UNIVERSITI PUTRA MALAYSIA

FACTORS ASSOCIATED WITH IRON DEFICIENCY ANAEMIA AMONG PREGNANT WOMEN ATTENDING SELECTED HEALTH CLINICS IN SELANGOR AND KUALA LUMPUR, MALAYSIA

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By

TAN MENG LEE

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March 2021

Chair : Assoc. Prof. Chin Yit Siew, PhD
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Iron deficiency anaemia (IDA) is defined as the presence of anaemia (Hb<11 g/dL) and iron deficiency (SF<15µg/L), which is a major health problem during pregnancy leading to adverse impacts on maternal and infant health. The cross-sectional study aimed to determine the factors associated with IDA in 400 third trimester pregnant women from six randomly selected health clinics in Selangor and Kuala Lumpur was carried out. Socio-demographic characteristics and knowledge on dietary iron supplementation and anaemia were assessed using a set of standardised questionnaire via face-to-face interviews. Information on obstetrical characteristics was obtained using secondary data from the antenatal medical record. Dietary practices were assessed using a semi-quantitative food frequency questionnaire. Information on haemoglobin (Hb) was obtained using secondary data from the antenatal medical record and serum ferritin (SF) was obtained from 1mL of venous blood sample drawn by trained nurse and analysed using ADVIA Centaur analyser for the determination of iron status. Bivariate analyses and multiple logistic regression were performed to determine the associations between socio-demographic characteristics, obstetrical characteristics, dietary practices, knowledge on dietary iron supplementation and anaemia as well as IDA. The prevalence of IDA was 15.2%, with mean ± standard deviation Hb of 11.12 ± 1.01 g/dL and median (interquartile range) SF of 27.40 (32.20) µg/L. IDA were significantly associated with pregnant woman of Malay ethnicity (OR=8.693, 95% CI=1.079-70.022, p=0.042), spouse of older age (OR=1.077, 95% CI=1.021-1.136, p=0.007), who had pre-pregnancy underweight (OR=3.105, 95% CI=1.363-7.074, p=0.007) and non-compliant towards dietary iron supplementation (OR=3.415, 95% CI=1.792-6.508, p<0.001), explaining 15.4% of the variances in IDA. Findings of the present study suggested that Malay women who had pre-pregnancy underweight and non-compliant towards dietary iron supplementation should be targeted for assessments of iron status during antenatal care visits. Pregnant women whose

spouses of older age should also be targeted so that preventive and intervention measures against IDA could be taken as required.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Master Sains

FAKTOR-FAKTOR YANG BERKAITAN DENGAN ANEMIA KEKURANGAN ZAT BESI DALAM KALANGAN WANITA HAMIL DARI KLINIK-KLINIK KESIHATAN TERPILIH DI SELANGOR DAN KUALA LUMPUR, MALAYSIA

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Anemia kekurangan zat besi (IDA) didefinisikan sebagai keadaan anemia (Hb<11g/dL) berserta kekurangan zat besi (SF<15µg/L), dan merupakan salah satu masalah kesihatan utama semasa kehamilan yang boleh membawa impak buruk terhadap kesihatan ibu dan anak. Kajian keratan rentas ini telah dijalankan bertujuan untuk menentukan faktor-faktor yang berkaitan dengan IDA dalam kalangan 400 orang wanita hamil trimester ketiga dari enam klinik kesihatan yang terpilih secara rawak di Selangor dan Kuala Lumpur. Ciri-ciri sosio-demografi dan tahap pengetahuan mengenai pengambilan suplemen zat besi serta anemia telah dinilai dengan menggunakan satu set soal selidik berstruktur melalui temu-ramah secara bersemuka. Informasi mengenai ciri-ciri obstetrik telah diperolehi daripada rekod kesihatan ibu. Amalan pemakanan telah dinilai dengan menggunakan soal selidik kekerapan makanan semi-kuantitatif. Informasi mengenai hemoglobin (Hb) telah diekstrak daripada rekod kesihatan ibu dan ferritin serum (SF) telah diperolehi daripada 1mL sampel darah vena yang diambil oleh jururawat terlatih dan dianalisis dengan peralatan analisis ADVIA Centaur bagi penilaian status zat besi. Analisis bivariat dan regresi logistik berganda telah digunakan untuk menentukan hubungan antara ciri-ciri sosio-demografi, ciri-ciri obstetrik, amalan pemakanan dan tahap pengetahuan mengenai pengambilan suplemen zat besi serta anemia dengan IDA. Kadar prevalens IDA adalah 15.2%, dengan min±sisihan piawai Hb yang bernilai 11.12±1.01 g/dL dan median (julat interkuatil) SF yang bernilai 27.40 (32.20) µg/L. IDA dikaitkan secara signifikan dengan wanita hamil yang beretnik Melayu (OR=8.693, 95% CI=1.079-70.022, p=0.042), pasangan yang lebih berusia (OR=1.077, 95% CI=1.021-1.136, p=0.007), kurang berat badan sebelum kehamilan (OR=3.105, 95% CI=1.363-7.074, p=0.007) dan tidak mematuhi pengambilan suplemen zat besi (OR=3.415, 95% CI=1.792-6.508, p<0.001), menjelaskan pemerhatian kajian yang mana terdapat 15.4% variasi dalam IDA. Dapatan kajian ini mencadangkan bahawa wanita Melayu yang

