Research Article

Knowledge, Attitude and Practice Towards Iron Deficiency Anaemia Among Pregnant Women in Kota Kinabalu, Sabah

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ABSTRACT

Introduction: Iron deficiency anaemia is a major public health concern, particularly among pregnant women, and it not only affects their health but also their birth outcomes. Despite the implementation of nutrition interventions and iron supplementation, the prevalence remains high. Therefore, this study aimed to determine the level of knowledge, attitude, and practice towards anaemia and its association with anaemia among pregnant women in Kota Kinabalu, Sabah. *Methods*: This cross-sectional study recruited 162 pregnant women aged 18 to 49 years who attended two randomly selected health clinic located in Kota Kinabalu, through convenient sampling. A Malay back-to-back translated questionnaire was used to determine the level of knowledge, attitude, and practice towards anaemia. *Results*: Most pregnant women (54.3%) had good knowledge and 51.2% showed a positive attitude towards anaemia. The pregnant women elicited moderate practice towards anaemia. A total of 37% of pregnant women were anaemia. No association was found between knowledge and attitude toward anaemia on the incidence of anaemia among pregnant women. *Conclusion*: This present study revealed that while most pregnant women had good knowledge and a positive attitude towards anaemia, their practices were only moderate. No association was found between knowledge and attitude and the incidence of anaemia. These findings warrant further in-depth study in a wider population of pregnant women to unravel the incongruities identified.

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1. Introduction

Proper nutrition is essential during the early stages of life, which begins during the early stage of pregnancy. During pregnancy, nutritional requirements increase to support fetal growth and development while maintaining maternal metabolism and tissue development (Yisak & Ewunetei, 2021). Common nutritional issues for pregnant women include anaemia and iodine deficiency (Daud *et al*., 2020). Anaemia can be caused by a variety of reasons, including nutrient deficiencies, an inadequate diet, infections, inflammation, chronic diseases, and genetic red blood cell disorders. Iron deficiency, mainly caused by insufficient dietary

iron consumption, is regarded as the most common nutritional deficiency that leads to anaemia (WHO, 2023).

Iron is a micronutrient that is engaged in a variety of enzymatic reactions that are critical in the transport of oxygen from blood circulation to the tissues. Women of childbearing age and pregnant women are among the most vulnerable populations to the development of anaemia (Chaparro & Suchdev, 2019). This issue arises during pregnancy because, despite the temporary absence of menstruation, the overall iron need during this period is much higher than in non-pregnant women (WHO, 2023).

According to WHO (2023), the global overall anaemia prevalence in women of reproductive age, aged 15-49 years, was 29.9%, which equates to more than half a billion women. In pregnant women, the prevalence was 36.5%. Since 2000, the global prevalence of anaemia in women of reproductive age remains unchanged, whereas the prevalence among pregnant women has decreased slightly (WHO, 2023). In Malaysia, according to the NHMS 2019, the overall prevalence of anaemia was 21.3%, and among women of the reproductive age group was 29.9% (IPH, 2019). Also, according to a review by Rahman *et al*. (2022), the prevalence of anaemia among pregnant women in Malaysia was between 19.3 and 57.4%, whereas the prevalence of iron deficiency anaemia ranged between 20.8 and 21.2%.

There is an urgent need to address the iron deficiency anaemia issue among pregnant women. As the prevalence of anaemia among pregnant women in Malaysia is increasing yearly, it may be due to their lack of knowledge of anaemia and food choices (Hasnah *et al*., 2020). However, there is still a lack of data on the information of knowledge, attitude, and practice studies toward anaemia among pregnant women, particularly in Sabah since most of the research was conducted in Peninsular Malaysia. Hence, this research aimed to determine the level of knowledge, attitude, and practice towards anaemia among pregnant women in Kota Kinabalu, Sabah.

2. Materials and Methods

2.1 Study Design and Location

This cross-sectional study was conducted to assess the level of knowledge, attitude, and practice towards anaemia among pregnant women in Kota Kinabalu, Sabah. This study employed quantitative research among 162 pregnant women. In this study, two out of five health clinics were randomly selected by using Statistical Package for Social Science (SPSS) version 28.0. Therefore, this study included health clinics at Inanam and Menggatal. Ethics approval was received from the Medical Research & Ethics Committee, Ministry of Health, Malaysia (Ethics approval number: NMRR ID-23-00793-MRI).

