Factors Associated with Adolescent Girls' Dietary Diversity Status in the Context of Household Food Insecurity in Hosanna Town, South Ethiopia

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Abstract

Background: Food insecurity and poor dietary status are major public health issues, particularly among adolescent girls which would perpetuate the cycle of intergenerational malnutrition. However, adolescent girls are underrepresented in nutrition-related programs. Therefore, this study aimed to determine the dietary diversity status of adolescent girls in the context of household food insecurity in Hosanna Town, South Ethiopia.

Methods: A community-based cross-sectional study was conducted on 451 families with adolescent girls selected by cluster sample technique from May 21 to June 20, 2019. Data were collected using a pre-tested structured questionnaire and analyzed using SPSS version 23. Logistic regression analysis was conducted to identify determinants of dietary diversity among adolescent girls. P-value< 0.05 was considered statistically significant.

Results: In this study, 41.7% (95%: CI 36.9-46.5%) of the households were food insecure and 57.8% (95% CI.53.5-62.2) of adolescent girls consumed a diversified diet, with a mean dietary diversity score of 5.38 (SD±1.75). Having an employed father (AOR= 3.05; 95 % CI: 1.35-6.87) and exposure to televised media (AOR=2.86; 95 % CI: 1.23-6.42) were positively associated with dietary diversity scores. However, household food insecurity (AOR=0.22; 95 % CI: 0.13-0.37) was inversely associated with dietary diversity scores.

Conclusion: Less than 60% of adolescent girls met the minimum dietary diversity score. Paternal occupation, exposure to media, and household food security status were factors associated with the consumption of a diversified diet. The dietary status of adolescent girls will be improved by ensuring household food security. Multi-sector approach and the importance of additional evidence are highlighted.

Keywords: Adolescent girls; dietary diversity; food insecurity; Hosanna; Ethiopia

Introduction

Adolescents, aged 10 to 19 years, make up more than 20% of the worldwide population and 20–26% of the total population in Ethiopia (Christian and Smith, 2018; Gonete *et al*., 2018). Second, only to childhood, adolescence is a period of most rapid growth in human life (Tesfaye *et al.,* 2015) which contributes to 50, 20 and 50 % of adult weight, height, and skeletal mass, respectively(Teji *et al.,* 2016; Birru *et al*., 2018a). Furthermore, it is a key window of opportunity to intervene in an intergenerational cycle of malnutrition (Krebs *et al*., 2017; Lassi *et al*., 2017; Gonete *et al.*, 2018).

Adolescents in developing countries, on the other hand, are vulnerable to nutritional deficits (Fatima *et al.*, 2014) as a result of food insecurity (Belachew *et al.,* 2011). Dietary Diversity Score (DDS), a proxy for optimal micronutrient (MN), is defined as the number of different food groups ingested over time. Alongside with food variety and consumption of animal-source foods, DDS is used to assess the level of food security and quality of diet (Belachew *et al*., 2013; Danquah *et al*., 2018; Tariku *et al*., 2019). Household food insecurity risks the dietary diversity of family members (Belachew *et al*., 2013; Fatmaningrum *et al.,* 2016). As the situation worsens, intrahousehold food allocation is undermined, and girls' diets are frequently the first to be affected (Kang *et al.*, 2019).

Despite significant progress in addressing nutrition related health problems, adolescents' diet has improved very slightly over the last 50 years (Rao *et al*., 2013; Akseer *et al*., 2017). Diet related problems, in particular MN deficiency is a global public health concern (Gebremedhin *et al.*,2014; Krebs *et al*., 2017), affecting 500 million women of reproductive age (Abdullahi *et al*., 2014). Although the problem impacts both sexes

and all age groups, it is more prevalent among adolescent girls (Belachew *et al*., 2013; Asres *et al,*. 2014; Kang *et al*., 2019).

To address diet-related health problems, Ethiopia has formulated national nutritional programs and policies (FMOH, 2016). However, the programs have mainly targeted pregnant mothers and children aged 6–59 months, leaving adolescent girls underrepresented. Furthermore, the association between household food insecurity and the status of dietary diversity was less studied. Therefore, this study aimed to assess the dietary diversity status of adolescent girls in the context of household food insecurity in Hosanna Town, South Ethiopia.