kurang berat badan sebelum kehamilan dan tidak mematuhi pengambilan suplemen zat besi harus disasarkan bagi penilaian status zat besi semasa lawatan perawatan antenatal. Wanita hamil yang mempunyai pasangan yang lebih berusia juga harus disasarkan supaya langkah pencegahan dan intervensi terhadap IDA dapat diambil mengikut keperluan.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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LIST OF ABBREVIATIONS

AGP	α-1-acid glycoprotein
ANC	Antenatal care
ATP	Adenosine triphosphate
B	Beta coefficient
BMI	Body mass index
CDC	Centers for Disease Control and Prevention
CI	Confidence interval
CMIA	Chemiluminescent microparticle immunoassay
CRP	C-reactive protein
Dcytb	Duodenal cytochrome B
DEFF	Design effect
DMT1	Divalent metal transporter 1
EP	Erythrocyte protoporphyrin
FBC	Full blood count
Fe^{2+}	Ferrous ion
Fe^{3+}	Ferric ion
FFQ	Food frequency questionnaire
FPN1	Ferroportin
G6PD	Glucose-6-phosphate dehydrogenase deficiency
H^{+}	Hydrogen ion
Hb	Haemoglobin
HCP1	Haem carrier protein 1
Hct	Haematocrit
HIV	Human immunodeficiency virus

IDA	Iron deficiency anaemia
IDE	Iron deficient erythropoiesis
JKEUPM	Ethics Committee for Research involving Human Subjects, Universiti Putra Malaysia
LR	Likelihood ratio
MANS	Malaysian Adult Nutrition Survey
MCH	Maternal and Child Health
MCV	Mean cell volume
MICOS	Mother and Infant Cohort Study
MREC	Medical Research and Ethics Committee
mRNA	Messenger ribonucleic acid
NCCFN	National Coordinating Committee on Food and Nutrition
OR	Odd ratio
RDW	Red blood cell distribution width
RNI	Recommended nutrient intake
ROC	Receiver Operating Characteristics
SD	Standard deviation
SE	Standard error
SF	Serum ferritin
SOP	Standard operating procedures
TfR	Transferrin receptor
TIBC	Total iron-binding capacity
TS	Transferrin saturation
USDA	United States Department of Agriculture
WHO	World Health Organisation
α	Cronbach's alpha

CHAPTER 1

INTRODUCTION

1.1 Background

Pregnancy, also known as gestation, is a process of foetal development from the time of conception until birth, which typically lasts approximately 40 weeks counting from the first day of a woman's last menstrual period (Department of Health and Human Services, 2018). The weeks throughout a pregnancy are divided into three trimesters, which include first trimester (gestational week < 12), second trimester (gestational week = 13-27) and third trimester (gestational week ≥ 28) (Ministry of Health Malaysia, 2013c).

During pregnancy, health conditions ranging from common discomforts such as nauseas, vomiting, backache, cramps, headache, fatigue and oedema to serious complications may develop. Besides obesity, urinary tract infections, gestational diabetes mellitus, placenta previa, preeclampsia, hyperemesis gravidarum and foetal problems, anaemia is one of the most common health problems experienced by pregnant women (National Health Service, 2018; Department of Health and Human Services, 2017; CDC, 2016; WHO, 2013).

