ORIGINAL ARTICLE

Knowledge of Oral Iron Consumption among Pregnant Women at Hospital Universiti Sains Malaysia

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ABSTRACT

Introduction: Knowledge of oral iron consumption has been shown to affect compliance with oral iron supplementation. The aim of this study was to evaluate the knowledge of oral iron consumption among pregnant women at Hospital Universiti Sains Malaysia. **Methods:** This was a cross-sectional study conducted among 410 pregnant women attending the Obstetrics Clinic, Hospital Universiti Sains Malaysia from 1st October 2019 until 27th February 2020. The study used a validated questionnaire consisting of 41 items. The sociodemographic profile, obstetrics characteristics, iron supplementation details, and knowledge score were analysed as descriptive data. The association between the knowledge score and the associated factors were determined using simple and multiple linear regression analyses. **Results:** Of the 389 respondents, the majority (90.7%) had poor knowledge, and only 9.3% of pregnant women had good knowledge. Less than 50% were aware that iron supplements should be resumed up to six weeks postpartum. Merely 36.8% knew that milk would not help in iron absorption, and only 10% knew that abdominal pain is one of the side effects of oral iron supplements. Less than one-third knew that tofu and potatoes have high iron content. Age, educational level, maternal gravidity, history of oral iron intake and compliance status (missed iron pills more than seven days) were significantly associated with knowledge score ($p \leq 0.05$). **Conclusion:** Poor knowledge of oral iron consumption among pregnant women have been established. Effective counselling and educational programmes on oral iron supplementation should be initiated to improve awareness among pregnant women.

Keywords: Pregnant Women, Iron Supplements, Anaemia, Knowledge

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INTRODUCTION

Anaemia is a common health issue affecting 38.2% of pregnant women worldwide. Globally, 50% of the anaemia cases are contributed by iron deficiency (1). In Malaysia, iron deficiency anaemia (IDA) among pregnant women remains a significant burden to the health authority (2). The prevalence of IDA and iron depletion among Malaysian pregnant women are reported at 31.6% and 19.1%, respectively (3). Generally, pregnant women are more vulnerable to iron depletion because of the inadequate iron stores to fulfil the high iron needs during pregnancy. It is obvious that gestational anaemia is associated with various effects on both mother and foetus including maternal fatigue, reduced exercise tolerance, increased incidence of preterm birth and lowered foetal birth weight (4,5). Besides, prepartum anaemia may increase risk of postpartum haemorrhage (PPH) as a study among pregnant women in Tanzania has shown that the risk of PPH is significantly higher among pregnant women with gestational anaemia. The authors have proposed that severe anaemia can affect myometrial contractility due to low supplies of haemoglobin and oxygen to the uterus (6). These findings are consistent with a study reported by Frass (2014) which found that about 30% of anaemic pregnant women developed PPH due to uterine atony, which eventually leads to high risk of postpartum blood transfusion (7). Postpartum haemorrhage audit showed that pregnant women with anaemia were at a higher risk of receiving blood transfusion (58.5%) compared to pregnant women without anaemia (17.8%) (8).

Blood transfusions are associated with multiple potential adverse effects, such as allergic reactions, haemolytic transfusion reactions, the transmission of infectious agents, etc. (9). The increasing awareness about the safety of blood transfusion has led to an implementation of principles for patient blood management (PBM) concepts

aimed at optimising erythropoiesis, minimising blood loss and increasing anaemia tolerance with the overall goal of improving patient outcomes (10). Appropriate management of anaemia and IDA in pregnancy is a part of PBM in obstetrics. Daily oral iron intake with low dose of iron (30 to 60 mg) is strongly recommended to all pregnant women to ensure sufficient red cell mass and haemoglobin concentration. A higher dose of elemental iron (120 mg) is indicated for pregnant women with confirmed IDA (11). Oral iron supplementation is also advocated to be resumed 6 to 12 weeks following delivery in areas with high prevalence of gestational anaemia (12). In Malaysia, oral iron supplements are freely distributed to all pregnant women with the dose ranged between 100 to 200 mg of ferrous iron/day (2). Though oral iron supplements are freely provided to all pregnant women, poor adherence with oral iron therapy remains as an important factor leading to the partial success of this PBM programme (2,13,14). Awareness of oral iron intake by pregnant women may be lacking, which are the main factors as a motivation or barrier to the intake of oral iron supplements.

