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Adherence to WHO Dietary Recommendations and Its Associated Factors Among Pregnant Women Attending ANC at MKCSH, Southwest Ethiopia

Daniel Desta*, Efrem Negash, Abdi Geda

Department of Public Health, College of Health Science, Mettu University, Mettu, Ethiopia

Email address:
demolisdesta8989@gmail.com (D. Desta), negashefrem96@gmail.com (E. Negash), abdi.geda@meu.edu.et (A. Geda)
*Corresponding author

Abstract: *Introduction:* Maternal nutrition is essential for fetal development and growth, as well as the health of offspring throughout their lives. A nutritious prenatal diet improves fetal development and may aid in the prevention of congenital defects, premature birth, and low birth weight. Despite the fact that pregnant women are generally aware of the importance of a well-balanced diet during their pregnancy, their nutritional intake remains unsatisfactory. Lower socioeconomic women, in particular, follow dietary requirements less frequently and have poorer pregnancy and child health outcomes than higher socioeconomic women. *Objective:* To determine the level of adherence to WHO dietary recommendations and associated factors among pregnant mothers following antenatal care in Mettu Karl's comprehensive specialized hospital. Method: An institution-based cross-sectional study was carried out among 401 randomly selected pregnant women from July 25-September 28/2021. Socio-demographic, obstetrics, and adherence to the dietary recommendation data were collected using a structured questionnaire. Data were entered into Epi data 3.1 and exported to SPSS version 25 for analysis. Bivariate and multivariable logistic regression models were fitted. An adjusted odds ratio with a 95% Confidence level was used to assess the association between independent and dependent variables. The statistical significance was declared at P-values of < 0.05. *Results:* A total of 401 pregnant women were included in the study with a response rate of 94.5%. More than half (56.3%) of the participants met the recommendations for cereals, 22.4% for dairy, 10.4% for fruit, 29.1 for meat, and less than 10% for vegetables. In the multivariable logistic regression analysis, the factors significantly associated with overall adherence to the dietary recommendations were distance from Health facility (< 40 minutes' walk) (AOR=2.26, 95% (CI) (1.97, 7.63), educational status (secondary and above) (AOR=2.31, 95% (CI) (1.57, 3.42), wealth status (in better off) AOR =7.89, 95% (CI) (9.57, 8.42) and early registration for ANC (<4 months) (AOR=2.99, 95% CI (1.99, 3.21)). *Conclusions:* A significant proportion of pregnant women do not consume the recommended daily servings from the five food groups. Intervention strategies are warranted, particularly those that increase women's ability to evaluate their diet and also encourage positive dietary changes.

Keywords: Dietary Recommendations, Adherence, Associated Factor, Metu Karl Compressive Specialized Hospital, Pregnancy

1. Introduction

Maternal nutrition is critical for fetal development and growth, as well as offspring health throughout life [1]. A healthy antenatal diet promotes fetal growth and may help to avoid congenital abnormalities, early birth, and low birth weight. Despite the fact that pregnant women are typically aware of the necessity of a balanced diet throughout pregnancy, their actual nutritional consumption remains suboptimal [2, 3]. Women from lower socioeconomic backgrounds, in particular, follow dietary guidelines less frequently and have poorer pregnancy and child health

outcomes than women from higher socioeconomic backgrounds [4]. A sound, nutrient-rich, and energy-proper eating regimen during pregnancy is pivotal for the ideal growth, development of the baby and for the wellbeing of pregnant women [5]. Women's bodies endure anatomical, physiological, and biochemical changes throughout pregnancy [6, 7]. These biological changes increase women's nutrient requirements [7]. Pregnant women should consume a variety of meals that are high in calories, protein, vitamins, minerals, and water.

Despite this, the majority of pregnant women in underdeveloped nations have insufficient nutritional intakes in contrast to the World Health Organization's recommended guideline (WHO) [8]. Pregnant Asian and African women's diets, in particular, are largely cereal-based, with little intake of animal products, vegetables, and fruits [9].

