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ORIGINAL RESEARCH

Dietary Supplements Intake During Pregnancy Among Pregnant Women in Ethiopia

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Introduction: Pregnant women are expected to take one or more dietary supplements (DS) like iron, folic acid, zinc, calcium, magnesium, prenatal vitamins, etc. for maternal and child health during pregnancy. Despite its growing use in Ethiopia, data concerning currently marketed maternal DS products have not been intensively investigated so far. Taking into consideration the existing problem, this study was set out to assess the prevalence and commonly used DS during pregnancy in a referral hospital in Ethiopia.

Methods: A facility based cross-sectional study was employed to conduct this study from November 2020 to January 2021. The sample size was obtained by using the single population proportion formula and participants were selected and approached by using a systematic random sampling technique. Data were collected through a semi-structured interviewer-administered questionnaire. Descriptive statistics including frequencies and percentages were used to describe continuous and categorical variables and multivariate logistic regression was used to observe the association of the independent variables to the dependent variable.

Results: The overall prevalence of DS use was 84.2% and the most used product was Fefol (iron and folate supplement) (62.4%). A majority (87.8%) of DS products were obtained by prescription. In multivariate regression analysis, DS use during pregnancy was significant among nulliparous women and women who went to college and above [adjusted odds ratio (AOR): 8.142, 95% confidence interval (CI) (1.298–51.070)] and [AOR: 9.259, 95% CI (1.998–42.906)], respectively.

Conclusion: Even though the prevalence of DS practice showed improvement among the study participants, the duration of the DS intake is less than that recommended by the WHO. Pregnant women who did not have birth before and who went to college or above showed significant association with the use of DS.

Keywords: dietary supplements, prenatal nutrition, prenatal vitamins, Fefol, pregnant women

Introduction

Adequate nutrition is an important health care package for maternal and child health in the course of pregnancy. Pregnant women are susceptible to nutritional deficiencies due to an increment in nutrient needs to provide increased nutritional demands due to fetal growth and development, and changes in maternal metabolism such as pregnancy induced development of tissues.[1] Additionally, nutritional requirements for healthy women can be increased based on the trimesters of the fetus.[2,3] Although this pregnancy associated increased nutritional demand can be met by an appropriate consumption of food in a balanced diet, additional use of dietary supplements (DS) has been thought a key nutritional product with a crucial role in the maintenance of adequate nutritional status.[4]

According to the World Health Organization (WHO), the prevalence of preterm and underweight babies delivered are about 15 million and 20 million respectively.[5,6] Women from low- and middle- income countries suffer from multiple-micronutrient deficiencies due to inadequate intake of animal products, fruits, vegetables and fortified foods[7] and consequently, more than 95% of those born with low birth weight are occurring in these countries.[8]

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Furthermore, studies show that globally, around 9.8 million women are at risk for vitamin A deficiency. African and South-East Asian countries are reported as nations with the highest burden of prenatal deficiencies of dietary supplements (9.8% and 9.9% respectively). So, low socio-economic status, compromised health conditions and dietary intake are commonly reported attributes of deficiencies of DS during pregnancy.[9]

Recent evidence suggests so far the particular importance of DS[10] and in fact, available information indicates that 14 of the 21 essential micronutrients' (seven vitamins, five minerals and choline) requirements increase with the trimester of the pregnancy.[11] In the United States of America, 97% of pregnant women are advised to take DS as part of their prenatal care regimen whereas only 67% of African-American and 84% of Caucasian women of the population showed adherence for this recommendation.[12] Apart from these DS, some clinicians consider single nutritional preparations to benefit some pregnant women with certain needs. For instance, iron and folic acid (folate) have long been prescribed or recommended during pregnancy by virtue of their beneficial roles to prevent or treat particular pregnancy-related health conditions.[13]

Along with this growth in prenatal nutrition, however, there is increasing concern over pregnant women at risk of dietary deficiency in several key nutrients such as calcium, iron, folic acid and vitamin D.[13] A considerable amount of literature has been supporting the link between inadequate maternal nutritional status and adverse pregnancy outcomes,[14,15] poor infant survival,[16] congenital anomalies[17] and risk of chronic diseases and impaired mental development in later life.[18]

