



# **Factors Influencing the Attitude and Practice Towards Anaemia among Pregnant Women Attending Primary Healthcare Clinics in the Kuala Langat District (FAP-PW), Malaysia: A Cross-Sectional Study**

**Hazlin M <sup>a</sup>, Beatrice JNL <sup>b\*</sup>, Yew ML <sup>c</sup>, Tan SY <sup>d</sup>,  
Sumitha SC <sup>e</sup>, Hamid MJ <sup>a</sup> and Ammaar NI <sup>a</sup>**

<sup>a</sup> *Telok Panglima Garang Health Clinic, Telok Panglima Garang, 42500 Kuala Langat, Selangor, Malaysia.*

<sup>b</sup> *Kampung Bandar Health Clinic, Jalan Kurau, 42500 Kuala Langat, Selangor, Malaysia.*

<sup>c</sup> *Tanjung Sepat Health Clinic, Kampung Kundang, 42800 Kuala Langat, Selangor, Malaysia.*

<sup>d</sup> *Jenjarom Health Clinic, Jalan Kampung Jenjarom, 42600 Kuala Langat Selangor, Malaysia.*

<sup>e</sup> *Telok Datok Health Clinic, Jalan Pegawai, 42800 Kuala Langat Selangor, Malaysia.*

## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

## **Article Information**

### **Open Peer Review History:**

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here:

<https://www.sdiarticle5.com/review-history/124295>

**Original Research Article**

**Received: 01/08/2024**

**Accepted: 03/10/2024**

**Published: 05/10/2024**

\*Corresponding author: E-mail: [beatricejee.moh@gmail.com](mailto:beatricejee.moh@gmail.com);

**Cite as:** M, Hazlin, Beatrice JNL, Yew ML, Tan SY, Sumitha SC, Hamid MJ, and Ammaar NI. 2024. "Factors Influencing the Attitude and Practice Towards Anaemia Among Pregnant Women Attending Primary Healthcare Clinics in the Kuala Langat District (FAP-PW), Malaysia: A Cross-Sectional Study". *Asian Research Journal of Gynaecology and Obstetrics* 7 (1):288-99. <https://journalarjgo.com/index.php/ARJGO/article/view/237>.

## ABSTRACT

**Introduction:** Clinical observation has shown suboptimal knowledge, attitude and practice (KAP) among pregnant women attending primary healthcare clinics in the Kuala Langat district. This study aims to determine the KAP of anaemia management among pregnant women in late pregnancy and the associated factors with poor attitudes and practices among pregnant women.

**Methods:** A cross-sectional study was carried out among 395 pregnant women from May to August 2023. We included pregnant women aged 18 years and above at 34 to 38 weeks of gestation and excluded those who were illiterate in the Bahasa Melayu language or had poor cognition. The KAP was assessed using a 49-item validated questionnaire: 19 questions (knowledge), 17 questions (attitude) and 13 questions (practice) related to anaemia during pregnancy, its common cause, signs, symptoms, treatment and prevention.

**Results:** The majority (83.1%) attained good knowledge scores. 92.8% had poor attitude scores and 31.0% had poor practice scores. Using multivariate logistic regression analysis, two factors: (1) complications during pregnancy (OR=0.26, 95% CI 0.07, 0.97,  $p<0.046$ ), (2) late bookers (OR=1.30, 95% CI 1.04, 1.62,  $p<0.022$ ) were significantly associated with the poor attitude. Three factors: (1) spacing (OR=1.97, 95% CI 1.20, 3.25,  $p<0.008$ ), (2) pre-pregnancy iron supplements (OR=0.62, 95% CI 0.39, 1.00,  $p<0.049$ ) (3) good knowledge (OR=0.21, 95% CI 0.06, 0.74,  $p<0.015$ ) were significantly associated with the poor practice.

**Conclusion:** This study indicated poor attitudes among pregnant women. Primary care providers play a pivotal role in counselling and strengthening health literacy among pregnant women.

*Keywords: Attitude, practice, anaemia, pregnancy, primary care.*

## 1. INTRODUCTION

Anemia in pregnancy is defined as a hemoglobin (Hb) level of  $< 11.0$  g/dl while its severity is classified as severe (Hb $<7$  g/dl), moderate (Hb 7.0-9.9 g/dl), to mild anemia (Hb 10.0-10.9 g/dl) [1,2]. The problem of anemia affects half a billion women of reproductive age globally and remains a critical challenge mainly in Low and Middle-Income Countries such as Malaysia [3]. In Malaysia, anaemia in pregnancy remains a challenging health problem with its prevalence of 30% among reproductive age and 19.3 to 57.4% in pregnant women [2,4]. It was also shown that 80-90% of the pregnant women in Malaysia have low iron stores while 38-42% develop anemia as pregnancy advances due to IDA [2,5].

