

Determinants of adherence to iron-folic acid supplementation among postnatal mothers in Addis Ababa referral hospitals, Ethiopia

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Abstract

Abstract: In Ethiopia, adherence to iron-folic acid supplementation is extremely low. There were only 5% who took more than 90 tablets during their pregnancy. However, only limited data is available on the determinant factors of non-adherence. Therefore, the aim of this study was to identify determinants of adherence to iron-folic acid supplementation among postnatal mothers in three referral hospitals of Addis Ababa, Ethiopia.

Methods: An institutional based unmatched case-control study was conducted on 240 women who have been at postnatal care. Data were collected using interviewer administered questionnaire. Data were entered and analyzed using EpiData and SPSS version 20.0, respectively. Bivariate and multivariate logistic regressions were employed to identify the determinants at p-value < 0.25 and < 0.05, respectively.

Results: The major determinant factors of adherence to iron-folic acid supplementation were, mothers age group 29-33 [AOR=1.66, 95% CI: 2.010-0.0492], ANC initiation time [AOR=4.21, 95% CI: 2.3-10.6], counseling on IFAS [AOR=3.89, 95% CI: 1.8-8.4], time taken to travel to health facility [AOR=3.17, 95% CI: 1.35-7.4], gravidity [AOR=2.08, 95% CI: 1.06-4.09], morning sickness [AOR 0.33, 95% CI: 0.15-0.69] and planned pregnancy [AOR=4.2, 95% CI: 1.6-10.9].

Conclusion: This study highlighted age of participants, planned pregnancy, antenatal care initiation time, morning sickness, gravidity, counseling and distance to health facility are the key factors that have independently associate with adherence. Counseling should be given for clients on the correct dosage and duration of supplementation to prevent anemia and neural tube defects.

Introduction

Subdermal Iron folic acid (IFA) adherence is the extent to which patients take medication or condition of sticking to dose and time for taking IFA supplement as prescribed by their health care providers or per recommendations.¹ Women are said to be adhered to iron-folic acid supplement (IFAS) if they took 90 or more supplements.²

World Health Organization (WHO) recommends that all pregnant women receive a standard dose of 30–60mg iron and 400µg (0.4mg) folic acid starting as early as possible during gestation. Ideally, women should take 180 tablets before delivery. However, many countries, including Ethiopia, aim for women to receive 90+ tablets during pregnancy.³

Studies conducted in different parts of the world have shown low adherence of women taking daily iron-folic acid supplementation. This is among one of the main reasons why IFAS programs have been less effective.⁴

Several developing countries are now implementing iron-folic acid supplementation programs, but only a few countries significantly improved anemia control and prevention. According to the demographic health

survey of 2008, adherence to iron-folic acid supplement by pregnant women in Kenya is low. Nationally only 2.5% of pregnant women take iron-folic acid supplement more than 90 days of the recommended 180 days.⁵

Also in Ethiopia, IFAS is integral part of ANC and it is free of charge for pregnant women. However, effectiveness and success of such intervention depend on its adherence. Many experts believe that one of the main reasons that the Ethiopian national IFAS program has failed is because of women's non-adherence to IFAS. According to Ethiopia national data of EDHS 2016, adherence to IFAS is disappointingly low as 58% of pregnant women did not take any tablet, 30% took less than 60 tablets, and only 5% took 90+ during their pregnancy.⁶

This indicates that identifying key factors associated with non-adherence to IFAS is an important step to improve the utilization of IFA tablets by pregnant women in both urban and rural areas of Ethiopia. Unfortunately, there is no much prior work in this regard, especially in urban areas (e.g. Addis Ababa) of Ethiopia. Therefore, the main aim of this research work is to bridge this information gap and pave the way for the betterment of IFAS utilization in Ethiopia.

Methods

Study design

An institutional based unmatched case control study was conducted to identify the determinant factors of adherence to iron-folate supplementation on 240 postnatal mothers in three referral hospitals in Addis Ababa, Ethiopia.

