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Anaemia-Related Knowledge Amongst Pregnant Women in Kuala Terengganu, Malaysia

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Abstract

The prevalence of anaemia amongst pregnant women in developing countries is increasing yearly, particularly in Malaysia. This problem may be due to their lack of knowledge of anaemia and food choice. This study aimed to measure the knowledge levels on anaemia and iron absorption amongst pregnant women in Kuala Terengganu, as well as the association of knowledge levels between socio-demographic characteristics. Pregnant women were selected from government health clinics located in Kuala Terengganu, Malaysia. A total of 71 pregnant women aged between 18 and 44 years participated in the study. They self-administered the socio-demographic form and the knowledge questionnaire. Overall, they had moderate knowledge level with mean score of 57.41 ± 4.80. A significant association was found between knowledge level and monthly household income ($p<0.05$). Meanwhile, no significant association was found between knowledge level with socio-demographic characteristics (age, gravida, occupation, husband's occupation, and education level) ($p>0.05$). This study provided an early insight into knowledge of anaemia amongst pregnant women in Kuala Terengganu. Educational intervention should be implemented to increase and improve pregnant women's knowledge of anaemia and iron absorption.

Keywords**:** knowledge, anaemia, pregnant women

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Introduction

Anaemia is a common health-related problem that occurs during pregnancy. Anaemia during pregnancy is diagnosed by estimating the hemoglobin (Hb) levels in blood.The World Health Organisation (WHO) defines anaemia as Hb< 11.0 g/dl [1], while Centres for Disease Control and Prevention (CDC) defines anaemia as Hb <11.0 g/dl in the first and third trimesters, and <10.5 g/dl in the second trimester [2]. Symptoms of anaemia include feeling exhausted, weakness, palpitation and indigestion [3].

Worldwide, approximately 56 million (41.8%) pregnant women were diagnosed with anaemia, which ranged from 53.8% to 90.2% in developing countries and 8.3% to 23.0% in developed countries [1]. It can be caused by either iron deficiency, folic acid deficiency, B12 deficiency, or protein deficiency [3]. However, iron deficiency anaemia (IDA) is the leading cause of nutritional deficiency during pregnancy [4,5]. Pregnant women are particularly prone to iron-deficiency anaemia due to the high demand for iron during pregnancy.

IDA during pregnancy has negative impacts on mother and fetus. They were prone to pre-term birth, low birth weight, miscarriage, as well as maternal and neonatal mortality [6,7]. This is because iron is an essential micronutrient for normal development and functions of all tissues in the body [8] It is also necessary for oxidative phosphorylation, neurotransmission and myelin synthesis in the brain [9]. Besides, iron-containing heme proteins (hemoglobin and cytochromes) take part in tissue oxygen delivery and energy metabolism.

However, the prevalence of IDA in Malaysia is still high even though free iron supplements are provided. In 2015, findings from the National Health and Morbidity Survey (NHMS) reported that the overall prevalence of anaemia in Malaysia was 24.6%, with Terengganu being the second highest in the prevalence (29.7%) [10]. This problem may be due to lack of knowledge of anaemia and food choice [11]. Studies regarding knowledge of anaemia amongst pregnant women in Malaysia are limited, particularly in Terengganu. Further research is needed to examine this knowledge amongst pregnant women. Therefore, this study is aimed to measure the knowledge levels of anaemia and iron absorption amongst pregnant women in Kuala Terengganu, as well as the association of knowledge levels between socio-demographic characteristics.

MATERIALS AND METHODS

Study Respondents

A cross-sectional study was conducted at health clinics in Seberang Takir, Terengganu for a period of one year,which was from May 2015 to April 2016. Convenience sampling was used because of their convenience in accessibility and proximity. The respondents consisted of pregnant women who were attending health clinics for check-ups. Sample size was calculated by using Raosoft, Inc. sample size calculator. The calculator used a marginal error of 5%, confidence level of 95%, population size of 86, response distribution of 50% and the estimated sample size was 71. A formal permission to conduct the study was obtained from the Universiti Kebangsaan Malaysia Medical Centre (UKMMC) Ethical Committee (FF-2016-024) as well as from the Medical Research and Ethic Committee of Ministry of Health Malaysia, and from National Medical Research Register of Malaysia (NMRR) (15-1934-27267(IIR) prior to the study. Meanwhile, all the respondents were asked for consent before the implementation of the study.

