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Original Research

Magnitude of Poor Dietary Diversity and Associated Factors Among High School Adolescent Girls in Dire Dawa City, Eastern Ethiopia

Kemal Chekol[1*], Abdu Oumer[2], Muluken Yigezu[3]

[1]*Eastern Command Level 3 Hospital, Dire Dawa, Ethiopia*
[2]*Department of Midwifery, College of Medicine and Health Sciences, Dire Dawa University, P.O.Box: 1362, Dire Dawa, Ethiopia*
[3]*Department of Public Health, College of Medicine and Health Sciences, Dire Dawa University, P.O. Box: 1362, Dire Dawa, Ethiopia*

Abstract

Background: Adolescence, which lasts from the ages of 10 to 19 years, is a period of rapid growth, cognitive development, and reproductive health readiness. However, in urban areas such as Dire Dawa the dietary diversity and contributing factors of adolescent girls have received less attention. Therefore, this study was conducted with the major aims to assess the magnitude of poor dietary diversity and associated factors among high school adolescent girls in Dire Dawa, Eastern Ethiopia.
Methods: A cross-sectional survey using stratified multistage random sampling was conducted in February and March of 2025 on 517 high school girls in Dire Dawa ages 13 to 19. An FAO Minimum food Diversity for Women (MDD-W) style 24-hour food memory test was one of the questionnaires used to gather data and analyzed by SPSS version 26. We identified the factors associated with MDDs in bivariable and multivariable logistic regression. Adjusted odds ratio with 95% confidence interval was reported. A significance level of $p<0.05$ was applied. The findings were shown using 95% CIs for adjusted odds ratios (AOR).
Results: The results showed that, 274 (53%) of the high school girls (95% CI: 0.487-0.573) were able to achieve adequate dietary diversity. Adolescent girls aged 13–16 had significantly higher likelihood of eating inadequately compared to those aged 17–19 (AOR = 1.60; 95% CI: 1.04, 2.46; p=0.031). Students attending public schools were around four times more likely than those attending private schools to have inadequate dietary diversity (AOR = 3.95; 95% CI: 1.82, 8.57; p=0.001). The considerably higher likelihood of low dietary diversity for girls from homes without home gardens (AOR = 22.1; 95% CI: 10.5, 46.6; $p<0.001$) were significantly factors associated with minimum dietary diversity score.
Conclusion: The prevalence of poor dietary diversity was high in study area. Age group, school type, and home gardening were identified as factors associated with the dietary diversity of high school girls. These results emphasize the need of school based and community level initiatives that promote home gardening and target younger adolescents in public schools in order to enhance food choices and minimize nutritional deficiencies in this vulnerable population.

Keywords: Associated Factors, Dire Dawa, Dietary Diversity, High School Adolescent Girls

*Corresponding author: Kemal Chekol, kemalchekol16@gmail.com, +251902583805

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1. Introduction

To evaluate dietary quality and nutrient adequacy, the Minimum Dietary Diversity (MDD) metric requires the consumption of at least five out of ten specified food groups within the previous 24 hours. The MDD for adolescent girls specifically measures the dietary diversity of girls aged 10 to 19, emphasizing the importance of variety and balance in their diet. This is crucial for meeting nutritional needs and supporting growth, development, and long-term health [1]. Nutritional diversity refers to the variety of foods consumed by an individual. A diverse diet helps ensure adequate intake of essential nutrients such as proteins, vitamins, and minerals, while low dietary diversity is commonly associated with deficiencies in calcium, iron, and vitamin A, particularly in developing countries like Ethiopia [2].

Adolescence can be divided into three stages: early adolescence (10–13 years), marked by puberty and rapid growth; middle adolescence (14–15 years), characterized by major physical changes and identity formation; and late adolescence (16–19 years), when the body matures into its adult form [3]. The World Health Organization (WHO) defines adolescence as the period between ages 10 and 19 [4]. This stage of life is particularly important because up to 45% of skeletal growth, 15–25% of adult height, and about 37% of bone mass are attained during these years. Globally, adolescents represent about 20% of the population, with higher proportions in low-income countries such as El Salvador (26%) compared to 14% in the United States [5].

Nutritional demands rise substantially during adolescence. A healthy diet not only supports physical development but also strengthens immunity, cognitive function, and overall well-being [6]. For adolescent girls, nutrition plays an especially critical role as it affects reproductive health, future pregnancies, and intergenerational outcomes [7]. Dietary diversity (DD), a key measure of nutrient adequacy, requires at least five out of ten food groups in a 24-hour period, as recommended by FAO. However, low dietary diversity is strongly linked to stunting (22.9%) and anemia among Ethiopian adolescents, with socioeconomic disparities and widespread food insecurity in Dire Dawa (39.4%) exacerbating these risks [2].