2.2 Study population

Sample size was calculated using a formula from Daniel (1999) at a 95% confidence level. The prevalence used was based on the study conducted by Kadir *et al*. (2021), in which 9.3% of the pregnant women had good knowledge. As the prevalence is less than 10%, the precision will be half of the prevalence, which is 0.047. The non-response rate of this study was 10%, thus the total sample size of this study was 162 pregnant women. Eligible pregnant women were recruited in this study. The inclusion criteria were (i) women who were pregnant (first to third trimester), (ii) Malaysian, (iii) attended a health clinic at Kota Kinabalu, (iv) aged between 18-49 (adult women of reproductive age) and (v) able to understand Malay. Pregnant women who were unable to respond and did not fulfil the criteria were excluded from this study. The exclusion criteria for this study were (i) having multiple pregnancies and (ii) having medical problems such as uncontrolled diabetes mellitus, hypertension, chronic kidney disease and thalassemia.

2.3 Data Collection Procedures

The data was collected physically through a self-administered questionnaire, which was at Inanam's and Menggatal's health clinic in September 2023. All eligible pregnant women who attended the antenatal check-up were approached at the waiting area. Written informed consent was obtained from the pregnant women prior to the beginning of the survey. The questionnaire consists of 4 sections. These include sociodemographic data, antenatal characteristics, the knowledge, attitude, and practice towards anaemia, and the use of iron supplements during pregnancy, respectively. For the knowledge, attitude, and practice towards anaemia, the questionnaire was adapted from a study by Huong *et al.,* (2022), where it was also adapted according to Food and Agriculture Organization (FAO) guideline (Jalambo *et al*., 2016; Macias & Glasauer, 2014; Shahzad *et al*., 2017). A back-to-back translation method was used to translate the questionnaire from English to Malay. The questions format was closed-ended. The KAP questionnaire consisted of 21 questions and was divided into three subsections, which were knowledge (11 questions), attitude (4 questions), and practice (6 questions).

2.3 Statistical analysis

The data of this study was analyzed by using the IBM SPSS version 28.0 (IBM, Chicago, IL, USA). This research study applied descriptive statistics to describe the level of knowledge, attitude and practice, and the sociodemographic data antenatal characteristics, in terms of frequency, mean, standard deviation, and percentage. The normality of continuous variables was determined using the Kolmogorov-Smirnov test. Pearson Chi-Square test was used to determine the association between knowledge, attitude and practice towards anaemia and the incidence of anaemia among pregnant women. Independent T-test and One-way ANOVA were used to compare the mean differences between the knowledge and attitude based on sociodemographic characteristics. Statistical significance was set at $p<0.05$ for all evaluated parameters.

3. Results and Discussion

A total of 162 pregnant women with a mean aged of 30.3±5.1 years participated in this study as shown in Table 1. The majority of the pregnant women (55.6%) aged between 30 to 49 years old. Most of the pregnant women (91.4%) were Bumiputera Sabah, followed by Malay (6.2%), and Chinese (2.5%). Based on the results, a total of 134 pregnant women (71.6%) were from B40 household income. A total of 62 of the pregnant women (38.3%) had the highest education level of at least secondary school; meanwhile, 24.2% had the highest education level of STPM/Diploma. At the time of the study, more than half of the pregnant women (53.7%) were in their third trimester.

The prevalence of iron deficiency anaemia among pregnant women in Kota Kinabalu, Sabah was found to be 37.0% (n=60). This study's finding was lower than a study conducted in Kuala Terengganu, Malaysia, which found 40.9% of pregnant women were anaemia (Bah *et al*., 2020). A possible explanation for this might be that in the previous study, the number of respondents was only 88 pregnant women, which was lower than this present study. In a review study by Rahman *et al*., (2022), it was found that the prevalence of iron deficiency anaemia among pregnant women in Malaysia was 31.6 to 34.6%, which was slightly lower than the present study. Another similar study that was conducted in Selangor, Malaysia, found the prevalence of anaemia was 33%, which was lower than this study (Soh *et al*., 2015). This might be because in the previous study, the data was collected only among pregnant women during their first antenatal check-up at 1st trimester, meanwhile, this present study included all pregnant women in all trimesters. Also, these differences highlight the need to consider other factors, including dietary intake as well as local factors and geographical location, when assessing the prevalence of anaemia among pregnant women (Abdallah *et al*., 2022). Location has a significant impact on the prevalence of iron deficiency anaemia (IDA)

among pregnant women. Urban locations often have better access to a variety of foods, healthcare facilities, and educational resources, which helps to reduce iron deficiency anaemia prevalence (Ayensu *et al.*, 2020).

