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Modeling Dietary Diversity Practice and Related Factors of Women Reproductive Age at Asaita Woredas, Ethiopia: Community Based Cross-sectional Study

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Abstract

Background: Competent and health diet throughout women reproductive age is crucial for the health of both mother and new born. Dietary diversity is a procurator indicator of women reproductive age nutrient sufficiency.

Objectives: This study was planned to evaluate the dietary diversity exercise and associated factors among women reproductive age at Asaita districts, Afar region, Ethiopia.

Methods: Community based cross-sectional study was done on randomly chosen 422 women under reproductive age at Asaita woredas from February to March, 2020. Data was gathered by using interviewer and 24 hours dietary call up methods. Data entered and analyzed using SPSS version-25. Ordinary logistic regression model was employed to assess factors associated with dietary diversity and potential factors were screened at P-value less than 5%.

Results: The average dietary diversity score was 4.17±1.112SD. Approximately 13.0%, 78.5% and 8.5% of women reproductive age had low, medium and high dietary diversity practice respectively. Family size of male, family size of female, marital status, education level, house with window, having cell phone, bank, refrigerator, television and cart were significant factors associated with women dietary diversity practice at 5% level of significance. The odds of being "low dietary" instead of "high dietary" multiplies by OR=0.665 for each 1-unit increase in family size of female household. Odds of house with window is in low dietary rather than high dietary scores are OR=2.793 times estimated odds for house with no window's.

Conclusion: Marital status, house with window, having cell phone, owner of bank account and refrigerator had a positive association with dietary diversity whereas family size, education level, having television and cart had a negative relation with women under reproductive age of dietary diversity.

Keywords: Reproductive age; Dietary diversity score; Chi-square test; Odds ratio.

Background

A food groups or number of individual food items that consumed over a given period of time and an essential element of diet quality is dietary diversity which reflects overwhelming a diversity of foods within and across food groups that connected with competent ingestion of necessary nutrients and upgrades good health [1-3]. In addition, ability of ensuring enough intake of vital nutrients which can encourage good health, mental development and physical through accelerating the diversity of food across and within food groups[4].

According to study done in Ethiopia[5] children and women under reproductive age are most vulnerable to malnutrition because of low dietary intakes, improper food storage and preparation, dietary taboos, inequitable distribution of food within the household, infectious diseases and care as a more specifically reason out. Dietary diversity can be ensured the improvement for the caliber of additive food that has been adverted as one of the cost effective strategies for improving health, reducing morbidity and mortality of young children as reported by world health organization[6]. One of the major public health problems in the low income and middle income countries was multiple micronutrient deficiencies, particularly for reproductive women. An increment in dietary diversity is associated with socio-economic status and household food security and a procurator blinker of maternal nutrient sufficiency and mends health outcomes for both mothers and babies is maternal dietary diversity[7, 8].

Source of dietary was different across the world due to accessibility of agricultural outcome, socioeconomic status and cultural practice of the community. In 2010 Food and Agricultural Organization (FAO) reported that approximately three-quarters of variety found in agricultural crops have been gone over the last century, and this erosion continues. About 90% of our food energy and protein comes from only 15 plant and 8 animal species, with frightening effects for nutrition and food security[9]. In Ethiopia foods that most households consumed was cereals(barley, sorghum, wheat, rice) which is estimated to 90% of weekly consumption at least one of these cereals used in six of the last seven days. In addition, the country households were experienced 60% low dietary diversity and 40% medium diet dietary diversity scores[10, 11].

A large health burden can be caused due to deficiencies of Marco and micronutrients which was imposed lost productivity, increased susceptibility to diseases, impaired growth and development

whereas intake of high diverse diets has been associated with lower rates of malnutrition[12, 13]. The prevalence of malnutrition among women of childbearing age were estimated as 15% are underweight and 35% are overweight approximately across worldwide[14]. The dietary diversity scores prevalence was different across regions of Ethiopia including our study area. This confirmed with study conducted in Addis Ababa which reported household had 5.9% low, 60.4% medium and 33.7% high[15], in Ahmara region 11.8% low, 67.2% medium and 21% high[11] ,South Ahmara 65.7% low and 34.3% high[16] and SNNPR 41.9% low, 48.5% medium and 9% high where High proportion of the households consumed vegetables (87.5%) and cereals (78.7%)[17]. Another study in Tanzania reported that more than 80% of the population were produce fruits and vegetables for consumption to increase dietary diversity[18, 19].

The dietary diversity has a number causes, with the most potential significant cause on the malnutrition. Several previous researcher suggested some socio demographic factors and clinical factors that associated to dietary diversity among pregnant women[20-23], children under five years[24-30] and households[11, 15-17, 31, 32], still little have been done regarding women under reproductive age which is base stage for fertility in human beings. However, A cross sectional study in Kenya reported that household gender, education level, age and family size were significantly associated with dietary diversity of women under childbearing in high agricultural potential areas[33].

