Dietary diversity score and associated factors among high school adolescent girls in a selected school of Yeka Sub-city, Addis Ababa

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Abstract

Introduction: Adequate dietary intake is critical for modification of eating behavior and provides nutrients required for growth particularly among adolescents. The evidence revealed the variation and unrelated data on the prevalence of dietary diversity among adolescent girls in Ethiopia.

Objective: To assess the magnitude of dietary diversity and associated factors among high school adolescent girls at the selected school of Yeka Sub-city, Addis Ababa, Ethiopia 2021.

Methods: A cross-sectional study was conducted in high schools of the Yeka sub-city. Self-administered questionnaires were used to collect data. Data were analyzed using SPSS and the characteristics of the study participants were reported using descriptive statistics. A logistic regression model was fitted to identify factors associated with dietary diversity.

Result: The mean score of dietary diversity was 4.9 ± 1.47 with a response rate of 97.2% among a proposed number of participants. The dietary diversity score is high in 56.7% and low among 43.3% of adolescents. Stayed a long time on social media (adjusted odds ratio = 2.6), school type (adjusted odds ratio = 6.5), educational status of mother (adjusted odds ratio = 8.7), consuming more sweet food (adjusted odds ratio = 3.6), occupation of the mother (adjusted odds ratio = 2.3), household security (adjusted odds ratio = 2.3), and fear of obese/worried about shape (adjusted odds ratio = 5.0) were statistically associated with low dietary diversity score.

Conclusion: The finding of the study revealed that the magnitude of low dietary diversity among adolescent girls was found to be high. Long time social media usage, school type, educational status of the mother, consuming more sweet food, occupation of mother, household food security, and fear of obese/worried about shape were statistically associated with dietary diversity score.

Introduction

Adolescence is an important stage in the lifecycle for growth and development. During this time, adolescents achieve 15%–20% of their adult height, up to 60% of their skeletal mass, and half their adult body weight.[1] Offering adolescents appropriate levels of support can improve their chances of maintaining healthful dietary behaviors into adulthood.[2] Adequate dietary intake is critical for modification of eating behavior and provides nutrients required for growth particularly among adolescents.[3]

In Ethiopia, 23.1% and 22% of adolescents were stunted and thin, respectively.[4] That is related to the dietary

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diversity score of <4 food groups.[5] Adolescence represents a window of opportunity to prepare nutritionally healthy food for adult life.[6] It may also be a period to shape and consolidate healthy eating and lifestyle behaviors, thereby preventing or postponing the onset of nutrition-related chronic diseases in adulthood.[1]

Inadequate dietary diversity is one of the major public health problems and can result in physical, emotional, and psychological changes among adolescents.[7] Adolescents are risky groups for malnutrition, but they are not part of a target in many intervention strategies.[5] The evidence indicated there was scarce of information about the prevalence and consequences of malnutrition among adolescents population in low- and middle-income countries.[8] The magnitude of low dietary diversity in the Ethiopian context was varied.[9,10]

Social media engagement by adolescent girls were high. Despite its appeal, there are potential negative consequences for disordered eating and reduced dietary diversity score.[11] Girls who regularly shared self-images on social media, relative to those who did not, reported significantly higher overvaluation of shape and weight, body dissatisfaction, dietary restraint, and internalization of the thin ideal.[11] As another study indicates 58% of girls want to lose weight while just 9% want to gain weight and 85% of young women worry "a lot" about how they look.[12]

Consumption of fast foods such as sweets has become increasingly popular among adolescents as a result of urbanization and an increase in the number of supermarkets, lowering the dietary variety score indirectly.[13]

The cultural and social factors contribute to the gender difference in the type of food consumed by the adolescent, as of study conducted in India boys are more advantaged and girls tend to consume fewer protein and vitamin-rich foods.[14] There is also a systematic review conducted in sub-Saharan Africa that revealed gender as one of the contributing factors for the difference in nutritional status.[15]

The adolescent has typically been considered at low risk of poor health and getting less attention of health care and adequate dietary as well. Dietary diversity is critical in adolescents because they need the energy to grow and develop both physically and mentally. Psychosocial, sociodemographic status, and diet-related behavior are predictors for dietary diversity scores as stated by many studies.[6,16–18] In Ethiopia, there is a lack of attention for adolescence as a childhood age group from government and families as well.