Lacerte et al. (2011) have shown that the adherence to oral iron therapy is significantly correlated with the knowledge of anaemia (p value < 0.05) (15). Researchers in India reported that pregnant women's understanding regarding the adverse impacts of anaemia in pregnancy and the benefits of oral iron therapy were the key elements for adherence to iron supplementation (16). The level of knowledge of oral iron consumption varies across developing countries. In Indonesia, research conducted by Titaley et al. (2017) revealed that only 10% of the pregnant women had better awareness regarding oral iron supplementation (17). Ghimire et al. (2013) reported that 48.7% of pregnant women in Nepal had clear understanding about anaemia and iron supplements (18). In Shkodra, Albania, researchers have reported that only 32.6% of pregnant women had sufficient knowledge of oral iron intake and a proportion of them perceived that iron supplementation has detrimental effects on the mother and baby (19). A local study conducted in Kuala Terengganu demonstrated that only 58.3% of pregnant women had good awareness of iron consumption (20). Locally, few studies have been undertaken to determine the knowledge of pregnant women in term of anaemia and its general preventions. However, the study of knowledge explicitly for oral iron intake is still limited. Only one study evaluated pregnant women's knowledge and attitude towards oral iron intake, but the study tool used was not properly validated. Therefore, the purpose of this research was to explore the knowledge of oral iron consumption among pregnant women at Hospital Universiti Sains Malaysia (USM), Kelantan.

MATERIALS AND METHODS

A cross-sectional study was conducted between 1st October 2019 to 27th February 2020. This study involved 410 pregnant women receiving treatment at the Obstetrics Clinic, Hospital Universiti Sains Malaysia, Kelantan. The participants were recruited based on systematic random sampling from which any second registered patient was chosen. The sample size was estimated based on 5% precision and 95% confidence level, using a single proportion calculation concerning the study done by Sonkar et al. (2017) in which 40% of the population had adequate knowledge (21). The minimum sample size required was 405. A self-administered, and validated questionnaire which was developed in the Malay language was used to collect the study data. On average, each questionnaire took about 20 minutes to complete. All pregnant women who received treatment at the Obstetrics Clinic, Hospital Universiti Sains Malaysia, understood the Malay language and gave informed consent in writing were included in this research. Those who were an illiterate, non-Malaysian resident and/or had any mental disorder were excluded from this study.

The questionnaire development included several stages, including an extensive review of the literature (16, 21–26), content validation by a multidisciplinary group of experts and face validation by 30 pregnant women. Subsequently, a validation study was conducted twice, involving 122 separate pregnant women for each validation study 1 and 2. Besides, 30 respondents from validation study 1 were tested twice using the same set of questionnaires at an interval of two weeks apart to determine the test-retest reliability. The knowledge items were analysed using two-parameter logistic item response theory (2-PL IRT) analysis using R package ltm. There were 22 knowledge items in the validation study 1 but reduced to 19 items after the repeat IRT analysis as the difficulty and discrimination parameters of these remaining 19 items were close to or within the acceptable values. The Cronbach's alpha was > 0.7, and Intraclass Correlation Coefficient (ICC) value for test-retest was 0.74 which were considered acceptable.

The questionnaire consisted of four sections with 41 questions: (i) sociodemographic profile (8 items), (ii) obstetrics characteristics and iron supplementation details (15 items), (iii) knowledge of oral iron consumption (18 items) (one item regarding the timing of oral iron intake was excluded from the validated questionnaire due to availability of the new type of iron supplement which best taken with meals). The knowledge response was rated based on a three-point scale (True/False/Don't know). One mark was given for each 'Correct' answer, and zero marks were given for 'Wrong' or 'Don't know' responses. The knowledge rating ranged from 0 - 18. Based on the expert opinion of a senior obstetrician, nine items out of 18 were listed as the fundamental items for determining the extent of knowledge of oral iron intake in pregnant women. Participants who responded accurately to all the fundamental items were considered

as having good knowledge.

