Dietary diversity practice and associated factors among pregnant women attending ANC in Kolfe Keranyo sub city health center, Addis Ababa, Ethiopia.

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Abstract

Background: Adequate and healthy diet during pregnancy is essential for the health of both mother and newborn. Dietary diversity is a proxy indicator of maternal nutrient adequacy. However, little is documented on the prevalence of dietary diversity among pregnant women.

This study was aimed to assess the dietary diversity practice and associated factors among pregnant women attending antenatal care in health centers of the coffee keranyo sub city, Addis Ababa, Ethiopia.

Methods: Institution based cross-sectional study was conducted on 406 randomly selected pregnant women attending ANC in health centers of the coffee keranyo sub city, Addis Ababa from March 2-April 2/ 2018. Data were collected by using interviewer and 24 H dietary recall method. Data had entered and analyzed using SPSS version 21. Multiple logistic regression was run to assess factors associated with the dependent variable at $P < 0.05$.

Results: The mean Dietary Diversity Score of pregnant women was 5.45 ± 1.83 . About 60.9% of pregnant women had good dietary diversity practice. Pregnant women who learned collage and above had more dietary diversity practice than the illiterate one [AOR=2.26, 95% CI: (1.066, 4.808)]. Pregnant women with monthly income more than 5,000 ETB had more dietary diversity than income less than 2,000 ETB [AOR=2.33, 95% CI: (1.234, 4.416)]. Pregnant women at second antenatal care visit had more dietary diversity than at the first visit [AOR=2.42, 95% CI: (1.183, 4.952)]. Having nutrition information during pregnancy increases 2 times better dietary diversity practice than none informed ones [AOR=2.10, 95% CI: (1.294, 3.422)].

Conclusions: The mean Dietary Diversity Score of pregnant mothers was 5.45. And 60.9% of pregnant women had a good dietary diversity score, whereas 39.1 % of them had a poor diet diversity score. Mothers' education, monthly income, second and third antenatal care visit and nutrition information had a significantly associated with pregnant mothers' dietary diversity.

Background

Adequate and healthy diet during pregnancy is essential for the health of both mother and newborn. Dietary diversity is a proxy indicator of maternal nutrient adequacy.

Dietary diversity refers to an increase in the variety of foods across and within food groups capable of ensuring adequate intake of essential nutrients that can promote good health, and physical and mental development (1).

There is no any single food which contains all the required nutrients for optimal health. (2) And a diversified diet is associated with a good nutritional status (3). A variety of foods in the diet has therefore been considered important in ensuring adequate intake of essential nutrients and in realizing an optimal nutritional status (4). Dietary diversity has been shown to be strongly and positively correlated with

nutrient adequacy in low-income countries. Nutrient adequacy is one important element of diet quality. Thus, the Minimum Dietary Diversity of Women can be used as a proxy for this aspect of diet quality. It can be used to monitor and evaluate programs that seek to improve diet quality in resource-constrained settings (5). Lack of dietary diversity is a challenge for communities in developing countries. Their diets are by default defined on starchy staples with inadequate animal products, fresh fruits and vegetables (6).

During pregnancy a woman needs good nutritional status for a healthy outcome. Women who have a poor nutritional status at conception are at higher risk of disease and death; their health depends greatly on the availability of food, and they may be unable to cope with their increased nutrient needs during pregnancy in situations of food insecurity. Infections such as malaria, HIV and infestation with gastrointestinal parasites can exacerbate such women's under nutrition (7).

During pregnancy all women need more food, a varied diet, and micronutrient supplements. When energy and other nutrient intake do not increase, the body's own reserves are used, leaving a pregnant woman weakened. Energy needs increase in the second and particularly the third trimester of pregnancy. Inadequate weight gain during pregnancy often results in low birth weight, which increases an infant's risk of dying. Pregnant women also require more protein, iron, iodine, vitamin A, folate, and other nutrients. Deficiencies of certain nutrients are associated with maternal complications and death, fetal and newborn death, birth defects, and decreased physical and mental potential of the child. Pregnant women need to consume extra vitamins and minerals, increase their calorie intake, and avoid certain foods such as chemicals to optimize the growth and development of their baby (8). However, little is documented on the importance of dietary diversity among pregnant women.