Knowledge Questionnaire

The questionnaire was adapted and modified from the *Adaptable Knowledge, Attitude and Practices* (KAP) model questionnaires from the FAO publication Guidelines in assessing nutrition-related knowledge, attitudes and practices (2014) It was then modified and translated into Bahasa Melayu [12]. A pilot study was conducted amongst 10participants (10%) prior to the study and they were excluded from the sample. Then, CFA (Confirmatory Factor Analysis) and EFA (Exploratory Factor Analysis) were performed to test validity and reliability of the questionnaire. This questionnaire was found to be valid and reliable with Cronbach's alpha of 0.806, indicating a high internal consistency.

Pregnant women were asked to fill in the socio-demographic form and a questionnaire regarding their knowledge of anaemia and iron absorption. The questionnaire consisted of 30 questions, with three answers, which were "agree", "don't know" and "disagree". The score for positive statements would be as follows: "disagree"=1, "don't know"=2 and "agree"=3. However, for negative statements, the score would be reversed: "disagree"=3, "don't know"=2 and "agree"=1. The respondents were categorised into three different categories based on their knowledge score; "poor" (1–30), "moderate" (31–60) and "good "(61–90).

Statistical analysis

All analyses were carried out by using IBM SPSS Version 21 and presented in the form of frequency, percentage, mean and standard deviation (SD). Meanwhile, Pearson's Chi-Square test and Fisher's Exact test were applied to assess the association between socio-demographic characteristics and knowledge levels of respondents. Statistical significance was set at a p-value of less than 0.05.

RESULTS AND DISCUSSION

Socio-demographic data of the pregnant women are shown in Table 1. A total of 71 Malay pregnant women with mean age of 28.2 ± 6.2 years old were successfully selectd from a health clinic at Seberang Takir, Kuala Terengganu, Terengganu. Their ages were ranged from 18 to 44 years old, while the majority of them were multigravida (52.1%), work as housewife (42.3%), graduated from at least secondary school (54.9%) and had monthly income of less than RM 2,500 (87.3%).

Table 2 shows the respondents' answers to knowledge questions. The total mean score for their knowledge was 57.41 ± 4.80, which indicated moderate knowledge. Table 3 shows the distribution of knowledge levels for pregnant women, depending on their scores. Based on the overall score, the study found that many had moderate knowledge of anaemia and iron absorption (80.3%). None of them had poor knowledge. Table 4 shows that there was a significant association between level of knowledge and monthly household income ($p<0.05$). Meanwhile, the study found no significant association between level of knowledge with age, gravida, occupation, husband's occupation and education level ($p>0.05$).

The present study revealed that the knowledge of pregnant women regarding anemia and iron absorption was at moderate level. Contradicting to these findings, a study in Putrajaya found that the pregnant women had higher knowledge regarding anaemia [13]. Besides, another similar study in Terengganu found that the pregnant women population also had higher knowledge of iron supplementation, which might be explained by their higher education level [14]. It was noteworthy that the present study found comparable knowledge levels across different education levels, indicating that education was not a direct factor which effected pregnant women's knowledge relating to health.

A high percentage of pregnant women in this study (74.6%) knew the definition of anaemia, which indicated that the majority of them had good knowledge on the definition of anaemia. Similarly, a high percentage (81.1%) of pregnant women in Putrajaya knew the meaning of anaemia correctly [13]. Meanwhile, the majority of respondents knew that hematinic pills that were provided by the health clinics or hospitals were iron supplements, which indicated that they also had good knowledge regarding iron supplements.

