

Dietary diversity practice and associated factors among late adolescent girls in Tegede district high Schools, northwest Ethiopia

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Abstract

Introduction: Estimating the dietary and nutrient intake is one of the indirect methods of assessing nutritional status. Diets of adolescent girls in developing countries including Ethiopia are low in diversity, mostly consuming cereals with limited animal source foods and essential nutrients that led to malnutrition. The problem is highly exacerbated at adolescent stage, which exhibited rapid physiological changes. Hence, this study aimed to assess dietary diversity and associated factors among high school late adolescent girls in Tegede district. **Methods:** A school based cross-sectional study was conducted on 400 systematically selected adolescent girls from January to February 2018 in Tegede district high schools. Dietary diversity score was measured using a validated 24-hour dietary recall questionnaire based on 10 food groups. Binary logistic regression was used and Bi-variable and multivariable analysis were used to identify factors associated with dietary diversity and 95% confidence interval and Odds Ratio (OR) was computed to assess the strength of association. Variables with 0.05 p-value in the multivariable analysis were taken as significantly associated with the dietary diversity score. **Result:** The proportion of adolescent girls who had adequate dietary diversity was 47.3% [95% CI: (42- 52%)]. Urban residences [AOR=6.60(3.90 11.16)], Living with family [AOR=5.53(3.26 9.37)], common decision on food preparation at household level [AOR=1.97(1.14 3.39)], school nutrition club member [AOR=2.33(1.34 4.05)] and access to home gardening (AOR=2.69[(1.57 4.62)]) were significant determinants of adequate dietary diversity. **Conclusion:** This study indicated the proportion of adolescent girls who had diversified diet was low. Family residences, Students living status, decision in home food preparation, school nutrition club member and access to home gardening were significant associated factors. These finding underscored that strengthening of school nutritional club and home gardening is mandatory to curb nutritional related problems.

Background

Dietary diversity score defined as the number of food groups consumed by an individual or members of house hold inside or outside the home over a reference period[1]{Kennedy, 2011 #43; Kennedy, 2010 #51; Kennedy, 2011 #43}. It signifies household or individual diet of quality. Furthermore, dietary diversity score is a metric of food security nutrition information, early warning system and target of global or domestic intervention. Inadequate dietary diversity poses a health problem among poor people in the developing countries suggests that they feed mostly on starchy staples without or with minimal use of animal products, fresh fruits and vegetables[2]. The dietary data indicated that the diet of many children and adolescents is low in energy and nutrients, it was noted that dietary diversity was poor[3]. Developmental process of adolescents increase demands on both macro and micro nutrients significantly. The impaired physical growth, low cognitive power for education, low productivity; low birth weight of fetus, neural tube effect (deformity) and other health effect will face due to that micro nutrient deficiency. Low dietary diversity is one causes of micronutrient deficiencies[4].

Some studies have investigated the dietary diversity against adequacy of nutrient in developing countries, found a good relationship with studies in developed countries[5]. Poor nutrition during adolescence will not

only affect adult body size, resulting in shortness or thinness, but may also affect the nutritional status of any children born to mothers who were malnourished during adolescence[5, 6]. Most of nutrition policies and interventions targeted on women during pregnancy and lactation and children up to the age of two years. Though these periods of time are critical, it is imperative that adolescent girls are also targeted in order to break the intergenerational cycle of malnutrition[5, 7]. Adolescents have typically been considered a low risk group for poor health and little attention is paid for those large group of population in developing countries[8].

Globally, half of all adolescent girls in some countries are stunted, increasing risk of complications in pregnancy and delivery and of poor foetal growth and outcome[9]. Prevalence of low BMI (<18.5 kg/m) in adult women has decreased in Africa and Asia since 1980, but remains higher than 10% in those developing regions. In low and middle income countries, 50 percent of adolescent girls do not eat 3 meals per day; most skip breakfast, protein intake is inadequate and fat intake is low, factors which may contribute to the prevalence of underweight in these regions[10]. Anaemia (haemoglobin<110 g/L), which might be attributed to low consumption and absorption of iron in the diet [11].

Most women in sub-Saharan Africa inter-pregnancy with poor nutritional status like Iron deficiency, micronutrient deficiency which affects health negatively[12]. Pre-pregnancy underweight and micronutrient deficiencies increase the risk of preterm birth.