Ethiopian adolescent girls face numerous dietary challenges, including poverty, limited access to a variety of foods, and poor nutritional awareness. Their diets are often dominated by cereals and staples, with limited intake of fruits, vegetables, and animal products. Studies indicate that 50.9% of girls and 52.2% of mothers lack adequate knowledge about dietary diversity, contributing to micronutrient deficiencies, anemia, and stunted growth [8]. The prevalence of

adequate dietary diversity among Ethiopian adolescents is just 39.24%, and socioeconomic status including income, parental education, and household resources has been shown to strongly influence dietary patterns [9].

Other household and social factors also play an important role. Women's dietary diversity has been found to correlate significantly with education, marital status, and access to resources such as mobile phones, bank accounts, and household amenities (e.g., refrigerators, windows, televisions) [10]. Larger families tend to consume monotonous diets, while peer influence and media exposure affect food choices, particularly in urban areas where international food trends are promoted. Studies from Ethiopia and across Sub-Saharan Africa consistently demonstrate that improved dietary diversity reduces stunting, anemia, and micronutrient deficiencies [11].

Nevertheless, inadequate dietary diversity remains closely associated with poor adolescent health outcomes, including impaired cognitive development, stunting, and long-term risks such as reduced fertility and poor maternal health [12]. Globally, non-communicable diseases (NCDs) account for 60% of deaths, with 79% occurring in low-income countries where poor nutrition is a major risk factor [2]. In Ethiopia, 22.9% of adolescent girls are stunted, 8.82% are underweight, and only 75.4% meet the minimum dietary diversity standard [13]. Evidence shows that private school students report higher dietary diversity than their public-school peers, underscoring the role of socioeconomic inequality [11]. Although dietary diversity is widely recognized as essential for adolescent growth, menstruation, and cognitive development [14], there is still limited understanding of the specific factors shaping it among Ethiopian adolescent girls, particularly in urban settings such as Dire Dawa.

2. Methods And Materials

2.1. Study Area and Period

The study was conducted in Dire Dawa, an administrative city located 515 kilometers east of Addis Ababa, Ethiopia. According to the Ethiopian Central Statistics Authority (2024), the city has an estimated population of 566,000, comprising 286,000 men and 280,000 women. Of these, 200,000 reside in rural areas and 366,000 in urban areas. The ethnic composition of Dire Dawa includes Oromo (46%), Somali (24%), Amhara (20.3%), Gurage (4.6%), and other smaller groups such as Harari, Tigray, Kenbata, Silte, and Wolaita (approximately 5%) [15].

Administratively, the city consists of 47 kebeles, with 9 urban and 38 rural. According to the Dire Dawa Administration Education Bureau (2024), 24,377 students were enrolled in

secondary schools (Grades 9–12) during the 2024–2025 academic year. These students attend fifteen high schools, including eight private and seven public institutions. Like other regions of Ethiopia, food availability in Dire Dawa is influenced by seasonal fluctuations, which may impact nutritional status and dietary diversity. Access to fresh produce and essential food items can be limited during the dry season, while availability increases during harvest periods. These seasonal variations were considered when interpreting study results.

2.2. Study Design

A school-based cross-sectional study design was employed to assess dietary diversity among adolescent girls.

2.3. Population

2.3.1. Source Population

The source population included all adolescent girls attending Grades 9–12 in public and private high schools in Dire Dawa during the 2024–2025 academic year.

2.3.2. Study Population

The study population consisted of adolescent girls enrolled in randomly selected public and private high schools within the city administration.

2.4.Eligibility Criteria

2.4.1. Inclusion Criteria

All adolescent girls enrolled in Grades 9–12 and present during the data collection period were included in the study.

2.4.2. Exclusion Criteria

Adolescent girls absent during data collection were excluded and not replaced to minimize potential bias and administrative complexity. In addition, girls on medication for chronic conditions, such as diabetes mellitus, that could significantly restrict their food intake were excluded to prevent skewing dietary diversity measurements. Meticulous preparation and communication with schools were employed to minimize absenteeism during data collection days.

