on 10-item food indicators. These food items were; starchy staples, pulses, nuts and seeds, dairy, meat, poultry and fish, eggs, dark green leafy vegetables, other vitamin-A rich fruits and vegetables, other vegetables, and other fruits. For each food item a score of "1" was given for groups consumed and "0" for not consumed over the last one week consumed. The total DDS range from 0 to 10. Those who scores ≥ 5 were good Minimum Dietary Diversity for Women (MDD-W) and < 5 were recorded insufficient MDD-W [35].

Data management and statistical analysis

Data were collected using a pretested standard questionnaire by trained data collectors. WHO Anthro-plus was used to convert height and weight measurements to Z-scores for 5–19 years [36]. Questionnaires were programmed using ODK for electronic data collection and translated into local languages (Amharic in Ethiopia). Data collectors and supervisors were trained on research ethics, how to take consents and anthropometric measurements. Regular supervision was conducted during data collection in the field. Height and Weight were measured for each school adolescent. Height was measured to the nearest 0.1 cm and weight to the nearest 0.1 kg using a calibrated SECA weighing scale. Each subject weighed with light clothing and no footwear. All the measurements were taken twice; when necessary, any discrepancies resolved by a third measurement. The mean values were used for data analysis.

Multinomial logistic regression was conducted to investigate factors associated with adolescent nutritional status. Adolescents' nutritional status outcome was classified as thinness, normal and overweight. Normal weight as the reference category compared to thinness and overweight. Binary logistic regression analysis was conducted to see the association between predictor variable and stunting status of school adolescents. For stunted adolescent were considered as height-for-age *Z*-score less than − 2 standard deviation of the new WHO 2007 reference population.

First, univariate analysis was conducted to identify associations between individual variables and school-attending adolescent nutritional status (Stunting and thinness). Variables in the univariate analysis with P-Value less than 0.2 were included in the final model to. control confounders. In the final model for both stunting and thinness sex, age, mother occupation, father's education, Global diet Quality Score, Dietary Diversity score were included in the model. Clustering effect was observed using school as a cluster effect. *P*-value < 0.05 was considered as a cut-off point for statistical significance. Statistical analyses were conducted using STATA 14 software.

Results

Socio-demographic characteristics

A total of 1200 school-attending adolescents included in the study with a median age of 13 years with interquartile range of 12 and 14 years. The mean age of participant was 12 years ± 1.16 years standard deviations. A quarter of students 316 (26.38%) had only one sibling. For the majority of school adolescent, the education level of fathers and mothers was at the primary level (Table 1).

Dietary characteristics and nutritional status

School-attending adolescents frequently (5–7 times a week) consumed wholegrains (95.25%) and liquid oils (86.58%). Poultry, fish, dark green leafy vegetable, cruciferous vegetables, deep orange fruits, deep orange tubers were rarely consumed food groups. Legumes food group were consumed 2–4 times per week by half of the students. Juice was one of the frequently consumed food groups and 94.17% of school-attending adolescents took 5–7 times per week. The second most frequently consumed unhealthy food group was sugar-sweetened beverages, 82.08% of students consumed 5–7 times per week. Except for legumes, other vegetables, low fat dairy, and

Table 1 Socio demographic characteristics of urban school-attending adolescents in Addis Ababa ,2019 Ethiopia,

Variables	Frequency	Percent (%)
Gender		
Male	543	45.2
Female	657	54.7
Age in Years		
10 years	54	4.5
11 years	188	15.6
12 years	294	24.5
13 years	344	28.6
14 years	320	26.6
Fathers Education		
No schooling	225	23.1
Primary	430	44.2
Secondary	251	25.8
Technical and University	67	6.9
Mother Education		
No schooling	62	9.4
Primary	264	39.9
Secondary	237	35.8
Technical and University	99	14.9
Father/male guardian occupation		
Private	487	63.3
Government workers	228	29.6
Unemployment	46	5.9
Others (Paster, religious leader)	8	1.0
Mother/female guardian occupation		
Private	407	37.62
Government	238	22.00
Unemployment	46	4.25
Homemaker	391	36.14
Number of siblings (brother and Sister in the Household)		
No sibling	145	12.1
One sibling	308	25.7
Two siblings	316	26.4
Three siblings	225	18.8
Four and Above sibling	204	17.0

liquid oils, most of the students consumed healthy food groups one time per week. Only other vegetables, whole grains, and liquid oils were consumed at least 5 days in a week. The students rarely ate red meat and high fat dairy food groups. But most frequently ate sugar sweetened beverages, sweets and ice cream, and juice (Table 2).