This study aimed to assess the dietary diversity practice and associated factors among pregnant women attending antenatal care in health centers of the coffee keranyo sub city, Addis Ababa, Ethiopia.

Methods

4.1 Description of the study area

The study was conducted in the Kolfe Keranyo sub city which is one of the ten sub city of Addis Ababa. Addis Ababa is the capital city of Ethiopia and represented by all ethnic groups of Ethiopia. Administratively, the city is divided into 10 sub cities and 116 districts. The city has 3.8 million populations and has health service access in less than 2 kilometers for all people. There are 5 hospitals under the Ministry of health, 6 Hospitals under Addis Ababa Health Bureau, 2 Hospitals under Ministry of Defense, 1 Hospital under Police Force and around 40 Private Hospitals. The city also has 95 functional governmental health centers and more than 760 private clinics in the 10 sub cities. The cafe Keranyo sub city is found in the western part of Addis Ababa, Ethiopia. Administratively, the sub city is divided into 15 districts. There are 1 hospital under Ministry of health and 3 Private Hospitals. The sub city also has 11 functional governmental health centers and more than 176 private clinics in the sub cities (38). Based on

Kolfe Keranyo sub city health office, the total population of the sub city in 2017 is estimated to be around 547,940 and has a growth rate of 3.8% and population density of 4,165 persons per square kilometer. The sex ratio shows 48.5% are males and 51.5% are females. It had an estimated number of pregnancy 12,603 (38).

4.2 Study Design

Institutional based cross-sectional design was employed to assess dietary diversity among pregnant women attending ANC in public health centers of Kolfe Keranyo sub city, Addis Ababa.

4.3 Source and Target Population

4.3.1 Source population

The source populations were all pregnant women attending ANC in public health centers of Kolfe Keranyo sub city.

4.3.2 Target Population

All Pregnant women who visit the randomly selected health facilities during March to April, 2018 were considered as the study population

4.4 Inclusion and exclusion criteria

4.4.1 Inclusion criteria

All pregnant women attending ANC in the study facilities and being a resident of Kolfe Keranyo sub city for at least 6 months were included.

4.4.2 Exclusion criteria

All pregnant women attending ANC in the study facilities and currently live out of Kolfe Keranyo sub city were excluded.

4.5 Study Variables

Dependent Variable

Dietary diversity practice of pregnant women with

Independent Variables

age, educational status, health status, religion, occupation, number of ANC visit, nutrition information, parity, trimester, family size, Income level and food item avoidance.

4.6 Operational Definitions

Refers to the number of food groups consumed by pregnant women over a 24-hour period.

Low or poor dietary diversity score

When pregnant women consumed less than five food groups among the 10 groups within 24 h before the survey.

High or good dietary diversity score

When pregnant women consumed five or more food groups among the 10 groups within 24 h before the survey.

Minimum Dietary Diversity of pregnant women

Dietary diversity score of pregnant women receiving at least five food groups out of ten.

Dietary adequacy

taking any amount of each food group is considered as adequate.

Poor household

households with monthly income less than 2,000 ETB.

Medium household

households with monthly income from 2,000–5,000 ETB

Rich household; households with monthly income more than 5,000 ETB

4.7 Sample Size Determination

The required sample size was determined using the following assumption

Assumption 1

Of the proportion of dietary diversity practice, based on the previous study in Gondar, the prevalence of dietary practice is up = 40.1% (21).

Where: n = required sample sizes, 10% = non - respondent wrote

$Z_{\alpha/2}$ = critical value for normal distribution at 95% confidence interval which equals to 1.96 (Z value at $\alpha = 0.05$), d = an absolute precision (margin of error) = 5%

For the first objective:

p_1 = Proportion of pregnant women dietary diversity practice (40.1%).