According to WHO nutrient recommendations, pregnant women should eat at least 6-11 portions per day from the bread, cereals, pasta, rice, and potato group; at least 5 portions per day (more than 400g) from the vegetable and fruit group; 3 portions a day from the milk and dairy products group; 2 portions a day from the fish, poultry, meat, and bean group; butter, margarine, oils, sugar, sweets, and salt in small amounts. Moreover, a pregnant woman had better consume enough amount of foliate-rich foods including spinach, lettuce, cabbage, green beans, cauliflower, and fortified cereals [10].

Healthy eating habits during pregnancy have been linked with a lower risk of adverse pregnancy and birth outcomes. As a result, it is concerning that suboptimal dietary intake has been consistently reported during pregnancy, indicating poor adherence to dietary guidelines [11, 12]. Malnutrition, macronutrient, and micronutrient, a common in women and children throughout the world. Both of them to be major determinant of maternal and child health in developing countries [13, 14]. On the other hand, maternal malnutrition in developed countries is characterized by a combination of macronutrient over-nutrition and micronutrient deficiency [15, 16].

The prevalence of anemia and iron deficiency in pregnant and reproductive-age women in Ethiopia, Kenya, Nigeria, and South Africa is a public health issue, according to WHO standards. According to existing research, vitamin A, iodine, zinc, and foliate diet in these nations may be poor for both reproductive age and pregnant women. These deficits are caused by non-compliance with established dietary standards [17].

The global prevalence of non-adherent during pregnancy ranges from 41.8-43.8% with the greatest burden being found in Africa (61.3%) then South East Asia at 52.5%. [18].

In Africa, despite growing calorie consumption, the critical micronutrients like iron, folate, and vitamin D come out to be below the recommendations as per the existing guidelines for pregnancy. Furthermore, micronutrient supplementation appears to have dropped over the previous decade and eating habits have been moved drastically toward a high-fat, low-quality diet [19]. Being younger, not living with a partner,

drinking alcohol before pregnancy, years of formal education, socioeconomic classification, and household food insecurity were associated with poor adherence to nutritional recommendations [20–22].

WHO insisted all countries follow the existing dietary guidelines, non-compliance is also a common problem around the world, and one in every three individuals suffers from malnutrition, famine, or nutritional inadequacies. As a result, there is an increased risk of maternal morbidity and mortality, as well as poor pregnancy outcomes such as low birth weight and preterm birth, which are linked to an increased risk of neonatal morbidity and mortality [23, 24].

In Ethiopia, researchers have tried to investigate the dietary practice and dietary diversification during pregnancy but the level of adherence to the exiting WHO dietary recommendation and its associated factors have been ignored. So, the Ethiopian Ministry of Health and other stakeholders have a desire to prove pregnant women's level of adherence to dietary guidelines for both nutritional intervention programs as well as to develop dietary guidelines according to locally available food focusing on nutritional intervention for positive pregnancy outcomes [25].

Finally, a literature search on the issue under study showed that there is no single study published to determine the level of adherence to WHO dietary guidelines among pregnant women and its predictors in Ethiopia. Therefore this study aimed to assess and fill gap adherence to WHO dietary guidelines and its predictors among pregnant women in Ilu Aba Bor Zone.

2. Methods and Materials

2.1. Study Area and Period

The study was conducted in Ilu Aba Bor (I/A/B) zone Mettu Karl compressive specialized hospital (MKCSH). I/A/B is one of the Oromia region state zones located in the southwest part of Ethiopia, which is 600 km from Addis Ababa. Ilu Aba Bor is considered as one of the excess food-producing areas of the region and it is estimated that 1,197,156 people dwell in this zone. It has an estimated area of 16,555.36 KM^2. The main sources of food in the zone include cereal crops, fruit, vegetables, and animal products. The estimated number of pregnant women in the zone is about 44294 [26]. The study was conducted from July 25 – September 28, 2021. The study was conducted from July 25 –September 28, 2021.

Mettu Karl compressive specialized hospital (MKCSH), which is located in the Oromia region, Mettu town, is 600 kilometers from the capital city. The hospital serves 1.4 million people living in the Ilu Aba Bor zone and Gambela region of Ethiopia. The ANC clinic serves 15-25 mothers daily on average, and the researcher/s get no evidence for scheduled dietary education for pregnant mothers, but health professionals counsel their clients to take one extra meal daily [27].