Study area

This study was conducted in three referral hospitals of Addis Ababa, namely Zewditu Memorial Hospital (ZMH), St. Paul's Hospital (SPH) and Gandhi Memorial Hospital (GMH). Addis Ababa is the capital city of Ethiopia. The latitude of Addis Ababa is 9.005401, and the longitude is 38.763611.⁷ Based on the 2017 population projection, the total Population of the city is 3,273,001, among which 1,772,001 are women and 1,551,000 are men. According to Ethiopian Demographic and Health Survey (EDHS) 2011, the coverage of antenatal care (ANC) services, birth assistance by skilled provider, and postnatal care in the city were 93.6%, 83.9%, and 47.7%, respectively.⁸

Source and study population

The source population for this study was all women who were attending postnatal care (PNC) follow up at the three referral hospitals, i.e., ZMH, SPH and GMH, in Addis Ababa, Ethiopia. Participants of the study

are postnatal mothers who were attending PNC follow up at the three hospitals during the study period. The 240 randomly selected mothers who also fulfilled the inclusion criteria were the study population.

Inclusion and exclusion criteria

The inclusion criteria were postnatal mothers who attended their PNC follow up in the three referral hospitals during the study period. However, mothers who were critically ill during the study period and whose gestational age was below 37 weeks (i.e. preterm delivery) were excluded from the study.

Sample size determination and sampling procedure

The sample size was calculated using Epi Info, considering 95% confidence level (CI), 80% power, control to case ratio of 2, minimum odd ratio (OR) of 2, and 10% non-response gave a minimum sample of 82 cases of adherence and 164 controls.

As mentioned in the preceding sections, the study was conducted in three referral hospitals of Addis Ababa, namely ZMH, SPH and GMH. The number of participants per hospital was allocated based on the average number of mothers who attend PNC follow up per year. Previous PNC follow up per year for ZMH, SPH and GMH were 2471, 2580 and 974, respectively. Based on this data and the sample size of the study, the participants of each hospital were selected using a systematic random sampling method with intervals of two.

Operational definition

Antenatal service: Pregnancy check-up by health personnel, provision of iron/folic acid supplements, tetanus vaccination and health education and counseling.

ANC follow up: A woman who had regular antenatal care four times during pregnancy period.

Cases: For this study, cases are women who took 90+ tablets during pregnancy period.

Controls: Controls are women who took less than 90 tablets during their pregnancy period.

Adherence: Mothers are said to be adhered to IFA supplement if they took 90 or more supplements during their pregnancy period.

Non-adherence: Pregnant mother is said to be non-adherence to IFA supplement if they took less than 90 tablets during their pregnancy period.

Trimester: The number of weeks during pregnancy (1st, 1-12 weeks; 2nd, 13-26 weeks; 3rd, 27-40 weeks).

Gravidity: The number of pregnancies, whatever is the outcome.

Parity: The number of live births among the pregnancies.

Preconception folic acid supplementation: Standard recommendation of folic acid (400µg/day) for all women from the moment they begin trying to conceive until 12 weeks of gestation should take folic acid supplements.

Close family member: Are individuals who are related by blood, which includes grandparents, parents, siblings and children.

Dietary diversity score: Number of food groups consumed in the previous day. It is categorized as low dietary diversity (≤ 3 food groups), medium dietary diversity (4 to 5 food groups) and high dietary diversity (≥ 6 food groups).

Knowledge: From the knowledge questions asked, those who correctly answer less than two questions are considered to have poor knowledge and those who correctly answer more than two questions are considered to have good knowledge.

Data collection and Analysis

The data collection instruments were questionnaire contents included socio-demographic, obstetric history, health facility and knowledge related variables, dietary and nutritional factors, and pre-conception related variables. Women who took more than 90 tablets were considered to have adhered to the supplementation.

The questionnaire was pretested on 12 women of similar population at Tikur Anbesa hospital in Addis Ababa. Data were collected and supervised by six nurses (all holding Bachelor of Science degree). Both data collectors and supervisors were trained on how to collect the data and how to use the data collection instruments. The supervisors checked the completeness of the data every day.

The collected data were entered, coded and cleaned using EpiData version 7.2, and the data management and analysis were performed using SPSS version 20.0 software. Socio-demographic, obstetric, health facility and knowledge related variables, dietary and nutritional factors, and pre-conception related factors of women were presented in text and tables. Bivariate analysis was done and variables with less than 0.25 P-values were included in the multiple logistic regression analysis. In the multivariable analysis, predictors with P-value less than 0.05 were considered statically significant.