Table 1 Sociodemographic and antenatal characteristics of the pregnant women (n=162)

Characteristics	Mean±SD	Frequency n(%)
Age group (years)	30.3±5.1	
18-29		72(44.4)
30-49		90(55.6)
Race		
Malay		10(6.2)
Bumiputera Sabah		148(91.4)
Chinese		4(2.5)
Education		
Primary school		29(17.9)
Secondary school		62(38.3)
STPM/Diploma		39(24.1)
Degree/Master		32(19.7)
Household income*, n=157		
B40(< RM 3490)		116(71.6)
M40 (RM 3490 – RM 8199) & T20 (> RM8200)		41(25.3)
Current pregnancy trimester		
First trimester		28(17.3)
Second trimester		47(29.0)
Third trimester		87(53.7)
Anaemia status, n=146		
Yes		60(37.0)
No		102(63.0)

*Source: Department of Statistics, Malaysia (2019)

Knowledge of the pregnant women towards anaemia was assessed by grading based on the number of correct answers. The mean knowledge score among the pregnant women was 6.41±4.42. The pregnant women scored an average of 58.3% and elicited a moderate level of knowledge towards anaemia. This study is in line with Zani et al., 2020 in which pregnant women in Kuala Terengganu had a moderate level of knowledge on anaemia. In this present study, more than half of the pregnant women (54.3%) had good knowledge. This score was higher than that of another study that was conducted among pregnant women in Sana'a-Yemen, where only 0.4% of the pregnant women had a high knowledge of anemia. The previous research also adapted the KAP questionnaire according to the Food and Agriculture Organization (FAO) survey questionnaire, which was similar to this present study's questionnaire. This difference can be due to 89.9% of the pregnant women being from rural areas and only 38.9% having secondary education (Al-Rabeei *et al.*, 2023). This present study was conducted in the capital city of Sabah, which is an urban area, and most of the pregnant women had their secondary school education and higher education level. Low or moderate levels of education significantly impact the prevalence of anaemia among pregnant women, as they influence health awareness, decision-making, and access to resources. Women with lower levels of education are more likely to have inadequate information about anaemia, including its causes, symptoms, and prevention efforts, which can lead to delayed diagnosis and bad eating habits. Adherence to anaemia prevention and treatment approaches, such as iron and folic acid supplements, is further limited by a lack of health literacy and poor communication with healthcare practitioners (Rahman *et al.*, 2022).

Meanwhile, as shown in Table 2, the mean score of attitude was 5.54±1.07, and the overall attitude was 69.3%, indicating an average attitude towards anaemia. The current study shows that more than half of pregnant women (51.2%) had a positive attitude towards anaemia. This study's finding was slightly higher than a similar study that was conducted in Sana'a-Yemen, as only 49.3% of the pregnant women had a positive attitude towards anaemia (Al-Rabeei *et al.*, 2023). Furthermore, this study was in line with a study conducted by Oumer *et al.*, (2019) in Ethiopia, as more than half, 52.3% had a favourable attitude towards the prevention of anaemia. Next, a study by Ahamed *et al.*, (2018) also found that four-fifths of the studied women had a positive attitude toward IDA. This discrepancy in outcomes is related to the respondents' social, cultural, and educational variances. The negative attitude was related to their confidence in the preparation of meals high in iron. Nutrition education and education intervention among pregnant women are recommended to influence dietary behaviour change (Katenga-Kaunda et al., 2022). This is evident in a study where nutrition education on anaemia, improved dietary intake and haemoglobin levels (Sunuwar et al., 2019).