In Ethiopia, Most of the women in the reproductive age group were consuming a diverse diet and those subjects with better dietary diversity score had their body mass index in the normal range[34]. Particularly, vulnerable group due to their greater micronutrient needs were women under reproductive age (15-49 years old)[35]. In low income country like Ethiopia where resource is limited low quality, monotonous diets were the norm. large dimension of women (98.3%) based on monotonous food type whereas only 10.2% were found in the high dietary diversity score (DDS >6) means eating more than six food groups from ten in addition to very low intake of indispensable micronutrients rich foods such as Vitamin A and Iron[36].

Several studies conducted using cross sectional study design in Ethiopia which did not cover whole the geographical regions and administrative city. Ethiopia has nine administrative regions and two administrative city that exercised different norm, culture and multi-ethnic setting Some researcher used binary logistic regression and multiple regression to examine the effect of

covariates on the dietary diversity practice of women which restricts the chronological order of dietary diversity (low, medium and high) among women under reproductive age when it have ordinal nature. However, this study employed ordinary logistic regression model that permit analyzing chronological prevalence of dietary diversity practice of women under childbearing age which used to examine the association between independent factors and dietary diversity score in Asaita Districts of Afar region using community based cross-sectional study design.

Methods and Materials

Study area

The study was conducted in Asaita woreda in zone 1(Awsi Rasu), Afar region North-Eastern Ethiopia. The zone is located in the Northern part of the region and about 65km from the main town of the region (Samara) and 655km the North East of Addis Ababa the capital city of Ethiopia. The woreda has latitude and longitude of 11°34N 41°26E and an elevation of 300m. The dominant practice of woreda was pastoral and agro-pastoral system of livestock production. The mean temperature is between 30°C and 45°C per annum Afar regional state report [37].

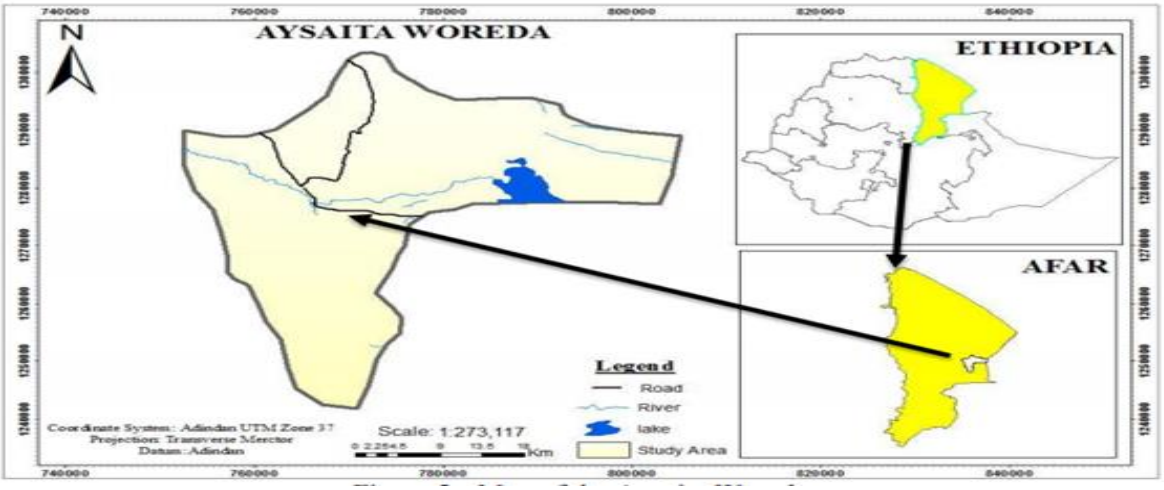

Fig. 1: Location map of study area of region and woreda.

Study design and period

A community based cross sectional study was conducted in February to March, 2020 among women under reproductive age (15-49) years that enrolled in nutritional status and its determinants whereas women below 15 years were excluded. This makes the sample size was 422 for Women in childbearing age.

Study population, sample size and sampling procedure

The study considered all women under reproductive age found in Asaita woreda at Afar Regional state and selects a sample following the laws of the statistical theory of sampling that help to make valid inferences about the population based on the data obtained from the sample which ascertain the degree of accuracy of the results. Single population proportion was used to compute Sample size and the total sample size required (N)= n + non-response of respondents. Assuming 95% confidence interval with 5% margin of error, $Z_{\alpha/2}$=1.96 and 10% probability for non-response rate. We obtained n= $\frac{Z_{\frac{\alpha}{2}}^2 pq}{d^2}$ where p is the prevalence of the attribute (51.4%) taken from previous research done in Addis Ababa[38].

$$n = \frac{1.96^2 * 0.514 * (1 - 0.514)}{0.05^2} = 384$$

Then, the sample (n) = 384+non response rate(0.1x384)= 422**.** Probability type of systematic sampling technique was used to get the study participants. The researcher was divided proportionally the sample size among the two kebeles to obtain a total number of childbearing women in the woreda and simple random sampling was employed during interview to select population size in each kebeles. Finally, the sample size was 422.