Low dietary diversity is also identified to be one of the factors associated with low educational performance.[19] Educational level and quality are the main components that affect the development and economic growth of the country.[20,21] So, the adolescents should meet the minimum dietary diversity score (MDDS) to alleviate the related problem. Despite the above facts, limited studies were conducted on dietary diversity of adolescent girls in Ethiopia, and no study was conducted in the study area. Therefore, this study was conducted to determine the magnitude of low dietary diversity score and associated factors among adolescent girls attending schools at Yeka sub-city. The findings of this study are inputs for further studies to be conducted on the nutritional status of adolescents in Ethiopia.

Method

Study setting period

The study was conducted at selected high schools of Yeka Sub-city high schools from 10 February to 10 July 2021. Yeka sub-city is found in the northeastern part of Addis Ababa, which bordered from the west by the Gulale and Areda sub-city, from the north by Kirkos and Bole sub-city while from the east by Lega Tafo Town.

Study design

A cross-sectional study was employed.

Population

Source population. The source population was all private and public high school girls at Yeka sub-city.

Study population. The study population was all schoolgirls who are attending the selected private/public high schools of Yeka sub-city.

Eligibility criteria

Inclusion criteria. Adolescent girls attending school at selected schools during data collection.

Exclusion criteria. Adolescent girls who did not come to school during data collection.

Sample size determination

Sample determination for the magnitude of the low dietary diversity score is as follows.

The sample size (n) required for the study was calculated using the formula to estimate a single population proportion by considering the following assumptions. $Z\alpha/2$ = critical value for normal distribution at 95% confidence interval (CI) to 1.96 (Z value at alpha = 0.05). According to the study conducted in 2018 at Jima town, about 38.7% of adolescent girls score low dietary diversity.[6]

Hence, according to the study, P = 38.7%
d (w) = margin of error of 0.05 with 95% CI level.

$$n = \frac{(Z\alpha/2)^2 P(1-p)}{d^2}$$

Table 1. Sample size calculation based on factors associated with dietary diversity score, Addis Ababa, 2021.

S. no	Factors	Power (1-β)	P-among unexposed	P-among exposed	Ratio	OR	Sample size with 10% non-response
1	Mother with no formal education	80%	0.211	0.789	1	13.9	31
2	Government school	80%	0.315	0.685	1	4.7	73
3	Low income	80%	0.318	0.682	1	4.6	75
4	Age (14–16)	80%	0.6523	0.3478	1	0.28	106
5	Family size <6	80%	0.6203	0.3797	1	0.37	165
6	Father with no formal education	80%	0.36	0.64	1	3.16	113
7	Government employee	80%	40.9	59.1	1	2.08	284

OR: odds ratio.
The largest sample size was 292.
Therefore, our sample will be 292.

$$n = \frac{(1.96)^2 \, 0.387 \,(1-0.387)}{(0.5)^2}$$

$$n = 365$$

Since the total population of adolescents is 964, the correction did by the correction formula

$$n = \frac{ni}{1+\dfrac{ni}{N}}$$

$$n = \frac{365}{1+\dfrac{365}{964}} \qquad 265$$

265 with 10% non-response yield 292.

Sample calculation for associated factors

The proportion of the factors was taken from a similar study conducted in Jima.[6] The calculation was done through online insertion in Epi info (www.openinfo.com) that adjusted with power $(1 - \beta)$ 80%, 95% CI, and 1:1 ratio the proportion of unexposed and exposed accordingly. The obtained sample is presented in Table 1.