Results

Socio-demographic characteristic of study subjects

A total of 240 postnatal women were interviewed with a response rate of 98%. Most of the cases (95%) and the controls (90.6%) were from Addis Ababa. There was no difference between the mean age of

cases (29.13; \pm 5.03) and controls (31.36; \pm 6.31) (0.193) (Table 1).

Table 1 Socio-demographic and economic characteristics of women who delivered in three referral hospitals of Addis Ababa, July to September 2020 ($n = 240$)

Variables	Case (%)	Control (%)
Residence		
Addis Ababa	79(95)	145 (90.6)
Out of Addis Ababa	4 (5)	15 (9.4)
Age of participant (mean; SD)		
18-23	5 (6.3)	17 (10.6)
24-28	40 (50)	36 (22.5)
29-33	15 (18.8)	50 (31.3)
>34	20 (25.1)	57 (35.7)
Age of partner (mean; SD)		
24-28	8 (10)	15 (9.4)
29-33	28 (35)	33 (20.6)
34-40	33 (41.3)	55 (34.4)
41-45	7 (8.8)	38 (23.8)
>45	4 (5)	19 11.9)
Able to read and write		
Yes	79 (98.8)	150 (93.8)
No	1 (1.3)	10 (6.3)
Highest grade completed		
Primary school	16 (20)	29 (18.1)
Secondary school	43 (53.8)	64 (40)
Above secondary	20 (25)	49 (30.6)
Occupation		
Government employee	21 (26.3)	34 (21.3)
Non-government employee	15 (18.8)	31 (19.4)
Businesswomen	13 (16.3)	19 (11.9)
Daily laborer	3 (3.8)	7 (4.4)
Student	11 13.8)	29 (18.1)
Housewife	17 (21.3)	40 (25)

Partner able to read and write		
Yes	78 (97.5)	145 (92.5)
No	1 (2.5)	3 (2)
Partner highest grade completed		
Primary school	7 (8.8)	29 (18.1)
Secondary school	39 (48.8)	73 (45.6)
Above secondary	34 (42.5)	58 (36.3)
Partner occupation		
Government employee	18 (22.5)	35 (21.9)
Non-government employee	28 (35)	43 (26.9)
Businessman	20 (25)	44 (27.5)
Daily laborer	7 (8.8)	21 (13.1)
Farmer	1 (7.5)	13 (8.1)
Jobless	6 (7.5)	4 (2.5)
Age at marriage (mean; SD)		
	24.29;4.35	24.20;4.6
15-24	49 (61.3)	74 (46.3)
25-34	47 (33.8)	61 (38.1)
≥35	4 (5)	18 (11.3)
Family size		
≤ 5	77 (96.3)	149 (93.1)
>5	3 (3.8)	11 (6.9)
Income		
500-1000	6 (7.5)	18 (11.3)
1001-2000	8 (10)	28 (17.5)
>2001	66 (82.5)	114 (71.3)

Obstetric history of participants

There was no difference between the cases and controls in terms of history of abortion, stillbirth, and mean age of mothers when they give birth for the first time. Regarding gravidity and parity, 65% of the cases and 80.6% of controls were Multigravida, and 46.3 % of the cases and 33.8% of the controls were Primiparous (Table 2).

Table 2 Obstetric histories of women who delivered in three referral hospitals of Addis Ababa, July to September 2020 ($n=240$)

Variables	Case (%)	Control (%)
Age of first time birth (mean; SD)	24.81±4.441	25.09±4.659
15-24	44 (55)	64 (40)
25-34	31 (38.8)	92 (57.5)
≥35	5 (6.3)	4 (2.5)
Gravidity		
Primigravida	28 (35)	31 (19.4)
Multigravida	52 (65)	129 (80.6)
Parity		
Primiparous	37 (46.3)	54 (33.8)
Multiparous	43 (53.8)	106 (66.3)
Previous history of abortion		
Yes	21 (26.3)	49 (30.6)
No	59 (73.8)	111 (69.4)
Stillbirth history		
Yes	3 (3.8)	19 (11.9)
No	77 (96.3)	141 (88.1)
Attend ANC		
Yes	77 (96.3)	139 (86.9)
No	3 (3.8)	21 (13.1)
Number of visits		
≤4	51 (63.8)	128 (80)
>4	29 (36.3)	32 (20)
ANC initiation time		
First trimester	58 (72.5)	43 (26.9)
Second trimester	22 (27.5)	117 (73.1)
Place of delivery to the last pregnancy		
Home	12 (15)	45 (28.8)
Public hospital	43 (53.8)	80 (50)