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$$n1 = (z_{\alpha/2})^2 p (1-p) / d^2 = (1.9^2 \times 0.6 \times 0.4) / 0.05^2 = 0.921984 / 0.0025 = 368.79 = 369$$

Dietary diversity practice (P1 = 40.1%) n1 = 369

Adding non-response rate of 10% = (369 + 369 × 10%) = 406

For the second objective:

The sample size required was calculated using two-population proportion formula by assuming; $r = n2/n1 = 1:1$, $Z_{\alpha/2}$ = the value of the standard normal distribution curve corresponding to the level of significance $\alpha = 0.05 = 1.96$ and the value of the standard normal distribution curve corresponding to 90% power = 1.21

$$n1 = \frac{[Z_{\frac{\alpha}{2}} \sqrt{\left(1 + \frac{1}{r}\right) P(1 - P)} + Z_{\beta} \sqrt{P1(1 - P1) + P2(1 - P2) / r}]^2}{(P1 - P2)^2}$$

Where: $P = (P_1 + r P_2)$

$1 + r$

for household income $p1$ = Prevalence of DDS at household income < 1000 birr = 25.8%, $p2$ = Prevalence of DDS at household income 1000–2000 = 51.3%. for educational status $p1$ = Prevalence of DDS among illiterate mothers = 23.5%, $p2$ = Prevalence of DDS among mothers learn college and above = 52.5%; for nutrition information $p1$ = Prevalence of DDS among mothers who had not nutrition information = 20.6%, $p2$ = Prevalence of DDS among mothers who had nutrition information = 45.5%; for marital status $p1$ = Prevalence of DDS among unmarried = 60%, $p2$ = Prevalence of DDS among married mothers = 40%.

Table 1
sampling size determination of associated factors of dietary diversity practice of pregnant women Kolfe
Keranyo sub city, Addis Ababa, 2018.

Variables	DDS P1 (%)	DDS P2 (%)	CI	Power	Allocation ratio	OR	Total sample size	Reference
Monthly income	25.8%	51.3%	95%	90%	1:1	2.59	163	Mekonnen Sisay. et al,2014
Education status	23.5%	52.5%	95%	90%	1:1	2.18	121	
Nutrition information	20.6%	45.5%	95%	90%	1:1	2.39	154	
Marital status	60%	40%	95%	90%	1:1	2.62	272	Direslgne Miskir. et al,2016
Therefore, the sample size was 406 among pregnant mothers who attending antenatal care.								

4.8 Sampling Procedure

A simple random sampling technique was employed to select health centers in the study area. From 11 health centers of sub cities 4 health centers were selected randomly. Then all pregnant women who visit the health center were recorded as a sampling frame in the selected health centers.

Finally, the sample size was proportionally allocated to selected health center catchment population and estimated pregnancy of Kolfe Keranyo sub city. Respondents were chosen with a systematic random sampling technique with every 2nd pregnant women based on the time of visiting. Kolfe Keranyo sub city has 11 functional health centers namely;- woreda1 (Ayer tena), woreda3(kara), woreda4 (AlemBank), woreda5 (Zenebework) ,woreda6(Woira), woreda8 (keranyo),woreda9 (total),woreda11 (philipos),woreda12 (kolfe), woreda13 (lomi meda),and woreda 14 (Birchiko).

Catchment population of the sub city has been estimated at 547,940 and estimated pregnancy of 12,603 (38

4.9 Data Collection Tool and Procedure

Data had collected from exit interview using a structured questionnaire and 24 hour recalls method adapted from different literatures mainly Food and Agriculture Organization (FAO) Guidelines for measuring household and individual dietary diversity (FAO, 2016) and (Exploring the new indicator Minimum Dietary Diversity-Women Results from Burkina Faso, 2015). A total of ten food groups was considered in this study, i.e. Cereals (Grains, white roots and tubers, and plantain), Pulses (beans, peas and lentils), Nuts and seeds, Dairy products, Meat, Poultry, and Fish, Eggs, Dark green leafy vegetables, and Other fruits (14).

The questionnaire had four main contents: The first includes socio demographic variables of pregnant women, including age, educational status, Religion, occupation, No of pregnancy or parity and trimester. The second group encompasses characteristics of the household, includes family size and household Income level, the third group captured Antenatal care, Health status and nutrition information. The fourth group includes: 24 hour recall feeding practice and dietary diversity. The questionnaire was first prepared in English and then translated to Amharic and translated back to English to observe its consistency. Dietary diversity score (DDS) was collected and calculated as the sum of the number of different food groups consumed by the pregnant women in the 24 H prior to the assessment.