Materials and Methods
Study setting, design, and period
A community-based cross-sectional study was conducted in Hosanna Town, Hadiya Ethiopia from May 21-June 20, 2019. The town is located 230 kilometers to the south of Ethiopia's capital city, Addis Ababa. The study area geographically lies between latitude 70 33′N and longitude 370 51′E with an elevation of 2177 meters above sea level. The town is bounded by Lemmo Werada which is mountainous and undulating. Teff and wheat are common stable foods produced in the area (Horamo *et al*., 2021). According to the projection, the town had a total population of 98,586. EDHS 2016 reported that 24.4% population were adolescents, of whom 49.3% were girls (EDHS, 2016).

Population, Inclusion/ Exclusion Criteria
All adolescent girls found at selected kebeles were included and chronically ill and/ or pregnant adolescents were excluded considering possible changes in dietary intake in the group.

Sample size determination and sampling technique
The sample size was calculated using the single population proportion formula using the following parameters: a study report on dietary diversity of 26.8% (Worku *et al*., 2017), 95 % significance level, 5% margin of error, 10% non-response rate, and 1.5 design effects. The final sample size was 451. Hosanna town has five Kebeles (the least administrative structure in Ethiopia) and three Kebele were selected by a lottery method. A cluster sampling approach was used and the

size of the adolescent girls for each cluster was estimated. The probability proportional to population size (PPS) technique was applied, in which larger settlements have an increased likelihood of being selected. From a total of 37"Mender or Goth" in three Kebeles, 30"Mender/Goth"were selected.In this study "Mender or Goth"consider a cluster. Data were collected from all households in identified clusters with adolescent girls. Whenever two or more eligible exists in a household, one was selected by lottery method. clusters (Figure.1).
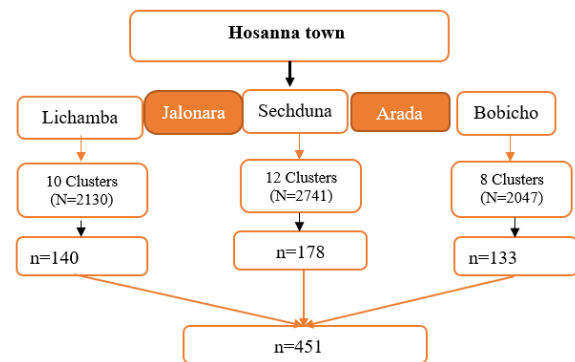
N= total number adolescent girl; n sample size of selected clusters in the kebele

Figure 1: Schematic representation of sampling procedure Hosanna town Ethiopia, 2019.

Data Collection Techniques
Data were collected through face-to-face interviews with professional nurses using a structured questionnaire. The questionnaire was used to assess variables on socioeconomic, demographic, food security, coping strategy, and dietary diversity status. The questionnaire was developed using the Ethiopian demographic and health survey 2016 (EDHS, 2016) and WHO/FAO guidelines (FAO and FHI 360, 2016). The household food insecurity access scale (HFIAS), created by Food and Nutrition Technical Assistance (FANTA), was used to assess households' food security status based on a recall of the last four weeks period (Coates, 2007). The HAFIAS tool is concerned with the occurrence and frequency of occurrence questions. There were nine questions on the HFIAS scale, and each question requires a mutually exclusive response. Study participants were also asked for various coping strategies (Belachew *et al*., 2013; Kisi *et al.*, 2018) in case of

actual or potential food insecurity. A 24-hour dietary recall was used to measure DDS in adolescents. Dietary groupings were designed by FANTA/FAO, which were subsequently separated into ten food groups (FAO and FHI 360, 2016).