Based on the latest findings from Global Health Observatory Data Repository/ World Health Statistics by WHO (2020b), the global prevalence of anaemia (Hb < 11.0 g/dL) during pregnancy was 40.1% in year 2016. Another report on the global prevalence of anaemia showed that approximately 32.4 million pregnant women were affected by anaemia with the mean haemoglobin (Hb) of 11.4 g/dL, whereby approximately 0.8 million of the pregnant women were severely anaemic during pregnancy (Gupta & Gadipudi, 2018; WHO, 2015; Stevens et al., 2013). Southeast Asia population has the highest prevalence of anaemia during pregnancy (48.7%), followed by Africa population with the prevalence of 46.3% (WHO, 2016). The prevalence of anaemia during pregnancy in developing countries (56.0%) was reported to be higher as compared to that of developed countries (18.0%) (Athe et al., 2020).

In Malaysia, anaemia during pregnancy has been reported in various settings as a mild-to-severe public health problem based on WHO classification (WHO, 2011a), with the prevalence ranging from 6.3% to 67.0% over the three decades (Siti Nur' et al., 2018; Mahdy et al., 2017; Ministry of Health Malaysia, 2018； Soh et al., 2015; Tan et al., 2013; Nik Rosmawati et al., 2012; Pontian District Health Office, 2012; Siti Khatijah et al., 2010; Thirukkanesh & Zahara,

2010; Jamaiyah et al., 2007; Hassan et al., 2005; Ahmad et al., 1997; Hanafiah et al., 1992; Arshad, 1984; Tee et al., 1984).

Among the various causes of anaemia, iron deficiency is the most common cause of anaemia, attributing approximately half of all the cases of anaemia (WHO, 2015; WHO, 2001). Anaemia caused by iron deficiency, which is also known as iron deficiency anaemia (IDA), can develop at any stage of the human life-cycle (Vos et al., 2017). However, pregnant women are more vulnerable to IDA than non-pregnant women due to increased iron requirements. IDA develops when the body has prolonged depletion of iron stores, leading to iron deficiency; and thus, affecting Hb synthesis and resulting in anaemia (WHO, 2011b). To date, only three published studies on IDA are available in Malaysia despite numerous local studies on general anaemia (Mahdy et al., 2017; Hassan et al., 2005; Arshad, 1984). The three studies were cross-sectional, conducted among 250, 52 and 315 pregnant women (in any trimester) in Kuala Lumpur, Kelantan and Selangor respectively. The studies reported that the prevalence of IDA among pregnant women in Malaysia was approximately 21.0%. As IDA was not the primary study outcome, the three existing local studies were limited to prevalence studies without investigating the factors associated with IDA.

Based on a systematic analysis involving 195 countries, IDA has been reported as one of the five leading causes of global disease burden (Vos et al., 2017). Globally, it is estimated that IDA was associated with 22% and 24% of maternal and perinatal mortality occurring per year respectively. As Southeast Asia and Africa are highly affected by IDA, approximately 37% and 43% of maternal mortality in Southeast Asia and Africa were caused by IDA respectively. Furthermore, it is estimated that 40% and 34% of perinatal mortality occurred in Southeast Asia and Africa respectively were also caused by IDA (Asrie, 2017; Ahmad et al., 2010). Numerous studies have shown that IDA during pregnancy is associated with increased risk of complications such as perinatal infection, pre-eclampsia, postpartum haemorrhage, premature delivery, foetal growth retardation, low birth weight, small-for-gestational age and mortality (Nair et al., 2016; Abu-Ouf & Jan, 2015; Frass, 2015; WHO, 2013). There are still limited studies around the world which investigated IDA (defined based on the use of Hb as screening indicator of IDA, with at least one additional assessment as confirmatory indicator of IDA) during pregnancy to the best of our knowledge despite the known adverse health outcomes of IDA on both pregnant women and their infants. About half of the existing studies which involved IDA during pregnancy were limited to prevalence studies. Whilst the remaining studies investigated factors associated with IDA, all were conducted in foreign countries. Furthermore, majority of the existing studies investigated only on certain factors in the aspects of socio-demographic characteristics and obstetrical characteristics. To date, studies which investigated factors in other aspects particularly dietary practices and knowledge level were scarce. Hence, there is an urgent need to determine the updated prevalence of IDA and its associated factors comprehensively in the Malaysian context to reduce the disease burden and adverse health outcomes among pregnant women and their infants.