The high prevalence of micronutrient deficiencies among pregnant women is associated with an increased demand of the nutrients because of fetal and maternal tissue growth and development.[19] Any compromised intake of these nutrients in both quality and quantity during pregnancy results in failure to fulfill the increased demand of essential nutrients which would result in some adverse pregnancy outcomes.[20,21] Nutritional deficiencies during pregnancy increase the vulnerability of the mothers to different disease, increase the rate of miscarriage, and the babies delivered will be underweight whose survival is at risk.[18] Moreover, the low weight gain of mothers due to compromised nutrition during pregnancy is a risk factor for the delivery of infants too small for their gestational age, which in turn leads to neonatal morbidity and mortality,[22] growth failure, retarded cognitive development and adulthood chronic diseases.[23]

Being one of the developing countries, Ethiopia has a high burden of malnutrition, morbidity as well as mortality of both mothers and children. According to Ethiopian demographic and health survey data of recent years, around 22.9% of the women with reproductive ages (15–49 years) were malnourished and the prevalence of malnutrition in Amhara region (the site of the current study) was 29%.[24] However, much of previous studies undertaken in Ethiopia demonstrated that the prevalence of undernutrition among pregnant women in different parts of the country varies from 15.2 to 35.5%.[25–27]

Despite supplement use becoming a common practice, safety and efficacy data concerning currently marketing maternal DS products have not been intensively investigated. In Ethiopia, previous studies on DS use in pregnancy mainly focused on prevalence, adherence and associated factors of folic acid and iron supplement use during pregnancy so far.[27–29] However, to the best of our knowledge, there has been no reliable evidence that explored the prevalence and potential associates of demographic characteristics of pregnant women who use newly emerging DS preparations in Ethiopia. This study therefore will set out to assess the use prevalence and types of DS products in pregnant women visiting University of Gondar Comprehensive Specialized Hospital (UOGCSH) ANC clinic and to ascertain the factors associated with their use.

Methods and Materials

Study Design, Period and Setting

An institution-based cross-sectional study was conducted in UOGCSH from November, 2020 to January, 2021. The hospital is found in Amhara region, at 738 km in a northwestern direction from Addis Ababa, the capital of Ethiopia. It is one of the teaching hospitals of the country at tertiary level and it is a referral center for district hospitals serving more than seven million population.

The ANC clinic of the hospital provides services including identification and follow up of the pregnant women and the fetus, early assessment of pregnancy related complications such as preeclampsia, anemia, and symptoms of stress and

other mental health problems. It is also engaged in the screening and treatment of some concurrent diseases such as sexually transmitted diseases and human immune virus. Moreover, the pregnant women get health education to develop healthy home behaviors and have full support and counseling to prepare both emergency and birth plans as well as to promote postnatal family planning/birth spacing.

Population

Source Population

Includes all pregnant women attending the ANC clinic of UOGCSH.

Study Population

Those pregnant women who were visiting the ANC clinic of UOGCSH from November, 2020 to January, 2021 and attained the study inclusion criteria.

Inclusion and Exclusion Criteria

Inclusion Criteria

Inclusion criteria requirements were those who women accepted the consent form to take part in the study, pregnant women who lived for at least 3 months in the town and age of 18 years or older, healthy and Ethiopian citizen women.

Exclusion Criteria

Pregnant women with pregnancy related complication which require special follow up and dietary modifications were excluded from the study. So, women with excessive nausea and/or vomiting, both gestational and chronic diabetes mellitus, hypertensive disorders, liver and renal diseases, gastrointestinal disorders and autoimmune diseases were not parts of this study.

Sample Size Determination and Sampling Technique

The sample size was calculated by using the single population proportion formula by considering the prevalence of DS use among the pregnant population was 18.3% as per a study done in Ethiopia,[30] 95% of confidence interval and 5% of marginal error. A total of 253 study participants were recruited into this study after adding a 10% non-response rate. The study participants were selected and approached by using a systematic random sampling method. The estimated number of pregnant women who visited the ANC clinic for the past three consecutive months was 2000. By using this estimate, the calculated Kth interval value to approach was 8 and so, every 8th pregnant woman was approached and interview for the study.