An ethical approval was obtained from the Human Ethics Committee of Universiti Sains Malaysia [ref no: USM/JEPeM/19010047]. The confidentiality of the data was strictly protected.

Data entry and analysis were performed using International Business Machine Corporation (IBM) Statistical Package for the Social Sciences (SPSS) version 26.0 (SPSS, Chicago, IL). The sociodemographic profile, pregnancy characteristics, iron supplementation details, knowledge and perception of the pregnant women were analysed and presented as descriptive data. The data were presented as frequency (percentage) for categorical variables and mean (standard deviation) for numerical variables. The association between the sociodemographic profile, obstetrics characteristics, iron supplementation details and the outcome of interest (knowledge score) were determined using simple and multiple linear regression analyses. $p < 0.25$ was set for inclusion of variables for multivariable analysis. Backward selection method was explored for variable selection in the multivariable analysis. The level of statistical significance was set at $p \leq 0.05$.

RESULTS

Sociodemographic profile, pregnancy characteristics, and iron supplementation

A total of 410 questionnaires were distributed, and 389 completed questionnaires were returned, achieving a response rate of 94.8%. Table I and II present the sociodemographic profile, pregnancy characteristics and oral iron supplementation details of the respondents. The mean age of the respondents was 31.07 ± 5.63 years. The majority were Malay (98.5%) and married (99.7%). They were predominantly unemployed (41.4%) and had secondary education (44.7%). Most of the pregnant women were multigravida (80.5%) and in the third trimester of pregnancy (66.3%). Out of 313 multigravida women, only 11.3% had a history of anaemia in the previous pregnancy. About 5.9% of the respondents had blood disorders in current pregnancy with IDA was the most common blood disorders reported (91.3%). More than half (53.7%) of the respondents were not aware of their haemoglobin level. Two hundred and thirty-five (60.4%) respondents had previous experience of oral iron consumption. Most of the respondents (96.4%) were recommended for oral iron supplements during current pregnancy, and only 11.1% experienced adverse effects of iron supplements. Out of 375 respondents advised for oral iron supplementation, 39.8% were either partial or non-compliant with oral iron therapy. Forgetfulness (55.0%) was the main cause of poor compliance.

Table I: Sociodemographic profile of pregnant women

Characteristics	n (%)
Age[a] (years)	31.07 ± 5.63
Ethnicity	
Malay	383 (98.5)
Chinese	3 (0.8)
Indian	0
Others	3 (0.8)
Marital status	
Married	388 (99.7)
Unmarried	1 (0.3)
Education level	
No formal education	0
Primary school	4 (1.0)
Secondary school	174 (44.7)
Certificate/Diploma	96 (24.7)
Degree/master/PhD	115 (29.6)
Occupation	
Government	120 (30.8)
Private	55 (14.1)
Self-employed	51 (13.1)
Student	2 (0.5)
Unemployed	161 (41.4)
Household income[b] (RM)	
< 4360 (B40 - Bottom 40%)	300 (77.1)
4360 – 9619 (M40 – Middle 40%)	75 (19.3)
9619 (T20 – Top 20%)	14 (3.6)
Husband's education level	
No formal education	1 (0.3)
Primary school	22 (5.7)
Secondary school	196 (50.4)
Certificate/Diploma	90 (23.1)
Degree/master/PhD	80 (20.6)
Smoking status	
Smoker	11 (2.8)
Non-smoker	378 (97.2)

[a] Age is expressed as mean (standard deviation)
[b] Household income is categorised based on the 2018 report from Khazanah Research Institute (27)

Knowledge of oral iron supplementation

The mean knowledge score was 11.1 ± 3.32. Of the 389 respondents, only 36 (9.3%) respondents had good knowledge, while 353 (90.7%) had poor knowledge score. Table III shows knowledge of oral iron supplementation of the respondents. Three hundred and fifty-three (90.7%) respondents understood that they should take oral iron supplement every day, but less than half (48.6%) answered correctly that iron supplements should be taken up to six weeks postpartum. About half (50.4%) of the pregnant women knew that the dosage of iron therapy increases with worsening of iron deficiency anaemia. Most of the respondents were mindful that tea (70.2%) and coffee (70.4%) do not help in iron absorption, but only 36.8% responded correctly that milk does not help in absorption of iron. Unfortunately, only a few of the respondents (10%) were aware that abdominal pain is one of the side effects of iron tablets. Less than one-third knew that tofu and potatoes have high iron content.