1.2 Problem statement

Anaemia during pregnancy is considered as one of the common public health problems in Malaysia. Numerous local cross-sectional studies conducted in the recent years found that anaemia during pregnancy remains prevalent in Malaysia, with the prevalence ranging from 24.6% to 57.4% (Siti Nur' et al., 2018; Mahdy et al., 2017; Soh et al., 2015; Nik Rosmawati et al., 2012; Pontian District Health Office, 2012; Siti Khatijah et al., 2010; Jamaiyah et al., 2007). However, based on the Annual Report by Ministry of Health Malaysia (2018), a decreasing trend in the prevalence of anaemia from 38.3% in year 2004 to 6.3% in year 2017 was reported among pregnant women at gestational week of 36. Contradiction of the findings could be explained by the difference in assessment points, whereby majority of the local studies assessed anaemia status of pregnant women at any trimester of pregnancy. Meanwhile, the national study assessed anaemia status of pregnant women at the end of last trimester (specifically at gestational week of 36). Anaemia during pregnancy could have been resolved particularly near the end of last trimester before delivery due to the dietary iron supplementation programmes implemented in Malaysia. As approximately 80% of placental-foetal iron transfer occurs throughout the third trimester, previous studies reported that maternal iron intake during the third trimester was significantly associated with cord blood ferritin of infants (Kling & Coe, 2016; Monk et al., 2016). Thus, further research on anaemia is needed, with the focus on IDA which is the primary type of anaemia, and pregnant women in the third trimester.

A systematic review and meta-analysis by Haider et al. (2013) reported that majority of the existing studies investigated merely on general anaemia without focusing on IDA during pregnancy. Based on our literature search, similar situation with limited literatures was also observed in Malaysia, whereby three local studies were related to IDA during pregnancy despite substantial previous studies on general anaemia. In addition, due to the relatively low cost and quick assessment, anaemia is often used as a proxy for IDA (Yaghoobi et al., 2015; Haider et al., 2013). The terms 'anaemia' and 'IDA' are also often used interchangeably, which further result in ambiguity and difficulty in interpretation of the findings (Khaskheli et al., 2016; Yaghoobi et al., 2015; Balarajan et al, 2011; Aikawa et al., 2006). Thus, it is crucial to conduct research on IDA during pregnancy, particularly in local settings.

As maternal mortality ratio in Malaysia has declined by 23.7% (declined from 38.0 to 29.0 per 100,000 live births in year 2000 and 2017 respectively) over the past 17 years, it is expected to have some improvements in the aspect of public health problems, including IDA during pregnancy (WHO, 2019). However, despite using different cut-off points for haemoglobin (Hb) and serum ferritin (SF) in defining IDA, the prevalence of IDA during pregnancy in Malaysia has not been remarkedly improved over the years, whereby the prevalence remains fairly unchanged at approximately 21.0% as shown in the local studies conducted by Mahdy et al. (2017), Hassan et al. (2005) and Arshad (1984). For the study by Mahdy et al. (2017) which was conducted in

Kuala Lumpur, the primary outcome was to compare SF by age, ethnicity, education level, parity and gestational age. Primary outcome of another study in Kelantan by Hassan et al. (2005) was to determine the associations between SF and other biomarkers such as Hb, mean cell volume (MCV) and mean cell haemoglobin concentration (MCHC). On the other hand, another study conducted in Selangor by Arshad (1984) aimed to determine the factors associated with general anaemia (Hb < 10 g/dL). As all the local studies are limited to prevalence of IDA, there is an urgent need to further determine the underlying factors associated with IDA in order to improve understanding of IDA during pregnancy in Malaysia.