4.10 Data quality management

Four clinical nurses were participated in the data collection process. The data collection process was supervised by two senior Public Health professionals and the principal investigators. Both data collectors and supervisors were trained for 1 day about the contents of the questionnaire and on how to collect the data properly in order to minimize errors. The principal investigators and supervisors had made daily supervision during the whole data collection process. The questionnaire was reviewed and checked for completeness, accuracy and consistency by the supervisors and investigators daily and at the end of the whole data collection process.

The questionnaires were pre-tested to check on the length, content, question wording and language. The questionnaire was administered to 5% the sample size, who had attended ANC at non selected (Alem bank) health center. Then error was corrected accordingly.

4.11 Data analysis

After all the relevant data was collected, it had entered and then analyzed using SPSS version 21. Using the 10 food groups, dietary diversity categories were formulated namely; low dietary diversity category (< 5 food groups) and good or high dietary diversity category (≥ 5 food groups). The dietary diversity score variable was dichotomized as category 0 for those not meeting the minimum dietary diversity and category 1 for those meeting the minimum diversity.

In the bivariate analysis, the independent variables with a P-value less than 0.05 with the dependent variable were fitted into a multivariable logistic regression model to identify their independent effect on dietary diversity. Independent variables included in the multivariable analysis include mother's educational status, trimester, and number of ANC visit, nutrition information and household monthly income. The association between the dependent and the independent variables was measured using odds ratio (OR) with 95% Confidence Interval (CI). Those variables with p-value of less than 0.05 in the multivariable analysis were considered to be significant for predictors of minimum dietary diversity.

Result

5.1 Socio- demographic characteristics

Of the 406 eligible respondents, 402 were willing to respond the questionnaire, which was a response rate of 99%.The mean age of the pregnant women was 27.35 ± 7.89 SD with the range of 16–44 years. Most of the women were married (91.5%) and only 26.1% of the respondents learn collage and above and 30.1% of the pregnant women were housewife.

78.4%% pregnant women were not the household heads, about 81(20.2%) of the pregnant women are informal salaried employees.

In regard to family size, the average size was 4 people, with 4.47 ± 1.95 SD. The mean monthly household income was 3686.26 ETB and about 306 (76.1%) of the household earned below 5000 ETB monthly.

Table 2
Socioeconomic and Demographic characteristics of Pregnant Women in Kolfe Keranyo sub city, Addis Ababa 2018. (n = 402)

Variables	Frequency	Percentage %
Age <20	79	19.7
20–29	176	43.7
≥30	147	36.6
Mean 27.35 ± 7.9 SD		
Religion Orthodox	179	44.5
Muslim	150	37.3
Protestant	59	14.7
Catholic	14	3.5
Marital status Married	368	91.5
Unmarried	22	5.5
Divorced	12	3.0
Education Illiterate	52	12.9
Primary	119	29.6
Secondary	126	31.3
Tertiary	105	26.1
Occupation Salaried	81	20.2
Labour	74	18.4
Business	84	20.9
Housewife	122	30.3
Other	41	10.2
Household head Respondent	87	21.6
Husband	315	78.4
Level of income <2,000	95	23.6
2,000–3,500	113	28.1
3,501-5,000	98	24.4
>5,000	96	23.9
Mean 3,626.06 ± 3,050.05		

Variables	Frequency	Percentage %
Family size 1–3	169	42.0
4–6	150	37.3
>=7	83	20.7
Mean 4.47 ± 1.95 SD		

5.2 Maternal and nutrition characteristics

The mean parity of the study respondents was 3 children with the range 1–7. More than half (51.2%) of the pregnant women were in their second trimester and about 165 (41.0%) of the respondents were at second ANC visit during the interview. About 190 (47.3%) of having nutrition information about the importance of dietary diversity during pregnancy, And the ANC visit was the main source of information for 63% of mothers.

Notably, in regard to maternal morbidity, the study found that 117 (29.1%) of the pregnant women reported some form of illness/disorder in the preceding two weeks prior to the day of the interview. The most commonly reported disorders were dyspepsia/heartburn by 37% of the study participants. Due to cultural or personal dislike 126 (31.3%) of pregnant women had avoided at least one food item from their meal. Of these egg 46%, dark green leafy vegetables 27% and milk and milk products 17%.