The prevalence of IDA in Malaysia is still high even though pregnant women are provided with free iron supplements or hematinic pills. The problem might be due to their lack of knowledge of anaemia and food choice [11]. Maternal knowledge is associated with consumption of animal-source food during pregnancy [11], which proved that an appropriate knowledge regarding iron content in food and iron absorption is needed so that they can consume an adequate amount of iron from food and supplements. They also need to know about the enhancers and inhibitors for iron absorption, for example, vitamin C and meat will enhance iron absorption in the body, whereas tea, coffee and calcium will inhibit iron absorption [15], and thus they have to plan and control their diet. They need to know these factors so that they can avoid taking food or drinks that will inhibit iron absorption, such as drinking tea which is the cultural tradition for Malaysians [15]. A previous study conducted in Ethiopia showed that drinking tea or coffee immediately after meal was associated with increased risk of anaemia [16], emphasising the importance of increasing women's knowledge regarding food that enhance and inhibit iron absorption. The major causes of IDA were inadequate intake of iron in the diet, decreased iron absorption, increased iron requirements, and chronic blood loss. To increase iron consumption and optimise its absorption by minimising inhibitors and maximising enhancers were recommended for iron deficiency prevention [17].

Knowledge regarding food that enhance and inhibit iron absorption is important so that pregnant women can control and choose their food wisely. Previous studies had found no association between total dietary iron intake and iron status [18,19]. Moreover, another study found that women with different iron status (poor, mild and normal) had similar total iron intakes, which indicated that there was no association between total dietary iron intakes with iron status [20]. This was because regardless of their high iron intake, iron absorption was prevented by those inhibitors, causing a low iron level in the body. Based on the present study, it can be concluded that the pregnant women had moderate knowledge on food that enhance iron absorption because 31.0% to 63.4% of them knew that vitamin C, orange juice, meat, chicken, fish will help iron absorption. Educating them on food that contained vitamin C may be a good idea and will benefit them as most of them might know and heard about vitamin C, but did not know which food is rich in vitamin C.

Food that inhibits iron absorption, include coffee, tea, milk, chocolate, cereals, as well as phytate and polyphenols compound. Phytate and phenolic (polyphenols) are two main compounds found in food that can inhibit iron absorption. Phytate is an antioxidant

compound which is found mostly in cereals and legumes, including oil seeds and nuts (walnuts and almonds [21]. The main concern about phytate is that it can bind to a certain micronutrient such as iron and slows down its absorption in the body. Phytate is the strongest inhibitory predictor of iron bioavailability from the diet of all pregnant women [22]. Consuming food that contains a high amount of phytate and polyphenols together with hematinic pills will decrease iron absorption in the body.

Meanwhile, phenolic compounds are found in food and drinks, such as tea, coffee, spices (chili), and certain vegetables. The phenolic compounds are released from food or drinks during digestion, and then combined with iron in the intestinal lumen, causing it to be unavailable for absorption [23]. A study in Thailand proved that chili (spices that contain high phenolic compounds) inhibited iron absorption [24]. In Malaysia, chili is commonly known as a spiceand it is mainly used in food and meals. Chili contains high amount of polyphenol, which is one of the main compounds that inhibit iron absorption [25]. However, only a few knew this fact as proven by this study. Meanwhile, only 5.6% of the pregnant women in this study had good knowledge about chili as an inhibitor for iron absorption, while the rest (94.4%) had poor knowledge. Chili and chili-containing food is an inhibitor for iron absorption [24] and were associated with insulin resistance, as eating chili food can decrease insulin resistance [26]. Not knowing this fact, pregnant women might consume hematinic pills with food or meals that contain chili, causing inhibition of iron absorption in the body.

The present study found a significant association between knowledge levels with monthly household income of the pregnant women. Contradict to the present study, a study in India found no significant association between knowledge level and monthly family income [27]. Furthermore, the present study found no significant association between age, gravida, occupation, husband's occupation, and education level with knowledge level. Similarly, previous studies also revealed that there was no significant association between knowledge of anaemia with education [28], age [29], and occupation [27]. A study in China agreed with findings of the present study because they also found that pregnant women with higher educational level did not necessarily have better knowledge of anemia and concluded that the prevention and intervention programmes should focus on pregnant women at all education levels [30].