As aetiology of IDA could be multifactorial, complex and context specific, addressing determinants of IDA during pregnancy remains challenging (Chaparro & Suchdev, 2019; Balarajan et al., 2011). To date, local studies which investigated the factors associated with IDA during pregnancy remain unavailable in Malaysia. Foreign studies showed that socio-demographic characteristics and obstetrical characteristics were associated with IDA during pregnancy (Ajepe et al., 2020; Obasi & Nwachukwu, 2013; Tran et al., 2013; Suchila et al., 2012; Lao & Ho, 2004; Suega et al., 2002). For instance, previous studies in foreign countries reported that lower education level (Ajepe et al., 2020; Obasi & Nwachukwu, 2013; Suega et al., 2002), lower household income (Obasi & Nwachukwu, 2013), higher gravidity (Tran et al., 2013), higher parity (Obasi & Nwachukwu, 2013; Lao & Ho, 2004) and late antenatal care (ANC) booking (Ajepe et al., 2020; Suchila et al., 2012) were associated with higher risk of IDA among pregnant women. Hence, determination of socio-demographic characteristics and obstetrical characteristics are important for the present study.

Previous studies which investigated the association between dietary practices and IDA were limited to foreign countries. Findings in several foreign studies reported that lower intake of dietary iron supplements during pregnancy was associated with higher risk of IDA (Ajepe et al., 2020; Makhoul et al., 2012; Suega et al., 2002). Although numerous studies on general anaemia or iron deficiency which were conducted in Malaysia (Arshad, 1984) and other countries (Mehrotra et al., 2018; Abay et al., 2017; Lebso et al., 2017; Mulepati & Chaudhary, 2017; Saaka et al., 2017; Aikawa et al., 2016; Cheema et al., 2016; Bedi et al., 2015; Abriha et al., 2014; Makhoul et al., 2012) reported dietary intakes as the contributing factor, existing studies on IDA were scarce. As indicated by a study in Malaysia, lack of knowledge is perceived to result in higher risk of health problems such as malnutrition and micronutrient deficiencies among pregnant women (Siti Nur' et al., 2018). To date, there is no published study which investigated the associations of knowledge on dietary iron supplementation and anaemia with IDA among pregnant women in both local and foreign countries. Thus, associations of dietary practices, knowledge on dietary iron supplementation and anaemia with IDA are needed to be confirmed.

Besides the existing variables, other potential variables on socio-demographic characteristics (such as age, ethnicity and working status of pregnant woman, age, ethnicity, education level and working status of spouse, family type, household size), obstetrical characteristics (such as frequency of ANC visits, pre-pregnancy BMI, anaemia history) and dietary practices (such as intakes of energy, carbohydrate, protein, fat, iron, folic acid, vitamin C and calcium) required to be identified. Determination for knowledge on dietary iron supplementation and anaemia is also needed. While several findings on IDA remain inconsistent, further research is required. Research that investigates multiple factors with inclusion of different aspects instead of single factor or aspect as in several previous studies is also needed. In short, to fulfill the existing knowledge gaps, the present study investigated the associations of socio-demographic characteristics, obstetrical characteristics, dietary practices, knowledge on dietary iron supplementation and anaemia with IDA among pregnant women.

Hence, research questions of the present study were as follows:

1) What is the prevalence of IDA among third trimester pregnant women?
2) Are socio-demographic characteristics, obstetrical characteristics, dietary practices and knowledge level associated with IDA among third trimester pregnant women?

1.3 Significance of the study

Findings of the present study can contribute and update the data on the prevalence of IDA among pregnant women in Selangor and Kuala Lumpur. It is postulated that findings on Hb and SF among the pregnant women in the present study can serve as baseline data for researchers, managers of health and nutritional programmes as well as public health policy-makers in developing and enhancing IDA prevention and intervention programmes. Findings of the present study can be used as a reference for anaemia prevention programme by Ministry of Health Malaysia. The present study is consistent with the National Plan of Action for Nutrition of Malaysia, Sustainable Development Goals, specifically Goal Three: Ensure Healthy Lives and Promote Well-being for All at All Ages as well as Global Nutrition Targets 2025. Besides, findings of the present study can be used as a reference for health surveillance on pregnant women in the Health Management Information System, Medical Information Management System and Health Information Centre, Malaysia as well as Global Monitoring Framework on Maternal, Infant and Young Child Nutrition. Furthermore, findings on the prevalence of IDA can indirectly help to evaluate the effectiveness of dietary iron supplementation programme during pregnancy in the health clinics.