Data Quality Control
The data collection tool was pretested in Durame town on 5% of the sample size, and internal consistency was confirmed using Cronbach's alpha. The alpha coefficients for the dietary diversity score tool (10 questions), coping strategies (9 items), and household wealth tool (23 items) were 0.67, 0.69, and 0.78, respectively. Possible tool modification was considered based on the pre-test results. To ensure consistency, a structured questionnaire was prepared in English, then translated into Amharic and back-translated to English by multilingual specialists. Data collectors and supervisors were trained for two days to ensure data quality. Data were collected from heads or formal caretakers at the household and checked daily for consistency and completeness

Data Processing and Analysis
Data were entered using Epi-Data version 3.1 and then exported to Statistical Package for Social Science (SPSS) version 23 for analysis. Descriptive statistics were applied to each variable, including the outcome variables. Principal component analysis (PCA) was used to compute for household's wealth index, which was based on EDHS 2016 household assets and housing quality characteristics (EDHS 2016). First, all the households were asked about the ownership of assets. Those who owned the asset received a score of "1," while those who do not possess received a score of "0". Household wealth index status was ranked; the highest, middle and lowest. The measurements and cut-offs to food security status were analyzed based on the HFIAS FANTA tool. Accordingly, households are categorized as food secure if they either had not underwent any food insecurity or experience or are rarely worried about running out of food. The rest were categorized as food insecure. The latter are further grouped into three categories of food insecurity namely mild,moderate and severe food insecurity (Coates 2007). A summary measure based on the consumption of five or more food groups by adolescents

during the last 24-hour period was considered adequate for DDS and otherwise, it was declared inadequate for DDS (FAO and FHI 360, 2016; Birru *et al.*, 2018b). Factors associated with DDS among study participants were identified using bivariate and multivariate logistic regression. Variables with a p-value of less than 0.25 in bivariate analysis were candidates for multivariate analysis. Hosmer-Lemeshow test was used to check the goodness-of-fit of the multivariable logistic regression model. In multivariable analysis, variables with a p-value of less than 0.05 at a 95% confidence interval (CI) were declared as statistically significant.

Ethical Consideration
Ethical clearance was obtained from the Ethics Review Board of Hosanna Health Science College with refe.no 09/7540. An official letter was written to the city and administration health unit and consequently, permission was secured. Heads of household were informed of the study's objective, benefits, rights, and others. Written signed consent was obtained from each study participant prior to the interview. Information obtained from study participants during the study was kept confidential.

Results
Socio-Demographic characteristics of participants
A total of 434 households participated in the study, which yields a response rate of 96 %. The majority of the study participants were Protestants in religion (61.1%) and Hadiya in ethnicity (78.8%). The median age of adolescent girls was 15 years (IQR=4) and a higher number of them were late adolescents (17-19years) (35.3%) and almost all adolescent girls ever attended school. In this study, 43.2%, 24.7%, and 18.5% of adolescent girls had housewives, merchant, and governmental employee mothers respectively. Regarding paternal occupation of adolescent girls, 37.4% were government employees followed by merchants (20.8%). About half (48.8%) of adolescents' mothers were educated to the primary level and more than two third (35.5%) of the fathers were graduates of college/university. Over half (57.4%) of households were composed of a family size of five or more (Table 1).

Table 1: Socio-demographic characteristics of households and adolescents in Hosanna town, Ethiopia, 2019 (n=434).

Variables		Frequency	Percent
Age of adolescent girls	Early	130	30
	Middle	151	34.8
	Late	153	35.2
Adolescent girls ever attended school	Yes	429	98.8
	No	5	1.2
Religion	Protestant	265	61.1
	Orthodox	99	22.8
	Muslim	37	8.5
	Others*	33	7.6
Ethnicity	Hadiya	342	78.8
	Kembata	53	12.2
	Siltie	28	6.5
	Other**	11	2.5
Adolescent's maternal educational status	No formal education	75	17.7
	Primary (1-8 grade)	207	48.8
	Secondary (9-12 grade)	74	17.5
	Collage and above	68	16
Educational status of the father (n=422)	No formal education	36	8.5
	Primary (1-8 grade)	104	24.7
	9-12 grade'	132	31.3
	Graduate	150	35.5
Maternal Occupation (n=421)	Gov't employee	78	18.5
	NGO	17	4
	Private employee	24	5.7
	Merchant	104	24.7
	Housewife	182	43.2
	Daily laborer	8	1.9
	Other+	8	1.9
Fathers' occupation (n=423)	Gov't employee	158	37.4
	NGO+	24	5.7
	Private employee	19	4.5
	Merchant	88	20.8
	Farmer	49	11.6
	Daily laborers	18	4.3
	Others	67	15.8
Household family size	≤5	185	42.6
	>5	249	57.4
Households' wealth index category	Highest	146	33.6
	Middle	153	35.3
	Lowest	135	31.1