2.5. Sample Size Determination

For the first objective, the sample size was calculated using the single population proportion formula:

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

Where:

- n = Require Sample Size
- Z = 1.96 (standard normal value at 95% confidence interval)
- P = 0.5 (prevalence of dietary diversity in public and private schools)
- d = 0.05 (margin of error)

Substituting the values:

$$n = \frac{(1.96)^2 \cdot 0.5(1-0.5)}{(0.05)^2} = 384$$

After adding a 10% non-response rate, the adjusted sample size was 422.

For the second objective, the largest sample size (470) was calculated based on the factor "access to dietary resources." After accounting for a 10% non-response rate, the final sample size was 517. Since this was larger than the first calculation, 517 students were adopted as the final study sample to ensure sufficient statistical power and accommodate non-response.

2.6. Sampling Techniques and Procedure

A stratified multistage sampling technique was employed. First, half of the fifteen secondary schools (eight private and seven public) were randomly selected to ensure representation from both school types. Within each selected school, classes were randomly sampled from Grades 9–12 to ensure that all grade levels were equally represented.

2.7. Data Collection Tool

Data were collected using a structured questionnaire adapted from the literature. The questionnaire consisted of four main sections:

1. Sociodemographic characteristics.
2. Dietary diversity, assessed using a 24-hour dietary recall. Participants listed all foods and beverages consumed, including snacks, which were then categorized into ten food groups: grains; pulses; nuts and seeds; dairy; meat; poultry and fish; eggs; dark green leafy vegetables; vitamin A rich fruits and vegetables; and other fruits and vegetables [13]. One point was awarded for each food group consumed, with scores ranging from 0–10. A score of less than 5 indicated inadequate dietary diversity, while 5 or more indicated adequate diversity [16].

3. Household food security, measured using the Household Food Insecurity Access Scale (HFIAS), which assesses the frequency of food insecurity over the previous four weeks. Scores range from 0 to 27, with households classified as food secure, mildly insecure, moderately insecure, or severely insecure [17].
4. A dietary and meal frequency checklist to assist participants in recalling their food consumption accurately.

2.8. Data Collection Procedures

Data were collected through face-to-face interviews using Kobo Toolbox. Four BSc nurses supervised the process, while four diploma nurses conducted the interviews. To reduce recall bias, participants were prompted about snacks and drinks they might otherwise forget, and foods were classified into the appropriate food groups.

2.9. Data Quality Control

To ensure data quality, the questionnaire was translated into Amharic and Afan Oromo and back-translated to English. A pretest was conducted with 5% of students from a school not included in the main study. Data collectors underwent a three-day training covering theoretical instruction, mock interviews, and practical demonstrations on dietary diversity and HFIAS assessments. Only those who demonstrated competency were allowed to collect data. The pilot study helped identify potential recall biases and refine data collection procedures.

Study Variables

2.9.1. Dependent Variable

- Dietary diversity practice.

2.9.2. Independent Variables

- Sociodemographic factors: school type, parental education, age, family income.
- Dietary factors: meal frequency, food availability, cultural dietary practices.
- Environmental factors: school feeding programs, market access.

2.10. Operational Definitions

- **Adolescent girls:** Females aged 10–19 enrolled in secondary school [4].
- **Minimum dietary diversity (MDD):** Adequate if the adolescent consumed foods from five or more food groups in the previous 24 hours; poor if less than five [1,16].

- **Household food insecurity:** Lack of sufficient access to nutritious food, measured using HFIAS [17]. Classified as food secure, mildly insecure, moderately insecure, or severely insecure.

2.11. Data Entry and Analysis

Data were entered into EpiData version 3.1 and exported to SPSS version 26 for analysis. Descriptive statistics (frequencies, percentages, means, and standard deviations) summarized key variables. Bivariate associations were assessed using chi-square and independent t-tests. Variables with $p < 0.25$ in bivariate analysis were entered into multivariable logistic regression to identify independent predictors. Adjusted odds ratios with 95% confidence intervals were reported, and model fit was evaluated using the Hosmer-Lemeshow test.

3. Results

3.1. Sociodemographic Characteristics

All 517 adolescent girls participated in the study, yielding a 100% response rate. The mean age was 15.2 years (±2.1), with 322 (62.3%) aged 13–16 years. Most participants (434, 83.9%) were enrolled in public schools. Regarding parental occupation, over half of the mothers (282, 54.5%) were housewives, while the majority of fathers (282, 54.5%) worked in the private sector. Educational attainment differed by parent: 235 (45.5%) of mothers had only completed primary school, whereas 282 (54.5%) had attained secondary education or higher. Fathers showed relatively higher education levels, with 344 (66.5%) completing secondary school or beyond and 173 (33.5%) completing only primary education. Family size varied, with 204 (39.5%) of households having ≤5 members and 313 (60.5%) having more than five (Table 1).