2.2. Study Design, Population, and Sample Size

Pregnant women who visited the MKCSH during the study period were selected by a systematic random sampling technique. They are considered as the study population, drawn from the source population of all pregnant women who attended antenatal care at MKCSH. The women had to be residents in the Ilu Aba Bor zone at least for 6 months to be included in the study. Pregnant women who were seriously ill and/or had a difficulty of communication were excluded. The required sample size was determined using a single population proportion formula with the following assumptions: 50% of proportion, at 95% of confidence interval and 0.05 marginal errors with an additional 10% added to account for non-response. The final sample size taken was 424 from the total pregnant women.

2.3. Data Collection Tools and Procedures

Data on potential determinants of adherence to WHO dietary recommendations were collected using structured and pretested questionnaires through interviews. The validity of the questionnaire was checked against the conceptual framework of the study. The questionnaire was administered in the local language, Afan Oromo and Amharic. The questionnaire had four main components: socio-demographic characteristics; Wealth index, and obstetric and food frequency questionnaire (FFQ), derived from previously validated surveys [28, 29]. Fifty-seven locally available foods were also considered. The questionnaire was first prepared in English and then translated to Afan Oromo and Amharic then translated back to English to observe its consistency. The translated version was pretested prior to the actual survey and modifications were made by professionals accordingly. Five data collectors and one supervisor were recruited. The training was provided by the principal investigator to ensure consensus and understanding of what was intended to be measured by each question in the questionnaire and the data collection process was monitored daily by the supervisor and principal investigator.

2.4. Operational Definitions

The wealth distribution was generated by applying principal components analysis to 33 household variables. Then it was grouped into three; better-off, middle, and poor [30].

Poor;-below 30 percentile;

Meddle; - from 31-60 percentile;

Better off;-61 and above percentile.

2.5. Level of Adherence

The questionnaire (FFQ) had six possible intake frequency categories, ranging from 'never or less than once per month' to '6 or more times per week.' The intake frequency for each food item was converted to the average daily intake for each food group and for each participant within a range from 0 minimum values to 1 which is the maximum value for each food group. The total score ranged from 0 (minimal adherence to the WHO dietary recommendations) to 5 (maximal adherence). Then the score was categorized to reflect two levels of adherence: (1) <3, poor level of adherence (2) ≥3 good level of adherence good [31].

2.6. Data Processing and Analysis

The collected data was compiled, checked for any inconsistency and missed value, coded, and entered using Epi-data version 3.1 and exported into SPSS version 25 for data management and analysis. The data was cleaned for missing values by running frequencies and crosstabs. Descriptive analysis was performed to describe the study variables. The results of the descriptive statistics were expressed as percentages and frequency in the tables.

Logistic regression model fitness was checked using the Hosmer-Lemeshow test and statistical significance was declared as the model fitted. Multicollinearity was checked. The independent variables used in the regression analyses were those that previous studies have found to influence dietary intake in pregnancy and were variables that in the present study were correlated with adherence to the food group recommendations at the 25% level of significance, as recommended by other studies. A logistic regression analysis was used to compute the crude odds ratio with its 95% CI and variables with a P-value <0.25 in the bivariate analysis were candidates for multivariable analysis. A statistically significant association was declared at a p-value of less than 0.05. Finally, the findings were described in text, percent, odds ratio (OR) and presented using frequency tables, and charts.

3. Results

3.1. Socio-demographic Characteristics of the Study Participants

A total of 401 pregnant women were included in the study which makes the response rate 94.57%. The mean age of respondents was 21.9. (SD ± 1.08). More than one-third (34.3%) of the respondents were in the age groups of 25-29. Regarding the educational status of the study participants, 35.07% have completed secondary education. More than two-thirds of the study participant (83.5%) had a family size of 5 or less (Table 1).

3.2. Obstetrics and Other Health and Facility Related Result

The mean gestational age of the respondents during the study period was 31.7 (SD±4.6) weeks. More than half of study participants (57.1%) started their ANC follow-up before 4 months, while the rest (42.9%s) started ANC after four months of their last menstrual period. One-fourth (25%) of the respondents walk <40 minutes to reach the hospital, more than one third (35.1%) walk 41-79 minutes, and the majority (39.9%) walk more than 80 minutes to reach the hospital. Around two-thirds (72.8%) of study, participants

had a child before this pregnancy, while more than one-fourth (27.2%) are uniparous (Table 2).