Factors such as economic status, level of education, age, marital status, income and knowledge about nutrition were determinants of dietary diversity among adolescent and reproductive age women. The federal ministry of health and education and other non-governmental organization working in collaboration on school based nutrition to reduce hunger and malnutrition among students. Although many studies conducted to assess dietary diversity among different population groups, there is no study conducted to measure practices dietary diversity among late adolescents in schools. This study could help researchers and policy makers may be used as baseline information to give priority and set new interventions on adolescent girls in the study area. It also can be an input for reduce cycle of malnutrition.

Methods

Study design, period and setting

An institution based cross-sectional study was conducted from January to February 2018 in Tegede district, northwest Ethiopia. There are three high schools found in the district. In addition, the district has four health centers, and 22 health posts.

According to, 2017-2018 Amhara Region Bureau of Finance and Economics Development report, the total population in the district is 92,216, of which adolescent girls constitute 10%.

Source and study population

The source population were all late adolescent girls attending high school in Tegede district during the study period. During data collection period, about 968 late adolescents' girls were attended high school. Late adolescent girls attending classes in the three high schools of Tegede districts, but with no serious illness and those advised by physicians to take extra meal different from their normal habit were included in this study. The sample size was determined by using a single population proportion formula, assuming a 38.7% proportion of adequate dietary diversity in Jimma town [13], 5% margin of error, 95% confidence interval and 10% non-response during the data collection period to come with 400 study participants. A simple random sampling technique was employed to select the study participants, using the school roster as a frame. The participants were proportionally allocated in the three schools according to the total number of students in each school.

Operational definitions

Dietary diversity –the number food groups consumed over a 24 hour period.

Individual dietary diversity –The number of food groups consumed by individuals in or outside the home over a 24 –hour period(32).

Adequate dietary diversity score – Those individuals who were consumed five and above food groups(15).

Minimum dietary diversity-W-was a dichotomous indicator whether or not women of reproductive age had consumed at least five out of ten defined food groups in the previous day and night(15).

Food groups - Consumption of any amount and quality of food from each food group (all starchy staple foods, Beans and peas, Nuts and seeds, Dairy Flesh foods, Eggs ,Vitamin A-rich dark green leafy vegetables ,Other vitamin A-rich vegetables and fruits, Other vegetables ,Other fruits)is sufficient to count (33).

Late Adolescents: The adolescent age group who were encompassed the latter part of the teenage years, between the ages of 15 and 19(34).

Nutritional knowledge: The participants who had responded half of and above the questions related nutrition 'good knowledge' if not 'poor knowledge; who were found from age15-19.

Stunting: is defined as having a height-for-age z score (HAZ) $< -2SD$

Data collection procedures and variables of the study

Interviewed based questionnaire was used to collect the data. The dietary diversity was measured using a 24 hour recall dietary survey method, which was developed after reviewing literatures (FANTA-2016). The dietary diversity questionnaire used consists of 14 groups of foods, which covers almost every food taken. Some food groups in the dietary diversity questionnaire were combined into composite food groups to create the dietary diversity score.

Socio-demographic, adolescent characteristics were also collected. Wealth index also computed by principal component analysis. Primarily the tool was prepared in English and translated to Amharic, the local language, and re-translated to English to check consistency of the questionnaire. The questionnaire was pretested among 40 adolescent girls out of the study area. Six diploma nurses' data collectors and two health officer supervisors were deployed in the data collection process. Weight and height of adolescent girls were measured using Seca beam balance with light closing and take off shoes and measurements were rounded to the nearest 0.1 digits.

The data collectors were trained for one day before the actual data collection about objectives of the study and approaches to collect the data, anthropometric measurement, data recording, and ethical issues of the study. Completeness and consistency of the questionnaire were checked every day by principal investigator and supervisor.

Data processing and analysis

Data was checked, edited, coded and entered to Epi-info version 7.00 and exported to SPSS version 20.0 software for analysis. Normality was checked for all continuous variables. Interactions between different independent variables again were checked and co-linearity diagnostics was done by checking the variance inflation factor (VIF) of less than five. Means, standard deviations (SD) and percentages were used to describe the data and the results were presented with narration, frequency tables and graphs. Anthro-plus was used to enter and determine the nutritional status of girls and principal component analysis (PCA) method was used for wealth index analysis using explanatory methods of SPSS and ranked as poor, medium and rich. Binary logistic regression analysis model was fitted to identify determinants of adequate dietary diversity. Crude and adjusted odds ratio with 95%CI was computed to assess the strength of association between independent and outcome variables. Determinants was considered as statistical significant at a p-value less than 0.05 in the multivariable model.