Table 1: Sociodemographic characteristics of adolescent girls in Dire Dawa City, Eastern Ethiopia, 2025.

Variable	Category	Frequency (n)	Percentage (%)
Age Group	13–16 years	322	62.3
	17–19 years	195	37.7
School Type	Public	434	83.9
	Private	83	16.1
Mother's Occupation	Housewife	282	54.5
	Merchant	94	18.2
	Government Employee	94	18.2
	NGO	47	9.1
Father's Occupation	Private Sector	282	54.5
	Merchant	94	18.2
	Government Employee	94	18.2
	NGO	47	9.1
Mother's Education	Secondary or above	282	54.5
	Primary or below	235	45.5
Father's Education	Secondary or above	344	66.5
	Primary or below	173	33.5
Family Size	More than 5 members	313	60.5
	5 or fewer members	204	39.5

3.2. Dietary and Health Habits

3.2.1. Nutritional Knowledge and Practices

Of the 517 adolescent girls who participated, nearly half (250; 48.4%) were categorized as having inadequate nutritional knowledge. More than half (275; 53.2%) reported having eaten adequately in the previous 24 hours, while 242 (46.7%) reported otherwise. The majority (462; 89.4%) relied on home-cooked meals as their primary food source, whereas smaller proportions depended on food aid (32; 6.2%) or purchased meals (23; 4.4%). Regarding meal frequency, most participants (333; 64.4%) reported eating three meals per day, while 95 (18.4%) ate more than three meals. A minority reported reduced intake, with 59 (11.4%) eating two meals daily and 30 (5.8%) eating only one (Table 2).

Table 2: Knowledge, Food Access and Type among Adolescent Girls in Dire Dawa City, Eastern Ethiopia, 2025.

Variable	Category	Frequency (n)	Percentage (%)
Nutrition Knowledge	Good	267	51.6
	Poor	250	48.4
Had Enough Food (Past 24h)	Yes	275	53.2
	No	242	46.8
Primary Source of Food	Home-Cooked	462	89.4
	Food Aid	32	6.2
	Purchased	23	4.4
Meals Per Day	One	30	5.8
	Two	59	11.4
	Three	333	64.4
	More than three	95	18.4
Who Decides Food at Home	Mother	397	76.8
	Father	53	10.3
	Both Parents	37	7.2
	Sister	30	5.8
Source of Nutrition Info	Family	242	46.8
	Social media	227	43.9
	School	36	7.0
	Friends	12	2.3

3.2.2. Household and Information Sources

In most households (77%), fathers were reported as heads, reflecting prevailing cultural norms. However, 13.7% of households were headed by sisters, possibly due to the absence of fathers or the increasing role of women in family decision-making. Families were the main source of nutrition information (242; 46.8%), followed by social media (227; 43.9%), while schools (36; 7.0%) and friends (12; 2.3%) played smaller roles.

Handwashing practices were suboptimal, with 140 (27.1%) of the girls reporting they did not wash their hands before cooking or eating. Vomiting in the 24 hours preceding the survey was reported by 79 participants (15.3%), while the majority (438; 84.7%) did not experience this. Most participants (388; 75.0%) ate breakfast before school, whereas 129 (25.0%) skipped it. Dining habits varied: 137 girls (26.5%) reported eating out regularly, while 380 (73.5%)

consumed most of their meals at home. Home gardening was not widely practiced, with 376 (72.7%) reporting the absence of a home garden compared to 141 (27.3%) who had one.

A majority (325; 62.9%) reported having received some form of dietary education, while 192 (37.1%) had not. Snacking was common, with 314 (60.7%) girls reporting regular snacking compared to 203 (39.3%) who did not. More than half (275; 53.2%) reported eating predominantly sweet foods, while 242 (46.7%) did not (Table 3).

