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FACTORS ASSOCIATED WITH MATERNAL KNOWLEDGE OF IRON NUTRITION AND SUPPLEMENTATION IN THE RURAL TAIN DISTRICT, GHANA

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ABSTRACT: ***Background:*** *Pregnant women are at a high risk of iron deficiency anaemia in Ghana. Despite the provision of iron nutrition education and supplementation for the prevention of iron deficiency anaemia in pregnancy, the estimated prevalence of iron deficiency anaemia in pregnancy is relatively high. The associated factors such as maternal knowledge of iron nutrition and supplementation therapy are not clear due to limited data.* ***Objective:*** *This study aims to assess maternal knowledge of iron nutrition and supplementation and associated factors in the rural Tain District of Ghana.* ***Method:*** *Cross-sectional quantitative data was used. Data was collected from a sample of 480 pregnant women attending antenatal clinics in any of the health facilities in the Tain district. The ten health facilities were stratified and the allocation of samples to each of the ten facilities was proportionate to size. Simple random sampling was used to select individual participants from a compiled list of registered antenatal mothers in each health facility.* ***Results:*** *In all, 36% of participants reported having adequate knowledge of iron nutrition and supplementation. Pregnant women whose husbands have no formal/Primary education (AOR=0.0078(95% CI: 0.021, 0.294), Middle/JHS education (AOR=0.223(95% CI: 0.067, 0.743) were associated with a knowledge of iron nutrition and supplementation. Pregnant women who have one child (AOR= 0.150 (95% CI: 0.053, 0.426) and those who have two children (AOR= 0.375(95% CI: 0.146, 0.963) had lower odds of adequate knowledge of iron nutrition and supplementation.* ***Conclusion:*** *Maternal knowledge of iron nutrition and supplementation for the prevention of iron deficiency anaemia is low. Health education on iron nutrition and supplementation therapy should be strengthened.*

KEYWORDS: Factors, associated, maternal, knowledge, iron nutrition, supplementation

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INTRODUCTION

Anaemia is one of the global health problems. It is highly prevalent in less-developed countries with pregnant women being the most affected group (Loy, Lim, Chan, et al., 2019). The causes of anaemia during pregnancy in developing countries include micronutrient deficiencies of iron, folate, vitamins A and B12, and anaemia due to parasitic infections such as malaria or chronic infections like TB and HIV. However, in Sub-Saharan Africa, iron deficiency in the diet is the leading cause of anaemia among pregnant women (Stephen, Mgongo, Hussein Hashim, Katanga, Stray-Pedersen & Msuya, 2018). Iron requirements during pregnancy are well-established (Bilimale, Anjum, Sangolli & Mallapur, 2010). However, a major problem in maintaining iron balance in pregnancy is that iron requirements during pregnancy are not equally distributed over its duration. In the last trimester of pregnancy, the growth of the fetus is exponential. This means that more than 80% of fetal iron is used during this period. The total daily iron requirement increases during pregnancy from 0.8mg to about 10mg during the last six (6) weeks of pregnancy (Agarwal, Kochar & Goel, 2008).

Studies have shown that an adequate iron balance can be achieved if an iron store of 500mg is available during the second and third trimesters of pregnancy (Aikawa, Jimba, Nguen, Zhao, Binns & Lee, 2006). However, most women worldwide enter pregnancy without adequate iron reserves or are already iron deficient due to poor compliance with iron supplements, frequent deliveries, and low iron bioavailability in diet (Dhakal, Chapman, Simkhada, Van Teijlingen, Stephens & Raja, 2007). According to Murray-Ko and Beard (2007), a present type of diet prevailing in most developing countries, there is a deficit of about 400-500mg in the amount of iron absorbed versus required during pregnancy.