Table 3

Maternal and nutrition characteristics of pregnant women in Kolfe Keranyo sub city, Addis Ababa 2018.
(n = 402)

Variables	Frequency	Percentage %
No of parity 1–3	268	66.7
4–6	123	30.6
>=7	11	2.7
Mean 2.95 ± 1.69 SD		
Trimester 1st Trimester	39	9.7
2nd Trimester	206	51.2
3rd Trimester	157	39.1
Time of ANC started 1st trimester	161	40.0
2nd trimester	231	57.5
3rd trimester	10	2.5
No of ANC visit 1st visit	88	21.9
2nd visit	165	41.0
3rd visit	106	26.4
4th and above visit	43	10.7
Have you been sick in the last 2 weeks? Yes	117	29.1
No	285	70.9
Do you have an information about dietary diversity is important during pregnancy? Yes	190	47.3
No	212	52.7
Do you avoid any food group in the current pregnancy? Yes	126	31.3
No	276	68.7

5.3 24 hours dietary diversity practices of pregnant mothers

5.3.1 Dietary diversity score of the pregnant women

Out of the 10 food groups, the study found the mean DDS was 5.45 ± 1.83 SD with scores ranging from 3 to 10 food groups. Based on the categories developed, Nearly 2/3rd (60.9%) of respondents had a good dietary diversity score (≥ 5 food groups) and about 39.1% of the participants were in the low diversity

The most commonly eaten foods were cereals (100%) and pulses were the second most eaten food group 63.9%. Notably, the egg was minimally consumed 36 (8.9%).

Table 4
Respondents by food group, pregnant women in kolfe keranyo sub city, Addis Ababa 2018. (N = 402)

Food group	N = 402	Percentage
Cereals (Grains, white roots and tubers, and plantain)	402	100
Pulses (beans, peas and lentils)	257	63.9
Nuts and seeds	132	32.8
Dairy products	149	37.0
Meat, poultry, and fish	189	47.0
Eggs	36	8.9
Dark green leafy vegetables	173	43.0
Other vitamin A-rich fruits and vegetables	129	32.0
Another vegetable	253	62.9
Other fruits	88	21.8

5.4 Factors associated with dietary diversity practice of pregnant women

Bivariate analysis showed that there was an association between dietary diversity practices of pregnant mothers and mother's educational status, trimester, number of ANC visit, nutrition information and household monthly income, whereas, age, marital status, religion, household head, mothers occupation, parity, family size, time of ANC start, avoidance of food items and sickness had no association with dietary diversity practices of mothers.

The result Table 5 of, multivariate analysis showed that there was statistically significant ($p < 0.05$) association between educational status, family monthly income, number of ANC visit and nutrition information dietary diversity practices of pregnant mothers.

Pregnant women learned collage and above had 2.3 times, good dietary diversity practice than the illiterate mothers [AOR = 2.264., 95% CI: (1.066, 4.808)]. Pregnant women with household income more than 5,000 ETB had dietary diversity practice almost 2.3 times than those households having a household income less than 2000 per month [AOR = 2.334, 95% CI: (1.234, 4.416)]. Pregnant women who were at second ANC visit had 2.4 times more attaining minimum dietary diversity than who were at the first visit [AOR = 2.420, 95% CI: (1.183, 4.952)].

There was also a statistical association between nutrition information and minimum dietary diversity practices of mothers during pregnancy. Having nutrition information during pregnancy increases 2 times the dietary diversity practice of pregnant women than none informed ones [AOR = 2.104, 95% CI: (1.294, 3.422)].

Table 5

; Multivariable logistic regression analyses showed factors associated with dietary diversity practice among pregnant women in Kolfe Keranyo sub city, Addis Ababa 2018. (n = 402)