Data collection and measurements

Primary data were collected for this study using self-administrative questionnaires.in procedure we followed the Food and Agriculture organization of United Nations definition of dietary diversity score which stated it as a qualitative 24-hour recall of all the food and drinks consumed by respondents (if measured at individual level) or any other household member (if measured at household level)[39]. One day recall time is subject to less recall error than a week or month recall period which in-lined with many studies in dietary diversity[40]. Likewise, the dependent variable considered in the study was women dietary diversity score that calculated from a 24 hour recall of women's nutritional status. Based on food items consumed in the past 24 hour, women were assigned the number of food groups they used, ranging from 0 to 8 or a score of 1 was given to each food groups consumed that attained maximum values of 8 points for women dietary diversity score. Then, according to sample of Food and Agriculture Organization[39]

recommendation, women were classified into three groups:- ≤ 3 Food groups as low dietary diversity, 4-5 food groups as medium dietary diversity and ≥ 6 as high dietary diversity.

Based on the reviewed literature and the aims of current study we considered socio-demographic characteristics of women under reproductive age such as gender, household head, family size of male, family size of female, age, religion, educational status, relationship with child, ever attended school, occupation, ethnicity, number of room in house, kind of house, house window, having electric power, marital status of the household head were considered as independent variables. Moreover, women were interviewed they had their own radio, mobile, bank account, refrigerator, television and cart to know they are accessible with such technological device in-lined to dietary diversity.

Operational definitions

- Dietary diversity can be defined as the number of different food groups consumed by an individual over 24-hours.
- Food groups are a collection of foods that contain a similar mix of nutrients.
- Inadequate dietary diversity: When women have low dietary diversity related to the standard recommendations**.**
- Minimum dietary diversity is the consumption of four or more food groups from the seven defined food groups for higher dietary quality and to meet basic nutritional needs [41].
- Healthier consumption pattern is consumption pattern with higher factor loading for food items strongly recommended by WHO to be consumed by women, particularly all the five major food groups (vegetables, fruit, meat, milk (dairy) and egg).
- Household is an individual who comprise a family unity and who live together under the same roof.
- Household size is the number of a person living together in one house.

Statistical data analysis

In current study, data were entered in Excel and exported to SPSS version-25 for further analysis. Frequency and percentages of each variable was calculated and displayed using tables. Descriptive measures for continuous variables were calculated and their normality distributions

were checked. Chi-square test of association and ordinary logistic regression were employed to assess the potential determinants of dietary diversity of women and predict the dietary diversity score.

Chi-square test of association

In chi-square test, the null hypothesis makes a statements concerning how many cases are to be expected in each category if the null hypothesis if correct. It is based on the differences between the observed and the expected value of each category. The chi-square statistic is defined as:

$$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i} \qquad [1]$$

Where O_i is the observed number of cases in category i ,and E_i is the expected number of cases in category i. The chi-square test used in this study to know the association between socio-demographic variables, food groups and dietary diversity of women. In addition, goodness of model also checked by applying chi-square test.

Logistic regression

Regression is a statistical procedure which attempts to predict the values of a given variable, (termed the dependent, outcome or response variable) based on the values of one or more variables (called independent variables, predictors, or covariates). Regression analysis is model building for the relationship between a dependent and one and/or more independent variables. In the regression if the response variable is continuous we can use the usual linear regression model whereas when the response variable is discrete, taking on two or more possible values the appropriate regression model is logistic regression which was proposed as alternative method in the late 1960s and early 1970s[42].

The problem of non-normality and heteroscadasticity lead to the model estimation method to be maximum likelihood after natural logarithm transformation of the odd ratio of the response because in logistic the relationship between the response with the set of explanatory variables is not linear hence the procedures used in the linear regression is extended to logistic regression. Logistic regression models are classified according to the type of categories of response variable

as follows:-binary logistic regression model, multinomial logistic regression model and ordinal logistic regression models[43].

The binary logistic regression model is used to model the binary response variable, whereas the multinomial logistic regression is a simple extension of the binary logistic regression model where the response variable has more than two unordered categories. Ordinal logistic regression models are used to model the relationship between independent variables and an ordinal response variable when the response variable category has a natural ordering, this employed in current study.

Ordinary logistic regression

Ordinal logistic regression is an extension of binary logistic regression for analyzing ordinal response variable having more than two categories by considering the ordering of the response variable categories. This model is used to describe the relationship between an ordered categorical response (dependent) variable and one or more explanatory (independent) variables. There are different types of ordinal logistic regression models, the most commonly used are: the adjacent-category, the continuation-ratio, the proportional odds models, the unconstrained partial-proportional odds model, the constrained partial-proportional odds model[43].

