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Research Article

Assessment of Knowledge, Attitude and Practice Levels Regarding Anaemia Among Pregnant Women in Putrajaya, Malaysia

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Abstract

Objective: This study aimed to determine knowledge, attitude and practice levels regarding anaemia among pregnant women in Putrajaya. This study was also conducted to identify the associations between knowledge, attitude and practice and socio-demographic and antenatal characteristics. **Methodology:** A total of 370 pregnant women participated in this study. Socio-demographic information and antenatal characteristics and knowledge, attitude and practice in relation to anaemia were collected using questionnaires. The Sysmex Haematology Analyser was used to measure the Full Blood Count (FBC). **Results:** The mean age and haemoglobin level of respondents were 30.2 ± 4.2 years of age and 12.1 ± 4.8 g dL⁻¹, respectively. The median for the total knowledge score was 84.2 and the mean score for attitude and practice were 72.4 ± 6.7 and 69.9 ± 13.1 , respectively. The subjects' knowledge score was higher among the group of second trimester ($p < 0.05$), the number of children three or more ($p < 0.01$) and a pregnancy distance of one to two years ($p < 0.001$). The attitude score was higher among the working subjects ($p < 0.05$) but there was no significant difference in practice scores according to sociodemographic and antenatal characteristics ($p > 0.05$). Knowledge had a moderate and significant relationship with attitude ($r = 0.317$, $p < 0.01$) but no significant relationship with practice. Meanwhile, attitude had a significant positive and moderate relationship with practice ($r = 0.330$, $p < 0.01$). **Conclusion:** Positive attitude regarding anaemia influences the high level of knowledge and good practice concerning this condition. Increasing the level of awareness of anaemia among pregnant women is seen as an important step in improving knowledge, attitude and practice levels regarding anaemia.

Key words: Anaemia, knowledge, attitude, practice, pregnant women

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Anaemia is a major public health problem throughout the world. Anaemia is a condition whereby the number of red blood cells that transport oxygen are insufficient to meet the needs of the body. Haemoglobin is a component found in red blood cells that carries oxygen¹. Pregnant women are classified as anaemic when their haemoglobin concentration falls below² 11.0 g dL⁻¹. According to a report by the World Health Organization³, the global prevalence of anaemia among pregnant women aged 15-49 years old was 38.2%, while the prevalence of anaemia in pregnant women in Asian countries was 39.3%. In the context of South-Eastern Asia, Vietnam has the lowest prevalence of anaemia among pregnant women at 23%, followed by Timor-Leste at 24% and Malaysia at 27%, while Cambodia comparatively has the highest prevalence of anaemia during pregnancy at 51%³.

During pregnancy, women will experience higher blood volume and an increase in the mass of red blood cells, an expansion of 45%⁴. Therefore, pregnant women are at a higher risk of anaemia during pregnancy and this increases the risk of complications that contribute to the morbidity and mortality of the mother and foetus, such as foetal growth retardation, stillbirth and maternal deaths during childbirth⁵.

Lack of knowledge about nutrition is perceived to be a factor that leads to malnutrition and may trigger practices that cause complications⁶. According to Moradi *et al.*⁷, an assessment of the level of knowledge and practice concerning anaemia among pregnant women in Iran showed that only 43.3% of pregnant women consumed iron supplements appropriately, even though 75.9% of the pregnant women were aware of the importance of iron during pregnancy. The level of knowledge, attitudes and practices regarding anaemia is very closely associated and if the level of aforementioned elements is low, there is a tendency for complications.

According to the Ministry of Health in Malaysia, in 2014, 14.2% of pregnant women in Putrajaya had a recorded case of anaemia at 36 weeks of gestation⁸. This percentage was higher than the goal of 11.8% set by the Ministry of Health Malaysia in 2014 for the prevalence of pregnant women with anaemia. In recognizing the importance of knowledge, attitude and practice related to anaemia among pregnant mothers, this study was conducted to assess those factors in relation to socio-demographic and antenatal characteristics.