Table 3: Health and Dietary Behaviors among Adolescent Girls in Dire Dawa City, Eastern Ethiopia, 2025

Variable	Category	Frequency (n)	Percentage (%)
Washes Hands Before Cooking/Eating	Yes	377	72.9
	No	140	27.1
Diarrhea (Recent)	Yes	13	2.5
	No	504	97.5
Vomited (Past 24 Hours)	Yes	79	15.3
	No	438	84.7
Eats Breakfast Before School	Yes	388	75.0
	No	129	25.0
Home Gardening	Yes	141	27.3
	No	376	72.7
Received Nutrition Education	Yes	325	62.9
	No	192	37.1
Eats Outside Regularly	Yes	137	26.5
	No	380	73.5
Consumes Snacks	Yes	314	60.7
	No	203	39.3
Consumes Mostly Sweet Foods	Yes	275	53.2
	No	242	46.8

3.3. Magnitude of Dietary Diversity

Among the 517 adolescent girls surveyed in Dire Dawa, staple foods such as bread, pasta, rice, injera, and porridge were the most commonly consumed by 497 (96.1%) participants. In contrast, nutrient-dense foods like organ meats were consumed by only 48 (9.3%), and milk or dairy products by 110 (21.3%). Notable dietary gaps were observed, with fewer than half reporting intake of vitamin A–rich fruits and vegetables 241 (46.6%), meat and fish 227 (43.9%), or citrus and other fresh fruits 138 (26.7%). Moderate consumption levels were recorded for leafy greens 275 (53.2%), eggs 263 (50.9%), and legumes 260 (50.3%).

The dietary diversity score (DDS), measured on a scale from 0 to 10, was not normally distributed (Shapiro–Wilk test, $p < 0.001$). The median [IQR] DDS was 5 [3–7]. Overall, 274 (53%) of adolescent girls achieved adequate dietary diversity (≥5 food groups). Adequacy varied by school type: 98 (86.7%) of private school students (95% CI: 79.4–94) reported adequate dietary diversity compared with 236 (46.5%) of government school students (95% CI: 41.8–51.2) (Table 4).

Table 4: Patterns of dietary diversity consumption (1–10) factors associated with poor DDS among adolescent girls attending public and private school in Dire Dawa City eastern Ethiopia 2025.

Code	Food Group	Did Not Consume (%)	Consumed (%)
1	Bread, Pasta, Rice, Injera, Porridge	20 (3.9)	497 (96.1)
2	Leafy Greens (Spinach, Kale, Cabbage, etc.)	242 (46.8)	275 (53.2)
3	Vitamin A-Rich Veg/Fruits (Carrot, Mango.)	276 (53.4)	241 (46.6)
4	Citrus/Fresh Fruits (Oranges, Apples, etc.)	379 (73.3)	138 (26.7)
5	Other Vegetables (Tomato, Eggplant, etc.)	374 (72.3)	143 (27.7)
6	Organ Meats (Liver, Kidney, Heart)	469 (90.7)	48 (9.3)
7	Meat/Fish (Beef, Goat, Chicken, etc.)	290 (56.1)	227 (43.9)
8	Eggs	254 (49.1)	263 (50.9)
9	Legumes (Beans, Lentils, Chickpeas)	257 (49.7)	260 (50.3)
10	Milk and Dairy (Milk, Yogurt, Cheese)	407 (78.7)	110 (21.3)

3.4. Associated Factors for Poor Dietary Diversity

3.4.1. Bivariable Analysis

The bivariable logistic regression identified several sociodemographic, behavioral, and environmental factors associated with poor dietary diversity. Younger adolescents (13–16 years) were more likely to have poor dietary diversity compared to older girls (17–19 years) (COR = 1.47, 95% CI: 1.03, 2.11, p = 0.0345). Higher household income was unexpectedly associated with greater odds of poor diversity (COR = 2.08, 95% CI: 1.33, 3.26, p = 0.0014). School type was a strong predictor: girls attending public schools were over seven times more likely to report poor dietary diversity compared with those in private schools (COR = 7.52, 95% CI: 3.88, 14.6, p < 0.0001). Environmental and dietary factors were also important. Lack of a home garden was associated with markedly higher odds of poor dietary diversity (COR = 19.0, 95% CI: 9.94, 36.5, p < 0.001). Girls who did not consume sweet foods (COR = 3.66, 95% CI: 2.54, 5.26, p < 0.0001) and those who did not exercise (COR = 1.54, 95% CI: 1.03, 2.30, p = 0.0347) also showed higher risk. Reliance on purchased food was strongly linked to poor diversity (COR = 8.21, 95% CI: 2.41, 28.0, p = 0.0008).