Data Collection Tool and Procedures

Data were collected through a semi-structured interviewer administered questionnaire by the principal investigators. The data collection questionnaire was prepared by intensive reading of relevant literatures done in the area of DS use during pregnancy.[27,31–35] It comprises items focusing on socioeconomic and socio-demographic characteristics, parity and gravidity, use practice and perceived reasons for using or not using DS, types of DS products and whether or not these products are prescribed, reading practice of DS level, frequency and dosage forms of DS, occurrence of side effects and experience of discussion with health care providers, and information resources of DS. The antenatal and clinical data as well as the anthropometric measurements of the pregnant women were directly copied from the respondents' assessment charts from the ANC clinic at the time of data collection.

Data Quality Control Technique

Before the data collection procedure was started, intensive training was given to the data collectors on the contents of the training of the instrument, the methods of data collection and handling of the collected data.

Statistical Analysis

The collected data using a quantitative method were cleaned and entered into and analyzed using IBM SPSS Statistics for Windows, version 22.0. Descriptive statistics were carried out and presented with narration and tabulation. Binary

logistic regression (bivariable and multivariable binary logistic regressions) analysis was performed to identify statistically significant variables.

The variables that have statistically significant associations at p-value≤0.2 with the dependent variable in the bivariable logistic regression analysis were further considered as a candidate for a multivariable logistic regression for controlling the possible effect of confounding variables. Age, number of deliveries, gestational age, number of children, educational status, number of family and place of residence of the study participants have a p-value of less than or equal to 0.2 in bivariable logistic regression analysis and the multivariable logistic regression was computed for these variables. Lastly, variables with p-value≤0.05 in a multivariable binary logistic regression model were reported as significantly associated with the dependent variable and their adjusted odds ratio (AOR) with a 95% confidence interval was used to measure the strength of association.

Ethical Considerations

The study was conducted by following the declaration of Helsinki. The research and ethics review committee of School of Midwifery, University of Gondar, the Hospital Clinical Director and head of ANC clinic of UOGSH reviewed the study proposal, the data collection tool and the verbal informed consent statement, and provided the ethical clearance letter and approved the study. The purpose of the study was explained to the study participants and a verbal informed consent was obtained from each of the respondents. The names and other identifiers of participants were not documented and their data will never be shared for third parties.

Definition of Terms and Operational Definitions

The Dietary Supplement Health and Education Act (DSHEA) of 1994 issued by FDA defines the term "dietary supplement" as a product that collectively meets the following requirements.[36]

- A product (other than tobacco) intended to supplement the diet or contain one or more of the following: vitamin, mineral, herb or other plant-derived substance (eg, ginseng, garlic), amino acid, concentrate, metabolite, constituent or extract.
- A product intended for ingestion in pill, capsule, tablet or liquid form.
- A product not represented for use as a conventional food or as the sole item of a meal or diet.

Prenatal vitamins are preparations made for supplementation of pregnant women to meet the needs of vitamins and minerals for healthy pregnancy. The preparations contain 400 µg folic acid, 6 µg vitamin B_{12}, 2 mg riboflavin, 70 mg vitamin C, 400 IU vitamin D, 20 mg niacin, 3 mg thiamine, 10 mg vitamin E, 17 mg iron, 200 to 300 mg calcium, 15 mg zinc, and 150 µg iodine.

Fefol is maternal nutritional supplement comprising 150 mg ferrous sulphate and 0.5 mg folic acid.

Prescription DS refers to supplement that are safe and effective that used under health care providers, whereas nonprescription DS are safe and effective supplement for use without health care provider prescription.

Untoward effects: Unintended and harmful response experienced after the intake of supplement or the combinations of supplements under suggested conditions and suspected to be associated with the supplement.