The overall mean score GDQS food groups consumed by school-attending adolescents one week period was 19.99 ± 2.81 Standard Deviation (SD). The one-week period mean healthy (GDQS+) sub metrics score across 16 healthy food groups was 8.81 with ± 2.86 SD. The mean score for unhealthy (GDQS-) food groups consumed within one week was 11.17 with ± 1.59 SD.

The overall stunting prevalence was 8.17% with 95% CI: 6.74–9.85%. From the total stunted cases 61(62.24%) are males and 37(37.76%) female school adolescents.

Factors associated with stunting among school adolescents

Sex of school-attending adolescents were significantly associated with stunting status of school adolescents. Males were 1.95 times more likely to be stunted compared to female adolescents with 95% CI: 1.11,3.39 in the final model controlling other factors (Table 3).

Factors associated to thinness among school adolescents

Multivariable multinomial logistic regression indicates that gender and grade were statistically significant with thinness status of school adolescents. The associations between consumption of citrus fruits, low fat dairy and white roots and tubers school adolescents' thinness status were statistically significant. Except white roots and tubers all food groups (Citrus fruits, Low fat dairy) were under healthy diet food group category. Thinness compared with consumption of Low-fat dairy from 2 to 4 times per week compared to non-consumption, the relative risk for thinness to normal would be expected to increase by a factor of 1.66. While consumption of citrus fruits and white roots and tubers 2–4 times per week compared to non-consumption or once per week the risk for thinness decreased by a factor of 0.52 and 0.28 respectively compared to normal school adolescents' nutritional status (Table 4).

Discussion

The prevalence of stunting and thinness were 8.17% and 12.67% respectively among school-attending adolescents in Addis Ababa. In this finding there was no association between adolescents stunting and thinness with the overall GDQS. Males and older school-attending adolescents were significantly associated with stunting status. Consumption of citrus fruits and white roots tubers were positively associated to thinness. While consumption of low-fat dairy for 2–4 times per week was positively associated with thinness status of school adolescents.

The prevalence of stunting in this study was low compared to previous studies among in school adolescent [6–8]. This low stunting prevalence in our study may be due to this study conducted in urban settings [8] .In urban setting families have an opportunity to get more media exposure compared to rural setting [37]. In addition, reginal variation due to sociodemographic and climatic variation between regions in Ethiopia may be the

Table 2 GDQS food groups consumed by school-attending adolescents and their Nutritional status in Addis Ababa