A decline in iron status below 500mg during the second and third trimesters due to physiological changes that normally accompany pregnancy, leads to an increase in the efficiency of absorption of dietary or supplemental iron (Cambell, Graham & Norrby, 2006). For instance, in the second trimester, iron absorption is increased by about 50%, and in the last trimester, it may increase by up to about four times the norm due to the high demand for iron by the fetus (Bharati, Parul, Steven & Subarna, 2010).

Anaemia and iron deficiency anaemia in pregnancy can lead to adverse health outcomes for both mothers and their fetuses. Such outcomes are not limited to premature rupture of membrane, fetal growth restriction, premature birth, low birth weight, poor development of the fetal brain and cognitive abilities of the newborn) (Tan, He, Qi, Yang, Xiong, Liu, Wang, Zou, Lee, Sun, & Liu, 2020; Stephen, et al., 2018). In low and middle-income countries, 12% of low birth weight, 19% of preterm births, and 18% of perinatal mortality are attributed to maternal anaemia (Tan, et al., 2020). World Health Organisation revealed that, considering the marked increase in iron absorption during pregnancy, it is not possible to maintain the iron status of a pregnant woman with normal dietary practices, even if her diet's iron content and bioavailability are very high and that daily iron supplementation should be given in all pregnant women (WHO, 2016). In regions where iron deficiency anaemia prevalence is >40%, supplementation should continue in the postpartum period (Di Renzo, Spano, Giardina, Brillo, Clerici & Roura, 2015).

In Ghana, each pregnant woman is given 28 to 30 tablets of iron pills every month during antenatal visits. A pregnant woman is expected to take one tablet (60mg) of iron daily and finish the course by the end of every month (Appiah, Nkuah & Bonchel 2020; Peña-Rosas, De-

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Regil, Garcia-Casal & Dowswell, 2015). Despite all the efforts to prevent anaemia in pregnancy through the provision of iron supplements and iron nutrition education, the estimated prevalence of iron deficiency anaemia in some populations of pregnant women is relatively high.

Given that a positive effect of iron supplement therapy is achieved over a prolonged period, pregnant women may not adhere to iron treatment. Ponnusankar, Surulivelrajan and Anandamoorthy (2004) have questioned whether pregnant women have adequate knowledge of iron supplement therapy which to some extent can contribute to their compliance with an iron supplement. The results of the judgment of these scholars show some ambivalence. Pregnant women's knowledge about anaemia in pregnancy, treatment, compliance with iron supplements, anaemia complication, intake of iron-rich foods, and understanding of causes, symptoms, consequences and prevention of iron deficiency anaemia in pregnancy is not always adequate due to low level of education (Enas & Dhaher, 2020; Kamau, Kimani & Mirie, 2019). Some pregnant women lack knowledge of the importance of iron supplement therapy during pregnancy (Wu, Moser, Chung and Lennie, 2008). Others lack knowledge about the anaemia and consequences of poor compliance with iron supplements (Ugwu, Olibe, Obi, & Ugwu, 2014), or lack of understanding of the value of clinic visits (Anil, Javad, Sangolli, Mahesh & Jawaharlal, 2010). Some pregnant women thought the need for iron supplements was intermittent, so they stopped taking the drug to see whether the medication was still needed. This is purely due to a lack of knowledge on anaemia in pregnancy and its prevention or treatment (Bender & Bender, 2005). In this regard, maternal knowledge of iron supplements becomes significant to pregnant women (Alina, Otilia, Lidia, Raluca, Gina, Laura & Mariana, 2013).

Maternal knowledge of iron nutrition and supplementation has been associated with iron supplement uptake and improved iron deficiency anaemia (Kamau, Mirie & ThuoKimani, 2019; Theng, Zakaria & Yosof, 2017). However, in Ghana, it is not clear whether the high rate of iron deficiency anaemia in pregnancy could be related to low knowledge of iron nutrition and supplementation among pregnant women. This uncertainty is borne out of scarce data on maternal knowledge of iron nutrition and supplementation in Ghanaian health facilities (Appiah, Nkuah & Bonchel, 2020). Specifically, the objective of this study is to access maternal knowledge on iron nutrition and supplementation and its relationship with background factors.