Table 2 Classification of total scores knowledge and attitude towards anaemia, n=162 [Presented as mean ± SD or n(%)]

	Knowledge	**Attitude**
Mean±SD	6.41±4.42	5.54±1.07
Mean score	58.3	69.3
Classification		
Poor score	60(37.0)	3(1.9)
Moderate score	14(8.6)	76(46.9)
Good score	88(54.3)	83(51.2)

A total of 142 pregnant women (88.3%), consumed dietary haem iron in their meals. For daily consumption, a total of 107 pregnant women consumed green leafy vegetables (66.0%) the most. The pregnant women demonstrated moderate food selection practices as they had the highest daily consumption of green leafy vegetables (66.0%), with 41.4% consumed them with three or more servings in a day. However, this present study's finding was lower than that of a study conducted in Kuala Terengganu, Malaysia, which found that 95% of pregnant women claimed to consume vegetables daily (Bah *et al.*, 2020). Green leafy vegetables are a potential source of iron for people who are iron deficient (Nomkong *et al.*, 2019). Animal-based foods are better suppliers of iron, but because they are more expensive, people on low incomes acquire their iron from plant-based meals. In this study, it was found that there was a total of 71.6% of the pregnant women who were in the B40 category for their household income. Thus, green leafy vegetables can serve as an essential supply of iron for low-income communities due to their low cost and widespread availability (Gupta & Yadav, 2016; Nomkong *et al.*, 2019).

However, a low daily consumption of vitamin-C rich fruits among 70 pregnant women (43.2%) was observed, and only 1.9% ate vitamin-C rich fruits during meals to enhance iron absorption. This study finding was not in line with a similar study conducted at Sana'a-Yemen, as a higher percentage (77.4%) of the pregnant women consumed vitamin-C-rich fruits (Al-Rabeei *et al.*, 2023). In a study that was conducted in Kuala Terengganu, Malaysia, it was found that the study findings were higher than this present study, as 95% of the pregnant women claimed to eat fruits (Bah *et al.*, 2020). Ascorbic acid is a major enhancer of non-heme iron absorption, and several intervention studies using vitamin C-rich products in conjunction with iron sources demonstrated better iron status (Millman, 2020; Skolmowska & Glabska, 2022).

Furthermore, only 13 pregnant women (8.0%) included legumes in their daily meals. Consumption of animal meat and fish were higher in a week. There were 92 pregnant women consumed animal meats (56.8%), and 77 of them consumed fish (47.5%) weekly. For animal meats, most of pregnant women (56.8%) consumed them weekly. A total of 65.4% consumed 1-2 servings of animal meats in a day, which is the recommended serving size for a day (MDG, 2020). This study's finding was lower than a similar study in Kuala Terengganu, Malaysia that found 94% of pregnant women claimed to eat red meat, liver, chicken

and fish daily (Bah *et al*., 2020). Not only that, but 68 pregnant women did not often consumed junk food (42.0%) and 67 of them also reported not consumed legumes (41.4%) often. The lowest daily consumption was legumes, as only 8.0% of the pregnant women included legumes in their daily meals. Similarly, in a study that was conducted by Huong *et al*., (2022), it was found that only 12.0% of the women included legumes in their daily meals.

For coffee or tea, a total of 57 pregnant women (35.2%) did not drink often, whereas more than half (60.5%) never consumed or consumed less than 1 cup of coffee or tea per day. Meanwhile, for milk, almost half of the pregnant women consumed milk daily (49.4%), where 68.5% of them consumed 1 to 2 cups per day. The pregnant women usually consumed these beverages before meal, where coffee or tea was 34.6% and milk was 53.7%. Only a total of 25.3% of pregnant women drank tea or coffee during or after meals. This finding was not in line with a similar study conducted in Yemen, as it was found that 68.4% of the study's participants drank coffee or tea with meals, indicating a poor practice towards prevention of anaemia (Al-Rabeei *et al*., 2023).

The practice of skipping meals was detected in 65.4% of the pregnant women. The practice of skipping meals among the pregnant women was observed when 25.3% often, and 40.1% seldom skipped meals. This present study's finding was lower than a previous study that was conducted by Huong *et al*., (2022), where 87.1% of the participants skipped meals. This may be because, the previous study was conducted among university students which was among reproductive age, however this present study was conducted among pregnant women (Huong *et al*., 2022). Poorly diversified and micronutrient-deficient diets during pregnancy continue to be one of the leading causes of nutritional anaemia in developing nations (Vanié *et al*., 2021).