Association between knowledge score and sociodemographic profile, pregnancy characteristics and iron supplementation

Ten variables, i.e. age, education level, husband's education level, household income, smoking status, maternal gravidity, history of oral iron intake, aware of their haemoglobin level, advised for oral iron intake within the last four weeks, and compliance status (missed iron pills >7 days) were significantly associated with knowledge score in the univariable analysis ($p \leq 0.05$). However, variables with p-value < 0.25 were included for multivariable analysis. In the multivariable

Table II: Pregnancy characteristics and oral iron supplementation details

Characteristics	n (%)
Maternal gravidity	
Primigravida	76 (19.5)
Multigravida	313 (80.5)
Maternal parity	
0 – 1	151 (38.8)
2	238 (61.2)
Gestational age	
First trimester (≤ 12 weeks)	17 (4.4)
Second trimester (13 – 27 weeks)	93 (23.9)
Third trimester (≥ 28 weeks)	258 (66.3)
Unsure	21 (5.4)
History of anaemia in previous pregnancy	
Yes	44 (11.3)
No	249 (64.3)
Unsure	20 (5.1)
Missing data	76 (19.5)
History of oral iron intake	
Yes	235 (60.4)
No	136 (35)
Unsure	18 (4.6)
History of blood transfusion	
Yes	22 (5.7)
No	345 (88.7)
Unsure	22 (5.7)
Blood disorders in current pregnancy	
Yes	23 (5.9)
No	346 (88.9)
Unsure	20 (5.1)
Most common blood disorders in current pregnancy	
IDA	21(91.3%)
Thalassaemia trait	2(8.7%)
Aware of their haemoglobin level	
Yes	180 (46.3)
No	134 (34.4)
Unsure	75 (19.3)
Advised for oral iron intake last 4 weeks	
Yes	375 (96.4)
No	12 (3.1)
Unsure	2 (0.5)
Source of iron pills	
Received from clinic	320 (82.3)
Bought from pharmacy	55 (14.1)
Missing info	14 (3.6)
Aware of the name of iron pills	
Yes	159 (40.9)
No	119 (30.6)
Unsure	97 (24.9)
Missing data	14 (3.6)
Aware of the dose of iron pills	
Yes	35 (9.0)
No	291 (74.8)
Unsure	49 (12.6)
Missing data	14 (3.6)
Adverse effects of iron pills	
Yes	43 (11.1)
No	303 (77.9)
Unsure	29 (7.5)
Missing data	14 (3.6)
Compliance status (Frequency of missed iron pills in last 4 weeks)	
Never missed iron pills	62 (15.9)
Missed iron pills 1-7 days	113 (29.0)
Missed iron pills >7 days	42 (10.8)
Unsure	158 (40.6)
Missing data	14 (3.6)
Reasons for non-compliance	
Iron pills not available	43 (11.1)
Forgetfulness	214 (55.0)
Side effects	16 (4.1)
Others	40 (10.3)
Missing data	76 (19.5)

analysis, only age, education level, maternal gravidity, history of oral iron intake and compliance status (missed iron pills >7 days) remained significantly associated with knowledge score. The respondents who were one year older had 0.24 significantly higher knowledge score (adjusted β = 0.24, 95% CI 0.13, 0.36, p ≤ 0.0001) and