Results

Socio demographic characteristics

A total of 400 school adolescent girls were participated in this study with response rate of 100%. The mean (\pm SD) age of the participants was 16.74(\pm 1.1) years and 97.7% of them were Orthodox Christians. About 161, 40% of the parents of the adolescent girls were poor and 55.2% of them had more than 5 family size. Moreover, 210 (52.5%) of the study participants were living in rental house far from their family, nearby their school. Regarding to the study participant parents' level of education, 76 % of mothers were illiterate and nearly half (51%) of the participants fathers were able to read and write. Most of mothers' (94%) occupation were house wife and 90% of fathers' occupation were farmers (Table 1).

Nutrition information and dietary habit characteristics

More than one-third (38%) of participants had got nutrition related information a week before data collection, of which family (52%) were the most common source of information. About 40% the study

participants were member of school nutrition club and the majority (85%) knew about the benefit of diversified diet. About one-third of (34%) the respondents had cumulative good knowledge and the majority (80.8 %) had frequency of meal three times per a day, 53% of them had habits of skipping meal and most of (96%) of the students had habits of fasting during fasting time (Table 2).

Dietary diversity practices

This study showed that 47% with [95% CI :(42- 52)] late adolescent girls had adequate dietary diversity practices. Grains and cereals and tubers 99.5%, Vitamin A rich fruits and vegetables 74.5%, pulses 60%, meat and poultry 57% were the most common food groups consumed by late adolescent girls. The median and mean (SD) dietary diversity score were 6 (IQR: 4 to7) and 5.71(\pm 2.31), respectively (Fig-1).

Factors associated with dietary diversity practices

The multivariable binary logistic regression showed that family's residence, student's living status, who made decision on food preparation, school nutrition club member and access to home gardening had a statistically significant association with dietary diversity (p -value <0.05).

This study showed that adolescents girls from urban area had 6.6 times higher probability of taking diversified diet than their counterparts from rural area [AOR=6.60,95% CI(3.90 - 11.16)]. Similarity, the odds of dietary diversity was 5.5 higher among those adolescent girls who lived with family as compared to those who live lone at rental house for during their schooling time [AOR=5.53,95%CI (3.26 - 9.37)]. This study also identified access to home and backyard gardening was found to be statistically associated with dietary diversity practices of adolescents girls. Those adolescents who had access to gardening were 2.7 times more likely to had adequate dietary diversity than their counter parts [AOR=2.67, 95% CI (1.57 - 4.62)]. Those adolescent girls who had been a member of school nutrition club were 2.33 times more likely to be practiced adequate dietary diversity compared to those with those who had no such participation [AOR= 2.33 ,95%CI(1.34 - 4.05)]. Furthermore, adolescents' parents who decided food preparation in common were 1.98 times more likely to be gained adequate dietary practice than decided separately [AOR= 1.97 ,95%CI (1.14- 3.39)] (Table 3).

Discussion

The study showed that minimum dietary diversity fulfilled among adolescent girls was 47.3% [95% CI:(42- 52)], the finding is in line with the study done in Amhara region, Ethiopia (47%)[14]. However, the finding was higher than the study conducted in Jimma, Ethiopia (38.7%); in Adama, Ethiopia (41.2%) and in Zimbabwe (34%)[13, 15-17]. The mean dietary diversity score also were relatively high compared to the study done in Gurage zone, Ethiopia (mean 4.69 ± 1.46); in Oyo state, Nigeria (mean 3.91 ± 1.01)[18];the possible reasons for those discrepancies could be: differences in access of plant based foods like vitamin A and differences in fruits ,vegetables and other animal sources food.

But this study is lower than similar study done in Bale, Ethiopia (80.7%)[19] and Iran (mean DDS= 6.25 ± 1.08)[20]. The possible reasons could be differences in socio-demographic behaviors,

difference in knowledge, feeding habit behaviors. In addition, maternal education and economy was associated significantly, but was not in this study.