Proportional odds model

Proportional Odds Model is used for modeling the response variable that has more than two levels with K set of explanatory variables by defining the cumulative probabilities, cumulative odds and cumulative logit for the J-1 categories of the response, this model simultaneously use all cumulative logits. A random sample is drawn from the joint distribution of (Y, X'), where Y is an ordinal response and $X'=(X_1, X_2 - - -, X_n)$ is a vector of independent variables. Let $\pi_j(X')$ denote the classification probabilities $Pr(Y=j/X')$ of response variable Y,j=1,2, - - -, k at any value $X'=(X_1, X_2, - - -, X_n)$ for a set of explanatory variables $X_1, X_2, - - -, X_s$. The cumulative probability can be given as:- $\pi_j(X) = p(Y \leq j / X) = P_1 + P_2 + P_3 + ... + P_j$. for j=1,2, - - -,J-1. Π_j (X) is the probability of being at or below category j given that k set of predictors [43]. The odds of the cumulative probabilities of the response variable for the J-1 categories:-

$$odds\left[\pi_j(X)\right] = \frac{\pi_j(x)}{1-\pi_j(x)}, j = 1, 2, ..., J-1. \quad [2]$$

The logarithm of the odds first j-1 cumulative probabilities

$$\ln(odds\left[\pi_j(X)\right]) = \ln\left(\frac{\pi_j(x)}{1-\pi_j(x)}\right), j = 1, 2, ..., J-1. \quad [3]$$

The relationship between the response variable and the set of predictors is not linear in ordinal logistic regression model. The logistic regression function uses the logit transformation of $\pi_j(X)$ cumulative probabilities of the response,

$$\pi_j(X) = p(Y \le j / X) = \frac{\exp(\alpha_j - (\beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k))}{1 + \exp(\alpha_j - (\beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k))} \quad [4]$$

Likewise the transformation of equation [4] to the logit for the matter of interpretation ordinal logistic regression result can be as follows:-

$$\log it\left[P(Y \le j / X\right] = \alpha_j - \sum_{j=1}^{J-1} \beta_j X_j, j = 1, 2, ..., J-1. \quad [5]$$

Equation [5] is called the proportional odds model (POM) to predict cumulative logits across J-1 response categories. This model estimates ln(Odds) of being at or below the jth category and assume that there is a linear relationship between the logits and the parallel regression lines and hence, this model estimates simultaneously multiple equations of cumulative probability. The model is solved for each category of the dependent variable except the last category.

In the model each logit has its own α_j term called the threshold value and their values do not depend on the values of the independent variables and the β_k's are the logistic regression coefficients and the estimated values of these parameters show the direction and the strength of the relationship between the explanatory variables and the logit (log odd) of the dependent variable. The result is interpreted as the effect (more likely and less likely) of the estimated category of the independent variables relative to the reference category on the log odds being in higher levels of the categories of the dependent variable.

Wald test for a single predictors

The Wald test is used to see the significance of a single explanatory variable in the model. The Wald test statistic is the square of the ratio of the estimated coefficient to its standard error and is defined as: W=$\left[\frac{\hat{\beta}}{SE(\hat{\beta})}\right]^2$ Under the null hypothesis H_0: $\beta_i = 0$, i= 1, 2, - - -, k and W has a chi-square distribution with one degree of freedom.

Goodness-of-fit measures

In this study the goodness of fit measure was used to assess how well a model fit the data. To check the goodness of fit Pearson chi-square and deviance goodness of fit were employed which compare the observed and expected values having chi-square distribution with n-p degrees of freedom. Both goodness-of-fit statistics should be used only for models that have reasonably large expected values in each cell. The model fit the data well when the test value of Statistic is small and the observed significance level being large. The researchers fail to reject the null hypothesis that the model fits the data well when the observed significance level for the statistic is large since good models have large observed P-values.

Results

Socio-economic and demographic variables

A total of 422 sampled women under reproductive age (WRA) of dietary diversity at Asaita districts, Afar region were used. An abridged WRA of dietary diversity information reveals that the proportion of household headship with respect to their gender categories of male and female headship were 87.4% and 12.6% respectively. Most of the women (83.6%) were not attended school in the districts. Similarly, the distribution of women's education status revealed that 361(85.5%) had illiterate, 21(5.0%) 1-12 school, 17(4.0%) college education and the remaining 23(5.5%) were university education. Regarding marital status of women about 23(5.5%) single, 369(87.4%) married, 22(5.2%) were divorced and the rest 8(1.9%) were widowed. The remaining characteristics had similar fashion of interpretations were attached here in detailed information below in Table 1.

A Chi-square test showed that except region and ethnicity, all characteristics were statistically significant association with dietary diversity of women at 5% level of significance. This implies that the presence those factors have effect to change the status of dietary diversity practice for women in the fertile women (Table 1).