Table III: Knowledge of oral iron supplementation

Items	Correct respondents n (%)
1. Iron requirement during pregnancy increases as pregnancy progress.	227 (58.4)
2. Anaemia in pregnancy can cause lethargy.	342 (87.9)
3. Anaemia in pregnancy may increase risk of preterm delivery.	308 (79.2)
4. Iron-rich foods:	
a) Eggs	214 (55.0)
b) Cockles	341 (87.7)
c) Tofu	145 (37.3)
d) Potatoes	147 (37.8)
5. Oral iron supplementation can prevent anaemia.[a]	290 (74.6)
6. Oral iron supplementation is necessary for normal foetal growth.[a]	352 (90.5)
7. Pregnant women should take oral iron supplement every day.[a]	353 (90.7)
8. Pregnant women should continue taking oral iron supplement until 6 weeks postpartum.[a]	189 (48.6)
9. Dose of oral iron supplement increases with worsening of IDA.[a]	196 (50.4)
10. Drinks/foods that can enhance oral iron absorption:	
Tea[a]	273 (70.2)
Coffee[a]	274 (70.4)
Milk[a]	143 (36.8)
Orange[a]	306 (78.7)
11. Side effects of oral iron supplement:	
Constipation	162 (41.6)
Abdominal pain	39 (10.0)

[a] *Fundamental item to assess knowledge of oral iron consumption among pregnant women*

those with a tertiary education had 1.33 significantly higher score in knowledge compared to those with secondary education (adjusted β = 1.33, 95% CI 0.09, 2.58, p = 0.036).

Pregnant women who were multigravida had 2.05 significantly lower knowledge score compared to primigravida (adjusted β = -2.05, 95% CI -3.95, -1.45, p = 0.035) and the respondents who had no history of oral iron intake had 1.48 lower knowledge score than those who had previous experience of oral iron consumption (adjusted β = -1.48, 95% CI -2.91, -0.04, p = 0.045). Pregnant women who were non-compliant with iron supplements (missed iron pills >7 days) had 1.63 lower knowledge score compared to those who were compliant (never missed iron pills) (adjusted β = -1.63, 95% CI -2.86, -0.40, p = 0.010). Approximately 30% of the variation in knowledge score was explained by age, education level, gravidity, history of oral iron intake and compliance status (missed iron pills >7 days) according to the multiple linear regression model (R2=0.296) (Table IV).

DISCUSSION

The findings of our study demonstrated that 11.3% of multigravida women had history of anaemia in previous

Table IV: Association of knowledge score with respondents' sociodemographic profile, pregnancy characteristics and iron supplementation details

Characteristic	Simple linear regression		Multiple linear regression	
	Crude β (95% CI)	*p*-value	Adjusted β (95% CI)	*p*-value
Age, years	0.12 (0.07,0.18)	0.0001	0.24 (0.13,0.36)	0.0001
Ethnicity				
Malay	Ref			
Non-Malay	0.28 (-2.41, 2.97)	0.840		
Marital status				
Married	Ref			
Unmarried	-5.08 (-11.60, 1.45)	0.127		
Education level				
Secondary education	Ref		Ref	
Tertiary education	1.40 (0.75,2.05)	0.0001	1.33 (0.09,2.58)	0.036
Husband's education level				
Secondary education	Ref			
Tertiary education	1.09 (0.43,1.75)	0.001		
Household income				
Low income	Ref			
Middle and high income	1.42 (0.64,2.20)	0.0001		
Smoking status				
Non-smoker	Ref			
Smoker	-2.77 (-4.76,-0.80)	0.006		
Maternal gravidity				
Primigravida	Ref		Ref	
Multigravida	1.22 (0.40,2.05)	0.004	-2.05 (-3.95,-1.45)	0.035
Maternal parity				
0 – 1	Ref			
2	0.37 (-0.31,1.05)	0.283		
Gestational age				
First trimester (≤ 12 w)	Ref			
Second trimester (13 – 27 w)	-0.02 (-1.86,1.82)	0.985		
Third trimester (≥ 28 w)	0.39(-1.21,1.99)	0.632		
History of anaemia in previous pregnancy				
Yes	Ref			
No	-0.80 (-1.84,0.25)	0.134		
History of oral iron intake				
Yes	Ref		Ref	
No	-0.75 (-1.44,-0.06)	0.033	-1.48 (-2.91.-0.04)	0.045
History of blood transfusion				
Yes	Ref			
No	-0.13 (-1.54,1.27)	0.854		
Blood disorders in current pregnancy				
Yes	Ref			
No	-1.08 (-2.47,0.30)	0.126		
Aware of their haemoglobin level				
Yes	Ref			
No	-1.11 (-1.81,-0.40)	0.002		
Advised for oral iron intake last 4 weeks				
Yes	Ref			
No	-2.23 (-4.13,-0.32)	0.022		
Aware of the name of iron pills				
Yes	Ref			
No	-0.68 (-1.41,0.05)	0.069		
Aware of the dose of iron pills				
Yes	Ref			
No	-0.55 (-1.67,0.58)	0.337		
Compliance status (Frequency of missed iron pills in last 4 weeks)				
Never missed iron pills	Ref		Ref	
Missed iron pills 1-7 days	-0.71 (-1.64,0.21)	0.130		
Missed iron pills >7 days	-1.87 (-3.21,-0.51)	0.007	-1.63 (-2.86,-0.40)	0.010