However, this study results were inconsistent with previous studies, which insisted the high knowledge level of anaemia amongst pregnant women was due to their high education levels [14,31]. Furthermore, Onyeneho and Subramaniam (2016) revealed that older mothers with paid employment had a better knowledge of anaemia as compared to younger mothers with unpaid employment. Similarly, Ahamed et al., (2018) also disagreed with the present study, whereby the study reported a significant association between women's knowledge of anaemia and their age. Moreover, good knowledge of anaemia had positive influence on practice and attitude to prevent and manage anaemia, especially during pregnancy [31]. A study amongst adolescents at secondary school in a rural district of Kelantan revealed that nutritional education increased the knowledge, attitudes and hemoglobin levels [32]. Therefore, these women need to be educated about their food choices and increase their knowledge levels so that they will increase the bioavailability of iron intake and decrease the consumption of food that inhibit iron absorption.

The limitation of this study was that it was conducted only in Kuala Terengganu, and thus cannot be considered as the knowledge level of all pregnant women in Terengganu population. It would be more informative if information on pregnant women's knowledge was gathered throughout Terengganu. Moreover, this study was conducted at Malay populated areas, whereby all respondents were of Malay ethnicity; hence, it limited the generalisation of other ethnicity, including Indians and Chinese. Nevertheless, this study provided an early finding on the knowledge of pregnant women regarding anemia and food that affect iron absorption.

CONCLUSION

The knowledge level of the pregnant women of this study was at moderate level. This study also revealed that the knowledge level of pregnant women was associated with monthly income, but not associated with age, gravida, occupation, education level as well as husband's occupation. This study provided an early insight into the knowledge of anaemia amongst pregnant women in Kuala Terengganu. Findings of this study emphasised and highlighted the need for the implementation of educational intervention to increase and improve the knowledge of pregnant women on anaemia and food that influence iron absorption.

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Table 1: Socio-demographic characteristics of the respondents (n=71)

Variables	Frequency (n)	Percentage (%)	Mean (SD)
Age (years)			28.2 (6.2)
18-24	27	38.0	
25-31	22	31.0	
32-44	22	31.0	
Gravida			
Primigravida (1)	30	42.3	
Multigravida (2-4)	37	52.1	
Grand-multigravida (≥5)	4	5.6	
Occupation			
Government	21	29.6	
Private	12	16.9	
Self-employed	8	11.3	
Housewives	30	42.3	
Occupation (husband)			
Government	17	23.9	
Private	21	29.6	
Self-employed	33	46.5	
Others	0	0.0	
Education Level			
Secondary-school	39	54.9	
Tertiary Graduate	32	45.1	
Monthly Household Income (RM)			
<RM 2500	62	87.3	
RM 2501 - RM 3500	4	5.6	
>RM 3501	5	7.0	

Table 2: Response to Knowledge Questions on Anemia and Iron Absorption.