METHODS

The study adopted a descriptive cross-sectional survey which took a snapshot of the maternal knowledge of iron nutrition and supplementation uptake in the Tain District. The Tain District is located in the Savanna Ecological Zone. It is one of the districts in the Bono Region of Ghana and accounts for 8% of Bono's total land area of 38,225 square kilometres. The district has Nsawkaw as its capital. Demographically, the Tain District is a rural district with about 109,342 people living in about 48 dispersed settlements. Less than 35 per cent of the female population has formal education in the Tain District. The major economic activities engaged in by people in the Tain District are farming and trading. Food and cash crop farming constitute the main livelihood activity in the Tain District. Tain District is a newly created district with ten health

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facilities made up of one hospital, five health centres, four clinics and one Community-Based Health Planning and Services (CHIPS) compound.

The target population for the study were pregnant women aged 13 years and above. However, only pregnant women who attended an antenatal clinic in the Tain District and were prescribed iron supplements were eligible for the study. The sample size was determined using Fisher's formula (Charan & Biswas, 2013). The formula is

$$n = \frac{z^2 pq}{d^2}$$

Where:

n = sample size

z= the standard normal deviate, usually set at 1.96 which corresponds to the 95 per cent confidence level

p= the proportion in the target population estimated to have inadequate knowledge of iron nutrition and supplementation=50%

q= the proportion in the target population estimated to have adequate knowledge of iron nutrition and supplementation (q=1.0 – p)

d= degree of accuracy desired, set at 0.05

For the purpose of the study,

z = 1.96, i.e. 95 per cent confidence level

p= 0.50 because the Tain District Annual Health Reports from 2011 to 2012 as shown in Table 1 below indicate that over 50% of the pregnant women were given iron nutrition and supplementation education to improve their knowledge.

q =1.0-0.50=0.50

d=0.05

Substituting these into the formula, we have:

$$n = \frac{(1.96)^2 (0.50)(0.50)}{(0.05)^2}$$

$$n = \frac{(3.84)(0.25)}{0.0025}$$

$$n = \frac{0.96}{0.0025}$$

n =384

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The calculated value 'n' showed a minimum sample size of 384. Because the study population was < 10 000, and on average, less educated populations tend to have higher non-response rates (Reyes, 2016), the sample was adjusted, and a non-response rate of 25% was added to arrive at a minimum sample size of 480. The ten health facilities in the Tain district were stratified and considered. A simple random sampling method was used to sample 480 pregnant women from the list of 2869 pregnant women registered at the antenatal clinic. Thus, all pregnant women who met the inclusion criteria were informed about the study and those who provided verbal and written informed consent to participate in the study were recruited.

Table 1: Proportionate allocation for each health facility in the Tain District

Names of Health Centres	Pregnant women prescribed with iron pills	Percentages	Sample size (n)
Debibi Clinic	285	9.9	47.0
Maame Nyarko Health Centre	422	14.7	70.0
Seikwa Health Centre	328	11.4	54.0
Brodi Health Centre	288	10.0	48.0
Nsawkaw Hospital	402	14.0	67.0
Badu Health Centre	388	13.5	64.0
Namasa Clinic	140	5.9	28.0
Menji Maternity Clinic	337	11.7	56.0
Brohani Clinic	170	5.9	28.0
Hani CHIPS Compound	109	3.8	18.0
Total	2869	100	480

A questionnaire was used to collect quantitative data. The first part of the questionnaire solicited background information from respondents. This information included age, parity, marital status, religion, education, occupation, spousal education, spousal occupation and duration of pregnancy. The second part of the questionnaire measured the knowledge level of pregnant women on iron nutrition and supplementation during pregnancy. This variable was categorized into components: source of iron nutrition, why the need for iron nutrition and supplementation, how to take the iron pills, iron absorption, side-effects, deficiencies, deceptions associated with iron supplements during pregnancy and contrary indicators of iron supplements. These variables were measured using the modified Morisky scale (Vlasnik, Aliotta, & DeLor, 2005; Setyowati, 2003). A total of 33 true statement questions about iron nutrition and supplementation (items) were asked on a 5-point Likert scale with options as strongly agree, agree, uncertain, strongly disagree and disagree.