From a total of 401 pregnant women included in the study More than half (56.3%) of the participants met the recommendations for cereals, 22.4% for dairy, 10.4% for fruit, 29.1 for meat, and less than 10% for vegetables (Table 3). Overall the prevalence of adherence to WHO recommendation was 18.45% (Figure 1).

Table 1. *Distribution of socio-demographic characteristics of pregnant women attending ANC at MKSH, 2021, Ilu Aba Bor zone, southwest Ethiopia.*

Variable	Category	Frequency	Percent (%)
AGE	15-24	112	30.5
	25-34	228	54.3
	35-45	114	25.2
Religion	Orthodox	119	29.6
	Muslim	115	28.6
	Protestant	163	40.6
	Catholic	4	0.9
Education Status	cannot read and write	51	12.7
	only can read and write	94	23.5
	primary education	115	28.7
	secondary school and above	141	35.16
Marital status	Single	26	6.7
	Married	358	89.2
	Divorced	11	2.6
	Widowed	6	1.5
Family size	≤5	335	83.5
	≥5	66	16.5
Occupation	house wife	169	41.8
	Government & other employee	232	57.8
Residency	Urban	350	87.3
	Rural	51	12.7
Wealth index	Better off	86	21.4
	Medium	107	26.8
	Poor	207	51.8

Table 2. *Obstetrics and other health and facility-related results among pregnant women, attending ANC at MKSH, 2021 Ilu Aba bor zone, southwest Ethiopia.*

Variables	Category	Frequency	Percent (%)
Having a child previously	Yes	291	72.5
	No	110	27.4
Number of ANC visits	2 visits	83	20.8
	3 visits	97	24.2
	4 visits	220	55
Gestational age (in trimester)	Second trimester	0	0
	Third trimester	401	100
Current anemia status	Yes	169	42.2
	No	231	57.8
Distance traveled to reach the Hospital in munities	<40	100	25
	40-79	141	35.1
	>80	160	39.9
Number of children	< 2	217	54.1
	≥ 2 children	184	45.9
Previous history of anemia	Yes	163	40.7
	No	237	59.3
First ANC visit	< 4 months	229	57.1
	≥ 4 months	172	42.9
Gravidity	Primi-gravidae	147	36.6
	Multigravida	255	63.7
Have been counseled diet by health professionals	Yes	63	15.7
	No	338	84.3

Table 3. *Level of Adherence to WHO dietary guideline of pregnant women attending ANC at MKSH, 2021 Ilu Aba zone, south west Ethiopia.*

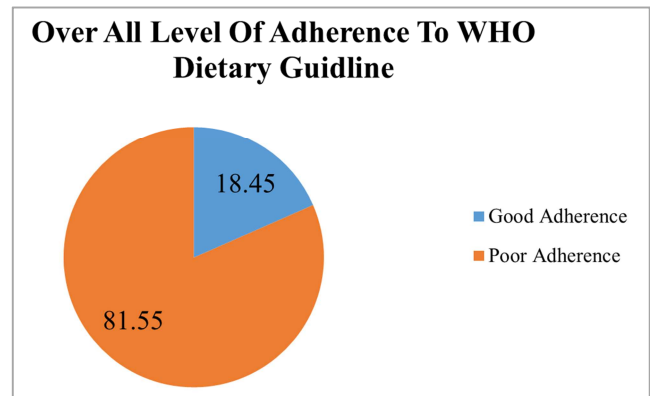| Variables	Adherence	Frequency	Percent
Adherence to WHO dietary guideline (cereals)	Adhered	226	56.3
	Not adhered	175	43.6%
Adherence to WHO dietary guideline (vegetable)	Adhere	27	6.7
	Not adhered	373	93.2
Adherence to WHO dietary guideline (fruit)	Adhere	56	10.4
	Not adhered	345	86
Adherence to WHO dietary guideline (milk)	Adhere	90	22.4
	Not adhered	311	77.5
Adherence to WHO dietary guideline (meat)	Adhere	117	29.1
	Not adhered	284	70.8

