

# Knowledge, attitude and practices (KAP) towards anaemia among female university students in Malaysia: A cross-sectional survey

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## ABSTRACT

**Introduction:** Anaemia is a common health problem in Malaysia, most common being iron deficiency anaemia (IDA). This study aimed to assess knowledge, attitude, practices (KAP), and health-seeking behaviour (HSB) towards anaemia among undergraduate female students. **Methods:** A cross-sectional study was conducted among 180 female university students from a medical university in Malaysia. Data were collected using an online questionnaire comprising KAP and HSB. SPSS version 25.0 was used for statistical analysis. **Results:** Most participants (60%) had an appropriate level of knowledge about anaemia. A positive attitude was shown with adequate awareness of anaemia. A total of 55.5% of participants reported having good health practices. However, 52.9% of the participants consumed less iron-rich foods and 81.7% reported skipping meals. The overall observed health-seeking behaviour was good. A statistically significant relationship was found between knowledge with attitude ( $p=0.003$ ) and practice ( $p=0.005$ ). This study observed that the study population had poor nutritional status, long menstrual duration, and vegetarianism. Moreover, infrequent consumption of vitamin C-rich fruits and low iron-folate supplementation were also observed. **Conclusion:** A good level of knowledge on IDA among students was noted. However, most of the students showed a lack of positive attitude and good practices towards preventing anaemia. University students are prone to IDA due to a lack of KAP, which can significantly affect health-seeking behaviour. This issue should not be neglected; therefore, implementing intervention programmes to educate students on the preventive measures against the risk factors of IDA is recommended.

**Keywords:** anaemia, health-seeking behaviour, knowledge attitude practice

## INTRODUCTION

In Malaysia, anaemia has a prevalence of 21.3% and represents a health concern among all high-risk groups, including children, pregnant women, and women of reproductive age (De Benoist *et al.*,

2008; IPH, 2019). Anaemia is defined as insufficient circulating red blood cells (RBCs) essential for oxygen transmission (WHO, 2001). It is characterised by a haemoglobin (Hb) cut-off value of <12.0 g/dL for women and <13.0 g/dL for men

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(WHO, 2001). Iron deficiency anaemia (IDA) is the most common and takes up about 50% of anaemia cases (De Benoist *et al.*, 2008). Usually, IDA occurs due to low intake of iron-rich foods, periodic blood loss or poor iron absorption. IDA initially presents with non-specific signs and symptoms such as pale appearance and fatigue. However, it can cause impaired cognitive development in children and an increased risk of miscarriage in pregnant women.

According to the National Health and Morbidity Survey (NHMS) 2019, one in five Malaysians have anaemia, with the most affected being reproductive women aged 15–49 years old (IPH, 2019). Young women are considered vulnerable to IDA because of iron loss during menstruation and failure to achieve the recommended daily iron intake (IPH, 2014). IDA is a common problem in Asia; however, studies are mostly done on pregnant women and children. There is limited data available for female university students (Alzaheb & Al-Amer, 2017). Female students enrolled in higher education could be more susceptible to IDA because they prioritise academic activities than consuming adequate diets. Insufficient knowledge, attitude, and practices (KAP) on IDA prevention can be classified as risk factors because they invigorate poor dietary habits and negligence in prevention activities. Poor dietary habits, such as skipping meals and eating fast food, are considered a public health concern among university students, making them vulnerable to nutritional deficiencies (Ganasegeran *et al.*, 2012). For this purpose, health-seeking behaviour (HSB) should be emphasised as it plays a role in the early detection of anaemia. Unfortunately, many people are less likely to seek medical care as they are unaware or do not take their symptoms seriously.

Based on the National Plan of Action for Nutrition Malaysia III (NPANM

III), the global nutrition target is to reduce 50% of anaemia prevalence in reproductive women by 2025 (NCCFN, 2016). Many KAP studies on anaemia from Malaysia have mainly focused on pregnant women and adolescents, when this issue is equally applied to female undergraduate students (Azma, Ainoon & Azlin, 2012). Therefore, it is crucial to collect information to assist the design of nutrition interventions and create awareness of the significance of KAP and HSB in preventing IDA among female university students. The current study aimed to determine the KAP and health-seeking behaviour towards anaemia among undergraduate female university students.