*Others; Catholic, wakata ** Others; Amhara, Alaba, Wolayta, Yem,+ Others; housewife, daily laboyrer , religious teachers, +* Others;religious teachers, daily laboyrer, +; NGO; Non-governmental Organization,*

Household Food Security Status

More than four in ten (41.7%) (95% CI: 36.9-46.5%) of households were food insecure and most of them (17.1%) were severely food insecure (Fig. 2). Most of the household used switching to less expensive and low-quality food (73.5%) and cutting non-food expenditures (53%) as coping strategies for their food insecurity (Fig. 3).

Dietary Diversity Status of Adolescent Girls

From a total adolescents involved in the study, 251 (57.8%) (95 CI: 53.5-62.2) consumed diversified diet 24-hours preceding the survey date. The mean DDS was 5.38 with a standard deviation of (SD) $\pm$ 1.75. Most of the adolescents consumed grains, white roots and tubers, plantains (97.5%), and pulses (87.6%) while nuts (22%), meat, poultry, and fish (22.4%) were the least eaten foods by adolescent (Table 2).
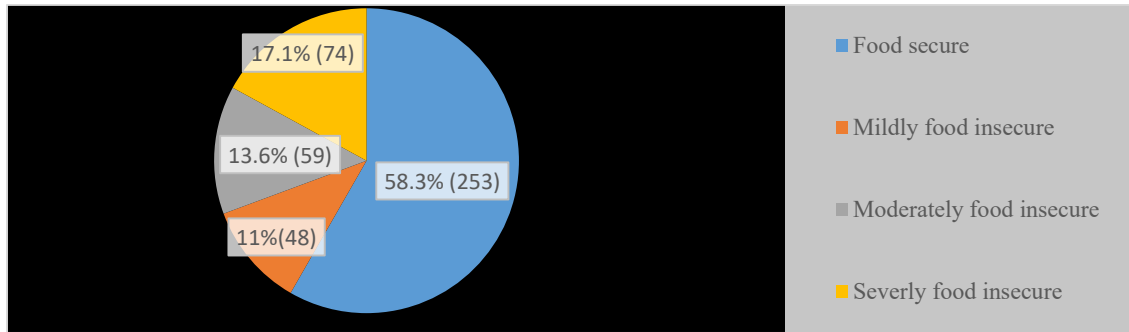
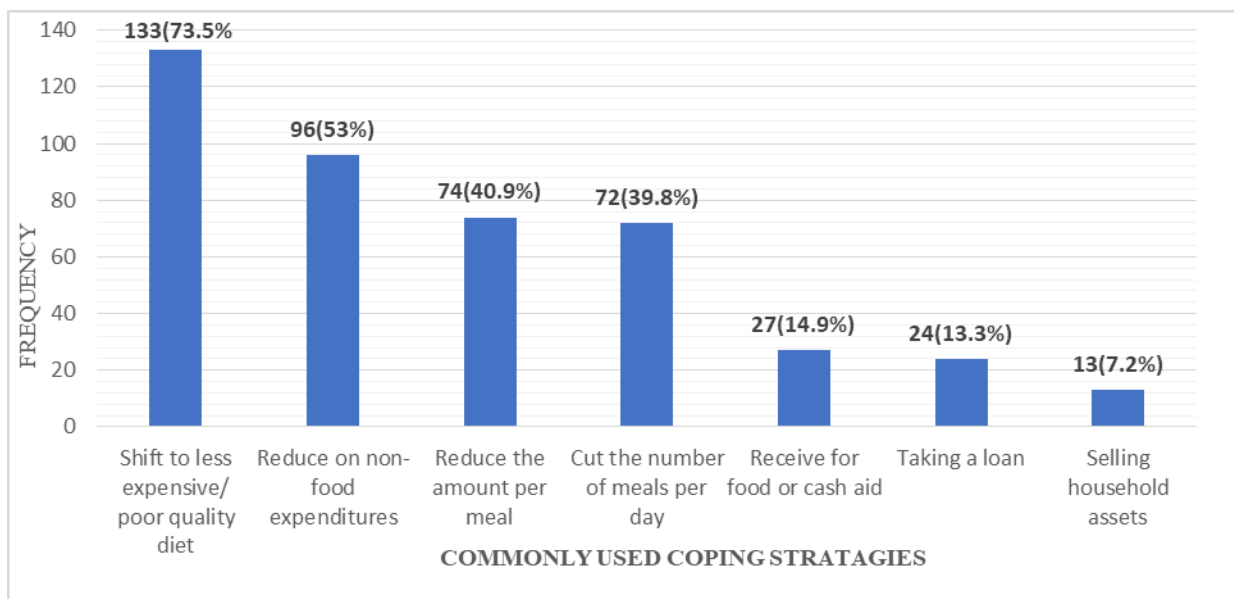Fig.2: Household food security status in Hosanna Town, Ethiopia, 2019.