Sampling method and technique

The study was aimed to be conducted at the high schools of Yeka sub-city woredas; therefore, one woreda (woreda 08) was selected by lottery method among 15 woredas available in the sub-city. Woreda 8 has two high schools Tesfa Birhan and mega craft High school and both schools were included. The megacraft had 314 students while Tesfa Birhan had 655 students. The number of students at each high school is known, and the sample size was proportionally allocated to ward schools since the number of the students at each school
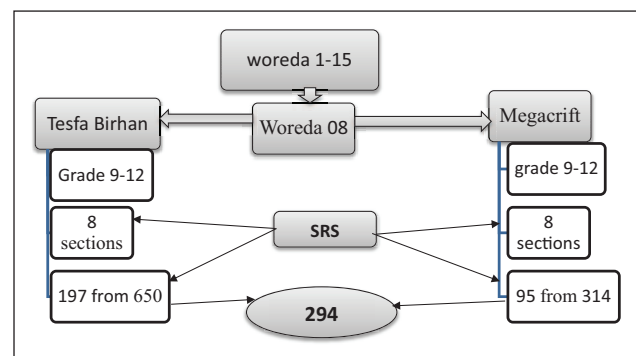
Figure 1. Sampling method hierarchy, dietary diversity score of high school adolescent girls of Yeka sub-city, Addis Ababa, Ethiopia, 2021.

is not equal. Again among a section of grades 9–12, two-two sections were selected by simple random sampling, and a total of 16 sections were selected from both schools. After sections were selected, the adolescent students were picked by simple random sampling based on the allocated number of samples (Figure 1).

Variable

Dependent variable. Dietary diversity score: Dietary diversity was assessed using a 24-h food recall method by the Food and Nutrition Technical Assistance (FANTA) 2016 version of the woman's minimum dietary diversity measurement tool. The four or less MDDS was categorized as inadequate (low) dietary diversity.[22]

Independent variable
- ❖ Socio-demographic factors
  - ✓ Family income;
  - ✓ Religion;
  - ✓ Educational status of father and mother;
  - ✓ Employment condition of the family.

- ❖ Psychosocial factors
  - ✓ Fear of obesity;
  - ✓ Stress;
  - ✓ Culture and belief.
- ❖ Diet-related factors
  - ✓ Household food insecurity;
  - ✓ Appetite loss.

Operational definition and measurements. Dietary diversity: Dietary diversity as a measure of household or individual food access and food consumption can be triangulated with other food-related information to contribute toward providing a holistic picture of the food and nutrition security status in a community or across a broader area.[23]

Household food secure: Among 18 questions of household food access security (HFAS) if the family of the girls respond (Q1a=0 or Q1a=1) and respond Q2-9=0.[23]

Household mildly food insecure: Among 18 questions of HFAS if the family of the girls responds ((Q1a=2 or Q1a=3 or Q2a=1 or Q2a=2 or Q2a=3 or Q3a=1 or Q4a=1) and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0).[23]

High dietary diversity score: Adolescent girls aged 10–19 years old who received foods greater than or equal to five food groups out of the nine food groups were assigned a high dietary diversity score.[6]

Low dietary diversity score: Adolescent girls aged 10–19 years old who received four or less MDDS were categorized as having inadequate (low) dietary diversity.[6]

MDDS: Those scoring five food groups among nine types of food group.[6]

Adolescent: Individuals aged 10–19 years old.

Woreda: Districts of Ethiopia, also called woreda are the third level of the administrative division of Ethiopia—after zones and the regional states.

Long stay on social media: Staying more than 2 h per day on social media.

Data collection method and tools

Data were collected using self-administer questionnaires from both family and adolescents. The 24-h dietary recall method was used to collect information for individual dietary diversity and 4 weeks recall method was used for the household food insecure access scale. The questionnaires of individual dietary diversity score and household food insecure access scale are adopted from food and agricultural organization (FAO) 2016.[23]

Data quality control. The data quality was assured by applying a properly designed and pre-tested questionnaire. The tool was pre-tested on 5% of the sample size at schools of Bole sub city before the actual data collection to establish its ability to elicit relevant information. In addition, the researchers ensured proper categorization and coding of the questions. The investigators and a supervisor conducted

regular supervision and follow-up. In addition, a regular check-up for completeness and consistency of the data was undertaken daily.