## **MATERIALS AND METHODS**

The study was conducted in compliance with the ethical principles outlined in the Declaration of Helsinki as revised in 2013. Detailed informed consent was obtained for the inclusion of subjects in this study. This study was reviewed and approved by the International Medical University (IMU) Joint-Committee on Research and Ethics (IMUJC) # 4.2/JCM-191/2019. All information collected were strictly confidential, and anonymity was ensured.

### **Sample size calculation**

A cross-sectional online study was conducted from 8th July to 10<sup>th</sup> August 2020 among 180 female undergraduate students aged 19–26 years old studying in various schools in IMU, Kuala Lumpur. The sample size calculated based on G\*Power analysis was 180 for 7.3% (Kharel *et al.*, 2017) prevalence of anaemia at 99% confidence level. The inclusion criteria were female undergraduate students studying at IMU. Those who did not fulfil the criteria were excluded from this study.

### Data collection

The online questionnaire was adapted from two validated questionnaires (Jalambo *et al.*, 2017; Shahzad *et al.*, 2017). It was developed using Google Forms and distributed through online platforms such as WhatsApp and Outlook. The questionnaire consisted of five sections: sociodemographic information, knowledge, attitude, practice, and HSB towards anaemia.

Study variables, such as age, ethnicity, height, weight, knowledge, attitude, practice, and HSB, were recorded from the data. In addition, the study participants' undergraduate programme, semester, average duration of menstrual cycle, and vegetarianism status were also obtained.

The KAP questionnaire consisted of 36 questions and was divided into four sections, namely knowledge (18 questions), attitude (8 questions), practice (6 questions), and HSB (4 questions). The knowledge section corresponded to the level of awareness the participants had on the dangers associated with IDA. The attitude section provided information on the participants' perspective and feelings towards IDA. The practice part aimed to assess the participants' dietary habits. Lastly, HSB questions were included to ascertain its correlation with KAP and demonstrate proactiveness for treatment.

### Data analysis

Data analysis was performed using SPSS version 25.0. All quantitative variables were examined for normality by the Shapiro-Wilk test before analysis, whereas continuous variables were presented as mean and standard deviation. One-way ANOVA was used to determine statistically significant differences between mean and median proportions of subjects with good and poor levels of KAP. Pearson correlation coefficient was used to evaluate the

relationship between each study variable. A *p*-value of <0.05 was considered statistically significant.

## RESULTS

### Demographic information

In this study, the participants' mean age was 21.6 years old and mean BMI was 20.7 kg/m<sup>2</sup> (Table 1). Based on the results, 23.3% (46) students were underweight and 7.8% (14) were overweight. Most participants consisted of Chinese students (81.1%), followed by Indians (7.2%), Malays (5.6%) and other ethnicities (6.1%). Regarding periodic menstruation, 19.4% (35) students had an average duration of 2–4 days menstruation, 74.4% (134) had 5–7 days, while 6.1% (11) had >7 days. Lastly, 98.9% (178) students were non-vegetarian. The descriptive statistics and characteristics of the study population are illustrated in Table 1.

**Table 1.** Descriptive statistics and characteristics of the study sample

<i>Characteristics</i>	<i>mean±SD</i>	<i>n</i>	<i>%</i>
Age group (years)	21.6±1.3		
19–20		40	22.3
21–22		89	49.4
23–24		47	26.1
25–26		4	2.3
BMI (kg/m <sup>2</sup> )	20.7±3.3		
<18.5		46	25.6
18.5–24.9		116	64.4
25.0–29.9		14	7.8
>30.0		4	2.2
Ethnicity			
Chinese		146	81.1
Malay		10	5.6
Indian		13	7.2
Others		11	6.1
Average duration of menstruation			
2–4 days			19.4
5–7 days			74.4
>7 days			6.1
Vegetarian			
Yes			2.2
No			97.8

### Knowledge

Knowledge was assessed by grading each response based on the number of correct answers and the subjects' degree of awareness. Each correct answer on understanding corresponded to one point. The participants were required to answer an additional question to verify

their knowledge if they answered "Yes" to the first question. A score of >24 points (>70%) and <14 points out of a total of 34 points were considered as good and poor knowledge, respectively (9).