Fig.3: Food insecurity-related household coping strategies in Hosanna town, Ethiopia, 2019.

Table 2: Consumption of food groups by adolescents using 24 hours recall method, in Hosanna Town, Ethiopia**, 2019.

Types of Diet	Frequency	%
Grains, white roots and tubers, and plantains	423	97.5
Pulses (beans, peas, and lentils)	380	87.6
Nuts and seeds	95	21.9
Dairy	230	53.0
Meat, poultry, and fish	97	22.4
Eggs	166	38.2
Dark green leafy vegetables	335	77.2
Other Vitamin A-rich fruits and vegetables*	248	57.1
Other vegetables**	195	44.9
Other fruits***	160	36.9

*; Mango, papaya, vegetables other than leafy greens (carrot, pumpkin, sweet potato, etc.) **; Beets, green pepper, legumes (excludes high-carbohydrate "starchy" roots) tomatoes ***; Avocado, banana, apple, etc.

Predictors of Dietary Diversity Status
From a total of 13 variables, adolescent girls' age, living with both parents, adolescent's mother's educational status, adolescent's paternal educational status, adolescent's maternal occupation, paternal occupation, adolescents listening to the radio, adolescents watching television, households' wealth index, and food security status at household, were ten potential covariates identified in bivariate analysis (p <0.25) and used for subsequent multivariable logistic regression analysis.

In multivariable logistic regression analysis, adolescent fathers' occupation, the adolescents' exposure to televised information, and household food insecurity were factors associated with the adolescent girl dietary diversity score. Adolescent girls having employed father were three times more likely to have a diversified diet when compared to those categorized as other (AOR= 3.05; 95 % CI: 1.35-6.87). Adolescent girls who were exposed to television media at least once a week were about 3 times more likely to have a diverse diet than the non-exposed ones (AOR=2.86; 95 % CI:1.23-6.42). Adolescent girls residing in food insecure households had a 78% less likelihood of consuming diversified diet than their counterparts (AOR=0.22, 95% CI.0.13-0.37) (Table 3)

Table 3: Factors associated with dietary diversity score among adolescent girls in Hosanna town, 2019, (n=434).