Results

Socio-Demographic Characteristics

All pregnant women approached agreed to participate in the study with a response rate of 100%. From 253 study participants more than half (53%) are found between age of 25 and 34 years and most (89.3%) of the study participants are married. More than 90% of the study participants have normal body mass index and 45.8% of the respondents came the ANC visit for their first child. More than two-thirds of the respondents came from urban areas while the rest are from rural side of the country (Table 1).

Table 1 Socio-Demographic Characteristics of Women Who Came to ANC, Gondar, Ethiopia, 2021

Variables	Frequency (%)
Age	
18–24	68 (26.9)
25–34	134 (53)
>35	51 (20.2)
Marital status	
Married	226 (89.3)
Unmarried (single, divorced, widowed)	27 (10.7)
Weight (kg)	
40–49	44 (17.4)
50–59	104 (41.1)
60–69	68 (26.9)
70–79	28 (11.1)
80–89	9 (3.6)
Height (cm)	
<150	18 (7.1)
151–160	93 (36.8)
161–170	117 (46.2)
171–180	25 (9.9)
Body mass index	
Underweight	7 (2.8)
Normal	230 (90.9)
Overweight	16 (6.3)
Number of deliveries	
0	116 (45.8)
1–2	75 (29.6)
>3	62 (24.5)
Gestational age in trimester	
1st trimester	66 (26.1)
2nd trimester	98 (38.7)
3rd trimester	89 (35.2)
Number of children (living)	
0	121 (47.8)
1–2	73 (28.9)
>3	59 (23.3)
Educational status	
No formal education	55 (21.7)
Elementary school	85 (33.6)
High school	63 (24.9)
College and above	50 (19.8)
Family income	
<500	13 (5.1)
501–999	45 (17.8)
1000–1999	66 (26.1)
>2000	129 (51)
Number of family members in the household	
Less than 4	128 (50.6)
4 and more	125 (49.4)

(*Continued*)

Table 1 (Continued).

Variables	Frequency (%)
Job of the women	
Housewife	123 (48.6)
Government employee	67 (26.5)
Private employee	49 (19.4)
Daily laborer	3 (1.2)
Others*	11 (4.3)
Place of residence	
Urban	175 (69.2)
Rural	78 (30.8)

Note: *Business owner, religious organization employee.

The Practice of Dietary Supplements Intake Among Pregnant Mothers

The reported practice to take dietary supplements by the study participants was 84.2%. Among those who reported that they are taking dietary supplement, about 76.1% women take in order to prevent anemia and delivery of babies with low birth weight. The fear of side effects of the supplements (35%) and the harmful effects they could result on the fetus (32.5%) were the frequent reasons to not take dietary supplements. Among the women who take dietary supplements, most (76.1%) take Fefol (iron + folic acid) and most (87.8%) of them are obtained by prescription (Table 2).

Table 2 The Practice of Dietary Supplements Intake Among Pregnant Women, Gondar, Ethiopia, 2021

Variables	Frequency (%)
Do you take dietary supplement during pregnancy	
Yes	213 (84.2)
No	40 (15.8)
Reasons to take the dietary supplement*	
I feel I have deficiency in my diet	59 (27.7)
To help the fetal development	62 (29.1)
I feel the fetus needs more dietary supplement	8 (3.8)
To prevent anemia and low birth weight of the fetus	162 (76.1)
Others	1 (0.4)
Reasons to not to take dietary supplement*	
Fear of side effects	14 (35)
Fear of its harmful effects to the fetus	13 (32.5)
I cannot afford the dietary supplements	8 (20)
Others	5 (12.5)
Type of dietary supplement*	
Iron	29 (13.6)
Folic acid	26 (12.2)
Fefol (iron + folic acid)	133 (62.4)
Prenatal vitamins	25 (11.7)
Prescribed or not	
Prescription	187 (87.8)
Non-prescription	26 (12.2)
How often do you take the dietary supplement	
Daily	141 (66.2)
Few days/week	57 (26.8)
Few days/month	11 (5.2)
Few days in entire pregnancy period	4 (1.9)

(*Continued*)

Table 2 (Continued).