Healthy Food groups	Never or 1/wk# of students (%)	2–4/wk# of students (%)	5–7/wk or ≥ 1/day# of students (%)
Dark green leafy vegetables	940 (78.3)	253 (21.1)	7 (0.5)
Cruciferous vegetables	1011 (84.5)	184 (15.3)	5 (0.4)
Deep orange vegetables	838 (69.3)	345 (28.7)	17 (1.4)
Deep orange fruits	1060 (88.3)	134 (11.4)	6 (0.5)
Deep orange tubers	1134 (94.5)	57 (4.7)	9 (0.7)
Other vegetables	61 (5.08)	143 (11.9)	996 (83.0)
Citrus fruits	952 (79.3)	223 (18.5)	25 (2.1)
Other fruits	910 (75.8)	271 (22.5)	19 (1.5)
Legumes	181 (15.1)	425 (35.4)	594 (49.5)
Nuts and seeds	1051 (87.6)	121 (10.1)	28 (2.3)
Poultry	1179 (98.2)	21 (1.7)	0 (0)
Fish	1194 (99.5)	6 (0.5)	0 (0)
Whole grains	13 (1.1)	44 (3.6)	1143 (95.2)
Liquid oils	130 (10.8)	31 (2.6)	1039 (86.5)
Low fat dairy	939 (78.2)	210 (17.5)	51 (4.2)
Eggs	951 (79.2)	236 (19.6)	13 (1.1)
Unhealthy Food groups	**Never or 1/wk**	**2–4/wk**	**5–7/wk or≥ 1/day**
White roots and tubers	35 (2.92)	461 (38.4)	704 (58.6)
Red meat	1111 (92.6)	89 (7.4)	0 (0)
Processed meat	9 (0.7)	219 (18.2)	972 (81)
Refined grains and baked goods	727 (60.6)	361 (30.1)	112 (9.3)
Sugar-sweetened beverages	24 (2)	191 (15.9)	985 (82.1)
Sweets and ice cream	81 (6.7)	348 (29)	771 (64.2)
High fat dairy	927 (77.2)	230 (19.1)	43 (3.6)
Juice	5 (0.4)	65 (5.4)	1130 (94.1)
Fried foods eaten away from home	42 (3.5)	301 (25.1)	857 (71.4)

cause of the difference compared to previous studies among school adolescents [11]. This implies the need of different setting contextual action for the implementation of nutritional intervention program for adolescent population. Boys are more stunted than girls in our finding. Our finding is supported by similar study conducted in Ethiopia [38]. In Ethiopia culturally boys had more free time to participate in outdoor activities compared to adolescent girls; adolescent boys physical activity may influence their body weight [39].

The prevalence of thinness in Our finding is lower than studies conducted in the northern 29% [8] and 14.9% [14] and 15% [7] southern part of Ethiopia. This may be due to different sociodemographic characteristics and adolescents from rural settings which are more likely to be involved in activities which need more energy expenditure [40] and different cultural characteristics in the rural setting [41]. While our finding was higher than compared to previous studies conducted in Ethiopia 8.8% [6], 4.9% [13], and 5.2% [4]. The high prevalence in the study setting needs further investigation.

The male school-attending adolescents were more likely to be stunted than female adolescents; which is consistent to previous studies [13, 42]. In Ethiopia, boys have more free time to participate in outdoor physical activities compared to adolescent girls; which influence their body weight [12]. School adolescents age increases the probability of stunted increased [11], while in this study there is no statistical significance between adolescents age to stunting. This may be due to available difference between boys and girls towards their growth spurt age [43].

The overall GDQS was not statically significant with school adolescents stunting and thinness. In this study the mean overall GDQS food group score was 19.99 while in non-lactating and non-pregnant women in India overall GDQS food group score was 24 [25]. The overall mean difference GDQS food group score value between in this school adolescent group and non-lactating and non-pregnant women may be due to age of the two populations. This indicate that the need for further food quality measurement for adolescents.

Table 3 Factors to stunting, Urban school-attending adolescents in Addis Ababa, 2019 Ethiopia