Statistical analysis

Data were checked for completeness, consistency, cleaned, coded, and entered the Statistical Package for Social Science (SPSS) software version 25 for analysis. Descriptive statistics were used to describe the study population about relevant variables. Logistic regression was fitted to identify the association between dependent (dietary diversity score) and independent variables. Both crude and adjusted odds ratios (AORs) with their corresponding 95% CIs were used to determine the strength of association. A p-value of less than 0.5 was used to declare the statistical significance of the finding in this study. The results were presented using text, tables, and graphs based on the types of data.

Ethical consideration

Ethical clearance was obtained from Addis Ababa Public Health Research Emergency Management Directorate (A/A/M/13286/227). The permission letters are also taken from the Yeka sub-city education office and the administrative office of each school. The written informed consent was obtained from the legally authorized representatives of study participants and assent was taken from the students. It was ensured that no extra benefit to being taken away from those who refuse to participate or given for those to allow to participate. The data were used for only the purpose of this study.

Results

Socio-demographic and socio-economic characteristics of adolescent girls

From the desired 292 samples, 284 (97.2%) adolescent girls have participated in this study. The majority (167; 58.8%) of adolescents were found in the age category of 14–16 years, and the median age of respondents was 16 years old with an interquartile range of 2 years. Most mothers have completed the minimum of primary school. One hundred twenty-eight (45.1%) of mothers are housewife and about 53.2% of the family earn less than 5000 ETB per month. Sixty-eight (23.9%) of the fathers joined higher education (Table 2).

Psychosocial-related variables of adolescent girls

One hundred four (36.6%) of adolescents stayed a long time on social media while 170 (59.9%) of adolescents fear of obese or are worried about their shape to limit their eating pattern. Seventy-three (25.7%) of adolescents were avoiding some food because they are being female. Ninety-one

Table 2. Socio-demographic and socio-economic characteristics of family/adolescent girls at Yeka sub-city high schools, Addis Ababa, Ethiopia, 2021.

Variables	Alternatives	Frequency	Percent
Age of girls	14–16	167	58.8
	17–19	117	41.2
School type	Government	193	68
	Private	91	32
Marital status	Married	75	96.8
	Divorced	9	3.2
Educational status of the mother	No formal education	72	25.4
	Grade 1–12	183	64.4
	Higher education	29	10.2
Occupation of mothers	Not housewife	156	54.9
	Housewife	128	45.1
Income of the family	Less than 5000 ETB	151	53.2
	5001–15,000 ETB	103	36.3
	Above 15,000 ETB	30	10.6
Education of fathers	No formal education	71	25
	Grade 1–12	145	51.1
	Higher education	68	23.9

Table 3. Psychosocial-related variables of adolescents at Yeka sub-city high schools, Addis Ababa, Ethiopia, 2021.

Variables	Alternatives	Frequency	Percent
Long stay on social media	Yes	104	36.6
	No	180	63.4
Fear of obesity/due to shape	Yes	114	40.4
	No	170	59.9
Missed food due to duration of education	Yes	100	35.2
	No	184	64.8
Avoid some food due to being female	Yes	73	25.7
	No	211	74.3
Reduce food due to cultural impact	Yes	91	32.2
	No	192	67.8
Stress/worried/angry	Yes	11	3.9
	No	272	95.8
Family disagreement	Yes	7	2.5
	No	277	97.5

(32.2%) adolescents were reduced food due to cultural impact (Table 3).