Health post	21 (26)	24 (15)
Private hospital	4 (5)	11 (6.9)
Last delivery assistant		
Female relative	10 (12.5)	13 (8.1)
Health extension worker	41 (51.3)	70 (43.8)
Health professional	25 (31.3)	67 (41.9)
Nobody	4 (5)	10 (6.3)
PNC follow-up		
Yes	36 (45)	60 (37.5)
No	44 (55)	100 (62.5)
Heard about modern contraceptive		
Yes	54 (67.5)	99 (61.9)
No	26 (32.5)	61 (38.1)
Information source on contraceptive		
Health worker	14 (17.5)	24 (15)
Mass media	26 (32.5)	52 (32.5)
Friends	5 (6.3)	24 (15)
Health extension worker	9 (11.3)	36 (22.5)
Partners help to attend ANC		
Yes	39 (48.8)	77 (48.1)
No	41 (51.3)	83 (51.9)
Partners help to decide where to give birth		
Yes	44 (55)	74 (46.3)
No	36 (45)	86 (53.8)
Morning sickness		
Yes	28 (35)	107 (66.9)
No	52 (65)	13 (33.1)

Preconception characteristics of the study participants

Out of the total participants, 81.3% of the cases and 60.6% of the controls have planned pregnancy, which shows a statistically significant difference. However, the majority of the controls [61.3%] and less than half of the cases [48.8%] used modern contraceptives right before conception. Moreover, there was no difference in their knowledge of where family planning is found and chronic illness before conception (Table 3).

Table 3 Preconception characteristics of women who delivered in three referral hospitals of Addis Ababa, July to September 2020(*n* = 240)

Variables	Case (%)	Control (%)
Use modern contraceptive		
Yes	39 (48.8)	9 (61.3)
No	41(51.3)	61 (38.8)
Know were family planning found		
Yes	38 (47.5)	107 (66.9)
No	12 (15)	24 (15)
Chronic illness before conception		
Yes	6 (7.5)	30 (18.8)
No	74 (92.5)	130 (81.3)
Current pregnancy type		
Planned	65 (81.3)	97 (60.6)
Unplanned	15 (18.8)	63 (39.4)

Knowledge and health facility-related characteristics of study participants

The majority of the study participants, 68.8% cases and 78.1% controls, have poor knowledge on iron-folic acid supplementation. Participants response on the benefits of IFAS were, to prevent maternal death

28.2% [13.8% cases and 14.4% controls], to prevent infant mortality 31.9% [20% cases and 11.9 % controls], to prevent birth defects 15% [12.5% cases and 2.5 % controls], and to give strength for the mother 10.6% [7.5% cases and 3.1% controls] (Table 4).

Table 4 Knowledge and health-facility related characteristics of women who delivered in three referral hospitals of Addis Ababa, July to September 2020 ($n = 240$)

Variables	Case (%)	Control (%)
Distance to health facility		
≤30 minutes	31 (38.8)	21 (13.3)
>30 minutes	49 (61.3)	139 (86.9)
Waiting time		
≤30 minutes	40 (50)	40 (25)
>30 minutes	40 (50)	120 (75)
Distance to source of contraceptive		
≤30 minutes	44 (55)	57 (35.6)
>30 minutes	36 (45)	103 (64.4)
Counseling on IFAS		
Yes	49 (61.3)	50 (31.3)
No	31 (38.8)	110 (68.8)
Encounter shortage of supplement		
Yes	26 (32.5)	71 (44.4)
No	54 (67.5)	89 (55.6)
Knowledge		
Good	25 (31.3)	35 (21.9)
Poor	55(68.8)	125 (78.1)
Benefit of IFAS		
Prevent maternal death	11 (13.8)	23 (14.4)
Prevent infant mortality	16 (20)	19 (11.9)
Prevent birth defects	10 (12.5)	4 (2.5)
give strength to the mother	6 (7.5)	5 (3.1)
Risk of IFAS		
Harm fetus growth	3 (3.8)	9 (5.6)
Cause bigger fetus	14 (17.5)	38 (23.8)
Result in complicated delivery	1 (1.3)	10 (6.3)

Nutritional characteristics of the study participants

More than half of the respondents [53.8% cases and 60 % controls] did not take additional food during pregnancy (Table 5).