Currently, the Ministry of Health Malaysia has integrated strategies under maternal and child healthcare programs whereby the management of IDA in pregnancy is standardized according to the Malaysian Perinatal Care Manual and iron supplementation is readily made available to all pregnant women in primary care health clinics [6]. Nevertheless, despite efforts to mitigate the problem of anemia in the district, clinical audits have shown suboptimal health literacy and treatment compliance among pregnant women. To date, there is also a scarcity of existing local studies pertaining to the root cause of IDA in pregnancy and indeed an exigency to implement strategies to alleviate this problem [4].

Moving on, the risk factors of anemia in pregnancy in Malaysia were found to be higher in the rural compared to urban and associated with the following antenatal characteristics; late antenatal booking, extremes of reproductive age, non-compliance to iron supplements, being in second or third trimester while the sociodemographic characteristics were; Indian ethnicity, low maternal educational level, low family income, and unemployment [4]. In addition, IDA in pregnancy leads to major adverse effects in both maternal and fetal outcomes if not adequately managed such as postpartum hemorrhage leading to twice the risk of maternal death and heart failure [4,7]. Whereas in the fetal outcome, it could lead to neonatal IDA, risk of adult hypertension, low birth weight, prematurity, and adverse effects on cognitive function and behaviour [4,7].

Clinical observation has shown suboptimal KAP among pregnant women attending government primary healthcare clinics in the Kuala Langat district. Looking into the Kuala Langat district health department Selangor data, the prevalence of pregnant women at 36 weeks of gestation with Hb level of  $<11.0$ g/dl remains high ( $>5\%$ ) over the consecutive years. Presently, there are no studies done in the district to determine the cause of the high prevalence of anaemia among pregnant women at 36 weeks of gestation. Hence this study aimed to determine KAP levels

regarding anaemia among pregnant women in the district and to identify its association with the socio-demographic and antenatal characteristics. With this, early identification of the root cause of anaemia among pregnant women in the district could facilitate early intervention and preventive measures in the local community.

## 2. METHODS

A cross-sectional study was conducted from May to August 2023 in ten government primary healthcare clinics providing antenatal services in Kuala Langat Selangor. All pregnant women aged 18 years and above at 34 to 38 weeks of gestation were invited to participate in the study. The selection of the 34 to 38 weeks range of gestation in this study corresponds to the Malaysian national key performance index target haemoglobin level of more than 11g/dl at 36 weeks of gestation for all pregnant women. Those who were illiterate in the Bahasa Melayu language or had poor cognition were excluded. The sampling method was conducted by systematic random sampling whereby every third pregnant woman who fulfilled the inclusion criteria was recruited in the study. The study sample size was determined with single and two-sample proportion formulas [8]. The two sample proportions formulas were used to calculate associated factors with the assumption that the two populations have the same variance, the assumption of homogeneity of variance, the populations are normally distributed, and each value is independent [8]. The largest sample size value calculated among all the variables were taken as the sample size in this study [8]. The sample size calculated was 395 pregnant women with a 20% drop-out rate.

The self-administered questionnaire was made available in the Bahasa Melayu language as the majority (80%) of the pregnant women in the district are of Malay ethnicity. Anonymous of the participants of the study was carried out to ensure confidentiality and mitigate response bias. This could encourage participants to answer the questionnaire honestly reflecting their attitudes and practices. There were five sections in the questionnaire whereby the first section examined the socio-demographic characteristics (age, ethnicity, education level, occupation, income, marital status). The second section examined the antenatal characteristics (BMI, booking gestation, booking and current haemoglobin level, parity, spacing, the presence of haematological disease (thalassemia and/or

sickle cell anaemia), complication during pregnancy, miscarriage, pre-pregnancy iron supplement intake, diet). The third section examined the knowledge, attitude and practices (KAP) using a locally validated questionnaire [7].

This validated questionnaire on KAP of anaemia management consisted of a total of 49 items: 19 (knowledge), 17 (attitude) and 13 (practice) related to anaemia, its common cause, signs and symptoms, treatment and prevention [7]. Frequency analysis was calculated for each question for the KAP domains using percentages of correct versus incorrect answers in the knowledge domain (true/false), positively versus negatively answered questions in the attitude (agree/disagree) and practice domains (yes/no) [7]. In the knowledge domain, a score of 1 was given for the correct answer and 0 if incorrect, while in the attitude domain, good responses were scored as 1 and poor responses were scored as 0. [7]. Positive answers were scored as 1 and negative answers were scored as 0 for the practice domain [7]. The overall KAP domains were assessed using sum score outcome, which was classified into two categories: good and poor. A score of below 70% was rated as poor while 70% and above was rated as a good level. The items in the knowledge and attitude domains had an acceptable internal consistency of Cronbach alpha at 0.82 and 0.72, respectively [7]. The items in the practice domain had acceptable reliability of Kuder-Richardson Formula 20 (KR20) at 0.80 [7].