Dietary diversity status and household food security of adolescent girls

The magnitude of high dietary diversity score was 56.7% (95%, CI: 50.8%–62.4%) while 43.3% (95% CI: 37.6%–49%) of them score low dietary diversity. The mean score of dietary diversity was 4.9 ± 1.47. About 67 (23.6%) of the household of adolescents in the study were difficult accessing food. The majority (183) (64.6%) of adolescents ate food three to four times within 24 h (Table 4).
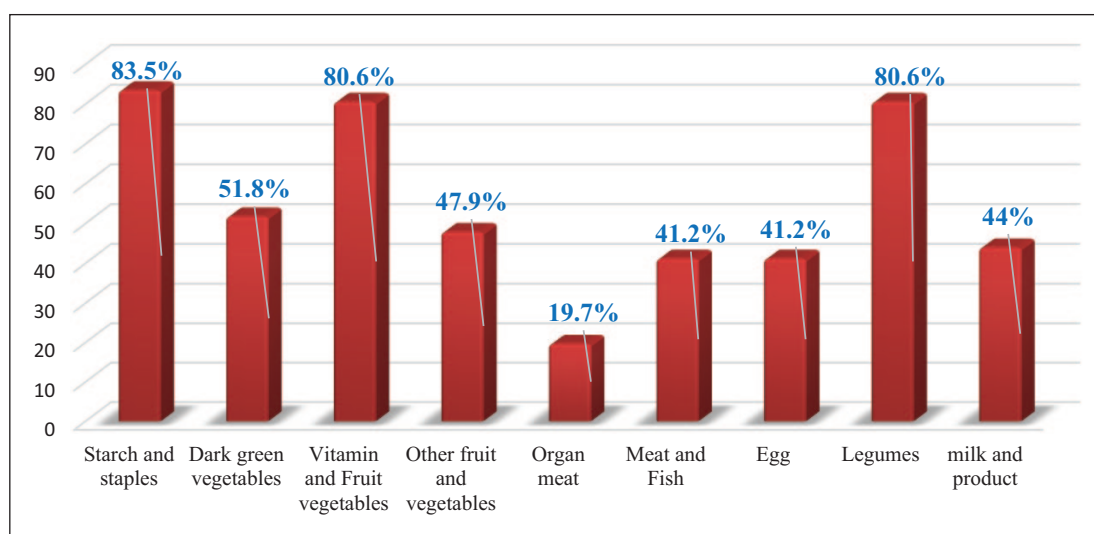
Dietary diversity of adolescent girls

Starch and staple foods are the more consumed type of food; about 237 (83.5%) of adolescents consumed starch and staple food during 24 h while only 57 (19.7%) of adolescents consumed organ meat (Figure 2).

Factors associated with dietary diversity

Binary logistic regression was carried out and the variables with p-value < 0.25 were entrant for multivariate logistic regression. All variables selected during binary logistic regression remain significant at p-value < 0.05 by multivariate modeling, and those variables are listed in Table 5. The

Table 4. Dietary diversity status and household food security of adolescents at Yeka sub-city high schools, Addis Ababa, Ethiopia, 2021.

Variables	Alternatives	Frequency	Percent
Household food security	Insecure	67	23.6
	Secure	217	76.4
Dietary diversity status	Lower	123	43.3
	Higher (adequate)	161	56.7
Consuming sweet drink	Yes	104	36.6
	No	180	63.4
Meal frequency	Twice a day	83	29.2
	3–4	183	64.6
	More than 4	18	6.3

Figure 2. Dietary diversity food of adolescents at Yeka sub-city high schools, Addis Ababa, Ethiopia, 2021.

outcome of multivariate logistic regression indicated the adolescents who stayed on social media were 2.6 times more likely to score low dietary diversity as compared with those who do not stay for a long time (AOR=2.6, 95% CI: 1.23–5.47). Likewise, the students who attend government school were 6.5 times more likely to consume low dietary diversity as compared with those attending private school (AOR=6.5, 95% CI: 2.87–14.95).

Similarly, the adolescents from illiterate mothers were 8.7 times more likely to consume low dietary diversity as compared with mothers who attend school to the minimum (AOR=8.7, 95% CI: 3.86–19.67). The adolescents who take a sweet drink in most were 3.6 times more likely to score low dietary diversity as compared with those do not consume sweet drink (AOR=3.6, 95% CI: 1.67–7.65). Adolescents whose mothers were not housewives were 2.8 times more likely to record lower dietary diversity as compared with those mothers who were housewives (AOR=2.8, 95% CI: 1.42–5.57). Adolescents from household insecurity were 2.3 times more likely to score lower dietary diversity as compared with those from household food security (AOR=2.3, 95% CI: 1.04–5.05). The adolescents who fear obese/

worried about their shape were 5 times more likely to record low dietary diversity as compared with those who do not (AOR=5.0, 95% CI: 2.40–10.23) (Table 5).