Table 1. Socio-economic and demographic variables of fertile women

Variable	Categories	Count (%)	Chi-square (P-value)
Household headship	Male	369(87.4)	20.206(0.000)[a]
	Female	53(12.6)	
Relationship of child	By birth	401(95.0)	11.955(0.003)[a]
	Not by birth	21(5.0)	
Attended school	Yes	69(16.4)	65.921(0.000)[a]
	No	353(83.6)	
Marital status	Single	23(5.5)	27.258(0.000)[a]
	Married	369(87.4)	
	Divorced	22(5.2)	
	Widowed	8(1.9)	
Education status	Illiterate	361(85.5)	71.987(0.000)[a]
	1-12 school	21(5.0)	
	College education	17(4.0)	
	University education	23(5.5)	
Current occupation	Daily laborer	17(4.0)	72.553(0.000)[a]
	Farmer	3(0.7)	
	Government employer	18(4.3)	
	House wife	369(87.4)	
	Merchant	15(3.6)	
Religion	Orthodox	16(3.8)	9.038(0.060)
	Muslim	405(96.0)	
	Protestant	1(0.2)	
Ethnicity	Amahara	28(6.7)	8.370(0.398)
	Tigray	3(0.7)	
	Oromo	4(0.9)	
	Afar	386(91.5)	
	Welayta	1(0.2)	
Kind of house	Finished floor	84(19.9)	42.928(0.000)[a]
	Rudimentary	338(80.1)	
House of window	Yes	370(87.7)	17.128(0.000)[a]
	No	52(12.3)	
House of electricity	Yes	370(87.7)	17.128(0.000)[a]
	No	52(12.3)	
Radio	Yes	220(52.1)	7.644(0.022)[a]
	No	202(47.9)	
Mobile phone	Yes	257(60.9)	40.755(0.000)[a]
	No	165(39.1)	
Bank account	Yes	244(57.8)	50.087(0.000)[a]
	No	178(42.2)	
Refrigerator	Yes	109(25.8)	85.975(0.000)[a]
	No	313(4.2)	

Television	Yes	137(32.5)	49.603(0.000)[a]
	No	285(67.5)	
Cart	Yes	29(6.9)	12.999(0.002)[a]
	No	393(93.1)	

Measures of central tendency for continuous variables

The mean age of the women under reproductive age was 36.53±7.667 standard deviation. In regard to family size in male and female were approximately the mean of 3 participants, between mean ± SD (2.28±1.138) and 2.04±0.914 with the range of 0-5 and 1-5 family size was presented respectively. The average number of room in house used for WRA was 1.20±0.400 SD with the range of 1-2 room(s) per household.

Table 2. Descriptive Statistics for continuous variables of WRA at Afar region, Aysaita districts

Variable	Minimum	Maximum	Mean	Sd
Age	15	49	36.53	7.667
Family size of male	0	5	2.28	1.138
Family size of female	1	5	2.04	0.914
No. of room in your house	1	2	1.20	0.400
Dietary diversity score	1	8	4.17	1.112

Distribution of 24 hours food categories score of fertile women

Off 14 food categories, the result revealed that the average of food categories were mean ± SD (4.17±1.112) among scores varied from 1 to 8 food categories (Table 2). According to the group formed, about 13.0% of the respondent was in the minimum dietary diversity (less than or equal to three) groups, 78.5% of participants were a medium diversity (four to five) groups and the remaining 8.5% were in the high diversity (greater than or equal to six) groups.

A participants almost full day consumed food category was grains 100%, vegetables and beans or peas were the second and third most eaten food groups of 90.5% and 78.0% were presented respectively. Notably, the vegetables or roots and other types of meat or poultry were minimally consumed 2(0.5%) and 3(0.7%). Likewise, meat made from animal organs, fish or sea food whereas fresh or dried and nuts or seeds were totally not consumed food groups (Figure 2). As the test result revealed in Table 3, one sample t-test shows that all food groups were statistically significant (P<0.05).

Table 3. Proportion of WRA eating commodity of 14 food categories with in the past 24 hours

Food categories	Categories	Frequency (%)	Mean ± Sd	One sample t- test (P-value)
Grains	Yes	422(100.0)	1.00±0.000	-
	No	-		
Vegetables or roots	Yes	2(0.5)	2.00±0.069	446.715(0.000)[a]