Ref: Reference group
The backward method was applied for variable selection in multivariable model. No multicollinearity was detected in the model. Model assumptions were fulfilled. Coefficient of determination (R^2) = 0.296.
p is significant at 0.05

pregnancy, and only 5.9% of the pregnant women had blood disorders in the current pregnancy. IDA was the most common blood disorders reported. The prevalence of anaemia in our study was substantially lower compared to previous studies which reported that the prevalence of gestational anaemia in Malaysia ranged between 33% to 43.6% (3, 28). The contradicting results could be due to the prevalence of anaemia in both studies was calculated based on the Full Blood Count results performed on patients' sample which could be more reliable compared to ours in which the prevalence of anaemia and IDA were derived from what was reported by the respondents. The fact that 5.1% of the pregnant women in our study were unsure whether they had IDA in the current pregnancy and more than half (53.7%) of them did not aware of their haemoglobin level, these may indicate that they were not well informed and had less awareness regarding their medical conditions and health status.

The majority of our respondents had poor knowledge even though most of them were multigravida and had a previous experience of oral iron intake. Overall, only 9.3% of the respondents had good knowledge. This

finding was consistent with a study reported by Titaley et al. (2017) which showed that only 10% of the pregnant women in Indonesia had sufficient knowledge about oral iron supplementation (17). In the local setting, our finding was lower compared to a study among pregnant women in Kuala Terengganu, in which 58.3% had good knowledge (20). The difference might be attributed to the education level whereby their subject's education level was predominantly diploma or degree compared to our subjects, which was secondary school. Besides, the definition of good knowledge in their study was different as the overall accurate response of 76% was considered good. In our study, 100% accurate response was required, in which all the fundamental items need to be answered correctly.

More than half of the respondents (51.4%) did not know that oral iron supplement should be resumed until six weeks postpartum. Consistent with our finding, about 40% of pregnant women in India failed to consume oral iron tablets postnatally, contributing to the high prevalence of postpartum anaemia (29,30). Poor awareness regarding these issues may be attributed to a lack of knowledge on the benefits of postnatal iron intake and improper implementation of postnatal iron supplementation guideline by health care facilities (31). In addition, only half (50.4%) of the respondents knew that the dose of iron tablets should be increased as iron deficiency anaemia worsened. In Germany, the dose of oral iron tablets ranged from 7 to 80 mg/day for women without IDA and 5 to 200 mg/day for women with IDA (32). Good knowledge of the precise dose of iron supplements is crucial to maintain a desirable iron status during pregnancy. The inadequate iron dose can predispose women to IDA, while excess iron could result in the formation of reactive oxygen species and lipid peroxidation in which both circumstances may have a detrimental effect on mother and foetus (33,34).

Most of the respondents were aware that tea (70.2%) and coffee (70.4%) do not enhance iron absorption. Surprisingly, more than half of the respondents were not well educated about the milk's effect on iron absorption. Similar findings were recorded among pregnant women in Kuala Lumpur, where 81.9% of the respondents knew that tea and coffee could inhibit iron absorption, but knowledge about the effect of milk on iron absorption was not evaluated in this study (25). On the other hand, researchers in Ethiopia estimated that 69.5% of the pregnant women did not know that consuming tea, coffee, and milk would hinder the absorption of iron. Hence, coffee and milk were consumed extensively by most of the women surveyed (35).