Table 5 Nutritional characteristics of women who delivered in three referral hospitals of Addis Ababa, July to September 2020 (*n* = 240)

Variables	Case (%)	Control (%)
Additional food during pregnancy		
Yes	37 (46.3)	64 (40)
No	43 (53.8)	96 (60)
Meal frequency		
More than three times	25 (31.3)	32 (20)
Three times	28 (35)	73 (45.6)
Two times	19 (23.8)	48 (30)
One time	8 (10)	7 (4.4)
Tea or coffee after meal		
Yes	37 (46.3)	59 (36.9)
No	43 (53.8)	101 (63.1)
Partner encourage to eat additional food		
Yes	51 (63.8)	80 (50)
No	29 (36.3)	80 (50)

Dietary diversity score among participant mothers

Among the study participants, 51.25% of the cases and 67.5% of controls had low dietary diversity score, 33.75% of the cases and 21.66% of controls had medium dietary diversity score, and 15% of the cases and 10.63% of controls had high dietary diversity score (Figure 1).

Factors associated with adherence to IFAS

Age of participants, ANC initiation time, gravidity, whether they get counseling on IFAS or not, time taken to travel to health facility, and whether the pregnancy was planned or not were independent predictors of adherence to IFAS.

Women who are in the age group 29-33 are 1.6 times more likely [AOR=1.66, 95% CI: 2.010-0.0492] to adhere IFAS than mothers who are in the age group of >34. Women who had planned pregnancy were 4 times more likely [AOR=4.2, 95%CI: 1.6-10.9] to adhere as compared to unplanned pregnancy. Women who started their ANC follow-up in the first trimester are 4 times more likely [AOR=4.21, 95%CI: 2.3-10.66] to adhere than those who started ANC follow up in the second trimester.

In addition to the above factors, women who travel less than 30 minutes to reach to the health facility have 3.17 times more likely [AOR=3.17,95%CI:1.35-7.4] to adhere IFAS than those who travel more than 30 minutes to reach to the health facility.

Moreover, women who had counseling on IFAS are almost 4 times more likely [AOR, =3.89, 95%CI: 1.8-8.4] to adhere IFAS. Women who are in Primigravida are 2 times more likely [AOR=2.08, 95% CI: 1.06-4.09] to adhere than Multigravida mothers. Women who had morning sickness during pregnancy are 0.33 times less likely [AOR=0.33, 95%CI: 0.15-0.69] to adhere than women without morning sickness (Table 6).

Table 6 Multivariable logistic regression model predicting adherence to IFAS, women who delivered in Addis Ababa referral hospitals, Ethiopia, July to September ($n = 240$)

Predictors	Case	Control	COR	AOR	95% CI	
					Lower	Upper
Age						
18-23	5(6.3)	17(10.6)	0.838	0.453	0.038	5.361
24-28	40(50)	30(36)	3.167	0.563	0.087	3.626
29-33	15(18.8)	50(31.3)	0.855	1.669	2.010	0.0492
>34	20(25.1)	57(35.7)	1	1		
ANC initiation time						
First trimester	58 (72.5)	43(26.9)	7.173	4.21	2.3	10.66
Second trimester	22(27.5)	117(73.1)	1	1		
Counseling on IFAS						
Yes	49(61.3)	50(31.3)	0.28	3.89	1.8	8.42
No	31(38.8)	110(68.8)	1	1		
Gravidity						
Primigravida	52(35)	31(19.4)	2.24	2.08	1.06	4.09
Multigravida	28(65)	129(80.6)	1	1		
Pregnancy type						
Planned	65(81.3)	97(60.6)	3.505	4.2	1.6	10.9
Unplanned	15(18.8)	63(39.4)	1	1		
Distance to health facility						
≤30 minutes	31(38.8)	21(13.3)	1.181	3.17	1.37	7.4
>30 minutes	49(61.3)	139(86.9)	1	1		
Morning sickness						
Yes	28(35)	107(66.9)	0.267	0.33	0.15	0.69
No	52(65)	13(33.1)	1	1		

Discussion

As seen in the preceding section, age of participants, ANC initiation time, gravidity, counseling on iron-folic acid supplementation, time taken to travel to the health facility, and planned pregnancy were significantly associated factors with adherence to IFAS.