The study has two outcomes: The poor attitude and poor practices of anaemia among pregnant women. The independent variables undertaken were as follows: sociodemographic characteristics (age, ethnicity, education level, occupation, income, marital status), antenatal characteristics (body mass index, booking gestation, booking haemoglobin level, current haemoglobin level, parity, spacing, haematological disease, complications during pregnancy, history of previous pregnancy miscarriages, pre-pregnancy iron supplement, diet) and knowledge.

### 2.1 Data Analysis

The data was undertaken using the IBM SPSS statistic version 26.0. There were two outcomes in this study: the attitude and practice of anaemia management among pregnant women attending primary healthcare clinics. The median score of

these outcome variables was reported as the data was not normally distributed. To examine the associated factors with attitude and practice of anaemia management among pregnant women attending primary healthcare clinics, the Pearson Chi-Square/Fisher exact test was used for bivariate analysis and multiple logistic regression was used for multivariate analysis.

Testing for multicollinearity and assumptions was also carried out before multiple logistic regression analysis. Testing for multicollinearity of the independent variables was carried out by examining the variance inflation factor (VIF). There was no multicollinearity detected and the VIF ranged from 1.06 to 1.14. The tolerance level of 0.1 (=VIF 10) was used because a tolerance of less than 0.20 is cause for concern; a tolerance of less than 0.10 almost certainly indicates a serious collinearity problem and a tolerance value of 0.10 corresponds to the "rule of 10" with respect to the VIF [9]. The statistical significance in the final model was accepted at p-values equal to or less than 0.05. The model fitness was assessed using the Hosmer-Lemeshow goodness of fit test. The analysis with the Hosmer-Lemeshow test showed a p-value of more than 0.05 (attitude domain:  $p=1.00$ , practice domain:  $p=0.55$ ), indicating an adequate model fit.

### 3. RESULTS AND DISCUSSION

#### 3.1 Results

The response rate was 91.4% (361/395). Most of the respondents (76.3%) were aged more than 35 years. The median age was 30 years and gestation was 36 weeks. The majority (76.7%) were Malay ethnicity and married (98.1%). Meanwhile, more than half (52.4%) of the respondents had secondary and below education level, were unemployed (52.6%) and had a household income of less than RM5000 a month (57.3%).

The antenatal characteristics showed that 37.6% of the respondents have a BMI of 25.5 to 29.9 kg/m<sup>2</sup>. The majority (67.8%) were early bookers, less than 5 parity (96.1%), close spacing (71.5%) and had a baseline (88.1%) and current (85.6%) haemoglobin of more than 11.0g/dl respectively. While most (83.8%) had no haematological disease, complications during pregnancy (95.0%), history of miscarriage in the previous pregnancy (85.6%) and pre-pregnancy iron

supplementation (54.6%), almost all (93.6%) were non-vegetarians. (Refer Table 1).

The median score for the knowledge domain was 83.4%, the attitude domain was 35.0% and the practice domain was 76.4% respectively. The majority (83.1%) of the respondents attained a good knowledge score of more than 70%. However, the majority of 92.8% ( $n=335$ ) of the respondents with a poor attitude score of below 70% while a quarter of 31.0% ( $n=112$ ) of the respondents attained poor practice scores of below 70%. (Refer Table 2).

In the preliminary model, five factors: (1) age of more than 35 years, (2) education level of diploma and above, (3) household income of more than RM3000 (4) late bookers (5) complications during pregnancy were significantly associated with the poor attitude towards anaemia management. Three factors: (1) spacing, (2) pre-pregnancy iron supplement (3) good knowledge were significantly associated with the poor practice towards anaemia management. (Refer Table 3).

In the final model, two factors: (1) complications during pregnancy, and (2) booking gestation were significantly associated with the poor attitude towards anaemia management. (Refer Table 4) Pregnant women who had complications during pregnancy had 74% lower odds of poor attitude (AOR=0.26, 95% CI 0.07, 0.97,  $p<0.046$ ) compared to those without complications. Pregnant women who were late bookers had 1.3 times higher odds of poor attitude (AOR=1.30, 95% CI 1.04, 1.62,  $p<0.022$ ) compared to those who were early bookers.