Characteristic	Stunting Status		Crude OR (95% CI)	Adjusted OR (95% CI)
	Not stunted	Stunted		
Gender				
Female	620	37	1	1
Male	482	61	1.99 (1.437,2.768) ***	1.95 (1.11,3.39) **
Grade				
Garde 5	280	20	1	1
Grade 6	273	27	1.38 (0.817,2.231)	0.72 (0.30,1.71)
Garde 7	276	24	1.2 (0.70,2.057)	0.49 (0.18,1.32)
Grade 8	273	27	1.38 (0.814,2.239)	0.33 (0.11,0.98) **
Age of Adolescents				
10 years	50	1	1	1
11 Years	150	10	3.187 (0.507,20.039)	2.76 (0.32,23.82)
12 Years	223	17	3.612 (0.516,25.287)	4.74 (0.56,40.22)
13 Years	282	13	2.247 (0.283,17.879)	3.58 (0.39,33.03)
14 Years	234	36	6.799 (1.094,42.259)	16.19 (1.74,150.82)
Mother/female guardian occupation				
Private	373	34	1	1
Government worker	208	30	1.509 (0.824,2.762)	1.45 (0.73,2.87)
Unemployment	45	1	0.260 (0.038,1.764)	0.39 (0.05,3.18)
Homemaker	368	23	0.704 (0.448,1.106)	0.64 (0.33,1.25)
Fathers'/male guardian educational status				
No schooling	203	22	1	1
Primary	395	35	0.832 (0.571,1.212)	1.32 (0.63,2.77)
Secondary	234	17	0.693 (0.368,1.304)	0.93 (0.40,2.15)
Technical and University	63	4	0.611 (0.267,1.394)	1.16 (0.32,4.17)
Cruciferous vegetables				
Never or 1/wk	923	88	1	1
2–4/wk	175	9	0.562 (0.304,1.037)	0.62 (0.27,1.44)
5–7/wk or > 1/day	4	1	2.297 (0.0558,9.459)	2.09 (0.34,13.07)
Other fruits				
Never or 1/wk	828	82	1	1
2–4/wk	257	14	0.573 (0.331,0.991)	0.58 (0.27,1.24)
5–7/wk or > 1/day	17	2	1.168 (0.288,4.738)	1.19 (0.26,5.51)
Legumes				
Never or 1/wk	171	10	1	1
2–4/wk	392	33	1.405 (0.777,2.543)	1.34 (0.56,3.23)
5–7/wk or > 1/day	539	55	1.676 (0.880,3.191)	1.72 (0.74,3.99)
Liquid oils				
Never or 1/wk	125	5	1	1
2–4/wk	30	1	0.839 (0.122,5.748)	0.98 (0.09,9.82)
5–7/wk or > 1/day	947	92	2.302 (0.9147,5.795)	2.21 (0.74,6.59)
Sweets and ice cream				
Never or 1/wk	79	2	1	1
2–4/wk	321	27	3.142 (0.700,14.096)	1.19 (0.25,5.64)
5–7/wk or > 1/day	702	69	3.624 (0.898,14.615)	1.83 (0.41,8.11)

NB: ***= $p < .001$, **= $p < .01$, *= $p < .05$

Table 4 Specific food item factors to thinness among Urban school-attending adolescents in Addis Ababa ,2019 Ethiopia, ($n = 1200$)

Specific food item frequency of consumption by adolescents	Thinness		Crude IRR (95% CI)	Adjusted IRR (95% CI)
	Normal	Thin		
Gender				
Female	501	68	1	1
Male	446	84	1.387 (0.98, 1.957)	**1.45 (1.06,1.99) ****
Grade				
Garde 5	250	32	1	1
Grade 6	228	47	1.61 (0.993,2.612)	**1.80 (1.03, 3.15) ****
Garde 7	243	30	0.965 (0.569,1.636)	1.09 (0.70,1.69)
Grade 8	226	43	1.486 (0.909,2.43)	1.56 (0.94,2.61)
Fathers'/male guardian educational status				
No schooling	178	27	1	1
Primary	336	63	1.236 (0.76,2.01)	1.19 (0.73,1.97)
Secondary	206	26	0.832 (0.468,1.478)	0.76 (0.42,1.38)
Technical and University	48	11	1.511 (0.6993.263)	1.49 (0.738,3.03)
Deep orange vegetables				
Never or 1/wk	675	102	1	1
2–4/wk	261	46	1.16 (0.91,1.49)	1.05 (0.72,1.52)
5–7/wk or > 1/day	11	4	2.41 (0.79,7.36)	1.81 (0.63,5.18)
Deep orange tubers				
Never or 1/wk	899	139	1	1
2–4/wk	44	9	1.32 (0.53,3.31)	1.14 (0.38,3.43)
5–7/wk or > 1/day	4	4	6.46 (1.57,26.55)	6.05 (0.52,70.78)
Citrus fruits				
Never or 1/wk	740	131	1	1
2–4/wk	189	17	0.51 (0.29,0.87)	**0.52 (0.26,0.99)****
5–7/wk or > 1/day	18	4	1.25 (0.60,2.61)	1.63 (0.64,4.16)
Low fat dairy				
Never or 1/wk	752	107	1	1
2–4/wk	158	35	1.56 (1.08,2.24)	**1.66 (1.07,2.58)****
5–7/wk or > 1/day	37	10	1.89 (0.91,3.97)	1.85 (0.76,4.49)
Egg				
Never or 1/wk	757	120	1	1
2–4/wk	181	28	0.97 (0.67,1.42)	0.84 (0.48,1.48)
5–7/wk or > 1/day	9	4	2.80 (1.14,6.91)	2.25 (0.65,7.71)
White roots and tubers				
Never or 1/wk	22	10	1	1
2–4/wk	347	68	0.43 (0.20,0.91)	0.44 (0.15,1.30)
5–7/wk or > 1/day	578	74	0.28 (0.13,0.59)	**0.28 (0.09,0.83)****
Refined grains and baked goods				
Never or 1/wk	563	103	1	1
2–4/wk	294	34	0.63 (0.41,0.97)	0.69 (0.45,1.05)
5–7/wk or > 1/day	90	15	0.91 (0.44,1.86)	0.98 (0.44,2.18)
High fat dairy				
Never or 1/wk	743	107	1	1
2–4/wk	172	37	1.49 (1.03,2.16)	0.99 (0.61,1.63)
5–7/wk or > 1/day	32	8	1.74 (0.65,4.62)	1.09 (0.34,3.55)
Fried foods eaten away from home				
Never or 1/wk	35	3	1	1
2–4/wk	242	29	1.39 (0.41,4.73)	0.95 (0.27,3.33)
5–7/wk or > 1/day	670	120	2.09 (0.68,6.43)	1.79 (0.56,5.72)