The questionnaire was pre-tested in a health facility that was not included in the actual data collection. To ensure validity, the questionnaire was shared and discussed with experts from the Department of Clinical Nutrition, and the study supervisor. The obtained feedback was used to cleanse the questionnaire and improve its quality to ensure the achievement of it's intended purpose. The reliability of the questionnaire was measured after pre-testing. The overall reliability coefficient, using Cronbach's alpha was 0.8153 while inter-item covariance was 0.77; suggesting that the measure of knowledge of iron nutrition and supplementation derived from the measures were robust.

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The questionnaires were administered by trained research assistants to all pregnant women who met the inclusion criteria and consented to the study. Four research assistants were recruited with a background in health, specifically diploma nurses and nutritionists, to assist in data collection. They respectfully approached pregnant women after their antenatal care, established rapport with them and requested their time to explain the study to them. For those who agreed, the consent form was read to them and they were allowed to seek further clarifications about the study. Those who consented to participate in the study then signed a consent certificate and were guided to answer the questionnaire. However, those who consented to participate in the study but did not have time to answer the questionnaire immediately after the antenatal care were allowed to send the questionnaire home and return it during the next antenatal visit.

Coding of the questionnaire was done by adding all the questions under a variable and the totals were grouped. For variable knowledge, thirty-three true statement questions related to iron nutrition and supplementation variable were asked to assess whether pregnant women knew the source of iron nutrition, the need for an iron supplement, how to take the iron pills, side effects, iron absorption, contrary indicators and iron deficiencies. These thirty-three questions were used to generate one dependent variable called knowledge of iron nutrition and supplementation. Out of a sample size of 480 pregnant women, 479 answered the questionnaire. There was no mission observation and the response rate was 99.8%. Knowledge of iron nutrition and supplementation was measured when all the responses for each respondent were added from questions 1 to 33. For participant 1, the total was 122, for participant 2, the total was 122, for participant 3, the total was 90, participant 4 the total was 90, up to the last participant. The scale used was 1= strongly disagree, 2=disagree, 3=uncertain, 4=agree and 5=strongly agree. If a participant's total score is above 93, it means agree which indicates that she has adequate knowledge of iron nutrition and supplementation, hence, the code given is 1. However, if the total score is 93 or less, it means disagree, representing inadequate knowledge of iron nutrition and supplementation and hence the code given is 0. Thus, > 93 the code is 1= agree = adequate knowledge, while ≤ 93 the code is 0 = disagree = inadequate knowledge. This transformation yielded a dependent variable to measure knowledge of iron nutrition and supplementation.

Descriptive analysis, Bivariate analysis (Chi-Square test) and multivariable logistic regressions were used. Descriptive analysis was used to determine the frequencies and percentages for the categories of the background variables (independent variables). Bivariate analysis was used to investigate the association between knowledge of iron nutrition and supplementation and background variables. Multivariable logistic regression was employed to predict group membership and variations in the likelihood of an event occurring.

ETHICAL CONSIDERATION

Ethical approval with reference number TDA/AB/114/236/170 was obtained from the Ethic Committee of Tain District Assembly, Ghana. Measures to ensure the privacy and confidentiality of information were provided. No participant's name was mentioned in any report. Academic staff, students, health professionals, staff of Ghana Health Service and non-governmental organisations may sometimes look at the research records. The participants were made to know that participation was voluntary, and therefore they have the right to not participate in the interview.