Three factors: (1) spacing, (2) pre-pregnancy iron supplement, and (3) knowledge were significantly associated with the poor practice towards anaemia management. (Refer Table 5) Pregnant women who had 2 years and more spacing had 1.97 times higher odds of poor practice in anaemia management (AOR=1.97, 95% CI 1.20, 3.25,  $p<0.008$ ) compared to those with poor spacing. Pregnant women who were on pre-pregnancy iron supplements had 38% lower odds of poor practice (AOR=0.62, 95% CI 0.39, 1.00,  $p<0.049$ ) compared to those not on supplements. Pregnant women who had good knowledge scores had 79% lower odds of poor practice (AOR=0.21, 95% CI 0.06, 0.74,  $p<0.015$ ) compared to those with poor knowledge scores.

**Table 1. Demographic and antenatal characteristics of pregnant women attending primary healthcare clinic in the Kuala Langat district (N=361)**

<b>Characteristics</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Demographic</b>		
<b>Age</b>		
≤ 35 years	85	23.7
> 35 years	276	76.3
<b>Ethnicity</b>		
Others	84	23.3
Malay	277	76.7
<b>Education level</b>		
Secondary and below	190	52.4
Diploma and above	171	47.6
<b>Occupation</b>		
Unemployed	190	52.6
Employed	171	47.4
<b>Income</b>		
≤ RM3000	207	57.3
> RM3000	154	42.7
<b>Marital status</b>		
Single	7	1.9
Married	354	98.1
<b>Antenatal characteristics</b>		
<b>Gestation (weeks)</b>		
34	88	24
35	61	17
36	95	26
37	54	15
38	63	18
<b>BMI (kg/m<sup>2</sup>)</b>		
< 18.5	15	4.2
18.5-24.9	117	32.4
25-29.9	136	37.6
≥30.0	93	25.8
<b>Booking gestation</b>		
Early booker	245	67.8
Late booker	116	32.2
<b>Booking haemoglobin (g/dl)</b>		
<11.0	43	11.9
≥11.0	318	88.1
<b>Current haemoglobin (g/dl)</b>		
<11.0	52	14.4
≥11.0	309	85.6
<b>Parity</b>		
< 5	347	96.1
≥ 5	14	3.9
<b>Spacing</b>		
< 2 years	258	71.5
≥ 2 years	103	28.5
<b>Underlying haematological disease (thalassemia, sickle cell anaemia)</b>		
No	303	83.8
Yes	58	16.2

Characteristics	Frequency	Percentage
<b>Complication during pregnancy</b>		
No	343	95.0
Yes	18	5.0
<b>History of miscarriage in the previous pregnancy</b>		
No	309	85.6
Yes	52	14.4
<b>Pre-pregnancy iron supplement</b>		
No	197	54.6
Yes	164	45.4
<b>Diet</b>		
Vegetarian	23	6.4
Non-vegetarian	338	93.6

**Table 2. The level of knowledge, attitude and practice of anaemia management among pregnant women attending primary healthcare clinics in the Kuala Langat district**

Variable (Total score %)	Frequency	Percentage
<b>Knowledge</b>		
Poor (0-69)	61	16.9
Good (70-100)	300	83.1
<b>Attitude</b>		
Poor (0-69)	335	92.8
Good (70-100)	26	7.2
<b>Practice</b>		
Poor (0-69)	112	31.0
Good (70-100)	249	69.0

**Table 3. Univariate analysis of the factors associated with the poor attitude and practice of iron deficiency anaemia management among pregnant women attending primary healthcare clinics in the Kuala Langat district**

	Preliminary model (SLR)							
	Attitude domain				Practice domain			
	COR	95% CI		¶p- value	COR	95% CI		¶p- value
	Lower	Upper			Lower	Upper		
<b>Demographic</b>								
<b>Age</b>								
≤ 35 years	1.00				1.00			
> 35 years	0.38	0.16	0.89	0.026	0.57	0.32	1.00	0.050
<b>Ethnicity</b>								
Others	1.00				1.00			
Malay	0.67	0.27	1.69	0.397	1.23	0.73	2.07	0.429
<b>Education level</b>								
Secondary and below	1.00				1.00			
Diploma and above	3.77	1.26	11.34	0.018	1.09	0.69	1.70	0.718
<b>Occupation</b>								
Unemployed	1.00				1.00			
Employed	1.47	0.63	3.46	0.372	1.11	0.71	1.74	0.640
<b>Income</b>								
≤ RM3000	1.00				1.00			