Eating frequency emerged as another determinant: compared with girls eating more than three times daily, those eating once daily (COR = 2.95, 95% CI: 1.27, 6.88, p = 0.0120), twice daily (COR = 2.18, 95% CI: 1.12, 4.24, p = 0.0216), or three times daily (COR = 1.87, 95% CI: 1.16, 3.00, p = 0.0104) were more likely to have poor dietary diversity. Other factors such as breakfast consumption, handwashing, and snacking showed no significant association, though snacking appeared protective. Poor knowledge (COR = 1.78, 95% CI: 1.26, 2.53, p = 0.0012) and lack of nutrition education (COR = 1.64, 95% CI: 1.14, 2.34, p = 0.0073) were also linked to inadequate dietary diversity. Food security (p = 0.6298) and stress/anxiety (p = 0.1077) showed no significant association at the bivariable level (Table 5).

Table 5: Results of a bivariable logistic analysis of the factors associated with adolescent girls' dietary variety score in Dire Dawa City, Eastern Ethiopia, 2025 (n=517)

Variable	Poor Diet	Adequate Diet	COR with 95% CI	p-value
Age Group				
17-19 years	80 (32.9%)	115 (42.0%)	1	
13-16 years	163 (67.1%)	159 (58.0%)	1.47 (1.03, 2.11)	0.0345
Household Income				
Lower & middle	35 (14.4%)	71 (25.9.%)	1	
Upper Income	208 (85.6%)	203 (74.1%)	2.08 (1.33, 3.26)	<0.0014
School Type				
Public	232 (44.9%)	202 (39.1%)	7.52 (3.88, 14.6)	0.0001
Private	11 (2.1%)	72 (13.9%)	1	
Family Size				
≤5 members	75 (14.5%)	129 (25.0%)	1	
>5 members	168 (32.5%)	145 (28.0%)	1.25 (0.84, 1.86)	0.2696
Home Garden				
No	232 (95.5%)	144 (52.6%)	19.0 (9.94, 36.5)	<0.001
Yes	11 (4.5%)	130 (47.4%)	1	
Consuming Sweet Foods				
Yes	89 (36.6%)	186 (67.9%)	1	
No	154 (63.4%)	88 (32.1%)	3.66 (2.54, 5.26)	< 0.0001
Physical Activity				
No	191 (78.6%)	193 (70.4%)	1.54 (1.03, 2.30)	0.0347
Yes	52 (21.4%)	81 (29.6%)	1.221	
Primary Food Source				
Purchased	20 (8.2%)	3 (1.1%)	8.21 (2.41, 28.0)	0.0008
Food Aid	16 (6.6%)	16 (5.8%)	1.23 (0.60, 2.52)	0.5685
Home cooked	207 (85.2%)	255 (93.1%)	1	
Eating Frequency				
>3 times	32 (13.2%)	63 (23.0%)	1	
Once Daily	18 (7.4%)	12 (4.4%)	2.95 (1.27, 6.88)	0.0120
Twice Daily	31 (12.8%)	28 (10.2%)	2.18 (1.12, 4.24)	0.0216
Three Times Daily	162 (66.7%)	171 (62.4%)	1.87 (1.16, 3.00)	0.0104
Eat Breakfast				
No	63 (25.9%)	66 (24.1%)	1.10 (0.74, 1.64)	0.6298
Yes	180 (74.1%)	208 (75.9%)	1	
Beliefs Fat-Free Foods				
Yes	89 (36.6%)	186 (67.9%)	1	
No	154 (63.4%)	88 (32.1%)	3.66 (2.54, 5.26)	<0.0001
Hand washing				
Yes	175 (72.0%)	202 (73.7%)	1	
No	68 (28.0%)	72 (26.3%)	1.09 (0.74, 1.61)	0.6631
Snack Consumption				
Yes	129 (53.1%)	185 (67.5%)	1	
No	114 (46.9%)	89 (32.5%)	1.84 (1.29, 2.63)	0.236
Knowledge				
Poor	136 (54.4%)	114 (45.6%)	1.78 (1.26, 2.53)	0.0012
Good	107 (40.1%)	160 (59.9%)	1	
Nutrition education				
No	105 (54.7%)	87 (45.3%)	1.64 (1.14, 2.34)	0.0073

Yes	138 (42.5%)	187 (57.5%)	1	
Food security				
Food secure	63 (48.8%)	66 (51.2 %%)	1	
Food insecure	180 (46.4%)	208 (53.6%)	0.91 (0.61, 1.35)	0.6298
Stress/anxiety				
Yes	38 (39.6%)	58 (60.4%)	1	
No	205 (48.7%)	216 (51.3%)	1.4 5(0.92, 2.28)	0.1077