MATERIALS AND METHODS

Sampling and study location: A cross-sectional study was performed at four government health clinics in Putrajaya,

namely, Precinct 9, Precinct 11, Precinct 14 and Precinct 18, from September, 2016 to April, 2017. The study sample consisted of 370 pregnant women aged between 21-44 years old who visited the government health clinics in Putrajaya for the first time during the current pregnancy. The survey employed a random sampling method. The sample size calculation was performed according to the total number of new antenatal cases registered at government health clinics in Putrajaya using a 95% confidence level and 5% margin of error⁹.

Ethical approval: This study was approved by the Ministry of Health, Malaysia [Reference No. NMRR-15-2138-28447(IIR)] and the Research Ethical Committee of Universiti Kebangsaan Malaysia (Reference No. UKM PPI/111/8/JEP-2016-274). Written consent was also collected from the respondents prior to commencement of the research.

Questionnaires: The questionnaires were administered in the Malay language. A standardized questionnaire was used to collect data on the participants' socio-demographic profiles, which included age, ethnicity, educational level, occupation and household income. Antenatal characteristics were also included in the questionnaire and comprised week of gestation, number of children and haemoglobin level. There were 19 questions on knowledge, 17 questions on attitude and 13 questions on practices related to anaemia, its common cause, signs and symptoms and treatment and prevention. Frequency analysis was calculated for each question for the knowledge, attitude and practices sections using percentages of correct versus incorrect answers in the knowledge section (true/false), positively versus negatively answered questions in the attitude (agree/disagree) and practice sections (yes/no). If an answer in the knowledge section was correct, it was scored as 1 and 0 if incorrect. Good responses in the attitude section were scored as 1 and poor responses were scored as 0. Positive answers were scored as 1 and negative answers were scored as 0 for the practice section. The overall knowledge, attitude and practice sections of the respondents were assessed using sum score outcome, which is classified into three categories: good, moderate and low. A score of 50% and below was ranked as low level, 51-69% was categorized as medium level and 70% and above was rated as a good level¹⁰. The questionnaire was piloted with 38 respondents for acceptability and consistency. The knowledge and attitude sections were developed by reviewing the literature and were tested for reliability using Cronbach's alpha. Both the variables were measured at 0.82 and 0.72, respectively, indicating an acceptable internal consistency of the scale item¹¹. The

developed practice section from the literature review was tested for reliability using the Kuder-Richardson Formula 20 (KR20) and measured 0.80, which is in the acceptable range¹². As the consistency and validity of the study questionnaire were stabilized, the instrument was made available for data collection.

Blood sampling: Trained medical personnel at the respective health clinics took the blood samples of the respondents. The Sysmex Haematology Analyser (Sysmex Europe GmbH, KX-21N™) was used to measure the Full Blood Count (FBC) in unit g dL⁻¹. Blood samples were taken from the subject's venous line in the cubital fossa (front of the elbow). The results of the analysis evaluated the status of haemoglobin, which was divided into a normal group (Hb>1 g dL⁻¹) and an anaemia group (Hb<11 g dL⁻¹).

Data analysis: All data from this study were analysed using the Statistical Package for Social Sciences (SPSS) version 23.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics, such as frequency, mean, standard deviation and percentage, were used to describe socio-demographic characteristics, antenatal characteristics and blood test values. Based on stem and leaf plot analysis, the data of the knowledge score were not normally distributed, while the attitude and practice scores were normally distributed. Therefore, both parametric tests (independent t-test and one-way ANOVA) and non-parametric tests (Mann-Whitney and Kruskal-Wallis test) were used to compare the differences between groups. Pearson correlation and Spearman's rank correlation coefficient were used to evaluate the relationship between the study variables. Statistical significance was set at p<0.05.

RESULTS AND DISCUSSION

Socio-demographic and antenatal characteristics: The socio-demographic characteristics of the study respondents are presented in Table 1. The sample population included 370 pregnant women who visited four government health clinics in Putrajaya. The majority of the respondents (38.4%) were between 31-35 years of age with a mean age of 30.2±4.2 years. The respondents in this study comprised of Malays (90.8%), Chinese (5.4%), Indians (3.2%) and other ethnic groups (0.6%). Most of the respondents were Malaysian Higher School Certificate (STPM)/diploma holders (45.1%), followed by degree holders (24.9%) and Malaysian School Certificate (SPM)/Malaysian Certificate of Education (MCE) holders (24.6%); only 5.4% held a master's degree. Since Putrajaya is a Federal Government Administrative Centre, a