	No	420(99.5)		
White root and tubers	Yes	49(11.6)	1.88±0.321	88.634(0.000)[a]
	No	373(88.4)		
Dark green leafy vegetables	Yes	99(23.5)	1.77±0.424	61.272(0.000)[a]
	No	323(76.5)		
Fruits that are dark yellow or orange inside	Yes	98(23.2)	1.77±0.423	61.604(0.000)[a]
	No	324(76.8)		
Other fruits	Yes	122(28.9)	1.71±0.454	54.805(0.000)[a]
	No	300(71.1)		
Any other vegetables	Yes	382(90.5)	1.09±0.293	41.663(0.000)[a]
	No	40(9.5)		
Meat made from animal organs	Yes	-	2.00±0.000	-
	No	422(100.0)		
Other types of meat or poultry	Yes	3(0.7)	1.99±0.084	364.598(0.000)[a]
	No	419(99.3)		
Eggs	Yes	50(11.8)	1.88±0.324	87.711(0.000)[a]
	No	372(88.2)		
Fish or seafood whereas fresh or dried	Yes	-	2.00±0.000	-
	No	422(100.0)		
Beans or peas	Yes	329(78.0)	1.22±0.415	35.659(0.000)[a]
	No	93(22.0)		
Nuts or seeds	Yes	-	2.00±0.000	-
	No	422(100.0)		
Milk or milk products	Yes	207(49.1)	1.51±0.501	41.433(0.000)[a]
	No	215(50.9)		
Dietary Diversity (Dependent variable)	≤3	55(13.0)		
	4-5	331(78.5)		
	≥6	36(8.5)		

Proportion of women under reproductive age who used food types

Grains were every day eaten food categories from14 food items in 24 hours before data gathering day. Any other vegetables were the most eaten food items from 14 food items in 24 hours before data gathering day.

A 382(90.5%) of the reproductive women participated that they consumed items equipped as of any other vegetables. The minority of women reproductive age were 2(0.5%) and 3(0.7%) responded that they ate foods prepared from vegetables or roots and other types of meat or poultry. While, meat made from animal organs, fish or sea food whereas fresh or died and nuts or seeds were totally not consumed food groups.

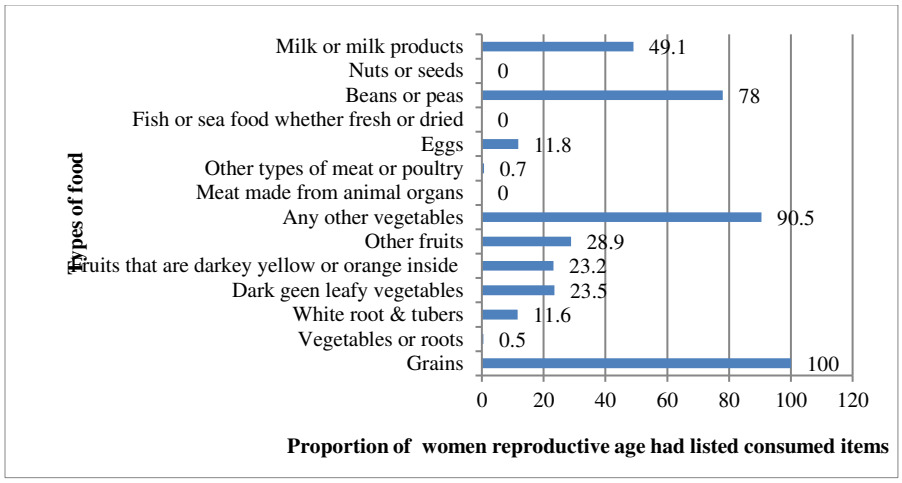

Fig. 2. Categorical distribution of consumed items to create them highly verified

In Figure-3 showed that, from a total of 422 dietary diversity of women reproductive age participants about 55(13.0%) were under minimum dietary (less than or equal to three) items, 331(78.5%) were optimal dietary (four to five) items and 36(8.5%) were maximum dietary (greater than or equal to six) items.

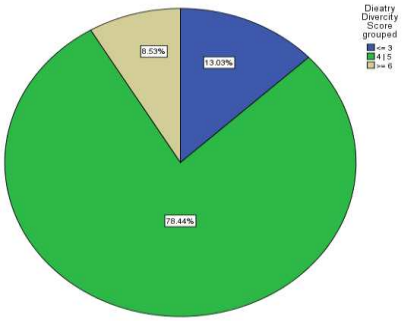

Fig. 3. Proportion of food items of reproductive women

Ordinary logistic regression model

In this study, OLRM was utilized to handle the relationships of the food items among women reproductive age (15-49) years. This model some time called with Base-Line Cumulative Logit (BCL) or Cumulative Logit Models (CLM), can have quantitative and qualitative predictors, intercept terms, etc. Multi-category logit models, Y has J categories, J>2. Extensions of likelihood ratio test for nominal and ordinal Y assume a multi-nominal distribution for Y.

OLRM utilized to manage influence of socio-economic and demographic variables versus food groups among women reproductive age committed by intimate family. The deviance Chi-square

test $G^2 = (Df = 763, P = 1.000)$ revels statistically significance at 1.00 that means >5%, that show the data clearly fitted OLRM in this study (Table 4). Therefore, we can generalize as a statistically insignificant variation of value in the forecasted and observed value explored under the OLRM. A Cumulative Logit Model (CLM) has form: $\log it[P(Y \leq j)] = \alpha_j + \beta_{ij} x_{ij}$; where, j=1, 2, 3; i=1, 2, 3, 4.

The contingency table data so can test blimey a model fitted. A deviance is use to test that all parameters are not equal to zero in the model. Deviance=G^2=299.617, df=763, P-value=1.000 for H_0: model holds with linear trends for all explanatory variables.