Table 3 Practice towards anaemia among pregnant women n=162 [Presented as mean ± SD or n(%)]

Characteristics	**Frequency n(%)**				
Do you consume dietary haem iron (present in animal meats)?					
Yes	143(88.3)				
No	19(11.7)				
How frequently do you consume the following foods?	Never	Not often	Monthly	Weekly	Daily
Animal meats	0(0.0)	17(10.4)	21(13.0)	92(56.8)	32(19.8)
Fish	4(2.5)	18(11.1)	16(9.9)	77(47.5)	47(29.0)
Vitamin C rich fruits	1(0.6)	11(6.8)	14(8.6)	66(40.7)	70(43.2)
Green leafy vegetables	0(0.0)	6(3.7)	5(3.1)	44(27.2)	107(66.0)
Legumes	6(3.7)	67(41.4)	16(9.9)	60(37.0)	13(8.0)
Coffee/Tea	43(26.5)	57(35.2)	16(9.9)	24(14.8)	22(13.6)
Milk	12(7.4)	28(17.3)	7(4.3)	35(21.6)	80(49.4)
Junk foods	9(5.6)	68(42.0)	22(13.6)	37(22.8)	22(16.0)
How much of the following foods do you consume per day?	Never or <1 serving/day		1-2 servings/day	>3 servings/day	
Animal meats	20(12.3)		106(65.4)	36(22.2)	
Fish	22(13.6)		121(74.7)	19(11.7)	
Vitamin C rich fruits	19(11.7)		104(64.2)	39(24.1)	
Green leafy vegetables	9(5.6)		86(53.1)	67(41.4)	
Legumes	100(61.7)		48(29.6)	14(8.6)	
How much of the following beverages do you consume per day?	Never or <1 cup/day		1-2 cups/day	4-6 cups/day	
Coffee/Tea	98(60.5)		62(38.3)	2(1.2)	
Milk	43(26.5)		111(68.5)	8(4.9)	

When do you usually consume the following foods?	Before meal	During meal	After meal	Never
Vitamin C rich fruits	61(37.7)	3(1.9)	95(58.6)	3(1.9)
Coffee/Tea	56(34.6)	11(6.8)	30(18.5)	65(40.1)
Milk	87(53.7)	6(3.7)	43(26.5)	26(16.0)
Do you tend to skip meals?				
Often	41(25.3)			
Seldom	65(40.1)			
Never	56(34.6)			

There was no significant association between knowledge and anaemia status of pregnant women. This indicates that whether the pregnant women knew about anaemia, its symptoms, causes, consequences, or prevention, it was not associated with their anaemia status. Furthermore, there was no significant association between attitude and anaemia. This indicates that self-awareness regarding anaemia, attitude regarding seriousness of anaemia, attitude on importance of including iron rich foods in diet, and self-confidence in preparing iron rich foods were not associated with a higher risk of being anaemia. This study is consistent with a study by Agustina *et al.*, (2021) that found no significant association between the KAP variables with anaemia prevalence. This shows that having high or moderate KAP scores toward anaemia was not associated with a lower risk of being anaemia (Agustina *et al.*, 2021).

Table 4 Association between knowledge and attitude towards anaemia with the incidence of anaemia among pregnant women

	Anaemia, n (%)	**Non-anaemia, n (%)**	**r**	**P value**
Knowledge				
Poor score	15 (9.3)	45 (27.8)	5.932	0.052
Moderate score	6 (3.7)	8 (4.9)		
Good score	39 (24.1)	49 (30.2)		
Attitude				
Poor score	1 (0.6)	2 (1.2)	0.022	0.989
Moderate score	28 (17.3)	48 (29.6)		
Good score	31 (19.1)	52 (32.1)		

4. Conclusion

Overall, more than half (54.3%) of the pregnant women demonstrated good knowledge towards anaemia. A positive attitude was also observed in most of the pregnant women (51.2%). However, a moderate level of practice towards anaemia can be seen among the pregnant women. In this present study, 37% of pregnant women were classified as anaemia. This present study highlights that the knowledge and attitude not associated with anaemic status among pregnant women. Future research can include pregnant women in a broader population in both urban and rural areas, as this present study was conducted in an urban area. Furthermore, future research can consist of dietary intake measurement as well to enhance the comprehensiveness of assessment and facilitate personalized interventions aimed at improving nutritional status and reducing the burden of anaemia.

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