In this study nearly all of the adolescent girls consumed cereals which was similar with the studies done in Iran, Adama and Jimma of Ethiopia. But Eggs, Other fruits and vegetables was least consumed in this study which was also similar the study done in Bale, Ethiopia. Since starchy staples are predominant diet, this is contributory factor for low dietary diversity score among many populations in Ethiopia.

This study revealed that urban residence of adolescent girls parents associated with increased practice of adequate dietary diversity compared with those who live in rural areas. The finding was supported by the study done in Gurage zone, southwest Ethiopia [15], Jimma, Ethiopia[21] and recently in Gondar city [22]. This might be due to the fact that urban residence increase the access of animal source foods, fruits and vegetables through market access. Likewise living with family was strongly associated with adequate dietary diversity practice than those who live alone in rental house, this finding was also supported by those study done in America [23]; eating with family meals had associated with better nutritional intake, more diverse and healthy eating patterns in adolescents. In addition, those students living alone may not have economic sources to access diversified food items.

This study also identified access to home (backyard) gardening showed significant association with dietary diversity practices of adolescent girls. This could be due to the fact that growing fruits and vegetables with garden might help to maximise access to various food groups all year round [24]. Therefore, home gardening could be contributory factor to adequate dietary diversity through increasing availability to eat diversely and generating income for better access to diverse foods.

Member of school nutrition club was positively associated with adequate dietary diversity compared with not a member, Being a member in nutrition club is one essential activity to improve knowledge, attitudes and feeding behaviours of adolescent girls, this is supported by NNP of Ethiopia[11].The findings of this study indicated that 34% of adolescents had good knowledge about dietary related questions, this could be from contribution of school nutrition club member awareness .But this was relatively low when compared to finding from Oyo, Nigeria [18]and Jimma town ,Ethiopia[13]; this difference might be due to less access of media exposure in the current study area.

Other factor found to significantly associated with adequate dietary diversity was decision in family food preparation, those family who had decided food preparation in common or both were two times higher to practice adequately when compared to decided either father or mother separately. This finding was similar with the assessment done in Zimbabwe [17].This could be due to male involvement in home food preparation increases variety food choice and availability of diversified raw food items in home .

This study assessed the individual dietary diversity practiced in the last 24 hour; but there might be lack of correct reflection of usual dietary habits of adolescents. The study also assessed the house hold based economy, but there might be recall bias of adolescents to tell assets accurately.

Conclusions

This study indicated the proportion of adolescent girls who had diversified diet was low. Family residences, students living with family, decision food preparation, school nutrition club member and access to home gardening were significant associated factors. These findings underscored that strengthening of school nutritional club and home gardening is mandatory to curb nutritional related problems.

Abbreviations

AOR: Adjusted Odds Ratio, OR: Odds Ratio, CI: Confidence Interval, BMI: Body Mass Index SPSS: Statistical Package for Social Science, WHO: World Health Organization PCA: Principal Component Analysis, SD: Standard Deviation, VIF: Variance Inflation Factors, CMHS: College of Medicine and Health Science, km: Kilo meter

Declarations

Ethical approval and consent to participate

Ethical clearance was obtained from Institutional Review Board of Institute of Public Health, CMHS, and University of Gondar. Permission letter was asked and obtained from Tegede District School Office and woreda administrator. Informed consent were collected from parents or guardians and gain agreements of oral assent from children 15 to 17 years and obtained written informed consent from participants who were greater than 18 years expected, after informing them all the purpose, benefits, risk, the confidentiality of the information and the voluntary nature of participants in the study. Name and personal identifiers of participants were not included in the study and individual records were coded and accessed only by the researcher. The respondents were notified that they had been the right to refuse or stop at any point of the interview. Data collectors and supervisors were health professionals who had experience of working in such data collection, due to that privacy and confidentiality of participants' information were ensured throughout the process.

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Competing interests

The authors declare that they have no competing interests

Availability of data and material

Data is available from the corresponding author upon request. Because the data contains sensitive issues in the data set.

Authors' contributions

BD, AA, AD and KS participated to design the study, performed data analysis, visualization, validation the whole work and prepared the manuscript. BD took part data collection, supervision and software and other resources. All authors read and approved the final manuscript.