Table 1: Socio-demographic and antenatal characteristics of study respondents (n = 370)

Characteristics	No. of sample	Percentage	Mean±SD
Age (years)			
21-25	56	15.1	30.2±4.2
26-30	135	36.5	
31-35	142	38.4	
≥36	37	10.0	
Race			
Malay	336	90.8	-
Chinese	20	5.4	
Indian	12	3.2	
Others	2	0.6	
Education level			
SPM/MCE	91	24.6	-
STPM/Diploma	167	45.1	
Degree	92	24.9	
Master	20	5.4	
Occupation			
Government employee	238	64.3	-
Private	58	15.7	
Self employed	8	2.2	
Housewife	66	17.8	
Household income			
<RM3000	71	19.2	5277.2±2420.8
RM3001-RM6000	217	58.6	
RM6001-RM9000	56	15.1	
>RM9000	26	7.1	
Gestational week			
First trimester	211	57.0	15.5±6.2
Second trimester	141	38.1	
Third trimester	18	4.9	
No. of children			
0	116	31.4	1.4±1.2
1-2	194	52.4	
≥3	60	16.2	
Hemoglobin level (g dL⁻¹)			
Non-anaemic	279	75.4	12.1±4.8
Anaemic	91	24.6	

majority of the respondents were government employees (64.3%) and the others were housewives (17.8%) followed by private-sector employees (17.8%) and self-employed (2.2%). The household income of the respondents was divided into four categories with a mean of RM5277.2±2420.8. Most of the respondents (58.6%) had a household income between RM3001 and RM6000, followed by 19.2% with a household income below RM3000. More than half of the respondents (57.0%) were in the first trimester, while the others had a gestational week indicating the second trimester (38.1%) and third trimester (4.9%), with a mean of 15.5±6.2 weeks of gestation. The majority of the respondents (52.4%) had one to two children (with a mean of 1.4±1.2). The mean haemoglobin level was 12.1±4.8 g dL⁻¹ and three-fourths of the respondents were not anaemic.

Assessment of knowledge on anaemia: Table 2 describes the responses to the individual knowledge questions by the

Table 2: Respondents responses to knowledge questions on anaemia during pregnancy (n = 370)

Statements	Percentage	
	Correct	Wrong
Anaemia is a condition that occurs when there is a shortage of red blood cells	89.2	10.8
Hemoglobin (Hb) in the blood less than 11 g dL ⁻¹ is known as anaemia	81.1	18.9
Iron requirement for pregnant women is higher than women who are not pregnant	91.9	8.1
Worm infection can cause anaemia	33.0	67.0
Inadequate intake of iron in the diet during pregnancy can cause anaemia	82.2	17.8
Gap duration between pregnancies less than 2 years is one of the causes of anaemia during pregnancy	51.1	48.9
Pale face or tongue is a sign of anaemia	85.1	14.9
Tired and weak are the symptoms of anaemia	89.5	10.5
Anaemic pregnant women at risk of losing their lives during or after pregnancy	69.5	30.5
Anaemia during pregnancy will cause low birth weight babies (less than 2.5 kg)	67.6	32.4
Intake of diet rich in iron during pregnancy can prevent anaemia	93.8	6.2
Liver is a food that high in iron	80.5	19.5
Meat is from animal sources that are rich in iron	75.4	24.6
Green leafy vegetables such as spinach are vegetables sources which rich in iron	89.2	10.8
Intake of citrus fruits such as lemons during the main meal can help the absorption of iron	75.9	24.1
Drink coffee or tea will decrease iron absorption if taken during the main meal	81.9	18.1
Anaemic pregnant women should take iron pills every day to prevent anaemia	87.6	12.4
Pregnant women are given iron pills for free by the health clinic during pregnancy	92.2	7.8
Regular medical check-ups during pregnancy are important	96.5	3.5