The mean score obtained was 60.3%, indicating a good level of knowledge on IDA among students. All respondents

**Table 2.** Characteristics of answers to knowledge questions

Characteristics	n	%
K.1 Do you know what is anaemia?		
Yes	180	100.0
No	0	0.0
K.2 Definition of anaemia?		
Lack of red blood cells	172	95.6
Hb levels <12g/dL	2	1.1
Related to blood	1	0.6
No answer	5	2.8
K.3 Most common type of anaemia?		
Iron deficiency anaemia	177	98.3
Vitamin deficiency anaemia	2	1.1
Aplastic anaemia	1	0.6
K.4 Harmful effects of anaemia?		
Yes	149	82.8
No	31	17.2
K.5 Most affected group in Malaysia by anaemia?		
Non-pregnant women of reproductive age	69	38.3
Pregnant women	98	54.4
Children	13	7.2
K.6 Causes of anaemia?		
Yes	162	90.0
No	18	10.0
K.7 Symptoms of anaemia?		
Yes	167	92.8
No	13	7.2
K.8 Consequences of anaemia for infants and young children?		
Yes	132	73.3
No	48	26.7
K.9 Consequences of anaemia for pregnant women?		
Yes	144	80.0
No	36	20.0
K.10 Prevention of anaemia?		
Yes	139	77.2
No	41	22.8
K.11 Identification of iron-rich foods?		
Yes	123	68.3
No	57	31.7

claimed to know about anaemia, where 96.7% defined the term correctly. The majority (98.3%) of students recognised IDA as the most prevalent type of anaemia. A high percentage of students were accurate on the function of Hb (96.1%) and aware of the harmful effects (82.8%), causes (90.0%) and symptoms (92.8%) of anaemia. Despite that, only 60%–80% of the students could correctly identify all the consequences of anaemia.

Moreover, only 38.3% answered correctly about the most affected group by anaemia: non-pregnant women. Approximately half of the students (55.6%) could recognise a person with anaemia. Most students also understood the consequences of anaemia on children (73.3%) and pregnant women (80.0%). A total of 139 respondents (77.2%) knew how to prevent anaemia,

but only 68.3% could identify the effects of different foods on iron absorption. The characteristics of answers to knowledge questions are shown in Table 2.

### Attitude

About 32.8% of students were unsure if they were diagnosed with anaemia (Table 3). A positive attitude was detected when 34.4% and 62.2% considered anaemia a serious or moderate health problem. Although the benefits of iron-rich foods were well known by 90.0% of respondents, 11.1% found difficulty and 20.0% were not confident in preparing these meals. Findings also showed that 72.8% were willing to take iron supplements if diagnosed with anaemia. Lastly, most respondents (87.8%) deemed nutrition education programmes beneficial for preventing IDA (Table 3).

**Table 3.** Characteristics of answers to attitude questions

Characteristics	n	%
A.1 How likely do you think you are to be anaemic?		
Very likely	33	18.3
Unsure	59	32.8
Not likely	88	48.9
A.2 How serious do you think anaemia is as a public health problem?		
Serious	62	34.4
Moderate	112	62.2
Not serious	6	3.3
A.3 How beneficial do you think it is to prepare meals with iron-rich foods?		
Beneficial	162	90.0
Not sure	17	9.4
Not beneficial	1	0.6
A.4 How difficult is it for you to prepare meals with iron-rich foods?		
Easy	32	17.8
Capable	128	71.1
Difficult	20	11.1
A.5 How confident do you feel in preparing meals with iron-rich foods?		
Very confident	20	11.1
Capable	124	68.9
Not confident	36	20.0
A.6 How serious do you think anaemia is as a public health problem?		
Yes	131	72.8
Maybe	37	20.6
No	12	6.7