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Assent forms were strictly used for minors below 18 years. The information which describes the benefits, risks and procedures for the research study was read and or explained to minors. They were allowed to ask any questions about the research. Those who agreed to participate were allowed to write their name and sign or thumbprint. Witness for a volunteer was also made to sign against his or her name to confirm that he/she was present while the benefits, risks and procedures of the study were read and explained to the volunteer. All questions were answered and the volunteer agreed to take part in the research.

Both the minors and adults were made to be aware that they reserved the right to withdraw at any point in time without any adverse effects on them. Informed consent was obtained from each participant by reading the information contained in the consent form to them. Participants were again made to be aware that the research has been reviewed and approved by the Ethical Review Committee of the Tain District Assembly for this reason if they have any questions about their rights as a research participant, they can contact the District Coordinator at the Tain District Assembly between the hours of 8:00 am and 4:30 p.m. through the phone lines 0201161855.

RESULTS

Background characteristics of the participants

Table 2 presents the background characteristics of the respondents. The modal age for the group was 25-29 years (25%). Nineteen per cent of the respondents were less than 20 years while 20% were aged 30-34 years. Eighty-five per cent of the respondents were married and 62% were farmers. Thirty-six per cent of the respondents were Catholics, followed by Muslims (19.2%). Pentecostals and Protestants constituted 16% and 13% respectively.

Forty-four per cent of respondents had no formal/primary education. Thirty-three per cent had education up to middle/JHS while 22.8% had education up to secondary/higher. The results show that 36% of the husbands of respondents had no formal/primary education while 35% had secondary/higher education. Among the husbands of pregnant women, farmers accounted for 53%. This reflects the situation in the area where farming is the predominant occupation.

Table 2: Background characteristics of the participants

Background characteristics	N=479	Percentage
Age		
<20	93	19.4
20-24	90	18.8
25-29	119	24.8
30-34	96	20.0
35+	81	17.0
Marital status		
Single	14	2.9
Cohabiting	57	11.9
Married	408	85.2
Religion		
Catholic	174	36.3

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Protestant	64	13.4
Pentecostal	75	15.7
Charismatic	51	10.6
Muslim	92	19.2
Traditional	23	4.8
Education level of participants		
No formal/Primary education	212	44.2
Middle school/JHS education	158	33.0
Secondary/Higher education	109	22.8
Occupation of participants		
Farming	299	62.0
Artisan/Service	113	24.0
Managerial/Professional	67	14.0
Education of husband		
No formal/Primary education	170	36.0
Middle school/JHS education	140	29.0
Secondary/Higher education	169	35.0
Occupation of husband		
Farming	252	53.0
Artisan/Service	76	16.0
Managerial/Profession	151	31.0
Number of children		
None	137	29.0
One	93	19.0
Two	66	14.0
Three or more	183	38.0
Number of stillbirths		
None	364	76.0
One	70	14.0
Two	37	8.0
Three or more	8	2.0
Duration of pregnancy		
Trimester I	34	7.0
Trimester II	213	45.0
Trimester III	232	48.0
Educated on iron supplement		
Yes	466	97.0
No	13	3.0

Maternal knowledge of iron nutrition and supplementation by background characteristics

Out of the total respondents, 36% had adequate knowledge of iron nutrition and supplementation. The results showed that maternal knowledge of iron nutrition and supplementation varied by background characteristics. Twenty-two per cent of pregnant women aged <20 years had adequate knowledge of iron nutrition and supplementation. The age of the respondent showed a significant association with knowledge of iron nutrition and supplementation. Twenty-seven per cent of respondents who were married had adequate

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knowledge while 37% of cohabiters had adequate knowledge of iron nutrition and supplementation. The association between marital status and maternal knowledge of iron nutrition and supplement was significant (P = 0.003).