3.4.2. Multivariable Analysis

After adjusting for potential confounders, several factors remained significant. Lack of a home garden was the strongest predictor: girls without gardens were over 22 times more likely to have poor dietary diversity (AOR = 22.1, 95% CI: 10.5, 46.6, p < 0.0001). Attending public school was also strongly associated (AOR = 3.95, 95% CI: 1.82, 8.57, p < 0.001). Age retained significance, with younger adolescents (13–16 years) showing higher odds of poor dietary diversity compared to older girls (AOR = 1.60, 95% CI: 1.04, 2.46, p = 0.031). Knowledge showed a borderline association: girls with poor knowledge had 1.5 times the odds of poor diversity (AOR = 1.50, 95% CI: 0.99, 2.28, p = 0.055).

Food insecurity emerged as a significant predictor in the adjusted model, doubling the odds of poor diversity (AOR = 2.00, 95% CI: 1.21, 3.34, p = 0.007). Interestingly, stress/anxiety showed a protective association: girls without stress or anxiety were twice as likely to report poor diversity compared to those with anxiety (AOR = 2.03, 95% CI: 1.19, 3.45, p = 0.009). No statistically significant association was found between physical activity and dietary diversity in the adjusted analysis (AOR = 1.56, 95% CI: 0.86, 2.84, p = 0.143) (Table 6).

Table 6: Factors associated with dietary variety score in Dire Dawa City, Eastern Ethiopia, 2025 (n=517)

Variable	Poor Diet	Adequate Diet	AOR, 95% CI	p-value
Age Group				
17-19 years	80 (32.9%)	115 (42.0%)	1	
13-16 years	163 (67.1%)	159 (58.0%)	1.60 (1.04, 2.46)	0.031
School Type				
Public	232 (44.9%)	202 (39.1%)	3.95 (1.82, 8.57)	0.001
Private	11 (2.1%)	72 (13.9%)	1	
Home Garden				
No	232 (95.5%)	144 (52.6%)	22.1 (10.5, 46.6)	0.0001
Yes	11 (4.5%)	130 (47.4%)	1	
Physical Activity				
No	191 (78.6%)	193 (70.4%)	1.56 (0.86, 2.84)	0.143
Yes	52 (21.4%)	81 (29.6%)	1.221	
Nutrition knowledge				
Poor	136 (54.4%)	114 (45.6%)	1.50 (0.99, 2.28)	0.055
Good	107 (40.1%)	160 (59.9%)	1	
Nutrition education				
No	105 (54.7%)	87 (45.3%)	1.40 (0.86, 2.27)	.175
Yes	138 (42.5%)	187 (57.5%)	1	
Food security				
Food secure	63 (48.8%)	66 (51.2%%)	1	

Food insecure	180 (46.4%)	208 (53.6%)	2.00 (1.21, 3.34)	.007
Stress/anxiety				
Yes	38 (39.6%)	58 (60.4%)	1	
No	205 (48.7%)	216 (51.3%)	2.03 (1.19, 3.45)	0.009

4. Discussion

Adolescence is a critical developmental stage marked by rapid physical growth, elevated nutrient needs, and the formation of lifelong dietary habits. Ensuring adequate dietary diversity during this period is essential to prevent micronutrient deficiencies, support healthy development, and break intergenerational cycles of malnutrition. In low- and middle-income countries such as Ethiopia, adolescent girls face heightened risks of poor dietary intake due to food insecurity, limited access to diverse foods, and socio-cultural barriers. Despite this, adolescent nutrition has historically received less research and policy attention compared with maternal and child nutrition, leaving important evidence gaps for targeted interventions.

This study examined the magnitude of poor dietary diversity and its associated factors among adolescent girls in Dire Dawa, Eastern Ethiopia. Only 53% (95% CI: 48.7, 57.3) of participants achieved the minimum dietary diversity (MDD), meaning nearly half of the girls remain vulnerable to inadequate nutrient intake. While staple foods such as injera, bread, pasta, rice, and porridge were widely consumed, nutrient-dense foods including fruits (26.7%), dairy products (21.3%), and organ meats (9.3%) were consistently under-consumed. These gaps highlight persistent risks of micronutrient deficiencies with long-term implications for adolescent health and well-being.