No.	Characteristics	n (%)			Mean (SD)
		Don't Know	Disagree	Agree	
1	Anemia is a condition in which blood hemoglobin is less than 11 mg/dL	11 (15.5)	7 (9.9)	53 (74.6)	
2	Iron transport oxygen to the tissues.	59 (83.1)	8 (11.3)	4 (5.6)	
3	Lack of iron can cause morbidity to the fetus	31 (43.7)	18 (25.4)	22 (31.0)	
4	Meat, chicken and fish were foods that high in iron	3 (4.2)	16 (22.5)	52 (73.2)	
5	Fresh fruit juice can reduce the negative affect of phytate and polyphenols	68 (95.8)	2 (2.8)	1 (1.4)	
6	Hematinic pill is an iron supplement	2 (2.8)	4 (5.6)	65 (91.5)	
7	Hematinic pill must be consumed daily to increase iron supply for fetus throughout the pregnancy	19 (26.8)	10 (14.1)	42 (59.2)	
8	Vitamin C-rich foods increase iron absorption	33 (46.5)	8 (11.3)	30 (42.3)	
9	Plants such as spinach, legumes and kale are rich in iron. Consumption of juice increase iron absorption of this food.	18 (25.4)	20 (28.2)	33 (46.5)	
10	Hematinic pill increases blood hemoglobin	3 (4.2)	11 (15.5)	57 (80.3)	
11	Coffee and tea cannot be taken with iron-containing food as they inhibit iron absorption	41 (57.7)	12 (16.9)	18 (25.4)	
12	Hematinic pill can be taken with coffee and tea ***	4 (5.6)	17 (23.9)	50 (70.4)	
13	Hematinic pill must be taken with other foods	8 (11.3)	22 (31.0)	41 (57.7)	
14	Hematinic pill can be taken with orange juice	21 (29.6)	28 (39.4)	22 (31.0)	
15	Boiled eggs inhibit iron absorption	66 (93.0)	3 (4.2)	2 (2.8)	
16	Milk is essential in bone development, but if taken with iron-containing foods it will inhibit iron absorption	17 (23.9)	17 (23.9)	37 (52.1)	
17	Chocolate drink and carbonated drink contain compound that help iron absorption***	18 (25.4)	22 (31.0)	31 (43.7)	
18	Vitamin C, meat, chicken and fish contain compound that enhance iron absorption	14 (19.7)	11 (15.5)	46 (64.8)	
19	Iron-inhibitor foods are coffee, tea, cocoa, milk and cereals.	33 (46.5)	14 (19.7)	24 (33.8)	
20	Chili is an inhibitor for iron-absorption	66 (93.0)	1 (1.4)	4 (5.6)	
21	Poultry (meat, chicken) can be taken with hematinic pill as it enhances iron absorption	22 (31.0)	4 (5.6)	45 (63.4)	
22	Hematinic pill must be kept in an airtight container and away from the sunlight	18 (25.4)	2 (2.8)	51 (71.8)	
23	Milk must be consumed two hours after taken hematinic pill	18 (25.4)	23 (32.4)	30 (42.3)	
24	Vitamin A is essential in maintaining the iron-balance in the body	65 (91.5)	0 (0.0)	6 (8.5)	
25	Vitamin A can be obtained from red-leafy vegetables or red-colored fruits.	30 (42.3)	16 (22.5)	25 (35.2)	
26	Iron absorption occur at small intestine, mainly in duodenum	61 (85.9)	4 (5.6)	6 (8.5)	
27	Consumption of hematinic pill will increase hemoglobin within two-week period.	22 (31.0)	20 (28.2)	29 (40.8)	
28	Vitamin C supplement that had been provided with iron supplement will help enhancing iron absorption	22 (31.0)	20 (28.2)	29 (40.8)	
29	Phytate compound found in certain foods inhibits iron absorption	63 (88.7)	7 (9.9)	1 (1.4)	
30	Polyphenols compound found in vegetables and certain fruits inhibit iron absorption	66 (93.0)	5 (7.0)	0 (0.0)	
	OVERALL				57.41 (4.80)

***negative statement

Table 3: Distribution of Knowledge Level (n=71)

Knowledge Level	Score (%)	Frequency (n)	Percentage (%)
Poor	0-30	0	0.0
Moderate	31-60	57	80.3
Good	61-90	14	19.7

Table 4: Association between knowledge and socio-demographic characteristics (n=71).

Variables	Knowledge Level, n (%)		*p*-value
	Intermediate	Good	
Age (years)			0.359[b]
18-30	40 (83.3)	8 (16.7)	
31-44	17 (73.9)	6 (26.1)	
Gravida			0.959[a]
Primigravida	24 (80.0)	6 (20.0)	
Multigravida and Grandmultigravida	33 (80.5)	8 (19.5)	
Occupation			0.247[a]
Working	31 (75.6)	10 (24.4)	
Housewives	26 (86.7)	4 (13.3)	
Occupation (husband)			0.299[b]
Government	12 (70.6)	5 (29.4)	
Private and self-employed	45 (83.3)	9 (16.7)	
Education Level			0.311[a]
Secondary-school	33 (84.6)	6 (15.4)	
Tertiary Graduate	24 (75.0)	8 (25.0)	
Monthly Household Income (RM)			0.012[b]**
≤RM 2500	53 (85.5)	9 (14.5)	
>RM 2500	4 (44.4%)	5 (55.6)	

[a]Pearson Chi-square test; [b]Fisher's Exact Test
***p*-value<0.05