The proportion of Catholics who had adequate knowledge of iron nutrition and supplement was 26%. Forty-five per cent of Protestants had adequate knowledge of iron nutrition and supplement. The result showed the difference between religion and maternal knowledge of iron nutrition supplementation (P=0.001). In Table 3, 14% of pregnant women with no formal/primary education had adequate knowledge of iron nutrition and supplementation while 66% of respondents with secondary/higher education knew about iron nutrition and supplementation. The association between the level of education and knowledge of iron nutrition and supplementation was significant (P=0.001).

Twelve per cent of pregnant women whose spouses had no formal/primary education had adequate knowledge of iron nutrition and supplementation while 55% of pregnant women whose spouses had education up to secondary/higher education had adequate knowledge of iron nutrition and supplementation.

Table 3: Maternal knowledge of iron nutrition and supplementation by background characteristics

Background Characteristics	*Adequate Knowledge* No. (%)	*Inadequate Knowledge* No. (%)	P-Value
Age			
< 20	20 (22%)	73 (78%)	
20 - 24	33 (37%)	57 (63%)	
25 - 29	57 (37%)	62 (64%)	0.039**
30 - 34	43 (45%)	53 (55%)	
35 +	38 (49%)	43 (53%)	
Marital status			
Never married (single)	14 (100%)	0 (0%)	
Cohabiting	21 (37%)	36(63%)	0.003**
Married	126 (27%)	282 (73%)	
Religion			
Catholic	44 (26%)	130 (74%)	
Protestant	29 (45%)	35 (55%)	
Pentecostals	27 (36%)	48 (64%)	0.001**
Charismatic	24 (47%)	27 (53%)	
Moslem	24 (26%)	68 (74%)	
Traditional/Pagan	3 (13%)	20 (87%)	
Education level of participants			
No formal /Primary education	28 (14%)	184 (86%)	
Middle school/JHS education	46 (28%)	112 (72%)	0.001**
Secondary/Higher education	80 (66%)	29 (34%)	
Occupation of participants			

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Farming	121 (19%)	178 (81%)	
Artesian/Service	50 (47%)	63 (53%)	0.012**
Managerial/Professional	42 (63%)	25 (37%)	
Education of husband			
No formal/Primary education	46 (12%)	124 (88%)	
Middle/JSS	29 (21%)	111 (79%)	0.001**
Secondary/Higher education	90 (55%)	79 (45%)	
Occupation of husband			
Farming	46 (18%)	206 (82%)	
Artesian/Technician/Services	32 (37%)	44 (63%)	0.001**
Managerial/Professional	86(72%)	65 (28%)	
Duration of present pregnancy			
Trimester I (0-4 months)	28 (82%)	6(18%)	
Trimester II (5-7 months)	59 (28%)	154 (72%)	0.873
Trimester III (8 months and above)	78 (34%)	154 (66%)	
Number of children			
None	28 (21%)	109 (79%)	
One	33 (35%)	60 (65%)	0.001**
Two	23 (35%)	43 (65%)	
Three and above	61 (33%)	122 (67%)	

Correlates of maternal knowledge of iron nutrition and supplementation

The analysis of knowledge of iron nutrition and supplementation by background variables suggested that maternal knowledge of iron nutrition and supplementation is influenced by some background variables (Table 3). Further analysis of knowledge of iron nutrition and supplementation by background variables was conducted using multivariable logistic regression. It was observed that husband education, was a significant determinant in predicting the wife's knowledge of iron nutrition and supplementation during pregnancy. Pregnant women whose husbands had no formal/primary education and middle/JHS education are less likely (AOR=0.0078(95% CI: 0.021, 0.294) and (AOR=0.223(95% CI: 0.067, 0.743) respectively to have adequate knowledge of iron nutrition and supplementation than those whose husband have secondary/higher education.