respondents. A total of 64 respondents (17.3%) answered all the questions of knowledge correctly and scored 19, which was equivalent to 100%. This indicates that the knowledge of those respondents in relation to anaemia was at a high level. Questions 1 and 2 pertained to the definitions of anaemia and most of the respondents were able to answer these two questions correctly, at 89.2 and 81.1%, respectively. Based on this high percentage, the respondents of this study already knew the definition of anaemia. For question 4, 67% of the respondents were under the assumption that worm infection can cause anaemia. For question 6, more than half of the respondents (51.1%) did not know that a duration in the gap between pregnancies of less than two years is among the causes of anaemia during pregnancy. In addition, there were several aspects of knowledge regarding anaemia that were answered correctly by more than 85% of respondents. This can be observed for questions 7 and 8, with the percentage of those who answered correctly being relatively high, at 85.1 and 89.5%, respectively. From these results, it was seen that respondents' knowledge and awareness on the signs and symptoms of anaemia was at a good level.

In addition, knowledge concerning risk of anaemia reflected different percentages. For example, for questions 9 and 10, only 69.5 and 67.6% of the respondents, respectively, were aware of the risk that anaemia holds for the expectant mother and child. Questions 11, 12, 13, 14, 15 and 16 showed percentages ranging from 75.4-93.8% for questions assessing the knowledge of the respondents regarding diet for treatment or prevention of anaemia. The answers to question 11 indicate that majority of the respondents (93.8%) were

aware that one means of prevention of anaemia is through the intake of a diet rich in iron during pregnancy. Based on question 13, 75.4% of the respondents knew that meat from animal sources is rich in iron, while for question 15, only 75.9% of the respondents knew that the intake of citrus fruits like lemons assist the absorption of iron. Questions 17, 18 and 19 indicate that most of the respondents (87.6, 92.2 and 96.5%, respectively) recognized another aspect of treatment of anaemia besides diet modification, with correct answers.

Assessment of attitude on anaemia: Responses to the attitude statements are reported in Table 3. The high percentage recorded for question 1 (87.8%) indicates the respondents were aware that anaemia is a serious health problem and this is illustrated in question 6, which found that a total of 85.4% of the respondents agreed that treating anaemia during pregnancy is beneficial for the baby. However, question 2 obtained a lower score, whereby 49.4% of the respondents agreed that all pregnant women would have anaemia and similarly, for questions 7 and 9, 48.6% of the respondents believed that it is impossible to prevent anaemia during pregnancy and 48.3% of the respondents agreed that anaemia is difficult to treat. Question No. 2, 7 and 9 showed that most of the respondents believed that anaemia is a common health problem experienced by all pregnant women and that it is neither preventable nor treatable. Furthermore, 51.5% of the respondents (question 3) believed that anaemia causes the pregnancy to be challenging. This is because anaemia causes pregnant women to be too tired to work, as stated in question 4 and 84.3% of the respondents agree with

Table 3: Respondents responses to attitude questions on anaemia during pregnancy (n = 370)

Statements	Percentage		
	A/SA*	UD*	DA/SDA*
Anaemia is a serious health problem	87.8	8.4	3.8
All pregnant women will have anaemia	49.4	33.8	16.8
Anaemia causes the pregnancy to be difficult	51.5	41.4	7.1
Anaemia makes pregnant women feel too tired to work	84.3	13.8	1.9
Anaemia complicates the birthing process	55.5	37.0	7.5
Treating anaemia during pregnancy is good for the baby	85.4	13.0	1.6
It is impossible to prevent anaemia during pregnancy	48.6	31.4	20.0
Gap duration between pregnancies is important to prevent anaemia	61.9	34.3	3.8
Anaemia is difficult to treat	48.3	33.3	18.4
It is difficult to prepare foods that are rich in iron	70.0	11.9	18.1
It is important for pregnant women to eat what they want during pregnancy even though they are low in iron content	62.7	16.8	20.5
The combination of iron supplementation and balanced diet during pregnancy is able to treat anaemia	85.1	10.8	4.1
It is important for pregnant women with anaemia to take iron tablets every day	85.4	11.6	3.0
Iron tablets will not cause the baby in the womb big in size	20.3	42.7	37.0
Pregnant women should undergo regular medical examinations during pregnancy	82.1	13.5	4.4
Pregnant women should take iron tablets even if they adopt a balanced diet during pregnancy	77.9	18.1	4.0
It is possible I will have anemia	45.4	37.0	17.6

*A/SA: Agree/Strongly agree, UD: Undecided, DA/SDA: Disagree/Strongly disagree

this statement. More than half (55.5%) of the respondents stated that anaemia also complicates the birthing process.