Variables	Practice		COR with 95%CI	P value	AOR with 95%CI
	≥ 5 (High)	< 5 (Low)			
Education Illiterate	22 (5.5)	30 (7.5)	1.00	0.033	1.00
Primary	72(17.9)	47 (11.7)	2.09 (1.08, 4.05)	0.034	2.16 (1.06–4.39)
Secondary	79 (19.7)	47 (11.7)	2.29 (1.19, 4.43)	0.033	2.13 (1.06–4.30)
Collage and above	72 (17.9)	33 (8.2)	2.98 (1.50, 5.92)		2.26 (1.07–4.81)
Income <2000	45 (11.2)	50 (12.4)	1.002.108 (1.2053.688)	0.056	1.00
2000–3500				0.208	1.78 (0.98–3.22)
3501–5000	74 (18.4)	39 (9.7)	1.681 (0.950–2.975)	0.009	1.48(0.80–2.75)
>5000	59 (14.7)	39 (9.7)	2.567 (1.418–4.646)		2.33 (1.23–4.42)
	67 (16.7)	29 (7.2)			
Trimester	19 (4.7)	20 (5)	1.00	0.201	1.00
1st trimester	112 (27.9)	94 (23.4)	1.25 (0.63, 2.49)	0.674	0.56 (0.23–1.36)
2nd trimester			2.79 (1.36, 5.73)		0.80 (0.29–2.23)
3rd trimester	114 (28.4)	43 (10.7)			
Number of ANC attendance	35 (8.7)	53 (13.2)	1.00	0.016	1.00
1st visit			2.58 (1.52, 4.39)	0.046	2.42 (1.18–4.95)
2nd visit	104 (25.9)	61 (15.2)	3.35 (1.85, 6.06)	0.058	2.30 (1.01–5.21)
3rd visit	73 (18.2)	33 (8.2)	4.99 (2.19, 11.42)		2.87 (0.96–8.51)
4th and above	33 (8.2)	10 (2.5)			
Having nutrition information	142 (35.3)	48 (11.9)	3.13 (2.05, 4.78)	0.003	2.10 (1.29–3.42)
Yes			1.00		1.00
No	103 (25.6)	109 (27.1)			

In the present study, a mean DDS of 5.45 ± 1.83 SD was reported in Table 4. 60.9% of pregnant women had good dietary diversity practice and 39.1% pregnant women did not receive a minimum dietary diversity, which is better than a similar study conducted in Kenya, reported mean DDS 4.6 (36). But this mean DDS is lower as compared to literatures conducted in different countries, Another study in Kenya showed mean DDS of 6.84 ± 1.46 SD and 60.6% of pregnant women received minimum dietary diversity was reported (26). A Similar study done in Pakistan and South Africa among pregnant women, where a mean DDS of 6.17 ± 0.99 (39) and 6.70 ± 2.22 SD (40) was recorded, respectively. This result was also greater than study conducted in Bahir Dar town, North West Ethiopia; showed that only 39.3% of the pregnant women had good dietary practice and the rest 60.7% of pregnant women reported poor dietary practices (35). Another study done in Gondar, Ethiopia near to this study area reported 40.1% as a good dietary practice of pregnant women (21). Similarly, same study conducted in Gojam, North West, Ethiopia showed, that only 47% of women were received ≥ 4 food group from 10 food groups (25). This difference is may be due to different cultural, educational and economic background and different study period for seasonal availability of different food groups.

In this study Table 4, around 100% and 63.9% of the pregnant mothers had consumed cereals (grains, white roots and tubers, and plantain) and Pulses (beans, peas and lentils), respectively in the previous 24 hrs. Conversely, egg and the other fruit food group were least consumed food groups (8.9% and 21.8%, respectively). Another study in Kenya showed that (99%) pregnant women had eaten cereals, (93%) vegetables and (92%) milk and milk products, but foods of animal origin were minimally consumed only 4% (26). Similar finding is observed in south Achefer, West Gojjam, Ethiopia, a large proportion of women (98.3%) relay on monotonous food group (25).

This study also showed that 31.3% of pregnant women avoid at least one food group from their meal. The reason for avoidance was either personal dislike or cultural beliefs that make the fetus, so big or causes maternal diarrhea. Similar study in Wollega, south west Ethiopia reported 35.8% (27). Study in Bahir Dar town, North West Ethiopia; indicated that 203 (33%) pregnant women avoid certain foods, of which 74.4% avoids food due to religious reason (35).

In regard to the association between dietary diversity and the selected maternal demographic factors (age, marital status, trimester of the pregnancy, occupation, and household size), this study did not find any statistically significant association. Similarly, findings were also documented in Kenya, except occupation those who reported being employed (salaried) had the highest odds (2.29 times) of attaining minimum dietary diversity as compared to the non-employed (26) and in Gondar, Ethiopia reported that no association (21). But, the study in Mirab Abaya, Southern, Ethiopia, reported that age and marital status had statistically significant association with pregnant women's dietary diversity (34).