Variables	Frequency (%)
The formulation of the dietary supplement	
Tablet	165 (77.5)
Liquid suspension/solution	48 (22.5)
How long have you been taking the dietary supplement	
Less than three months	193 (90.6)
Three months and more	20 (9.4)
Have you ever experienced any side effect	
Yes	103 (48.4)
No	110 (51.6)
What kind of side effect	
Bad test	38 (36.9)
GI irritation	76 (73.8)
Agitation	7 (6.8)
Kidney problem	1 (1)
Others	1 (1)
Source of information about the dietary supplement*	
Attending ANC personnel	114 (53.5)
Other health professional	3 (1.4)
Private pharmacy outlets	71 (33.3)
Family/friends	31 (14.6)
Mass-media	64 (30.0)

Note: *More than one answer.

Magnitude of Dietary Supplement Practice and Associated Factors

In multivariable logistic regression, to assess the practice of dietary supplementation, variables fitting the chi-square assumption directly undergwent bivariate, and then multivariate regression analysis. In multivariate regression analysis, number of deliveries and educational status of the women were significantly associated with dietary supplements use. The odds of taking dietary supplements were 8.142 times higher among those who have not gave birth before. And, the dietary supplementation women who went to college and above are more tended to use dietary supplementation than the women who did not get formal education [AOR: 9.259, 95% CI (1.998–42.906)] (Table 3).

Table 3 Magnitude of Dietary Supplement Practice and Associated Factors, Gondar, Ethiopia, 2021

Variables	Do You Take Dietary Supplements During Pregnancy		COR (95% CI)	AOR (95% CI)
	Yes	No		
Age				
18–24	54	14	1.210 (0.478–3.065)	1.059 (0.293–3.829)
25–34	117	17	0.678 (0.281–1.637)	0.895 (0.298–2.684)
>35	42	9	1	1
Number of deliveries				
0	90	26	1.950 (0.824–4.614)	8.142 (1.298–51.070)*
1–2	69	6	0.587 (0.192–1.793)	1.121 (0.218–5.764)
>3	54	8	1	1

(*Continued*)

Table 3 (Continued).

Variables	Do You Take Dietary Supplements During Pregnancy		COR (95% CI)	AOR (95% CI)
	Yes	No		
Gestational age in trimester				
1st trimester	49	17	2.460 (1.064–5.689)	0.976 (0.309–3.085)
2nd trimester	86	12	0.989 (0.413–2.370)	0.847 (0.310–2.318)
3rd trimester	78	11	1	1
Number of living children				
0	97	24	1.577 (0.661–3.761)	1.491 (0.226–9.859)
1–2	65	8	0.785 (0.276–2.234)	3.894 (0.727–20.850)
>3	51	8	1	1
Educational status				
No formal education	51	4	1	1
Elementary school	75	10	1.700 (0.505–5.717)	1.258 (0.346–4.579)
High school	53	10	2.406 (0.709–8.161)	2.746 (0.750–10.051)
College and above	34	16	6.000 (1.847–19.496)	9.259 (1.998–42.906)*
Number of family members living in the house				
Less than 4	108	20	0.972 (0.495–1.910)	0.628 (0.251–1.567)
4 and more	105	20	1	1
Place of residence				
Urban	153	22	0.479 (0.240–0.956)	0.525 (0.203–1.362)
Rural	60	18	1	

Note: *Indicates variables significant at *P*-value less than or equal to 0.05.
Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio.

Discussion

At the times of pregnancy and lactation, increased nutritional supplementation is expected to meet the increased needs in order to support and enhance the growth and development at both fetal and infant stages of development. So, every pregnant woman is expected to have a healthy and balanced diet during the period of pregnancy and this specified maternal diet plays a critical role in the fetal health, growth and development. Health professionals also should take pregnancy as an opportunity to encourage women to make dietary improvements as this time gives motivation for the women and their caregivers to change their aspects of nutrition and diet.