Question 8 states that the duration of the gap between pregnancies is important to prevent anaemia and 61.9% of the respondents agreed with this statement. For question 10, more than half (70.0%) of the respondents stated that it is difficult to prepare food that is rich in iron and 62.7% of the respondents believed that it is important for pregnant women to eat as she desires during pregnancy, even though the food may be low in iron (question 11). This belief will influence the intake of healthy nutrition during pregnancy and consequently will affect the intake of important nutrients such as iron.

In addition, a small percentage of the respondents (20.3%) believed that iron tablets will not cause the baby in the womb to increase in size, while 37.0% of the respondents believed otherwise and 42.7% were undecided for question 14. This shows that this belief is still held by the respondents and may influence the pattern of consuming iron tablets. However, a majority of the respondents (85.4%) agreed that the consumption of iron tablets daily is important for pregnant women with anaemia, as shown in question 13 and 77.9% of the respondents agreed that pregnant women should take iron tablets even if they adopt a balanced diet during pregnancy (question 16). Thus, most of the respondents agreed on the importance of iron tablets for pregnant women to meet their iron needs during pregnancy. For the treatment of anaemia, most of the respondents (85.1%) believed that the combination of iron supplementation and a balanced diet during pregnancy can treat anaemia as stated in question 12.

In addition, the statement that pregnant women should undergo regular medical examinations during pregnancy was agreed to by 82.1% of the respondents (question 15). Only 45.5% of the respondents stated that it is possible for them to have anaemia. Nonetheless, a high sense of self-assurance among the respondents indicates that they may not experience anaemia.

Assessment of practice on anaemia: Practices towards anaemia were assessed by asking the thirteen questions shown in Table 4. A majority of the respondents, 69.5%, changed their normal dietary patterns during pregnancy, as they were more concerned about the intake of healthy food and 72.4% were not vegetarian during pregnancy. For question 3, only 26.8% of the respondents did not experience vomiting in their first trimester of pregnancy and 73.2% experienced otherwise. Vomiting during early pregnancy can lead to a lack of nutritious food intake, especially food that contains iron. More than three-quarters of the respondents (77.3%) answered positively for question 4, which meant that they did not have pica during pregnancy. Pica is the intake of a non-food substance that contains no nutrients such as soil, clay, lime, soap and ice¹³. Question 5 showed that 54.9% of the respondents were not practising food taboos during pregnancy. Food taboos are practised by certain races in relation to pregnancy and may also influence the pattern of food intake by pregnant women. Based on a study in Mali, Africa, egg was avoided during pregnancy because it was believed to cause malaria, while meat was avoided because it was believed to make the baby heavier and may cause

Table 4: Respondents responses to practice questions on anaemia during pregnancy (n = 370)

Statements	Percentage	
	Positive	Negative
Have you changed your normal dietary patterns during pregnancy?	69.5	30.5
Are you a vegetarian during pregnancy?	72.4	27.6
Do you vomit in early pregnancy?	26.8	73.2
Do you have pica (such as ice, mud or charcoal) during pregnancy?	77.3	22.7
Are you practicing food taboos during pregnancy?	54.9	45.1
Do you eat meat/poultry/fish in your diet every day during pregnancy?	97.6	2.4
Are you taking citrus fruits or fruit juice during the main meal every day during pregnancy?	84.1	15.9
Do you include green leafy vegetables in your daily diet during pregnancy?	91.4	8.6
Do you drink coffee or tea during the main meal during pregnancy?	57.3	42.7
Do you skip meals during pregnancy?	64.6	35.4
Do you use cooking utensils made of iron during cooking?	83.5	16.5
Are you taking iron tablets daily before enrolling in a health clinic?	60.0	40.0
Do you take any supplements or traditional medicine during pregnancy?	69.5	30.5

difficulty during the birthing process¹⁴. Eggs are a rich source of folic acid, while meat is a source of iron. Both nutrients are important in the formation of red blood cells and less intake will cause anaemia.