Multivariable analysis showed that there was a statistically significant association ($p < 0.05$) between maternal educational status, family monthly income, second and third ANC visit and nutrition information with dietary diversity practices of pregnant mothers.

Pregnant women with household income more than 5,000 ETB had dietary diversity practice almost 2.3 times than those households having a household income less than 2000 per month. And in Kenya those households with higher income had better chances of having diversified diets, those with an income of between Kenyan shilling (KSh) 20, 000 and KSh30, 000 were 2.01 times more likely to attain the minimum diversity as compared to those who had an income of less than 10, 000 (26). This association is the same to study in Gondar, Ethiopia, dietary practice during pregnancy among mothers who had monthly income of 1000–2000 was 2 times higher than those < 1000 monthly income [AOR = 2.18, 95% CI: (1.39, 3.39)] (21). The Slightly strong association also observed in Bahir Dar, Ethiopia, pregnant women earn more than 2000 ETB monthly were 3.1 times more likely to have good dietary practice than those earning less than 1000 ETB [AOR = 3.12, 95% CI, 1.743, 5.586)] (35)

Pregnant women learned college and above had 2.3 times more dietary diversity practice than the illiterate mothers. Another related study also showed an association between women education and dietary diversity practice, in Kenya, study observed that those who had tertiary [AOR 2.93; 95% CI 1.40, 8.63) and secondary education [AOR 2.78; 95% CI (1.06, 5.32)] had greater odds of achieving the minimum dietary diversity as compared to those who had never attended school (26). Which is supported by the study conducted in Gondar identified that educational status have a strong statistical association with dietary practices of mothers during pregnancy [AOR = 2.59, 95% CI: (1.38, 4.85)] (21).

There is also a statistical association between nutrition information and dietary practices of mothers during pregnancy. Having nutrition information during pregnancy increases 2 times the dietary diversity practice of pregnant women than none informed ones. A Similar study showed strong association in Wollega, Western, Ethiopia, reported that Women who had information about nutrition during pregnancy had 6.3 more likely good nutrition practice than women who had no information during pregnancy [AOR = 6.26, 95% CI: (3.49–11.25)] (27) and in Gondar, Ethiopia, also there was a statistical association between nutrition information and dietary practices during pregnancy [AOR = 2.39, CI: 1.44–3.97] (21). In Bahir Dar, Ethiopia, pregnant women who had nutrition information were 3.17 times more likely to have good dietary practices than their counterparts [AOR = 3.17, 95%CI, (1.76, 5.67)] (35).

Pregnant women who were at second ANC visit [AOR = 2.420, 95% CI: (1.183, 4.952)] and third ANC visit [AOR 2.300, 95% CI: (1.014–5.213)] had more attaining minimum dietary diversity than who were at first visit. In Ghana showed that frequent ANC attendance were the only significant independent predictors of maternal dietary diversity (37). The association may be in three different reasons, first; pregnant women in the second and third visit had got enough health investigation, screening and nutritional advice during the first visit. Secondly, pregnant women at first visit had not information about dietary diversity and they might have hyperemesis which causes loss of appetite. Thirdly, pregnant women at the fourth visit assumed that eating protein diet at term leads the fetus big and not such important.

Conclusions

The mean dietary diversity scores among the pregnant mothers was 5.45 and 60.9% pregnant women had good dietary diversity practice.

All pregnant women, mostly rely on Cereals (Grains, white roots and tubers, and plantain), however, egg, other fruit and other vitamin A-rich fruits and vegetables were minimally eaten.

Factors like maternal educational status, family monthly income, second and third ANC visit and nutrition information were strongly associated with good dietary diversity practices of pregnant mothers.

Abbreviations

Ethics approval and consent to participate:

Bahir Dar University Ethical review committee wrote Ethical clearance to the Addis Ababa health bureau to give permission to conduct the research. And Then Ethical clearance was obtained from Ethical review committee of the Addis Ababa Health Bureau. Then the pregnant women from each selected health center were informed about the purpose of the study.

Availability of data and materials:

Questionnaire available as supplementary file

Competing interests:

The authors declare no Competing interests

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Authors' Contributions:

WT-wrote the first draft, data collection, analysis and interpretation

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