Discussion

The finding of this study revealed low dietary diversity among 43.3% (95% CI: 37.6%–49%) of adolescent girls, which is in line with a study conducted in South Ethiopia with 46.8% of adolescent girls scoring low dietary diversity score.[24] But our finding was higher than the study conducted in Gondar city (25.5%).[11] The variation might be due to differences in socio-demographic factors.

Likewise, our finding was less than a study conducted in Jima Town (67.3%),[5] Dembo district, Ethiopia 68%,[20] and other studies conducted in North Ethiopia; overall prevalence of low dietary diversity among adolescent girls was 85.5%.[20] The difference might be due to socio-economic variation or due to accessibility of information increased from time to time. Similarly, there may be some cultural difference between the study areas and might be due to the increment of health service quality.

Table 5. Factors associated with a dietary diversity score of adolescent girls at Yeka sub-city high schools, Addis Ababa, Ethiopia, 2021.

Variables	Alternative	Dietary diversity		Crude OR, 95% CI	AOR, 95% CI	p-value
		Low	High			
Long stay on social media	Yes	70 (67.3%)	34 (32.7%)	4.90 (2.93–8.30)	2.6 (1.23–5.47)	0.013
	No	53 (29.4%)	127 (70.6%)	I	I	
School type	Government	110 (57%)	83 (43%)	7.95 (4.14–15.27)	6.5 (2.87–14.95)	0.000
	Private	13 (14.3%)	78 (85.7%)	I	I	
Mothers' educational status	No formal education	55 (76.5%)	17 (23.6%)	6.85 (3.70–12.68)	8.7 (3.86–19.67)	0.000
	Formal education attended	68 (32.1%)	144 (67.9%)	I	I	
Occupation of mother	Housewife	31 (24.2%)	97 (75.8%)	I	I	
	Not housewife	92 (59%)	64 (41%)	4.50 (2.69–7.53)	2.8 (1.42–5.57)	0.003
Sweet drink	Yes	71 (68.3%)	33 (31.7%)	5.30 (3.14–8.94)	3.6 (1.67–7.65)	0.001
	No	52 (28.9%)	128 (71.1%)	I	I	
Food security	Insecure	35 (52.2%)	32 (47.8%)	1.60 (0.92–2.79)	2.3 (1.04–5.05)	0.040
	Secure	88 (40.6%)	129 (19.4%)	I	I	
Fear of obesity/shape	Yes	102 (60%)	68 (40%)	6.64 (3.78–11.68)	5.0 (2.40–10.23)	0.000
	No	21 (18.4%)	93 (81.6%)	I	I	

OR: odds ratio; CI: confidence interval; AOR: adjusted odds ratio.

The finding of the study indicated maternal occupation was associated with dietary diversity. According to our finding, adolescents from housewife mothers were 2.8 times more likely to have low dietary diversity as compared with mothers who were not a housewife. The finding can be supported by the fact that housewife mothers may have low education or information on dietary diversity than working mothers.[25] However, this finding was inconsistent with a study conducted in Jima[6] and Dambi district.[20] The variation can be attributed to socio-economic and nutritional education difference of different districts found in Ethiopia.

Correspondingly, the educational status of the mother was found to be associated with dietary diversity scores. In this study, illiteracy was found to be increasing odd of low dietary diversity. This was consistent with a study conducted in Jima,[6] in the Dambi district,[20] and in Gurage Zone.[24] This might be because illiterate mothers lack information on the importance of diversifying local available and affordable foods.

Drink sweeter (soft drink) was found to be significantly associated with dietary diversity. In this study, the adolescents who consume sweeter drinks were 3.6 times more likely to score low dietary diversity. This finding was consistent with a study conducted at Jima that revealed dietary diversity was negatively associated with more frequent consumption of sugar-sweetened soft drinks.[26] This may be because sugar-sweetened soft drink increases blood sugar level and will end up in loss of appetite that results in decreasing the variation of food intake.

School type was another predictor found in this study; according to our finding, the adolescents attending government school were 6.5 times more likely to score low dietary diversity scores as compared with those attending private school. This finding was in agreement with a study conducted in Jima Town.[6] However, there is no clear relationship or evidence why school type and dietary diversity score were associated, but it might be linked to the economic status of the family.