According to this study, pregnant women in age group of 29-33 years were 1.6 times more likely to adhere IFAS compared to mothers who were in age group of 34 and above. This study is in line with other cross-sectional studies conducted in northwestern zone of Tigray region in Ethiopia.⁹ This might be due to the reason that most of the women in this age group are Primigravida so that they will follow the guideline much better to insure good pregnancy outcome.

This study also revealed that early registration for ANC follow-up has statistically significant difference compared to late registration after the second trimester. The result of this finding is consistent with different studies conducted in Tigray region of Ethiopia and in India.^{9,10} This might be because of pregnant women who have registered early for ANC service and got repeated counseling have a chance to finish the recommended number of supplements.

In addition to the above factors, gravidity is one of the main associated variables found in our study with IFAS were Primigravida mothers are two times more likely to adhere than Multigravida mothers. This result is also supported by a study conducted in Jida district in Ethiopia, Urban-Slam in India, and Kiambu Country in Kenya.^{4,5,11} This is because mothers are very careful during the first pregnancy to follow the guideline and advice given to finish the IFAS to insure a successful pregnancy.

Moreover, this study highlighted that getting counseling on IFAS during pregnancy helps to significantly improve the level of adherence. This finding is in line with other studies conducted in Jida district of North Wollo zone and Afar region in Ethiopia, and in Senegal.¹¹⁻¹⁴ This is because of women who get better counseling on IFAS may have a good understanding and knowledge on how and for how long to take the supplement to improve maternal health and good pregnancy outcome.

Another factor that has a significant association with IFAS is the time taken to reach to the health facility. The finding of this study revealed that women who travel less than 30 minutes to reach the health facility are 3.17 times more likely to adhere compared to those who travel more than 30 minutes. This result is consistent with the study conducted in Aykel town, northwest Ethiopia.¹⁵ Geographic distance to health facilities could also affect women's access to ANC services and therefore affect access to IFAS.¹⁶ However, the finding of this study in this regard is not in agreement with another study conducted in Afar region of Ethiopia.¹⁴ This could be due to the reason that this study is conducted in referral hospitals of Addis Ababa where mothers might not get easy access to reach to the hospitals, hence creating an obstruction to get proper counseling and follow up on the adherence of IFAS.

In addition to the above factors, pregnant mothers who have morning sickness are 67% less likely to adhere to taking IFAS than pregnant mothers who do not have morning sickness. This might be because of most women believe that taking IFAS causes or worsens morning sickness.¹⁷

Furthermore, this study revealed that planned pregnancy has a better outcome for IFAS adherence than unplanned pregnancy. This might be because of the reason that whenever mothers plan for pregnancy

beforehand, there is a higher possibility of starting follow up early, which significantly improves the degree adherence to IFAS.

Limitation of the study

Like other cross-sectional studies, this study could also have some limitations. One possible limitation of this study is that the data collection process is subjected to some degree of information inaccuracies. This is because, the information on IFAS adherence is collected from self-reporting of participants. Because of human errors or other reasons, participants may sometimes provide inaccurate information. Such issues are, in fact, beyond the investigator's control.

Conclusion And Recommendation

This study highlighted several important findings that influence adherence of IFAS. Early registrations for ANC service, planned pregnancy, and distance to the health facility, gravidity, age, and morning sickness were found significantly associated with adherence to taking IFAS. IFAS should be available at all levels of care and in the form of suitable and with fewer side effects. Moreover, focus should be given on developing good practices, guidelines and strategies to improve IFAS adherence. Counseling should be given for clients on the correct dosage and duration of supplementation to prevent anemia and neural tube defects. Health care providers of maternal and neonatal care should give more attention of IFAS adherence for Multigravida mothers during pregnancy and the postpartum period.