Figure 1. *Shows overall adherence level to WHO dietary guideline of pregnant women attending ANC at MKCSH, 2021 Ilu Aba bor zone southwest Ethiopia.*

3.3. Factors Associated with Dietary Recommendation Adherence

In the bivariate logistic regression analysis, time of starting ANC, educational status of the women, distance traveled to reach the hospital in minutes, presence of a child previously; household wealth status, and gravidity were candidate variables for the multivariable logistic regression analysis. The multivariable logistic regression showed that being at a distance of <40 minutes away from the hospital, the Educational status of the women, time of initiation of ANC, and wealth status were significantly associated with the adherence to the dietary recommendations.

Women who were < 40 minutes' walk away from the Hospital were more likely to adhere to the dietary recommendation as compared to those who are > 40 minutes' walk away (AOR, 95% (CI) 2.26 (1.97, 3.63). Women whose educational status were secondary and above were most likely to adhere as compared to women without formal education (AOR, 95% (CI) 2.31 (1.57, 0.42). Women who were in better off and middle-class wealth status are more likely to adhere to dietary recommendations as compared to those classified under the classification of poor AOR, 95% (CI) 7.89 (9.57, 8.42). Women who started their ANC follow-up before four months of the last menstrual period are more likely to adhere to dietary recommendations as compared to those started after four months AOR, 95% (CI) 2.99 (1.99, 3.21). (Table 4).

Table 4. *Multivariable logistic regression analysis of factors with level adherence to WHO dietary recommendation of pregnant women attending ANC at MKCSH, 2021 Ilu Aba bor zone southwest Ethiopia.*

Variable Category		ADHERENCE		COR	AOR (CI)
		Adhered (%)	Non-Adhered (%)		
Distance to reach the hospital (minutes)	<40	72 (36)	27 (13.63)	3.75 (2.87, 7.24)	2.96 (2.97, 7.63) **
	40-79	59 (29.4)	83 (40.9)	0.94 (0.59, 1.48)	0.73 (0.42, 1.28)
	>80	69 (34.6)	91 (45.5)	1.00	1.00
Gravidity	Primi-gravidae	74 (46.7)	63 (26.3)	2.43 (2, 59, 3.71)	1.75 (1.05, 1.79)
	Multigravida	86 (53.3)	178 (73.6)	1.00	1.00
First ANC Visit	<4 months	132 (73.3)	97 (43.9)	3.59 (3.92, 5.89)	2.99 (1.99, 3.21) **
	≥4 month	47 (26.7)	124 (56.1)	1.00	1.00
Child presence	Yes	120 (76)	165 (68)	1.49 (1.86, 2.56)	0.96 (0.56, 1.66)
	No	38 (24.0)	78 (32)	1.00	1.00
Educational status	2ndray & above	94 (73.4)	34 (26.56)	4.75 (2.06, 8.64)	3.63 (1.79, 6.26)**
	primary	43 (36.7)	74 (63.2)	4.64 (1.98, 5.21)	3.93 (1.34, 3.12)**
	Read & write	17 (16.8)	136 (29.9)	1.00	1.00
	No formal education	13 (8.4)	40 (16.8)	0.069 (0.029, 0.15)	0.035 (0.02, 0.11)
Economic status	Better off	71 (82.55)	15 (17.45)	2.94 (1.48, 5.8)*	2.31 (1.57, 3.42)*
	Middle	66 (61.68)	41 (38.32)	10.29 (5.89, 17.96)	8.89 (8.42, 9.57)**
	poor	28 (13.53)	179 (86.47)	1.00	1.00
Age	15-24	32 (28.57)	80 (71.42)	0.6 (0.37-, 0.98)	0.43 (0.52, 2.87)
	25-34	91 (39.91%)	137 (60.08)	0.69 (0.44, 1.08)	0.243 (.42, 0.51)
	35-45	56 (49.12%)	58 (50.87)	1.00	1.00
Residency	Urban	32 (9.14)	318 (90.86)	0.60 (0.25, 1.45)	0.211 (0.2, 0.32)
	Rural	7	42	1.00	1.00

Significant level ** p value <0.01,* p value <0.05.