Characteristics	n		%	
	n	%	n	%
P.5 When do you usually consume the following foods?				
Vitamin C rich fruits	46	25.6	10	5.6
Coffee/Tea	65	36.1	51	28.3
Milk	76	68.9	46	25.6
P.6 Do you tend to skip meals?				
Often	39	21.7		
Seldom	108	60.0		
Never	33	18.3		
HSB.1 Would you seek medical attention if you suspect that you have anaemia?				
Yes	162	90		
No	18	10		
HSB. 2 Have you checked your haemoglobin levels in the past 1 year?				
Yes	80	44.4		
No	100	55.6		
HSB. 3 Have you taken iron folic acid (IFA) tablets in the past 1 year?				
Yes	25	13.9		
No	155	86.1		
HSB. 4 Have you taken deworming tablets in the past 6 months?				
Yes	3	1.7		
No	177	98.3		

### Practice

Out of 180 students, 91.7% included dietary haem iron in their meals, as shown in Table 4. Daily consumption of animal meats (73.9%) and green leafy vegetables (79.4%) were the highest. Most respondents consumed vitamin C-rich fruits weekly (44.4%); however, only 5.6% ate them during meals. Furthermore, only 15.0% of the students included legumes in their daily meals. Regarding beverages, most students did not drink coffee, tea (35%) or milk (30%) often. If so, approximately half of the population never consumed or consumed <1 cup of coffee, tea (61.7%) or milk (59.4%) per day. These beverages were also commonly consumed before meals, where coffee or tea was consumed by 36.1% and milk was consumed by 68.9%. The practice of skipping meals was detected in 87.1% of subjects.

### Health-seeking behaviour (HSB)

HSB was assessed by evaluating the participants' proactiveness for regular health inspection and performing activities to prevent the development of IDA. Out of a total of four activities, students who had done  $\geq 2$  activities were categorised as high HSB, <2 activities as low HSB (Asfaw, Ayanto & Aweke, 2018).

Overall, the participants displayed high HSB. About half (52.8%) of the students performed at least one activity, 43.3% students did two activities, and only 4.4% did none. As observed in this study, 90.0% of students would agree to seek medical attention if they suspect anaemia. However, only 44.4% checked their Hb levels, 14.0% had taken iron-folic acid (IFA) tablets in the past year, and 2.0% of students had taken deworming tablets in the past six months. The characteristics of answers to HSB questions are shown in Table 4.

### Association between KAP and HSB

Findings showed that there was statistically significant relationship between knowledge with attitude ( $p=0.003$ ) and practice ( $p=0.005$ ), but not with HSB (Table 5). A higher level of knowledge strongly corresponded to a better attitude in the study population, but weakly corresponded to practices towards preventing anaemia. In contrast, the variables attitude, practice, and HSB were found to have no significant associations with each other.

### DISCUSSION

Anaemia is prevalent among women of reproductive age, where young female

**Table 5.** Associations between KAP and HSB

		<i>Knowledge</i>	<i>Attitude</i>	<i>Practice</i>	<i>HSB</i>
Knowledge	Pearson	1	0.218	-0.209	0.054
	Correlation Sig. (2-tailed)		0.003*	0.005*	0.468
Attitude	Pearson		1	-0.067	0.096
	Correlation Sig. (2-tailed)			0.369	0.201
Practice	Pearson			1	0.052
	Correlation Sig. (2-tailed)				0.485
HSB	Pearson				1
	Correlation Sig. (2-tailed)				

\*Significantly correlated at  $p < 0.05$  (2-tailed); HSB: Health-seeking behaviour



students are prone to develop IDA due to hectic schedules and academic stress, resulting in negligence on a healthy lifestyle and poor dietary habits (Ganasegeran *et al.*, 2012). IDA generally causes fatigue and weakness due to less oxygen being supplied to the body, leading to impaired work productivity and poor academic performance (Soleimani & Abbaszadeh, 2011). The prevention of IDA includes lifestyle modifications, especially consumption of iron-rich foods (WHO, 2016). Thus, improving KAP towards anaemia among female university students is necessary to garner awareness on the prevention of IDA and the adoption of HSB.