In our finding, the adolescent girls who stayed on social media for a long time were 2.6 times more likely to score low dietary diversity as compared with those who did not stay for a long time. This finding is consistent with study conducted in the United Kingdom that revealed long time stay on social media affects eating behaviors.[27] This may be due to the fact that long stay on social media affects sleeping time that in turn increases stress which ends up in loss of appetite.

Fear of obese or worry about shape was found to be statistically associated with dietary diversity; in this finding, the adolescent girls who fear obesity or are worried about their shape were 5 times more likely to score low dietary diversity when compared with those who did not worry. This was agreed with a nutritional survey conducted, which justifies 85% of young women worry about how they look and need to lose weight.[12] This can be explained by the fact that adolescent girls who intend to decrease weight may prefer some type of food that decreases the variation of food they consume.

Generally, health education on behavioral change of adolescents toward dietary diversity and to give more emphasis for their dietary condition may help to improve dietary diversity. It is better if all types of schools are concerned about the diet of their students. The adolescent girls were recommended to reduce the time spent on social media. Further improving maternal and women education may play great role to increase food diversity using local available and affordable food types. Providing nutritional education by different stakeholders like non-governmental organization for community members may have an impact on increasing dietary diversity.

Limitations of the study

Data were collected by self-reporting and not included qualitative data like the amount of meal and hygiene of food. In this study, we used non-validated questionnaires which might affect the strengths of our recommendation.

Conclusion

The magnitude of low dietary diversity score noticed among adolescent girls was high while stayed a long time on social media, school type, educational status of the mother, consuming more sweet food, occupation of mother, household food security, and fear of obese/worried about shape were statistically associated with dietary diversity.

Author contributions

D.A. and L.W. have made substantial contributions to conception and design, acquisition of data, analysis, and interpretation of data. They have written the draft manuscript and provided final approval of the version to be published. L.W., D.A., K.M., and T.B. have made substantial contributions to the design, acquisition of data, analysis, and interpretation of data. All authors read and approved the final manuscript.

Data availability statement

Data are available upon reasonable request. All data relevant to the study are included in the article or uploaded as supplemental information. Data will be available upon request from the corresponding author.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Ethical clearance was obtained from Addis Ababa Public Health Research Emergency Management Directorate (A/A/M/13286/227). The permission letters are also taken from the Yeka sub-city education office and the administrative office of each school.

Informed consent

The written informed consent was obtained from the legally authorized representatives of study participants and assent was taken from the students.

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Supplemental material

Supplemental material for this article is available online.

References

1. Kambarami R, Schmale A and Namaste S. Adolescent Nutrition 2000-2017: DHS Data on Adolescents Age 15-19. *DHS comparative report no 47*, 2018, https://dhsprogram.com/pubs/pdf/CR47/CR47.pdf

2. St-Onge MP and Keller KL. Nutrition in adolescence. In: Shils ME, Shike M, Ross AC, et al. *Modern nutrition in health and disease*. 11th ed. Washington, DC: Wolters Kluwer Health Adis, 2012, pp. 734–743.

3. Ochola S and Masibo PK. Dietary intake of schoolchildren and adolescents in developing countries. *Ann Nutr Metab* 2014; 64: 24–40.

4. Hailegebriel T. Prevalence and determinants of stunting and thinness/wasting among schoolchildren of Ethiopia: a systematic review and meta-analysis. *Food Nutr Bull* 2020; 41(4): 474–493.

5. Kahssay M, Mohamed L and Gebre A. Nutritional status of school going adolescent girls in Awash Town, Afar Region, Ethiopia. *J Environ Public Health* 2020; 2020: 7367139.

6. Melaku Y, Dirar A, Feyissa GT, et al. Optimal dietary practices and nutritional knowledge of school adolescent girls in Jimma Town, South West Ethiopia. *Int J Adolesc Youth* 2018; 23: 299–307.