4. Discussion

This is the first research to employ the WHO dietary guidelines to investigate pregnant women's adherence to WHO food group recommendations and determinates of adherence among pregnant women in Ethiopia. The findings shed fresh light on the factors that influence women's eating patterns with respect to WHO dietary recommendations during pregnancy in Ethiopia. Inappropriate dietary practice during pregnancy has been linked to the risk of adverse pregnancy outcomes. Despite this fact, in this study, only 18.45% of respondents had appropriate dietary practices. This result is much lower than the study findings in Australia [32], Norway [33], and the USA [34]. The discrepancy might be due to differences in the study settings. Moreover, respondents in this study had a low level of education. Their literacy level might have been a barrier to access information related to good nutritional practice. Other factors that may contribute to the discrepancy include socio-demographic, socioeconomic, seasonal variations, and recall bias.

According to the current study, Household wealth indexes play a central role in determining women's dietary practices. In this study, the likelihood of having appropriate dietary practice increased with increased Household wealth indexes. Pregnant women from higher-income and middle-class households were more likely to follow WHO dietary recommendations than their counterparts. One plausible explanation for this is that pregnant women from higher-income households have more purchasing power and thus can afford to eat more diverse foods, as recommended by dietary recommendations, than pregnant women from lower-income households. This finding is consistent with research undertaken in Australia [32] and New Zealand [35].

Educational level is another predictor of adherence to dietary recommendations. Women with a secondary or higher level of education were more likely to adhere to dietary guidelines than women with no formal education. This finding is in line with a study done in Kenya [36], Tanzania [37], and Ghana [38]. The possible explanation for this might be, those mothers attaining secondary education and above were more likely to get information regarding the nutritional requirement and understand educational messages delivered through different media outlets.

Women who started ANC at 4 months are two times more likely to adhere to dietary recommendations than their counterparts who started later (>4 months). This might be related to their increased health-seeking behavior than those who start later. This finding is congruent with the findings of research done in Assela, which found that women who began their ANC follow-up early were three times more likely to stick to healthy dietary practices than those who began ANC later [39].

Women who lived 40 minutes' walk from a hospital were 3.8 times more likely to follow dietary guidelines than those who lived further away. This contradicts the findings of earlier research in Akaki, which found that distance from health facilities did not affect dietary adherence. This result might be explained by the fact that access to health care is simpler for individuals who live close to those who live far away [40]. The above finding has a disadvantage in that it is based on self-reported minutes of walking from the hospital, and recall bias should be considered when applying the results of this study.

5. Conclusion and Recommendation

The adherence level to dietary recommendations among pregnant women included in the study was found to be poor. Early initiation of ANC before 4 months, the educational status of pregnant women, being within a close distance of the health institution, and economic status positively affected the adherence level to dietary recommendations. PThe above factors were shown to impact WHO dietary guideline adherence, which could have implications for both future policy and practice. However, further research is needed to assess the predictors of guideline adherence for women during pregnancy.

Abbreviations and Acronyms

ANC: Antenatal Care
EAR: Estimated Average requirement
FAO: Food and Agriculture Organization
HBM: Health Believe Model
IFAS: Iron and Folic Acid Supplementation
IDA: Iron Deficiency Anemia
MeU ERC: Mettu University Ethical Review Committee
MKCSH: Mettu Karl Compressive specialized hospital
NZ: New Zealand
PRFT: Pregnancy related food taboo
PW: Pregnant Woman
PI: Principal Investigators
RNIs: Recommended dietary intake
SSA: Sub Saharan Africa
TPB: Theory Of planned Behavior
USA; United States of America
WHO: World Health Organization
WRA: Women of reproductive age

Ethics Approval and Consent to Participate

Ethical approval was acquired from Mettu University's Ethical Review Committee, department of public health, and authorization was gained from MKCSH administrations. Before the interview, participants were asked to consent.

Availability of Data and Materials

Data will be available upon the request of the corresponding author.

Competing Interest

The authors declare that they have no competing interests.

Authors' Contributions

DD: conception of the research idea, design, analysis interpretation and drafting the manuscript. EN, AG and DD: design, interpretation of results, reviewing and editing the manuscript. All authors have read and approved the final manuscript. DD is responsible for the overall content as guarantor.

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