To determine knowledge level, a score of >70% and <40% were considered as good or poor knowledge, respectively. The respondents scored an average of 60.3% and elicited an appropriate awareness level on IDA. This score was slightly higher than another study conducted among students from a home economics college who scored 54% (Shahzad *et al.*, 2017). Most students correctly answered the general characteristics of anaemia, such as its symptoms, causes, and harmful effects. In our study, 54.4% perceived pregnant women as individuals most affected by IDA. Pregnant women have a higher incidence rate, but anaemia remains most prevalent among non-pregnant women in Malaysia (De Benoist *et al.*, 2008). Prevention of IDA should start early to improve pregnant women's overall health status, thus progressively facilitating the reduction of maternal and perinatal mortality. Only seven students (3.88%) answered all questions correctly about the effect of each food on iron absorption. This showed that the study sample lacked nutrition knowledge, which was strongly reflected on their practices.

The respondents' overall attitude was positive; however, 32.8% were unsure if

they had anaemia, which was lower than observed in other studies (Singh, Rajoura & Honnakamble, 2019). Although the knowledge level and attitude observed were acceptable, the results obtained were unsatisfactory since this population who studied in a medical university was expected to better understand health issues and had convenient access to health facilities for medical diagnosis compared to the public.

The negative attitude was related to their ability and confidence in the preparation of meals high in iron. The present study recommends dietary counselling on food preparation to stimulate behavioural change and enhance dietary diversity and quality among the students (Lopes *et al.*, 2018). This is evident in a study where nutrition education in secondary schools increased Hb levels after KAP improvement (Yusoff, Daud & Ahmad, 2012). According to a study, iron supplements helped alleviate the undesirable effects of anaemia encountered by students (Soleimani & Abbaszadeh, 2011). Also, concentration and school performance among adolescent girls in Ghana were remarkably increased after iron and folic acid supplementation (IFAS) programme (Deshpande, Basil & Basil, 2009).

Numerous studies have reported that students' poor eating behaviour is strongly associated with stress and low self-esteem (Deshpande *et al.*, 2009). Nonetheless, the subjects demonstrated good food selection practices as they had the highest daily consumption of ideal portion-sized animal meats (73.9%) and green leafy vegetables (79.4%). Low daily consumption of vitamin C-rich fruits (37.8%) was observed in our population, which predisposes them to IDA due to decreased non-haem iron absorption secondary to low vitamin C intake.

However, more than half of the participants (52.9%) consumed less iron-rich foods. A total of 81.7% reported

skipping meals, and 63.9% drank tea or coffee during or after meals. Taking tea or coffee during or after meal decreases iron absorption and can lead to IDA. Tea consumption of >4 cups per day was related to a higher IDA prevalence, mainly due to the presence of iron absorption inhibitors (polyphenols and calcium) (Sung *et al.*, 2018). Moreover, 32.8% of participants consumed junk food weekly. These findings agree with Kannan & Ivan (2017); 25% of their study subjects regularly skipped meals, and 33% frequently consumed fried foods.

Based on the Malaysian Adult Nutrition Survey (MANS) 2014 (IPH, 2014), iron intake was the most inadequate in women where only 52% of the recommended nutrient intake was achieved, which was consistent with the previous study conducted by Loh & Khor (2010). The tendency to skip meals was found in 60% of respondents. Skipping meals and having an imbalanced diet is common among college students, as observed in Bangladesh, and this may contribute to IDA (Shill *et al.*, 2014). Many studies revealed a higher prevalence of anaemia among those skipping meals (Shill *et al.*, 2014).

Low nutritional status is a significant risk factor for anaemia, especially in underweight and overweight populations (Shill, Karmakar & Kibria, 2014). The Ministry of Health Malaysia (MOH) reported that women >19 years have an average iron loss of 1.90 mg per day during menstruation, which is double the amount of basal daily iron loss, thus increasing the risk of IDA in this age group (NCCFN, 2017). In this study, 74.4% of the students had an average menstruation duration of between five to seven days, and 6.1% of the students had an average duration of more than seven days.

Findings revealed that 52.8% of the participants had high HSB towards

anaemia. Also, the participants performed at least one or two of the preventive activities mentioned in Table 5, indicating high HSB among the female students.