A high percentage of the respondents, above 90%, correctly answered the questions on the practice of anaemia in question 6 and 8. For question 6, 97.6% of the respondents ate meat, poultry or fish as part of their diet daily during pregnancy. Question 8 concerns the intake of green leafy vegetables in their daily diet during pregnancy and it was agreed by more than 90% of the respondents. This kind of food contains a high iron content and it needs to be consumed daily during main meals to meet iron needs during pregnancy. In addition, question 7 also focused on diet during pregnancy and 84.1% of the respondents answered positively that they do consume citrus fruits or fruit juice daily during the main meal during pregnancy. This type of food contains high levels of vitamin C and helps with the absorption of iron¹⁵. More than half of the respondents (57.3%) practice good habits, whereby they refrain from coffee or tea during the main meal during pregnancy. This is because tea and coffee can obstruct the absorption of iron¹⁶.

The result of question 10 indicates that 64.6% of the respondents did not miss meals during pregnancy. A majority of the respondents (83.5%) used cooking utensils made of iron during cooking and this can help to increase their iron intake. A total of 60.0% of the respondents took iron tablets daily on their own initiative before they were registered at a health clinic (question 12). Additionally, 69.5% of the respondents (question 13) reported that they were not taking any supplements or traditional medicine during pregnancy.

Mean scores of KAP, according to socio-demographic and antenatal characteristics: Comparisons of the knowledge score, according to the socio-demographic and antenatal

characteristics as presented in Table 5, were analysed using the Mann-Whitney and Kruskal-Wallis tests, while the attitude and practice scores were analysed using an independent t-test and ANOVA. The median of the total knowledge score was 84.2 and mean scores for attitude and practice were 72.4 ± 6.7 and 69.9 ± 13.1 , respectively. All the respondents were in the category reflecting a good level of knowledge and attitude but a moderate level for practice regarding naemia. The mean score for knowledge was significantly higher among respondents in the second trimester compared to those in first trimester ($p < 0.05$) but no significant difference was seen between the third trimesters with the other two groups. According to the number of children, mean knowledge of nutrition for respondents with three or more children was higher compared to those without any children. However, no significant difference was observed between the group with 1-2 children and the other two groups. Attitude, the attitude score was higher in the working subjects ($p < 0.05$) compare to those who are not working. There was no significant difference in practice score based on sociodemographic and antenatal characteristics ($p > 0.05$).

The finding of this study revealed that gestational week and number of children contributed to the knowledge level about anaemia among respondents, while the level of education contributed to the attitude level. This finding is similar to the study by Daba *et al.*¹⁷ among pregnant women, which indicated that there was a strong correlation between the number of children and the knowledge of mothers ($p < 0.001$). Meanwhile, according to Manaf *et al.*¹⁸, gestational stage ($p < 0.05$) was significantly associated with the knowledge score of pregnant mothers. Results of the present study are consistent with Baby *et al.*¹⁹ who reported that there was no significant difference in knowledge score among the education levels of 50 antenatal mothers.

Table 5: Comparison of knowledge, attitude and practice score according to selected socio-demographic and antenatal characteristics