7. Gonete KA, Tariku A, Wami SD, et al. Dietary diversity practice and associated factors among adolescent girls in Dembia district, northwest Ethiopia, 2017. *Public Health Rev* 2020; 41: 23.

8. Galloway R. Global nutrition outcomes at ages 5 to 19. In: *Disease control priorities, third edition (volume 8): child and adolescent health and development*, 2017, https://elibrary.worldbank.org/doi/abs/10.1596/978-1-4648-0423-6_ch3

9. Birru SM, Tariku A and Belew AK. Improved dietary diversity of school adolescent girls in the context of urban Northwest Ethiopia: 2017. *Ital J Pediatr* 2018; 44: 48.

10. Tariku A, Gonete KA, Bikes GA, et al. Household food insecurity predisposes to undiversified diet in northwest Ethiopia: finding from the baseline survey of nutrition project, 2016. *BMC Res Notes* 2019; 12: 54.

11. McLean SA, Paxton SJ, Wertheim EH, et al. Photoshopping the selfie: self photo editing and photo investment are associated with body dissatisfaction in adolescent girls. *Int J Eat Disord* 2015; 48: 1132–140.

12. Croll J. Body image and adolescents. *Guidel Adolesc Nutr Serv* 2005; 40: 50.

13. Frary CD, Johnson RK and Wang MQ. Children and adolescents' choices of foods and beverages high in added sugars are associated with intakes of key nutrients and food groups. *J Adolesc Health* 2004; 34: 56–63.

14. Aurino E. Do boys eat better than girls in India? Longitudinal evidence on dietary diversity and food consumption disparities among children and adolescents. *Econ Hum Biol* 2017; 25: 99–111.

15. Darling AM, Sunguya B, Ismail A, et al. Gender differences in nutritional status, diet and physical activity among adolescents in eight countries in sub-Saharan Africa. *Trop Med Int Health* 2020; 25(1): 33–43.

16. School-based nutrition education in improving dietary diversity among adolescent girls, 2019, https://clinicaltrials.gov/ct2/show/NCT04116593

17. Poorrezaeian M, Siassi F, Qorbani M, et al. Association of dietary diversity score with anxiety in women. *Psychiatry Res* 2015; 230: 622–627.

18. Isabirye N, Bukenya JN, Nakafeero M, et al. Dietary diversity and associated factors among adolescents in eastern Uganda: a cross-sectional study. *BMC Public Health* 2020; 20: 534.

19. Uzosike TCJ, Okeafor I and Mezie-Okoye M. Dietary Diversity, Nutritional status and Academic performance of pupils in public primary schools in Port Harcourt Metropolis. *J Community Med Prim Heal Care* 2020; 32(2): 42–56.

20. Dahal G. The contribution of education to economic growth: evidence from Nepal. *Int J Econ Sci* 2016; 5: 22–41.

21. Marquez-Ramos L and Mourelle E. Education and economic growth: an empirical analysis of nonlinearities. *Appl Econ Anal* 2019; 27(79): 21–45.

22. FANTA. Minimum dietary diversity for women: a guide for measurement, 2016, http://www.fao.org/3/a-i5486e.pdf

23. FAO. *Guidelines for measuring household and individual dietary diversity*. FAO, 2010, https://www.fao.org/3/i1983e/i1983e.pdf

24. Worku M, Hailemicael G and Wondmu A. Dietary diversity score and associated factors among high school adolescent girls in Gurage Zone, Southwest Ethiopia. *World J Nutr Heal* 2017; 5: 41–45.

25. Wuneh AG, Ahmed W, Bezabih AM, et al. Dietary diversity and meal frequency practices among children aged 6-23 months in Agro Pastoral Communities in Afar Region, Ethiopia: a cross-sectional study. *Ecol Food Nutr* 2019; 58(6): 575–596.

26. Sweetman C, Wardle J and Cooke L. Soft drinks and "desire to drink" in preschoolers. *Int J Behav Nutr Phys Act* 2008; 5: 60.

27. Serenko A, Turel O and Siddiqui H. The impact of social networking sites use on health-related outcomes among UK adolescents. *Comput Human Behav Rep* 2021; 3: 100058.