In the present study, the observed score for seeking medical attention when encountering health issues was higher (90.0%) than a finding in the literature, which was 77.2% (Hadaye, Dass & Lavangare, 2018). The present study revealed 55.6% of participants did not check their Hb levels in the past year. Students generally rather stay undiagnosed or practise self-medication, consistent with another reported study (El Kahi *et al.*, 2012).

IDA may result from a lack of iron folate supplementation and deworming tablets. In our study, 86.1% and 98.3% of participants did not take these tablets, putting them at higher IDA risk. A reduction in anaemia prevalence was shown in a study conducted among the Indian population after supplementation with IFA alone or with vitamin C and deworming tablets (Joseph & Ramesh, 2013).

Good knowledge and change in attitude can help achieve the necessary shift in behaviour towards healthy foods to prevent IDA (Shahzad *et al.*, 2017). The present study showed a statistically significant relationship with a positive linear correlation ( $p=0.003$ ) between knowledge and attitude. Thus, a higher level of knowledge corresponds to a better attitude and vice versa. This finding was consistent with a study in Putrajaya, which observed that a high level of knowledge reflected a positive attitude towards anaemia (Adznam, Sedek & Kasim, 2018). In comparison, a weak negative correlation existed between knowledge and practice ( $p=0.005$ ). This result contrasted with findings by Imunticha, Achen & Quadras (2015), who found a weak but positive correlation between knowledge and self-

reported practices on IDA prevention.

Based on the discussion above, it is imperative to strengthen students' dietary knowledge and reinforce good food-based prevention practices against IDA. The synergistic effect of improved knowledge and attitude are more likely to prompt practices against IDA and develop HSB. A recent study by Singh *et al.* (2019) noticed a statistically significant change in KAP among Delhi adolescent girls before and after providing health education (Singh, Honnakamble & Rajoura, 2019). Researchers suggest that achieving the desired change of behaviour towards nutrition and health depends on gaining sufficient knowledge, changing attitude, and developing acceptable practices related to health and nutrition (Shariff *et al.*, 2008). Therefore, nutrition interventions should be reinforced, especially since 35.1% of Malaysian adults have low health literacy on managing medical issues and disease prevention (IPH, 2019). Besides that, government and educational institutions are suggested to organise programmes to help provide information on health and nutrition for students (WHO, 2001). Such programmes are expected to assist IDA prevention through counselling on the importance of consuming iron-rich foods and taking necessary tests and supplements to strengthen positive HSB towards anaemia (WHO, 2001). Through improved KAP and HSB, there will be lower incidences of morbidity and mortality caused by IDA (Inche, Sutan & Shamsuddin, 2014). Hence, the risk of IDA in these female students should not be neglected, and more research should be conducted to raise awareness that will promote changes in KAP and HSB to combat IDA.

Some limitations were identified in this study. While it was not among the primary purposes of this study, a

valuable measure of Hb level would be of great interest in determining the effects of KAP on the prevalence of anaemia among the study sample. Furthermore, a more homogenous and larger sample size may have been able to reveal clearer and more immediate differences between individuals with good and poor KAP.

## **CONCLUSION**

The female undergraduate students demonstrated an appropriate level of knowledge; however, the majority showed a lack of positive attitude and good practice towards preventing anaemia. In addition, skipping meals was observed in most students. A statistically significant correlation was only found between knowledge with attitude and practice. The overall HSB among the students was high. This study highlighted that female university students are prone to IDA due to a lack of KAP and thus recommends intervention programmes through educational institutions to improve KAP, encourage HSB, and take preventive measures against the risk factors of IDA in this population.

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## **Authors' contributions**

HC, led the data collection, did the analysis and prepared the draft of the manuscript; CJL, led the data collection and reviewed the manuscript; NRY, led the data collection and reviewed the manuscript; PDK, reviewed the manuscript; MS, designed the study and reviewed the manuscript; SA, corresponding investigator, conceptualised and supervised the study, and reviewed the manuscript.

## **Conflict of interest**

The authors have no conflict of interest associated with the materials presented in this paper.

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