In addition, findings on the factors associated with IDA in the present study can serve as references in order to promote healthy pregnancy effectively for reduction of multifactorial IDA and other health problems caused by IDA. To

date, as published studies on factors associated with IDA among pregnant woman are unavailable in Malaysia, findings on associations between socio-demographic characteristics, obstetrical characteristics, dietary practices, knowledge on dietary iron supplementation as well as anaemia and IDA in the present study can fill in the existing research gaps. Findings of the present study which include determination of the prevalence of IDA and its associated factors among pregnant women, can help healthcare providers including clinicians, nurses, nutritionists and dietitians in assessing, taking appropriate actions and managing IDA in a more effective way accordingly. This can be performed by targeting the at-risk groups based on their socio-demographic characteristics, obstetrical characteristics, dietary practices and knowledge level.

When iron status of pregnant women improves, it can help to reduce the risk of IDA, which can further help in promoting healthier pregnancies and therefore contributing to a healthier society of future generations. Thus, the disease burden and negative impacts on the community can be potentially minimised, which may further contribute to economic implication by saving the incurred costs of treating IDA or other health problems caused by IDA among pregnant women.

1.4 Objectives

1.4.1 General objective

To determine the factors associated with IDA among third trimester pregnant women attending selected health clinics in Selangor and Kuala Lumpur

1.4.2 Specific objectives

1) To examine the socio-demographic characteristics (age, ethnicity, education level, working status of pregnant woman and spouse, family type, household size, monthly household income), obstetrical characteristics (gravidity, parity, gestation of ANC booking, frequency of ANC visits, pre-pregnancy BMI, anaemia history), dietary practices (energy, carbohydrate, protein, fat, iron, folic acid, vitamin C and calcium intakes, dietary iron supplementation compliance) and knowledge level (knowledge on dietary iron supplementation and anaemia) among third trimester pregnant women
2) To determine the prevalence of IDA among third trimester pregnant women
3) To determine the associations between socio-demographic characteristics, obstetrical characteristics, dietary practices, knowledge level and IDA among third trimester pregnant women

4) To determine the contributions of socio-demographic characteristics, obstetrical characteristics, dietary practices, knowledge level towards IDA among third trimester pregnant women

1.5 Hypothesis

There are significant associations between socio-demographic characteristics, obstetrical characteristics, dietary practices and knowledge level and IDA among third trimester pregnant women attending selected health clinics in Selangor and Kuala Lumpur. There are significant contributions of socio-demographic characteristics, obstetrical characteristics, dietary practices and knowledge level towards IDA among third trimester pregnant women attending selected health clinics in Selangor and Kuala Lumpur.

1.6 Conceptual framework

As shown in Figure 1.1, independent variables for the present study are based on four main aspects, namely socio-demographic characteristics, obstetrical characteristics, dietary practices and knowledge level. Meanwhile, IDA is the dependent variable for the present study.