The explanatory variables can be both qualitative and quantitative variables in this model where a last category of a variable was considered as a baseline group. The result was included two quantitative and eight qualitative factors are statistically significant (P<5%), whereas a minimally one group should positively or negatively affecting dietary diversity among reproductive age. Statistically influencing explanatory variables were considered in the OLRM were family size of male, family size of female, marital status, education level, window, cell phone, bank, refrigerator, television and cart (P<0.05).

The estimated odds of being "low dietary" instead of "high dietary" multiplies by [OR=0.576, 95% CI: (0.377, 0.879)] for each unit increased by 1 of male family size of household. Odds of existing "low dietary" instead of "high dietary" multiplies by [OR=0.665, CI: (0.448, 0.988)] for each increased by 1 unit of female family size household. The estimated odds of a married status response is in low dietary rather than high dietary diversity scores are [OR=294195.561, (CI: 1.669, 51842701505)] times estimated odds for windowed response. The odds of an education level is in low dietary rather than high dietary diversity scores are [OR_1=0.065, OR_2=0.026 and OR_3=0.026] times estimated odds for higher education.

The estimated odds had a window's response is in low dietary rather than high dietary scores are [OR=2.793, (CI: 1.138, 6.853)] times estimated odds for had no window's response. The odds had a cell phone's is in low dietary rather than high dietary scores are [OR=20.005, (CI: 6.507, 61.503)] times estimated odds for had no cell phone's. The odds had a bank account's is in low dietary rather than high dietary scores are [OR=70.457, (CI: 16.359, 303.445)] times estimated

odds for had no bank account's. The estimated odds had a refrigerator's for household user is in low dietary rather than high dietary scores are [OR=11.752, (CI: 2.208, 62.545)] times estimated odds for had no refrigerator's for household user. The odds had a television's access is in low dietary rather than high dietary scores are [OR=0.034, (CI: 0.006, 0.185)] times estimated odds for had no television's access. The estimated odds had a cart's response is in low dietary rather than high dietary scores are [OR=0.002, (CI: 0.001, 0.006)] times estimated odds for had no cart's response.

Table 4. Multivariable analysis of dietary diversity of fertile women at 95% CI for coefficient

Variables	Categories	$\hat{\beta}$	S.E($\hat{\beta}$)	Wald	Df	P-Value	Exp($\hat{\beta}$)	Ci of Exp($\hat{\beta}$)	
								Lower	Upper
F. Size Male		-0.552	0.216	6.548	1	0.011[a]	0.576	0.377	0.879
F. Size Female		-0.408	0.202	4.065	1	0.044[a]	0.665	0.448	0.988
Marital Status (Windowed (Refr.))	Single	18.203	853.490	0.000	1	0.983	80438220.46	0	0.000
	Married	12.592	6.163	4.174	1	0.041[a]	294195.561	1.669	51842701505
	Divorce	-2.897	1.744	2.760	1	0.097	0.055	0.002	1.684
Education (University ed. (Refr.))	Illiterate	-2.736	1.365	4.018	1	0.045[a]	0.065	0.004	0.941
	1-12 school	-3.632	1.255	8.382	1	0.004[a]	0.026	0.002	0.309
	College education	-3.717	1.256	8.763	1	0.003[a]	0.024	0.002	0.285
Window	Yes (No((Refr.))	1.027	0.458	5.035	1	0.025[a]	2.793	1.138	6.853
Cell phone	Yes (No((Refr.))	2.996	0.573	27.370	1	0.000[a]	20.005	6.507	61.503
Bank account	Yes (No((Refr.))	4.255	0.745	32.604	1	0.000[a]	70.457	16.359	303.445
Refrigerator	Yes (No((Refr.))	2.464	0.853	8.343	1	0.004[a]	11.752	2.208	62.545
Television	Yes (No((Refr.))	-3.386	0.867	15.238	1	0.000[a]	0.034	0.006	0.185
Cart	Yes (No((Refr.))	-7.171	1.076	44.425	1	0.000[a]	0.002	0.001	0.006
Pearson Test		Chi-square			Df			Sig.	
		1983.645			763			0.000[a]	
Deviance Test		299.617			763			1.000	

F=Family, a= Statistically significant at 5%, Df= Degree of freedom, Ci= Confidence interval, Refr.= Reference group

Discussion of the study

In this study, around 13.0% of the respondent was in the minimum dietary diversity (less than or equal to three) groups, 78.5% of participants were a medium diversity (four to five) groups and the remaining 8.5% were in the high diversity (greater than or equal to six) groups in past one day. The study revealed that, almost all (100%) and 90.5% of the women reproductive age had eaten grains and vegetables respectively in the past one day and 0.5% had not eaten vegetables or roots items in the past 24 hours. The outcome of this study is minimum than that of the other outcome in Laikipia, Kenya[21], and Southern Ethiopia [45]. Furthermore, many studies in developing countries have documented that their dietary sources are mainly cereal based [46].