The number of children attained by a pregnant woman was assessed to ascertain its effect on knowledge of iron nutrition and supplementation. Pregnant women who have one child alive and those who have two children alive had lower odds (AOR= 0.150(95% CI: 0.053, 0.426) and (AOR= 0.375(95% CI: 0.146, 0.963) of having adequate knowledge of iron supplement therapy than those who have three or more children alive. None of the educational levels of the respondents was a significant predictor of knowledge of iron nutrition and supplementation.

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Table 4: Correlates of maternal knowledge of iron nutrition and supplementation

Variables		Wald	Sig.	Exp(B)	95% C.I. for EXP(B) Lower	Upper
Step 1[a]	**Age**	4.789	0.442			
	<20	0.002	0.969	0.981	0.379	2.542
	20-24	2.174	0.140	0.449	0.155	1.302
	25-29	0.763	0.382	0.569	0.160	2.017
	30-34	2.505	0.114	0.312	0.074	1.320
	35+					
	Marital status	1.180	0.554			
	Single	1.092	0.296	0.488	0.127	1.873
	Cohabiting	0.178	0.673	0.829	0.347	1.982
	Married					
	Occupation of participants	3.261	0.196			
	Farming	0.000	0.997	0.000	0.000	
	Artisan/Services	0.000	0.997	0.000	0.000	
	Managerial/Professional					
	Education of participants	0.390	0.823			
	No formal/Primary educ.	0.000	0.997	0.000	0.000	
	Middle school/JHS educ.	0.000	0.997	0.000	0.000	
	Secondary/Higher educ.					
	Education of husband	16.540	0.000			
	No formal/Primary	14.255	0.000	0.078	0.021	0.294
	Middle school/JHS educ.	5.964	0.015	0.223	0.067	0.743
	Secondary/Higher educ.					
	Occupation of husband	11.213	0.004			
	Farmer	1.631	0.202	2.067	0.678	6.300
	Artisan/Service	1.766	0.184	0.479	0.162	1.418
	Managerial/Professional					
	Duration of pregnancy	0.304	0.859			
	Trimester I	0.215	0.643	1.303	0.426	3.986
	Trimester II	0.006	0.936	0.976	0.534	1.783
	Trimester III					
	Number of children	12.868	0.005			
	None	2.735	0.098	0.383	0.123	1.195
	One	12.691	0.000	0.150	0.053	0.426
	Two	4.157	0.041	0.375	0.146	0.963
	Three or More					

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DISCUSSION

The study sought to find out factors associated with maternal knowledge of iron nutrition and supplementation. Generally, maternal knowledge of iron nutrition and supplementation was low. The mother's level of education was not associated with maternal knowledge of iron nutrition and supplementation. Husbands' level of education was associated with maternal knowledge of iron nutrition and supplementation. The number of children and the number of previous miscarriages pregnant women have had served as predictors of knowledge of iron nutrition and supplementation.

The background data of the pregnant women are shown in Table 2. Their ages ranged from <20 to 44 years old, while the majority of them were married (85%), worked as farmers (62%), with no formal/primary education (44%). Generally, pregnant women's knowledge of iron nutrition and supplementation was low (36%). This finding was similar to Ahamed, Kotb and Hassanen (2020) who studied the knowledge and attitude of pregnant women about iron deficiency anaemia at Assist University Women's Health Hospital, Egypt and found that 60% of the participants had poor knowledge of iron deficiency anaemia.

Interestingly, the result in Table 4 showed no significant association between knowledge of iron nutrition and supplementation and education of pregnant women. Similar to this finding, Theng, Zakaria and Yosof (2017) and Hasnah, Mohd Razif, Wan Nor Aliza, Hassan Basri, Yuzana, and Rohimah, (2020) also found no association between knowledge of iron supplements and education of pregnant women. Again, a similar result was found by Xu, Liu, Rao, Shi, Wang, Sharma, and Zhao (2016) that pregnant women with higher educational levels do not necessarily have better knowledge of anaemia and concluded that the prevention and intervention programmes should focus on pregnant women at all education levels.