	Preliminary model (SLR)							
	Attitude domain				Practice domain			
	COR	95% CI		p-value	COR	95% CI		p-value
		Lower	Upper			Lower	Upper	
> RM3000	4.15	1.59	10.79	0.048	1.14	0.73	1.80	0.567
<b>Marital status</b>								
Single	1.00				1.00			
Married	<0.01	<0.01	<0.01	0.999	1.12	0.20	6.23	0.894
<b>Antenatal characteristics</b>								
<b>BMI (kg/m<sup>2</sup>)</b>								
< 18.5	1.00				1.00			
18.5-24.9	1.95	0.60	6.33	0.265	0.65	0.36	1.18	0.156
25-29.9	1.20	0.33	4.39	0.783	0.75	0.41	1.39	0.358
≥30.0	3.39	0.56	20.36	0.183	0.50	0.16	1.56	0.232
<b>Booking gestation</b>								
Early booker	1.00				1.00			
Late booker	1.37	0.58	3.26	0.047	0.79	0.49	1.27	0.329
<b>Booking haemoglobin (g/dl)</b>								
<11.0	1.00				1.00			
≥11.0	1.46	0.33	6.48	0.615	1.08	0.55	2.14	0.817
<b>Current haemoglobin (g/dl)</b>								
<11.0	1.00				1.00			
≥11.0	1.76	0.40	7.76	0.454	0.50	0.24	1.03	0.059
<b>Parity</b>								
< 5	1.00				1.00			
≥ 5	<0.01	<0.01	<0.01	0.999	1.68	0.46	6.14	0.433
<b>Spacing</b>								
< 2 years	1.00				1.00			
≥ 2 years	1.39	0.57	3.38	0.471	0.51	0.32	0.82	0.006
<b>Haematological disease</b>								
No	1.00				1.00			
Yes	1.97	0.74	5.22	0.175	1.10	0.60	2.04	0.758
<b>Complication during pregnancy</b>								
No	1.00				1.00			
Yes	3.44	0.91	2.96	0.040	1.18	0.41	3.39	0.760
<b>History of Miscarriage in the previous pregnancy</b>								
No	1.00				1.00			
Yes	0.88	0.29	3.06	0.835	1.26	0.65	2.34	0.490
<b>Pre-pregnancy iron supplement</b>								
No	1.00				1.00			
Yes	2.40	0.99	5.81	0.053	1.60	1.11	2.53	0.043

	Preliminary model (SLR)							
	Attitude domain				Practice domain			
	COR	95% CI		p-value	COR	95% CI		p-value
		Lower	Upper			Lower	Upper	
<b>Diet</b>								
Vegetarian	1.00				1.00			
Non-vegetarian	0.68	0.09	5.29	0.712	0.68	0.29	1.63	0.388
<b>Knowledge</b>								
Poor (0-69)	1.00				1.00			
Good (70-100)	<0.01	<0.01	<0.01	0.999	2.18	1.24	3.83	0.007

*SLR: Simple logistic regression*  
*95% CI: 95% confidence interval*  
*COR: Crude odd ratio*  
*p-value <0.05*

**Table 4. Multivariate analysis of the factors associated with the poor attitude toward anaemia management among pregnant women attending primary healthcare clinics in the Kuala Langat district (backwards and forward method)**

	Final model (MLR)			
	AOR	95% CI		p-value
		Lower	Upper	
<b>Complication during pregnancy</b>				
No	1.00			
Yes	0.26	0.07	0.97	0.046
<b>Booking gestation</b>				
Early booking	1.00			
Late booking	1.30	1.04	1.62	0.022

*MLR: Multiple logistic regression*  
*95% CI: 95% confidence interval*  
*AOR: Adjusted odd ratio*  
*p-value <0.05*

**Table 5. Multivariate analysis of the factors associated with the poor practice of anaemia management among pregnant women attending primary healthcare clinics in the Kuala Langat district (backwards and forward method)**

	Final model (MLR)			
	AOR	95% CI		p-value
		Lower	Upper	
<b>Spacing</b>				
< 2 years	1.00			
≥ 2 years	1.97	1.20	3.25	0.008
<b>Pre-pregnancy iron supplement</b>				
No	1.00			
Yes	0.62	0.39	1.00	0.049
<b>Knowledge</b>				
Poor (0-69)	1.00			
Good (70-100)	0.21	0.06	0.74	0.015

*MLR: Multiple logistic regression*  
*95% CI: 95% confidence interval*  
*AOR: Adjusted odd ratio*  
*p-value <0.05*



### 3.2 Discussion

Presently, there is still a scarcity pertaining studies on anemia in pregnancy among our population in Malaysia. In our study, the majority (85.6%) of pregnant women had haemoglobin of more than 11.0g/dl respectively. This is in contrast with a similar study conducted among the rural population in India whereby the majority (45%) were reported to have anaemia [10]. In our study, we also found that the proportion of pregnant women with good knowledge scores was high (83.1%). This is in contrast with studies done elsewhere in some parts of India, Saudi Arabia and Euthopia whereby the majority of their knowledge was found to be poor [11–14]. However, consistent with local studies conducted in Terengganu, Putrajaya and Perak with similar knowledge components being assessed, the majority had good knowledge scores [7,15,16]. Nevertheless in some other parts of Terengganu, the majority of their knowledge scores were averagen [17,18]. Despite the average to good knowledge of anemia among most pregnant women, it is still of utmost importance to continue educational intervention to further increase and improve their knowledge [17]. In addition, good knowledge is crucial to ensure continuous adherence to iron therapy [19].