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Tables

Table 1: Socio-demographic characteristics of school adolescent girls in Tegde district high schools, northwest Ethiopia, 2017 (n=400)

Characteristics	Category	Frequency	Percentage (%)
Students current living status	With family	190	45.5
	Rental	210	52.5
Ethnicity	Amhara	393	98.3
	Tigray	7	1.7
Religion	Orthodox	391	97.7
	Muslim	9	2.3
Family residence	Urban	175	43.8
	Rural	225	56.2
Students marital status	Single	374	93.5
	Married	18	4.5
	Divorced or separated	8	2
Mother level of education	Unable to read and write	304	76
	Able to read and write	85	21
	Primary school	6	1.5
	Secondary school and above	5	1.3
Fathers level of education	Unable to read and write	156	39
	Able to read and write	205	51
	Primary school	24	6
	Secondary and above	15	4
Mother occupation	House wife	375	93.8
	Merchant	15	3.8
	Other	10	2.4
Father occupation	Farmer	359	89.8
	Merchant	20	5
	Government Employed	16	4
	Other	5	1.2
Decision in food preparation	Either father or mother	244	61%
	Both	156	39%
Family Size	<=5	179	44.8
	>5	221	55.2
Wealth Index	Poor	161	40
	Medium	75	19
	Rich	164	41
Distance of market	≤30 km	389	97.3
	31-70 Km	11	2.8

Table 2: Nutritional information and dietary diversity characteristics of school adolescent girls in Tegde district high schools, northwest Ethiopia, 2017 (n=400)

Characteristics	Category	Frequency	Percentage (%)
Got nutrition related information	Yes	152	38
	No	248	62
Source of information (n=152)	Mass media	16	10.5
	Friends	22	14.5
	Family	79	52
	School	35	23
School nutrition club member	Yes	161	40
	No	239	60
Know the dietary source of carbohydrates	Yes	122	30.5
	No	278	69.5
know the dietary source of fats	Yes	326	81.5
	No	74	18.5
know the dietary source of fibre	Yes	45	11
	No	355	89
know the health effects of vitamin -A deficiency	Yes	189	47
	No	211	53
know the dietary source of vitamin A	Yes	121	30
	No	279	70
know the benefits of diversified diet	Yes	339	85
	No	61	15
know the causes of mal nutrition	Yes	256	64
	No	144	36
know the causes of Anaemia	Yes	136	34
	No	264	66
Know causes impaired growth	Yes	246	62
	No	154	38
Overall level of knowledge	Poor	263	65.9
	Good	136	34.1
Usual meals per a day	Two times	8	2
	Three times	323	80.8
	Four times and above	69	17.2
Habit of eating snack	Yes	236	59
	No	164	41
Habit of skipping meal	Yes	212	53
	No	186	47
Reason for skipping meal	Tiredness	20	9.3
	Busy at work & forget	111	52.5
	Not to increase weight	64	30
	others	17	8.2
Habit of fasting	Yes	385	96
	No	15	4
Habits of dislike foods	Coffee	220	55
	Porridge, shirowet	110	27.5
	Vegetables	28	7

	Animal dairy products	17	4.3
	Meat	25	7
Nutritional Status	Thin	90	22.5
	Normal weight	286	71.5
	Over weight	24	6
Height-for-age Z-scores (HAZ)	Stunted	103	26
	Normal	297	74

Table 3: Bivariable and multi-variable logistic regression analysis of factors associated with dietary diversity among school adolescent girls in Tegede district, northwest Ethiopia, 2017(n=400)

Characteristics	Adequate dietary diversity		Crude OR (95%CI)	Adjusted OR (95%CI)
	Yes	No		
Family residence				
Urban	127	48	6.9(4.45 10.8)	6.60(3.90 11.16)*
Rural	62	163	1	1
Students Living with whom				
With family	130	60	5.55(3.61 8.52)	5.53(3.26 9.37)*
Rent	59	151	1	1
Got nutrition information				
Yes	90	62	2.19(1.45 3.30)	1.01(0.58 1.77)
No	99	149	1	1
Decision in food preparation				
Both	94	62	2.38(1.57 3.58)	1.97(1.14 3.39)*
Either mother or father	95	149	1	1
Knowledge				
Good	79	57	1.93(1.27 2.93)	1.59(0.92 2.76)
Poor	110	153	1	1
Access to gardening				
Yes	118	97	1.95(1.31 2.91)	2.69(1.57 4.62)*
No	71	114	1	1
School nutrition club member				
Yes	97	64	2.42(1.61 3.65)	2.33(1.34 4.10)*
No	92	147	1	1
Mother occupation				
House wife	169	206	1	1
Merchant	12	3	4.88(1.35 17.56)	1.62(0.36 7.24)
Other	8	2	4.88(1.02 23.27)	3.62(0.46 28.38)

* shows statistical significance at a p-value of 0.05.