Characteristics	No. of sample (n)	Knowledge score		Attitude score		Practice score	
		median (IQR)	p-value	(Mean±SD)	p-value	(Mean±SD)	p-value
Total	370	84.2 (26.3)		72.4±6.7		69.9±13.1	
Age							
21-25	56	84.2 (30.3) ^a	0.816 ¹	73.2±7.5 ^a	0.240 ³	69.8±11.3 ^a	0.970 ³
26-30	135	84.2 (21.1) ^a		73.1±6.5 ^a		71.1±12.2 ^a	
31-35	142	84.2 (21.1) ^a		71.6±6.6 ^a		68.5±14.2 ^a	
≥36	37	89.5 (34.2) ^a		72.3±6.2 ^a		71.1±14.9 ^a	
Education level							
Secondary	91	84.2 (26.3) ^a	0.604 ²	70.3±6.9 ^a	0.599 ⁴	68.0±14.5 ^a	0.053 ⁴
Tertiary	279	84.2 (26.3) ^a		73.1±6.4 ^a		70.5±12.6 ^a	
Occupation							
Working	304	84.2 (26.3) ^a	0.633 ²	72.5±6.9 ^a	0.019 ⁴	69.7±13.5 ^a	0.178 ⁴
Not working	66	89.5 (27.6) ^a		72.0±5.5 ^b		70.7±11.5 ^a	
Household income							
<RM5000	244	84.2 (26.3) ^a	0.279 ²	72.3±7.0 ^a	0.312 ⁴	70.2±12.6 ^a	0.198 ⁴
≥RM5001	126	86.8 (22.4) ^a		72.6±6.0 ^a		69.3±14.2 ^a	
Gestational week							
First trimester	211	78.9 (31.6) ^b	0.038 ¹	72.8±6.2 ^a	0.262 ³	69.4±12.9 ^a	0.295 ³
Second trimester	141	89.5 (15.8) ^a		72.1±7.3 ^a		70.4±13.0 ^a	
Third trimester	18	84.2 (32.9) ^{ab}		70.5±6.7 ^a		70.9±16.6 ^a	
No. of children							
0	116	78.9 (26.3) ^c	<0.001 ¹	72.8±7.1 ^a	0.296 ³	69.6±11.6 ^a	0.410 ³
1-2	118	89.5 (17.1) ^a		72.3±6.5 ^a		70.6±13.3 ^a	
≥3	136	81.6 (26.3) ^b		72.1±6.5 ^a		68.1±15.3 ^a	
Haemoglobin level							
Normal	279	84.2 (21.1) ^a	0.769 ²	72.2±6.6 ^a	0.935 ⁴	70.0±13.2 ^a	0.501 ⁴
Anaemic	91	84.2 (26.3) ^a		73.1±6.7 ^a		69.5±12.8 ^a	

¹Kruskal-Wallis test, ²Mann-Whitney test, ³ANOVA test, ⁴Independent t-test, ^{a,b}Different alphabets on the same column indicates a significant difference (p<0.05)

Table 6: Correlation coefficient between knowledge, attitude and practice scores

	Knowledge score	Attitude score	Practice score
Knowledge score	1	0.317 ^{a**}	0.007 ^a
Attitude score		1	0.330 ^{b**}
Practice score			1

^{**}Significantly correlated at p<0.01, ^aSpearman correlation, ^bPearson correlation

Relationship between knowledge, attitude and practice:

Results in Table 6 indicate that knowledge has a significant positive relationship and moderate level with attitude (r = 0.317, p<0.01) but no significant relationship with practices (r = 0.007, p>0.05). Thus, the higher the level of knowledge of respondents, the better their attitude; however, knowledge does not influence the respondents concerning their practices regarding anaemia. The result of this study also demonstrates that attitudes have a significant positive and moderate relationship with practices (r = 0.330, p<0.01). Attitude towards anaemia can improve practice among respondents in this study.

CONCLUSION

This study provides information related to the level of knowledge of anaemia among pregnant women. A quarter of the respondents were identified as anaemic. The median score

for knowledge of anaemia among respondents was higher than the mean score for attitude and practice. This study also revealed that gestational week and number of children contributed to the knowledge level of anaemia among respondents, while level of education contributed to the attitude level. Knowledge scores did not correlate with practice but significantly correlated with attitude. In addition, the attitude score also significantly correlated to the practice of the respondents.

Increasing the level of awareness of anaemia among pregnant women is seen as an important step in improving the level of their attitude toward anaemia. A positive attitude regarding anaemia influences the high levels of knowledge and good practice towards anaemia, as attitude was significantly correlated with knowledge and practice. The results of this study can help identify specific areas of health education that can be developed for pregnant women concerning anaemia to ensure the mother's health is at an optimal level during pregnancy.

SIGNIFICANCE STATEMENT

This study found that level of knowledge, attitude and practice regarding anaemia among pregnant women can be

of use to the Health Ministry of Malaysia and health-related agencies as they identify specific areas of health education to be developed for pregnant women pertaining to anaemia. This study will help the researcher to uncover the critical areas of anaemia issues faced by pregnant women that many researchers were not able to explore. Thus, a new theory on the factors that may contribute to anaemia disease among pregnant women may be developed.

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