In the present study, 84.2% of the respondents take DS at some point of their pregnancy period. This result showed better finding than some similar studies conducted in Colombia (68.6%),[33] the United States of America (69.8%)[37] and Denmark (77%).[38] The observed increment in the current study could be due to differences among the study setting. The data in our study were obtained from women who came to ANC follow up, which have access to DS and the information regarding pregnancy. This could be supported by 87.8% of the pregnant women who take DS in our study use prescription supplements from health institutions. However, the result goes in line with the finding of study conducted in Israel, which reported the DS utilization is 85%.[39] The Poland study also reported that the use of DS was 81.2%.[39] And, the study conducted in Jordan showed higher prevalence of DS practice (96.8%) than the current study.[32]

The practice of dietary supplementation is good during pregnancy among the study participants and showed significant association with number of deliveries and educational status of the study participants as compared to non-users of the dietary supplements. Women who went to college and above had odds of 9.259, 95% CI (1.998–42.906) to take dietary supplements than women who did not have formal education. Other studies conducted in different population and study settings also showed the same result with our study.[31,33,38,40,41] The best way to explain this finding could be that higher education increases the awareness as well as acceptability of the role of nutrition in good health. We also

found the dietary supplement intake was 8.142 times higher among women with their first pregnancy than women who were pregnant for the second time or more. Some studies also reported similar results which showed the association of nulliparity with high dietary supplement intake.[35,40,42] This could possibly be explained as the adherence of the pregnant women to the health care professional recommendation could increase as they do not have self-experience on pregnancy.

Preventing maternal anemia and low birth weight of the fetus was the most commonly reported (76.1%) reason to take dietary DS in the current study. This finding does not go in line with the result from a Saudi Arabian study on which the most reported reason was to meet the elevated fetal dietary requirement.[31] This discrepancy could be due to the guidelines for health education and treatment of pregnant women in low-income countries mainly focusing on maternal health issues such as anemia and maternal malnutrition. While the fear of adverse effects both for themselves and the fetus were the most reported reasons to not take dietary supplements among the non-users. But only half of the women who took the dietary supplements experienced some kinds of adverse effects. Based on this finding, it is reasonable to suggest that increasing the awareness of the pregnant women regarding the possible risks and benefits of the supplements could increase the practice.

Most (62.4%) of the study participants from the current study use Fefol (iron + folic acid) as DS during pregnancy. This could be due to the fact that using a combination formulation would be easier than using two independent formulations. This could imply having combination formulations may increase the practice due to their convenience to use.

Among those who take the DS, almost all reported that they took the supplements for less than three months. A prospective cohort study conducted in China showed same results with current study which says the average usage duration of the DS was 2.5 months.[35] But the findings are not in line with the WHO recommendation which suggests the dietary supplementations should be taken throughout pregnancy.[43]

Conclusion

This study addressed information on the prevalence of the DS practice, the types of supplements commonly used among pregnant women at the ANC clinic of UOGCSH and factors associated with DS use. Even though the prevalence of the dietary supplementation practice is good among the study participants, the duration of the DS intake is less than that recommended by the WHO. Pregnant women who did not have birth before and who went to college or above showed significant association with the use of DS. The investigators recommend that the general population should be given health education on proper dietary supplements' use through different media outlets. Health practitioners also should be guided to follow the WHO recommendation of dietary supplement use during pregnancy. Future guidelines and policies should give emphasis on articles that encourage the health care practitioners and the community to follow the standardized recommendations.

Limitations of the Study

Despite the fact that this study was able to provide useful information on dietary supplements practice among pregnant women, several limitations are noted. First, the study participants were women who came to health facility for their ANC visit. This may not give the whole picture of the practice in the community since there might be women who do not attend their ANC visit properly. Second, misreporting due to a recall bias may happen as mothers were asked to record all types of DS products, frequency and dosage forms of DS and other questions which need a recall ability. Thirdly, the nature of the data obtained by a cross-sectional study design limits the reader to establish a temporal relationship between the causes and the effects. Despite these limitations, we feel the study provide a reasonably accurate assessment of the dietary supplements practice among pregnant women and it is a very first kind in the study area.

Disclosure

The authors report no conflicts of interest in this work.

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