Declarations

Data sharing statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethical approval and consent to participate

The ethical issue of this study was approved by the ethical committee of Jimma University, department of nutrition and dietetics and official permission to undertake the study was obtained from the hospitals. The supportive staffs (i.e. card office, ANC clinic) was informed about the purpose of the study and verbal consent was obtained. Confidentiality of patient's information was assured, and information recorded anonymously.

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Author contribution

Tigist Alemu Taye, Melese Sinaga, and Abonesh Taye have substantial contribution on the conception, design analysis and interpretation of results. All authors read and approved the final manuscript.

Disclosure

The authors report no conflict of interest in this work.

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Abbreviations

ANC: antenatal care

AOR: adjusted odds ratio

CI: confidence interval

GMH: Gandhi Memorial Hospital

PNC: postnatal care

SPH: St. Paul's Hospital

SPSS: statistical package for social sciences

WHO: world health organization

µg: microgram

ZMH: Zewditu Memorial Hospital

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Figures

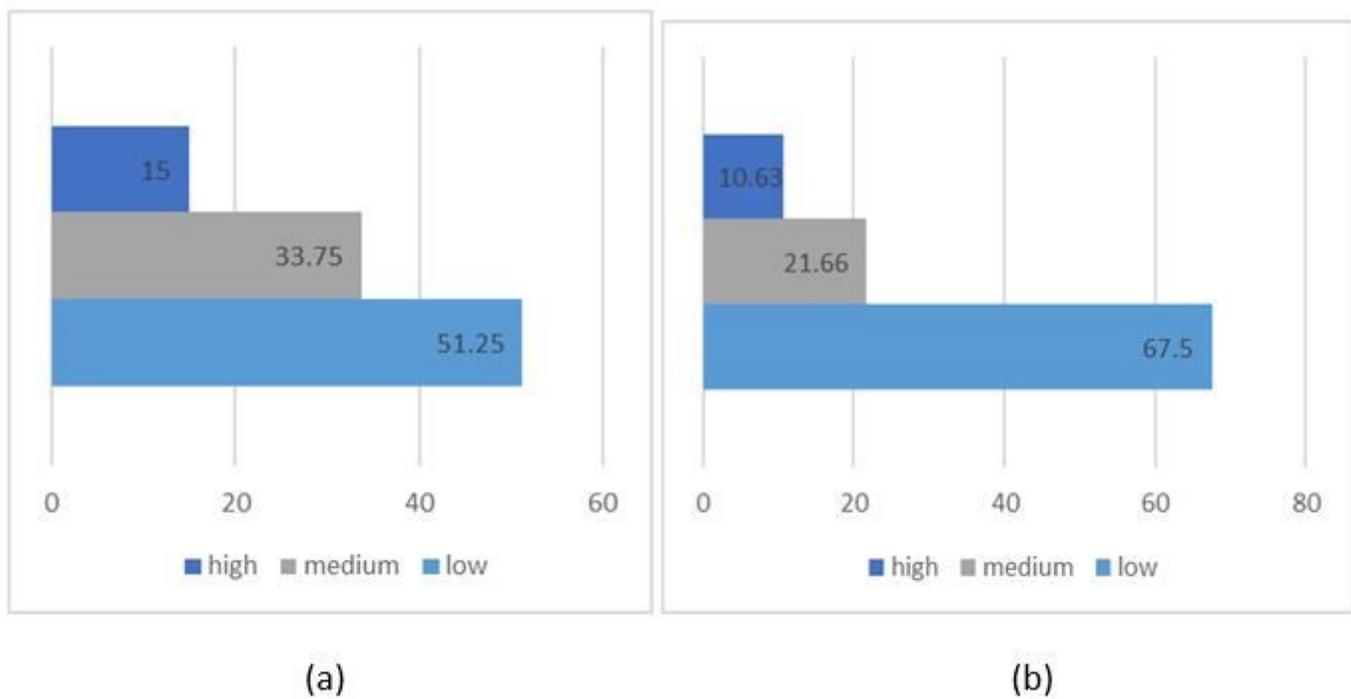


Figure 1

Dietary diversity score among participant mothers of cases (a) and controls (b), Addis Ababa referral hospitals, Ethiopia, July 15 to September 15, 2020 ($n = 240$).