The association between maternal knowledge of iron nutrition and supplementation and the husbands' level of education was found in the present study. Pregnant women whose husbands have no formal/primary education and those whose husbands have middle/JHS level of education were less likely to have adequate knowledge of iron nutrition and supplementation than those whose husbands have secondary/higher education. This finding is contrary to Hasnah, et al. (2020) who studied anaemia-related knowledge among pregnant women in Kuala Terengganu, Malaysia and found no association between anaemia-related knowledge among pregnant women and their husbands' level of education. This finding may be because pregnant women whose husbands have no formal/primary education may be less informed about their health and adverse pregnancy outcomes by their low-educated husbands compared to those whose husbands have higher education (Habib, Zein-Alabdin, Alenazy & Nooh, 2009). Furthermore, pregnant women whose husbands have low education may find it difficult to read about iron nutrition and supplementation. As a result, they may not be able to share information about the benefits of iron nutrition and supplementation with their wives.

The association between knowledge of iron nutrition and supplementation and the number of children a pregnant woman has was given credence by this study. Pregnant women who had one child and pregnant women who had two children had lower odds of having adequate knowledge of iron nutrition and supplementation compared to pregnant women who had three or more children. This finding is similar to Kamau, Mirie and ThuoKimani (2019) who studied maternal knowledge on iron and folic acid supplementation and associated factors among pregnant women in a rural county in Kenya and found that multiparous women were more

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likely to score high knowledge of iron and folic acid supplementation knowledge than pregnant women with no or one child. Besides, women with more children receive more family support regarding knowledge of and compliance with iron nutrition and folic acid supplementation during pregnancy (Tinago, Annang Ingram, Blake & Frongillo, 2017). Mortality risks from specific causes including coronary disease, circulatory disease, and cancer increased for multiparous women than primiparous (Dior, Hochner et al., 2013). These risks perhaps influence pregnant women with more than three children to attend the antenatal clinic and seek more information about healthy living including knowledge of and compliance with iron nutrition and supplementation.

IMPLICATION TO RESEARCH AND PRACTICE

Poor knowledge of iron nutrition and supplementation can lead to poor compliance with oral iron supplements. This in turn can lead to anaemia in pregnancy. This can result in the inadequate transfer of oxygen to the body tissue by the red blood cells, increasing the risk for cesarean delivery, transfusion, prenatal bleeding, preeclampsia and placental abruption. Besides, poor compliance due to inadequate knowledge of iron nutrition and supplementation is associated with an increased risk for poor cognitive, motor, socio-emotional and neurophysiologic development of the child. Knowledge of iron nutrition and supplementation can be improved if health education on iron nutrition and supplementation is strengthened by targeting pregnant women at risk of inadequate knowledge of iron nutrition and supplementation.

CONCLUSIONS

Pregnant women's knowledge of iron nutrition and supplementation is low. Maternal knowledge of iron nutrition and supplementation varies by background characteristics such as spousal level of education, number of children, and number of previous miscarriages. Pregnant women whose husbands have no formal/primary education and middle school/JHS education were less likely to know about iron nutrition and supplementation. Pregnant women who have one child and two children were less likely to know about iron nutrition and supplementation. Health education on iron nutrition and supplementation uptake should be strengthened by targeting pregnant women at risk of inadequate knowledge of iron nutrition and supplementation. Women could be identified by stratification based on personal factors (such as education, number of children and number of previous miscarriages). Further study should be conducted across the region to assess the association between knowledge of iron supplementation and compliance.

LIMITATIONS

Although the sample size was relatively large, it was not representative of the population of pregnant women in Ghana. Besides, the study involved only one district which may affect the generalisability of the study findings.

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FUTURE RESEARCH

The study only looked at the factors associated with maternal knowledge of iron nutrition and supplementation. It is, therefore, suggested that future studies should look at the influence of maternal knowledge of iron supplementation on compliance with daily iron supplement uptake during pregnancy.

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