The variables such as family size of male, family size of female, marital status, education level, window, cell phone, bank account, refrigerator, television and cart additionally revealed a robust relationship in the OLRM. The result is again in line with [20]. Again in [45] study had associated to socioeconomic factors for the reason that food groups increases as education level increase. Reproductive age among women who had cell phones in lower dietary diversity rather than higher dietary diversity were more than twenty times more likely than that of the participants had not cell phone. The outcome was parallel with studies done at South Gondar, Ethiopia[20].

An odds who had a television's is in low dietary rather than high dietary are [OR=0.034, (CI: 0.006, 0.185)] times estimated odds who had not television'. It delivers recognized a television contact which teaches a participants were obtained a diversified food items for health improvement promoting. A participants had a savings is again statistically ominously related with food items. The odds of having saving is in low dietary rather than high dietary diversity are [OR=70.457, (CI: 16.359, 303.445)] times estimated odds who had no bank account's. It is in line with the study piloted at South Africa everyplace families through minimum food items through additionally record needy, rarer families having cash in a bank account [47] and also totals for food items had stayed exposed in line to economic factors [19].

The estimated odds had a refrigerator's for household user is in low dietary rather than high dietary scores are [OR=11.752, (CI: 2.208, 62.545)] times estimated odds for had no refrigerator's for household user. The estimated odds had a window's response is in low dietary rather than high dietary scores are [OR=2.793, (CI: 1.138, 6.853)] times estimated odds for had no window's response. The estimated odds had a cart's response is in low dietary rather than high dietary scores are [OR=0.002, (CI: 0.001, 0.006)] times estimated odds for had no cart's response.

The estimated odds of being "low dietary" instead of "high dietary" multiplies by [OR=0.576, 95% CI: (0.377, 0.879)] for each increase by one in male family size of the household. Odds of existing "low dietary" instead of "high dietary" multiplies by [OR=0.665, (0.448, 0.988)] for every unit increase by one in female family size of household. The odds of an education level is in low dietary rather than high dietary diversity scores are [OR_1=0.065, OR_2=0.026 and OR_3=0.026] times estimated odds for higher education. Studies on [48, 49], note that women

allocated in both educated and family size statistically significantly good generous distribution of the household economical to healthy items. It is primarily reason family size and education status of women tends to had better consciousness and appreciative of dietary healthiness welfares [50]. Even if a family size and education status of women is an empowered of women.

The estimated odds of a married status response is in low dietary rather than high dietary diversity scores are [OR=294195.561, (CI: 1.669, 51842701505)] times estimated odds for windowed response. The studies of amount of food items had shown relationship with demographic factors [51].

Conclusion

An average food items amount in reproductive women were 36.53 and 13.0%, 78.5% and 8.5% of women reproductive age having minimum, optimal and maximum food items practice was presented in that order. Almost all eaten food groups were grains 100% and vegetables and beans or peas were the most commonly eaten the second and third most eaten food groups of 90.5% and 78.0% were presented respectively. Notably, the vegetables or roots and other types of meat or poultry were minimally consumed 0.5% and 0.7%. Likewise, meat made from animal organs, fish or sea food whereas fresh or dried and nuts or seeds were totally not consumed food groups. Hence, family size of male and female, marital status, education level, having cell phone, bank account, refrigerator, television and cart had powerfully related with food items applies in women under reproductive age at Asaita districts of Afar regional state, Ethiopia.

Limitations of the study

In this study there are different food items in the families which affect the pattern of intake capacity in the past one day (twenty four hours). The study environment is a primary data collected at a point of time, because it does not reveal the association between dependent and independent variables clearly.

List of Abbreviations

WRA: Women Reproductive Age, DDS: Dietary Diversity Score, OLRM: Ordinary Logistic Regression Model, OR: Odds Ratio, Sd: Standard deviation, Ci: Confidence interval, SPSS-25: Statistical Package for Social Science-25, Df: Degree of freedom

Declarations

Ethical Approval and Consent to Participate

The moral permission had been gotten from Statistics Department, Haramaya university, Dire Dawa, Ethiopia. The ethical approval was obtained from department of Statistics at Haramaya University with formal letter referenced as HU-Stat/101/20.

Consent for Publication

It is not related in this study.

Availability of Data and Materials

We used cross-sectional study design for this investigation obtained at Asaita Districts, Afar Regional State. Alebachew Abebe (Asst. Prof.) will be the contact person if someone wants to request the data from this study. The contact person Email: aleb.abebe@yahoo.com.

Competing Interests

The authors declare that we have no competing interests.

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Authors Contributions

Both authors design a data gathering format, pilot survey, editing and/ or clearing data and analyzed and interpretation of data by both Million W. (MSc) and Alebachew A. (Asst. Prof.). We are also edited the document and gave critical comments. Both authors were edited and checked all issues in the study.

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