Despite the good knowledge among the pregnant women, the majority (92.8%) had poor attitude scores. However, other studies done elsewhere in Saudi Arabia, India, locally in Putrajaya and some parts of Terengganu had shown their attitude scores to be average to good [7,14,16,20]. Similarly, in the state of Perak, only a quarter (39%) of the pregnant women had good attitude scores [15]. This discrepancy needs to be scrutinized to explain the poor attitude among our pregnant women. To address the problem of anemia, primary care providers play a crucial role whereby health promotion strategies that will positively impact the attitude should be incorporated to succour a positive health-related behaviour during pregnancy, which predominantly determines the pregnancy's outcomes [20,21].

Our study also demonstrated that complications during pregnancy and booking gestation were significantly associated with poor attitudes among pregnant women. Presently, we could not find literature which probed precisely into these components. However, in view of late bookers which has been shown to be associated with anaemia in pregnancy, we postulate early

bookers have good attitudes in self-care [22]. Nevertheless, these components are essential to be included in the assessment because a well-recognized and appropriate element of attitude and self-care would prevent or delay complications and the likelihood of pregnancy-related early death [23]. Looking into early antenatal booking, which is defined as before 12 weeks of gestation has been shown to produce favorable pregnancy outcomes and those with sufficient knowledge on the importance of early antenatal booking will result in good attitudes and practices among them [24]. Therefore, this is where again the primary care providers play an important role in the community, as they have a better understanding of local population lifestyles and beliefs which might affect a woman's knowledge and attitude towards antenatal care [24]. Primary care providers are the bridge between the community and the health care system while reinforcing health literacy [24]. Training should be initiated for primary care providers to identify these pregnant women, counsel and tackle the problem of poor attitudes among them in the community [24].

We found that more than a quarter of the pregnant women (31.0%) attained poor practice scores. Consistent with previous studies abroad in Saudi Arabia, Pakistan, Nigeria and some parts of Ethiopia 24% to 52% had poor to moderate practices [11,14,21,25]. However locally in the state Perak, 25.5% of the pregnant women had poor practices [15]. In addition we found three factors to be significantly associated with the poor practices; spacing, intake of pre-pregnancy iron supplement and knowledge. Previous studies abroad did not probe into the factors associated with practices. However, local studies conducted in Putrajaya and Perak state had shown no significant association between the intake of iron supplements and knowledge of the practices [7,15]. The discrepancies in findings among various states locally need to be further explored. These results also implied that there is still a need to ameliorate the practices among pregnant women and this could be achieved by improving their knowledge of anaemia. In a study conducted in India whereby women with no education were significantly associated with anaemia while in our study, good knowledge was shown to have lower odds of poor practices [26]. Therefore, we recommend similar approaches could be applied in India and Malaysia whereby primary healthcare providers should share knowledge on anaemia prevention in pregnant women.

The strength of this study includes a substantially large sample size of 395 pregnant women, which enhances the reliability and generalizability of the findings. The study involves the majority of clinics in the whole Kuala Langat district and these findings are most relevant and applicable to the current government primary care clinic settings in Malaysia. The limitation of the study includes, self-reported questionnaires, which are subject to bias and participants who were not literate in Bahasa Melayu were not included in the study. The resources in private primary care settings are different from government primary care settings. Thus, the result cannot be applied in private primary care settings.

#### 4. CONCLUSION

In conclusion, the study underscores a significant issue. Although our pregnant population generally possesses adequate knowledge about anemia, there is a notable deficiency in their attitudes and practices regarding its management. Despite good awareness, there is a disconnection in translating this knowledge into effective anemia management. This gap is consequential, as poor attitudes are linked to pregnancy complications and delayed prenatal care. Factors such as spacing pregnancies beyond two years, lack of pre-pregnancy iron supplements, and even possessing good knowledge are identified in this study as contributors to suboptimal practices. These findings emphasize the critical need to address these gaps in managing this vital medical condition during pregnancy to reduce associated morbidity and mortality. Consequently, primary healthcare providers emerge as key players in enhancing and fortifying the knowledge, attitudes, and practices of pregnant women through targeted health education strategies.

#### DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

#### CONSENT

As per international standards or university standards, respondents' written consent has been collected and preserved by the author(s)

#### ETHICAL APPROVAL

This study obtained ethical approval from the medical research ethics committee of Malaysia (RSCH ID-23-00256-KOQ) and followed current regulations on the protection of personal data.

#### ACKNOWLEDGEMENTS

The authors would like to thank the Director General of Health of Malaysia for his kind permission to publish this article as well as the Kuala Langat District Health Office, primary healthcare doctors and nurses for their assistance during the data collection.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

#### REFERENCES

1. Karami M, Chaleshgar M, Salari N, Akbari H, Mohammadi M. Global Prevalence of Anemia in Pregnant Women: A Comprehensive Systematic Review and Meta-Analysis. *Matern Child Health J.* 2022;26(7):1473–87.
2. Milman N. Iron Deficiency and Anaemia in Pregnant Women in Malaysia? Still a Significant and Challenging Health Problem. *J Preg Child Health*; 2015 [Accession 2023 Jan 15];02(03). Available:<http://www.omicsgroup.org/journals/iron-deficiency-and-anaemia-in-pregnant-women-in-malaysia--still-a-significant-and-challenging-health-problem-2376-127X-1000168.php?aid=54257>
3. Merid MW, Chilot D, Alem AZ, Aragaw FM, Asratie MH, Belay DG, et al. An unacceptably high burden of anaemia and its predictors among young women (15–24 years) in low and middle income countries; set back to SDG progress. *BMC Public Health.* 2023;23(1):1292.
4. Abd Rahman R, Idris IB, Isa ZM, Rahman RA, Mahdy ZA. The Prevalence and Risk Factors of Iron Deficiency Anemia Among Pregnant Women in Malaysia: A Systematic Review. *Front Nutr.* 2022;9: 847693.
5. Harvey T, Zkik A, Auges M, Clavel T. Assessment of iron deficiency and anemia in pregnant women: an observational