Several factors were strongly associated with poor dietary diversity. Lack of a home garden emerged as the most powerful determinant, with adolescents from such households being over 22 times more likely to report inadequate diversity. This association is substantially stronger than what has been observed in similar studies [18], likely reflecting Ethiopia's heavy reliance on domestic food production. Home gardens often provide direct, affordable access to fruits and vegetables in contexts where household income and market access are limited. Food insecurity also doubled the likelihood of poor dietary diversity, consistent with national and international evidence linking household economic hardship to low consumption of nutrient-rich foods [19, 20].

School type was another key predictor. Girls attending public schools were nearly four times more likely to have poor dietary diversity compared with their peers in private schools. This finding aligns with prior Ethiopian research [21] and likely reflects broader socioeconomic

inequalities, differences in parental education, and disparities in nutrition awareness. Private school students may benefit from better household resources, more diverse diets, and stronger parental involvement, while public school students often face structural disadvantages that compromise dietary quality.

Age and nutritional knowledge were also relevant. Younger adolescents (13–16 years) were more likely to have poor dietary diversity compared to older girls, possibly due to reduced autonomy in food choices and greater dependence on family diets [22]. Poor nutritional knowledge showed an association with inadequate diversity, though borderline significant in adjusted models. This suggests that while knowledge matters, it must be paired with supportive household and school environments to translate awareness into better dietary practices.

An unexpected result was the inverse association between stress or anxiety and poor dietary diversity. Girls without reported stress were more likely to have inadequate diversity, which contrasts with literature linking psychosocial stress to poorer eating behaviors. Possible explanations include cultural differences in stress reporting, comfort-eating behaviors that expand dietary variety, or reporting biases. This counterintuitive finding warrants further investigation.

These results are broadly consistent with earlier studies. The prevalence of MDD in this study mirrors findings from Southern Ethiopia [23] and aligns with national analyses that highlight low consumption of fruits and dairy [24]. The association between food insecurity and reduced dietary diversity also supports FAO's broader assessments [19, 20]. However, differences emerged. The prevalence of MDD in this study was lower than reported by [25], and the observed strength of the home garden association was far greater than previously documented. Such inconsistencies likely stem from contextual factors, including local agricultural practices, cultural food preferences & socioeconomic conditions that vary across Ethiopian settings [25].

Overall, this study underscores that adolescent dietary diversity in Dire Dawa is shaped more by structural and environmental factors than by individual behaviors alone. Interventions should therefore be multi-level: strengthening school-based nutrition education, particularly in public schools; expanding household-level strategies to promote food security and home gardening; and providing targeted support for younger adolescents who are especially vulnerable. By addressing both household and school-related determinants, policymakers and

practitioners can improve dietary diversity and safeguard the nutritional well-being of adolescent girls in Ethiopia.

5. Conclusion

Poor dietary diversity is highly prevalent among high school adolescent girls in Dire Dawa, with nearly half failing to meet the minimum dietary diversity requirement. Key determinants of inadequate dietary diversity include the absence of home gardens, attending public schools, food insecurity, younger age, and limited nutrition knowledge. Staple foods are widely consumed, but intake of nutrient-dense foods such as fruits, dairy, and organ meats remain low, highlighting persistent nutritional gaps. These findings emphasize the need for multi-level interventions that combine school-based nutrition education with household strategies to enhance food security and promote home gardening, particularly targeting younger adolescents and public-school students to improve overall dietary quality and support healthy adolescent development.

Abbreviations

DDS: Dietary Diversity Score, EPI: Expanded Program on Immunization, FAO: Food and Agriculture Organization, FANTA: Food and Nutrition Technical Assistance (Program), HFIAS: Household Food Insecurity Access Scale, HDDS: Household Dietary Diversity Score, SPSS: Statistical Package for the Social Sciences, WHO: World Health Organization.

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Authors Contribution

All authors contributed to the conceptualization of the study, data curation, formal analysis, methodology, software, and investigation. They were also involved in data acquisition, drafting the original manuscript, and reviewing and editing the final version.

Ethics Approval

Ethical clearance was obtained from the Institutional Review Board (IRB) of Dire Dawa University. Additional approvals were also secured from the Dire Dawa City Health Office and the respective public health facilities. The objectives of the study were clearly explained to all participants, who were informed of their right to refuse or discontinue participation at any time without any consequences. Informed oral consent was obtained from the heads of the selected departments, and finally, informed oral consent was obtained from each participant prior to data collection. Confidentiality of all information was strictly maintained throughout the study.

Conflict of Interests

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

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Availability of Data and Materials

The de-identified data used in this study are available from the corresponding author upon reasonable request.

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