Regarding the dietary iron, half of the respondents knew that eggs were a decent source of iron, but less than one-third were aware that tofu and potatoes are also rich in iron. This result was consistent with a study published in India which reported that only 25% and 40% of the pregnant women knew that chicken and eggs are good source of iron, respectively (16). Another study in Saudi Arabia also revealed that almost half of the respondents had inadequate knowledge of iron sources, as most of them could not differentiate between various types of iron-rich foods (36).

Awareness of the side effects of iron supplements was also low, as the respondents were unaware that the side effects of iron supplements include constipation (40%) and abdominal pain (10%). Research among pregnant women in Kenya revealed similar result as 48.7% of the participants did not know any side effects of iron supplements (37). A study on tolerability of oral iron pills found that 30-50% of the patients taking the iron supplements had adverse effects, mostly gastrointestinal disturbances (38). However, in our study, only 11.1% of pregnant women had adverse effects of iron supplements. The discrepancy could be attributed to an inability to recognise the symptoms due to poor understanding of the adverse effects of oral iron supplements.

In the current study, the knowledge score was influenced by maternal age, educational level, gravidity, history of oral iron intake, and compliance status (missed iron pills >7 days). There had been a greater level of awareness among pregnant women of older ages and higher education levels. Similarly, Kamau et al. (2019) reported that pregnant women aged more than 30 years were more prone to have better knowledge of oral iron supplementation compared to those below 30 years of age (37). Research among pregnant women in Saudi Arabia found that the knowledge score was higher among those with high education level, but there was no correlation between knowledge score and age (36). Educated pregnant women were possibly more concerned about their pregnancy and health of the foetus (28).

The lower knowledge score was correlated with multigravida women. In contrast to our result, researchers in Kenya reported that better awareness was observed among multiparous women compared to nulliparous women (37). The contrary effect could be due to multigravida women may believe that they were less vulnerable to IDA, thereby failing to obtain information on iron supplementation. Besides, insufficient knowledge was linked to pregnant women with no experience of oral iron intake. Similarly, a study conducted among pregnant women in Indonesia showed that a higher knowledge score was correlated with those taking iron supplements in previous pregnancy (39).

Poor knowledge score was also identified in pregnant women who were non-compliant with oral iron supplementation. Many researchers supported this finding (15,40,41). A study involving Indonesian pregnant women found that better compliance was observed among pregnant women with good knowledge

of oral iron consumption (17). As expected, educated pregnant women were more likely to have good knowledge because they may have extensive source of information about the benefits and importance of oral iron consumption. They also could be more concerned about undesirable pregnancy effects, resulting in more treatment adherence than uneducated women.

The present study used a validated and reliable questionnaire to assess knowledge of oral iron consumption among pregnant women. A validated and reliable questionnaire is essential to obtain good results. Our findings, therefore, give valuable insight into the knowledge of pregnant women about oral iron intake that can be used for potential improvement initiatives. Nevertheless, our study limitation is by the nature of data collection. All the samples were selected from a single centre with a homogenous population; hence the results may not reflect the degree of awareness and understanding of pregnant women nationwide. A broader range of patients' demographics could be analysed if a study is conducted in multiple centres.

CONCLUSION

Pregnant women in this study had inadequate knowledge about oral iron intake, which may affect the compliance towards oral iron supplementation. Therefore, it is important to implement appropriate and effective measures to improve knowledge of the pregnant women by giving clear instructions of oral iron intake, educating on the benefits of oral iron supplements and the adverse impacts of IDA in pregnancy and emphasising on the importance of compliance to oral iron consumption. Efficient educational resources such as booklets, pamphlets or online applications about oral iron supplementation, should be available and accessible to all pregnant women. In addition, involvement of the family members during clinic counselling is vital to ensure better understanding about oral iron consumption among pregnant women and their family members. Finally, attempts must be taken to improve the knowledge and counselling skills of health professionals by giving intensive training particularly among nurses and midwives who are often met by pregnant women.

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