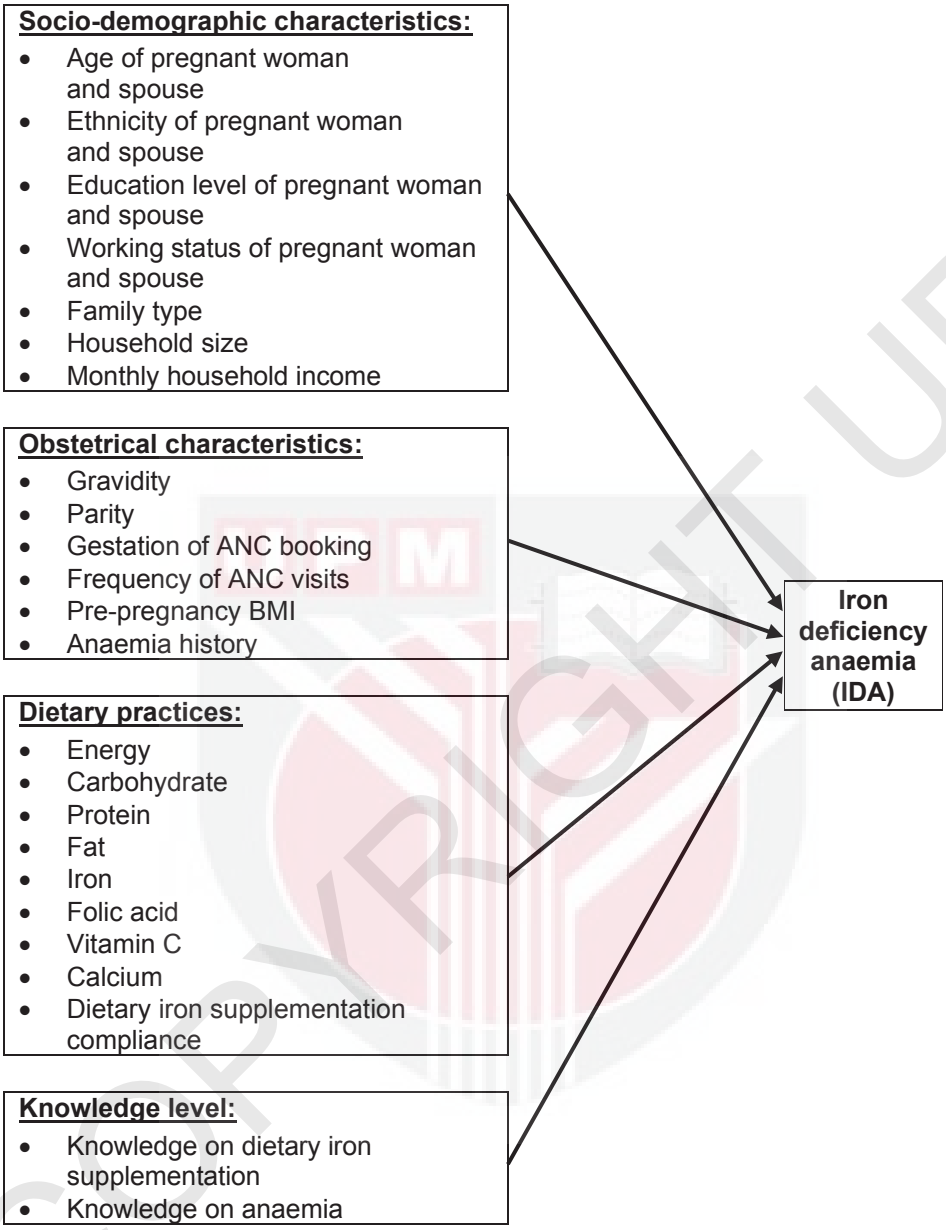

Figure 1.1: Conceptual framework

1.7 Glossary of terms

Definitions of several key terms and variables used in the present study are listed in the following:

Anaemia	Presence of Hb < 11 g/dL (CDC, 1998; WHO, 1968)
Iron deficiency	Presence of SF < 15 µg/L (WHO, 2020c; CDC, 1998)
Iron deficiency anaemia (IDA)	Coexistence of anaemia and iron deficiency (Hb < 11 g/dL and SF < 15 µg/L)
Iron deficiency erythropoiesis (IDE)	Presence of iron deficiency without anaemia (Hb ≥ 11 g/dL and SF < 15 µg/L)
Gravidity	Total number of pregnancies including current pregnancy, regardless of the pregnancy outcomes such as normal pregnancy, abnormal pregnancy and abortion (Ministry of Health Malaysia, 2013a).
Parity	Total number of deliveries including live birth and stillbirth (birth of a dead foetus in the womb with gestational age of ≥ 22 weeks) (Ministry of Health Malaysia, 2013a).
Gestation of ANC booking	Gestational week of the first ANC visit attended by the pregnant women for current pregnancy (Ministry of Health Malaysia, 2013c).
Frequency of ANC visits	Total number of ANC visits attended by the pregnant women (as of the date of data collection) for current pregnancy (Ministry of Health Malaysia, 2013c).
Dietary practices	Nutrient intakes and compliance towards dietary iron supplementation for current pregnancy
Dietary iron supplements	Oral iron-containing supplements in any forms, which include supplements containing iron only and supplements containing iron combined with other vitamin(s) and/ or mineral(s) (Loy et al., 2019; Haider et al., 2013; Yakoob &

	Bhutta, 2011)
Dietary iron supplementation compliance	Intake of dietary iron supplement for at least five days per week, which is equivalent to at least 70% of the actual prescription by healthcare providers in the health clinics for current pregnancy (Kamau et al., 2018; Sadore et al., 2015; Maina-Gathigi et al., 2013)

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