Figures

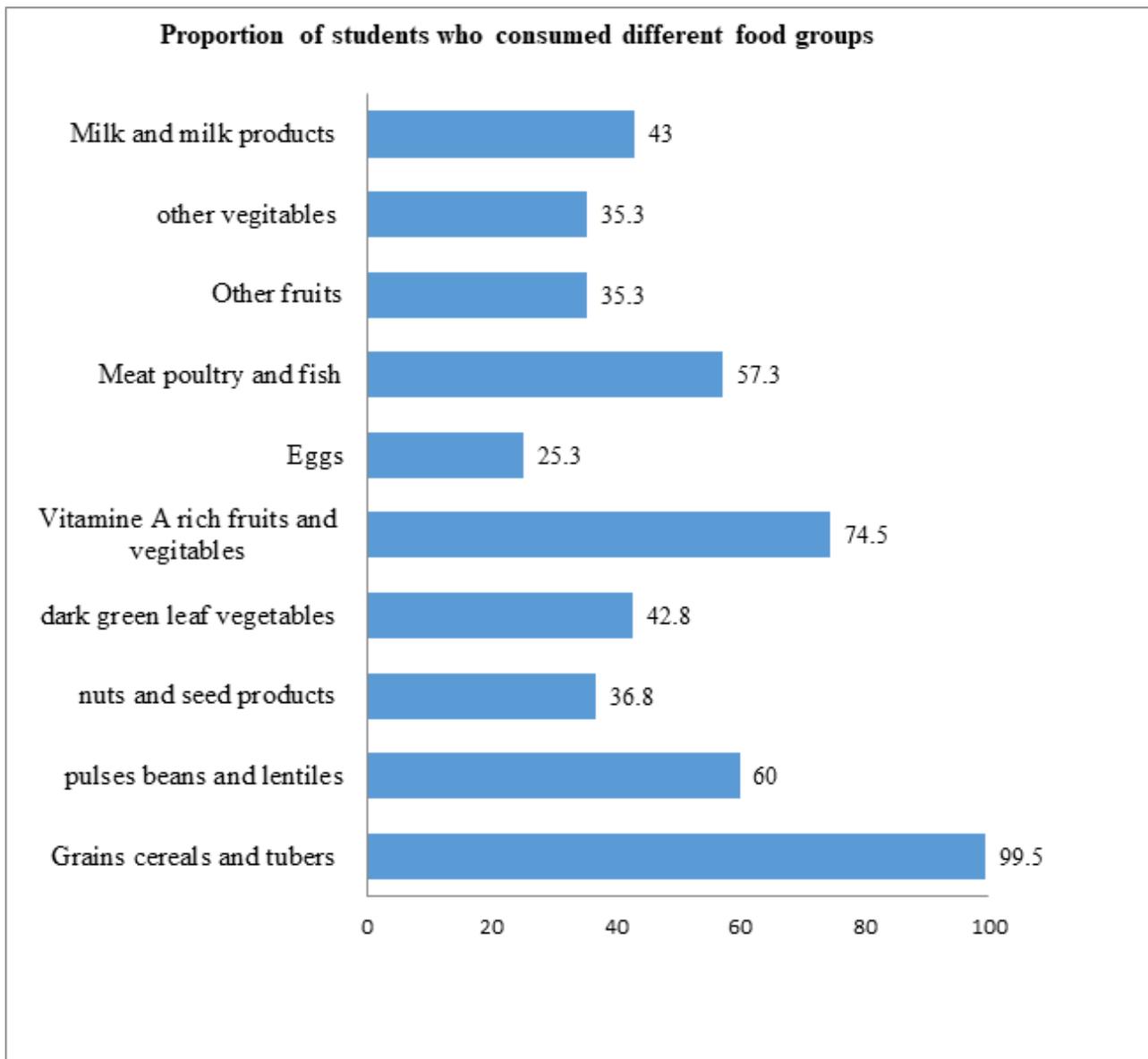


Figure 1

Fig-3. Proportion of consumed various food groups (10) during the last 24 hour