NB: ****= p <.001, **= p <.01, * =p <.05*

Healthy food groups like citrus fruits, deep orange tubers, low fat dairy are an important diet components for humans [44]. In this study indicated that school adolescents' thinness has association with consumption of citrus fruits, Low fat dairy and white roots and tubers. Almost 80% adolescents did not eat for the past seven days either citrus fruits or low-fat dairy products. In the other way 58% and 94% of adolescents take unhealth food groups like white root tubers and Juice respectively. This is an indication of malpractice for the frequency of consumption of health food group. Low-fat dairy products are reduced or naturally low-fat dairy products ($\leq$2% milk fat) [45]. The frequency and consumption of healthy diets like citrus fruits and low-fat dairy products increased the overall GDQS score. While Consumption of unhealth food group like White roots and tubers has decreased the overall GDQS score. This inverse finding may be due to adolescent population difference compared to adult population. In addition, it indicated that the need for well-designed strong design to implement for adolescent population.

Some of the limitations of this study include social desirability bias leads to positively distorting dietary habit of adolescents. The study focused only for government schools and not including private schools in which stunting and thinness are not considered issue [32]. Consumption of certain food groups were considered as a wealthier household status in the community. So, this misconception and attitude of the respondent may increase the Global dietary quality score for school adolescents. Secondly, recall bias may underestimate the type of food consumed leading to lower dietary scores.

Conclusion

This study revealed that the prevalence of thinness and stunting was high among urban school attending adolescents. The overall GDQS food score has no association with stunting and thinness status of school adolescents' Nutritional interventions need to consider health food consumption. Consider the need for dietary quality, gender focused promotion interventions through effective behaviour change communications.

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Authors' contributions
WWY: Data cleaning, Data Analysis, manuscript writing, editing. AW: involved from proposal writing until the manuscript writing phase. NA: involved from proposal writing until the manuscript writing phase. FW: involved from proposal writing until the manuscript writing phase. YB: involved from proposal writing until the manuscript writing phase. The author(s) read and approved the final manuscript.

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Availability of data and materials
The data that support the findings of this study are available from Addis Continental Institute of Public Health, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Addis Continental Institute of Public Health.

Declarations

Ethics approval and consent to participate
The research was conducted after approval of ethics from Institutional Review Board of Addis continental Institute of Public. All methods were carried out in accordance with relevant guidelines and regulations and informed consent was obtained from all subjects and/or their legal guardian(s).

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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