Variables	Variable category	Dietary diversity status		COR(95% CI)	AOR (95%CI)
		Adequate	Inadequate		
		No (%)	No (%)		
Age of adolescent girls	Early adolescent	71 (54.6)	59(45.4)	1	1
	Middle Adolescent	84 (55.6)	67 (44.4)	1.04 (0.65-1.67)	1.14 (0.64-2.02)
	Late adolescent	96 (62.7)	57(37.3)	1.4 (0.87-2.25)	1.56 (0.87-2.81)
Living With	Both parent	207 (61.8)	128 (38.2)	2.17 (1.35-3.49)	1.11 (0.57-2.38)
	One parent	38 (42.7)	51 (57.3)	1	1
Maternal educational status	No formal education	25 (33.3)	50 (66.7)	1	1
	Primary(1-8grade)	115 (55.6)	92 (44.4)	2.5 (1.44-4.35)	1.17 (0.57-2.38)
	Secondary(9-12grade)	54 (73.0)	20 (27.0)	5.4 (2.67-10.90)	2.22 (0.84-5.85)
	College and above	51 (75.0)	17 (25.0)	6 (2.8912.44)	1.78 (0.54-5.83)
Paternal educational Status	No formal education	8 (22.0)	28 (78.6)	1	1
	Primary(1-8 grade)	50 (48.0)	54 (52.0)	3.24 (1.35-7.77)	2.78 (0.92-8.38)
	Secondary(9-12 grade)	77 (58.3)	55 (41.7)	4.9 (2.07-11.56)	2.10 (0.68-6.47)
	Collage and above	110 (73.3)	40 (26.7)	9.6 (4.05-22.86)	1.98(0.56-07.07)
Maternal occupation	Employee	86 (72.3)	33 (27.7)	2.61 (1.60-4.25)	0.89 (0.38-2.06)
	Merchant	59 (56.7)	45 (43.3)	1.31 (0.81-2.11)	0.96 (0.52-1.78)
	Others**	99 (50.0)	99 (50.0)	1	1
Paternal occupation	Employee	144 (71.6)	57 (28.4)	3.99 (2.51-6.33)	3.05 (1.35-6.87)*
	Merchant	49 (55.7)	39 (44.3)	1.98 (1.15-3.42)	1.92(0.95-3.89)
	Others***	52 (38.8)	82 (61.2)	1	1
Listening to radio	Not at all	90 (51.0)	86 (49.0)	1	1
	Less than once a week	89 (62.2)	54 (37.8)	1.58 (1.01-2.27)	1.26 (0.73-2.18)
	At least once a week	72 (62.6)	43 (37.4)	1.6 (0.99-2.59)	1.01 (0.52-1.94)
Watching to television	Not at all	15 (27.8)	39 (72.2)	1	1
	Less than once a week	118 (55.4)	95 (44.6)	3.23 (1.68-6.20)	1.17 (0.52-2.63)
	At least once a week	118 (70.7)	49 (29.3)	6.26 (3.17-12.39)	2.86 (1.23-6.42)*
Household Wealth Index	Highest tertiles	111 (76.0)	35 (24.0)	3.96 (2.38-6.60)	1.47 (0.77-2.78)
	Middle tertiles	80 (52.3)	73 (47.7)	1.37 (0.86-2.18)	0.90 (0.51-1.60)
	Lowest tertiles	60 (44.4)	75 (55.6)	1	1
Household food security status	Food secure	187 (74.0)	66 (26.0)	1	1
	Food insecure	64(35.4)	117 (64.6)	0.19 (0.13-0.29	0.22 (0.13-0.37)*

*;p-value <0.05, **;P-value <0.001, ** other: Housewife/farmers, daily laborer, religious preachers*** other farmers, daily laborer, religious preachers*

Discussion

In this study, more than four in ten households were food insecure and nearly three in four (73.5%) households consume less expensive and low-quality food as a coping strategy. Only less than 60% of adolescent girls had adequate DDS. Father's occupation, the adolescent's exposure to televised media, and the household food insecurity were significant predictors of dietary diversity status among adolescent girls.

The current study revealed that 41.7% of households were food insecure. This finding is consistent with the studies in North West Ethiopia (37.2-44.4 %) (Wassie *et al.*, 2015; Birru *et al.*, 2018) and higher than that of Dembia District, Ethiopia (14%) (Gonete *et al.*, 2018). However, this study finding is lower than the study report from Addis Ababa (75%) (Birhane *et al.*, 2014) and Kenya (80.5%) (Macharia *et al.*, 2018). Seasonal variations in food security and variations in eating patterns among different socioeconomic and sociocultural groups might contribute to differences. This is supported by the previous evidence indicating that household food insecurity showed seasonal variations (Guo *et al.*, 2015; Belayneh *et al.*, 2020).