- French study. *Womens Health (Lond)*. 2016;12(1):95–102.
6. Ministry of Health Malaysia. Perinatal Care Manual 4th Edition; 2020 released June 2022.pdf [Internet]. [cited 2023 Sep 3]. Available: [http://hsegamat.moh.gov.my/oasis/uploads/936\\_PERINATAL%20CARE%20MANUAL%204th%20Edition%202020%20released%20June%202022.pdf](http://hsegamat.moh.gov.my/oasis/uploads/936_PERINATAL%20CARE%20MANUAL%204th%20Edition%202020%20released%20June%202022.pdf)
  7. Hidayah Ad SN, Sedek R, Mohd Kasim Z. Assessment of Knowledge, Attitude and Practice Levels Regarding Anaemia Among Pregnant Women in Putrajaya, Malaysia. *Pakistan J of Nutrition*. 2018;17(11):578–85.
  8. Arifin WN. Introduction to sample size calculation. *EIMJ*; 2013. [Accession 2024 Sep 18];5(2). Available: [http://eduimed.usm.my/EIMJ20130502/EIMJ20130502\\_10.pdf](http://eduimed.usm.my/EIMJ20130502/EIMJ20130502_10.pdf)
  9. Marcoulides KM, Raykov T. Evaluation of Variance Inflation Factors in Regression Models Using Latent Variable Modeling Methods. *Educ Psychol Meas*. 2019;79(5):874–82.
  10. Abhishek K, Ansari M, Topno R, Madhukar M, Purakayastha D, Mahajan H, et al. Prevalence of anaemia in pregnant women among rural population of Kurhani block, Muzaffarpur district Bihar: A cross-sectional Primary Health Center based study. *Journal of Scientific Research*. 2022;66:34–9.
  11. Habib A, Afzal M, Parveen K, Hussain M, Gilani SA, Nursing B. Knowledge, Attitude and Practices of Pregnant Women Regarding Iron Deficiency Anemia in A Rural Area of Lahore. 2018; Available: [https://www.researchgate.net/publication/335464620\\_Knowledge\\_Attitude\\_and\\_Practices\\_of\\_Pregnant\\_Women\\_Regarding\\_Iron\\_Deficiency\\_Anemia\\_in\\_A\\_Rural\\_Area\\_of\\_Lahore](https://www.researchgate.net/publication/335464620_Knowledge_Attitude_and_Practices_of_Pregnant_Women_Regarding_Iron_Deficiency_Anemia_in_A_Rural_Area_of_Lahore)
  12. Nivedita, Fatima Shanthini. Knowledge, attitude and practices of pregnant women regarding anemia, iron rich diet and iron supplement. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*. 2016;5(2):425–31.
  13. Masresha Leta Serbesa, Maleda Tefera Iffa. Knowledge, attitude and practice on prevention of iron deficiency anemia among pregnant women attending antenatal care unit at public hospitals of Harar Town, Eastern Ethiopia: institutional based cross-sectional study. *International Journal of Pregnancy & Child Birth*. 2019;5:2. [Accession 2022 Dec 26]; Available: <https://medcraveonline.com/IPCB/IPCB-05-00146.pdf>
  14. Samia Abd Elhakeem H Aboud, Hanan Abd Elwahab El Sayed, Heba Abdel-Fatah Ibrahim. Knowledge attitude and-practice regarding prevention of iron deficiency anemia among pregnant wome [Internet]. [cited 2022 Dec 26]. Available: <https://ijpras.com/storage/models/article/sOCNYToRYRctsp1PGaJS3EBGmwdQcnV5odTNq70U2PAYZMQrlh6QY7etMaWp/knowledge-attitude-and-practice-regarding-prevention-of-iron-deficiency-anemia-among-pregnant-wome.pdf>
  15. Fazeli NI, Khoo TH, Junaidi ANA, Dzulkafli NA, Chiew SC, Sahimi MS@, et al. Knowledge, attitude and practice of pregnant women regarding anemia during antenatal visit at Kampar Health Clinic. *electronic - Perak Medical Journal*. 2022;2(Supp 03):22–3.
  16. Theng CE, Zakaria NS, Yusof H. Knowledge and attitude on consumption of iron supplement among pregnant women in Kuala Terengganu, Terengganu. *Malaysian Applied Biology*. 2017;46:105–12.
  17. Zani H, Shahril MR, Rahman WNAWA, Mukhali HB, Ismail R, Yusop YM. Anaemia-Related Knowledge Amongst Pregnant Women in Kuala Terengganu, Malaysia. *Asian Journal of Medicine and Biomedicine*. 2020;4(2):1–9.
  18. Bah F, Harith S, Farisni TN. Food Knowledge and Practices Related to Anemic Conditions among Pregnant Women in Kuala Terengganu, Malaysia. *J-Kesmas: Jurnal Fakultas Kesehatan Masyarakat (The Indonesian Journal of Public Health)*. 2020;7(1):19–28.
  19. Kadir NA, Ahmad AH, Rahim NAA. Development and Validation of a Questionnaire Assessing the Knowledge and Perception of Pregnant Women about Oral Iron Consumption; 2021. Available: [https://medic.upm.edu.my/upload/dokumen/2021062816001431\\_MJMHS\\_0912.pdf](https://medic.upm.edu.my/upload/dokumen/2021062816001431_MJMHS_0912.pdf)
  20. Dhok A, Meshram A, Kanyal Butola L, Khare R. Knowledge, Attitude and Practice Study Among Rural Antenatal Women Regarding Anaemia, Iron Rich Diet and Iron Supplement. *International Journal of Current Research and Review*. 2021;13:27–32.

21. Gebremichael MA, Lema TB. Prevalence and Predictors of Knowledge and Attitude on Optimal Nutrition and Health Among Pregnant Women in Their First Trimester of Pregnancy. *IJWH*. 2023;15:1383–95.
22. Abd Rahman R, Idris IB, Isa ZM, Rahman RA, Mahdy ZA. The Prevalence and Risk Factors of Iron Deficiency Anemia Among Pregnant Women in Malaysia: A Systematic Review. *Front Nutr*. 2022;9: 847693.
23. Nurhasanah R, Malini H, Tarawan VM. Exploring the Meaning and Practices of Self-care toward Pregnancy-related Complication: A Qualitative Study in Rural Area Indonesia; 2022. Available:[https://medic.upm.edu.my/upload/dokumen/2023010416252810\\_2021\\_1492.pdf](https://medic.upm.edu.my/upload/dokumen/2023010416252810_2021_1492.pdf)
24. Maharaj R, Mohammadnezhad M. Perception of pregnant women towards early antenatal visit in Fiji: a qualitative study. *BMC Pregnancy Childbirth*. 2022 Feb 10;22:111.
25. Balcha WF, Eteffa T, Arega Tesfu A, Abeje Alemayehu B. Maternal Knowledge of Anemia and Adherence to its Prevention Strategies: A Health Facility-Based Cross-Sectional Study Design. *Inquiry*. 2023;60: 00469580231167731.
26. Kuppusamy P, Prusty RK, Khan SA. Assessing the prevalence and predictors of anemia among pregnant women in India: findings from the India National Family Health Survey 2019-2021. *Curr Med Res Opin*. 2024;40(1): 51–8.

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). This publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

© Copyright (2024): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*  
The peer review history for this paper can be accessed here:  
<https://www.sdiarticle5.com/review-history/124295>