In the case of food insecurity, households used to practice a variety of coping strategies like switching to low-quality food and cutting non-food expenditures. This is in line with other studies. Studies from Jimma Ethiopia (Belachew *et al.*, 2013), and Indonesia (Fatmaningrum *et al.*, 2016) reported that skipping meals, reducing portion sizes, eating a monotonous diet, selling goods to raise money, and asking for food aid were commonly used coping strategies in case of food insecurity.

In this study, less than six in ten adolescent girls ate a diverse diet. This intake is lower than studies report from other parts of Ethiopia (63.3-75.5%) (Birru *et al.*, 2018; Tadege *et al.*, 2018), but it is higher than study findings in Gurage Zone, Ethiopia (26.8%) (Worku *et al.*, 2017). The difference might be due to variations in food groupings criteria for cut-off points and study settings. The previous studies used nine food groups and six as a cut-off-point to declare adequacy of diversity and conducted on high school adolescent girls (Worku *et al.*, 2017; Birru *et al.*, 2018). The current study used ten food groups and five as a cut-off point (FAO and FHI 360, 2016).

According to this study, adolescent girls having employee fathers were more likely to consume a diverse diet when compared to others. Evidence suggests that the father's involvement significantly influences family functioning (Johnson *et al.*, 2021) including food security, dietary intake, and additional care (Abate and Belachew, 2017). Paternal monitoring for the adolescents dietary intake could be attributable to time at home due to the nature of occupation (Haerens *et al.*,2009); fathers who spent more time out of at home due to their occupation (living in abroad and daily laborers in our case) (Haerens *et al.*, 2009) may have poor monitoring for dietary intake of their household. Perhaps, employed fathers might have relatively leisure time than merchants and others, who might be too busy due to their field of occupation. However, this might be interpreted in light of extra precaution and requires for exploration of additional evidence.

Additionally, adolescent girls who watch television at least once a week were more likely to consume a diversified diet. Evidence shows that adolescence is a period marked by a transition from parental-controlled eating to self-directed autonomy over individual food choices and eating (Ziegler *et al.*, 2021). This transition is influenced by television media which has a stronger link to recommended levels of lifestyle behaviors (Beaudoin and Hong, 2011). Increased exposure to dietary principles information provided by various media improves adherence to healthy eating recommendations (Bonaccio *et al.,* 2013).

The current findings revealed that household food insecurity negatively influenced the dietary diversity of adolescent girls. This is consistent with other studies. conducted in Jimma and Northwest Ethiopia (Belachew *et al.*, 2013; Tariku *et al.,* 2019) and consequently practice diverse coping strategies (Belachew *et al.*, 2013; Fatmaningrum *et al.*, 2016).

Parental education is not associated with the dietary diversity score of adolescents. Contrary to an assumption that the level of parental education would influence adolescent girls' dietary diversity score through knowledge. Similarly, household wealth status is not a significant predictor of dietary diversity in this study, perhaps it may be linked to household food security and dietary diversity score, but it could not be in the causal pathway.

This study could make a significant contribution to generating evidence on the dietary status of adolescent girls. However, we recognize the following dietary questions (like DDS, and food frequency) are qualitative questionnaires alike weighed record methods that would measure nutrient intake. So DDS questionnaires are a proxy indicator. Additionally, it might have introduced recall bias associated with past dietary intake.

Conclusion

The dietary diversity score was not adequate in a substantial proportion of adolescent girls. Televised media, paternal occupation, and household food insecurity demonstrated statistically significant associations with adolescent girls' DDS. Therefore, collaborative efforts in agriculture, health, and education are required to ensure household food security. Furthermore, this highlights the importance of assessing nutrition related knowledge. Further evidence should be generated by longitudinal data to document nutrient adequacy in this segment of the population,

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

BB was involved in the design, conduct, acquisition, analysis, interpretation of data, and drafting of the manuscript; LP was involved in the design, analysis, interpretation, and revision of the manuscript. BBF, AE, RD, and ML were involved in the design, analysis, and revision of the manuscript. All authors read and approved the final manuscript to be published.

List of abbreviations

AOR; Adjusted Odds Ratio, CI: Confidence Interval, COR; Crude Odds Ratio, DDS; Dietary Diversity Score, EDHS; Ethiopian Demographic and Health Survey, MN; Micronutrients, PCA; Principal Component Analysis.

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