ปัจจัยที่มีความสัมพันธ์กับการรับประทานยาเม็ดเสริมธาตุเหล็กไม่ต่อเนื่องในหญิงตั้งครรภ์ในจังหวัดชายแดนภาคใต้ของประเทศไทย: การศึกษาเชิงสำรวจติดตามในโรงพยาบาล

Fators Associated with Non-adherence to Iron Supplements among Pregnant Women in Southernmost Provinces of Thailand: A Hospital – Based Longitudinal Survey

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บทคัดย่อ

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อประเมินสถานการณ์และศึกษาปัจจัยที่มีความสัมพันธ์กับการรับประทานยาเม็ดเสริมธาตุเหล็กไม่ต่อเนื่องในหญิงตั้งครรภ์ เป็นการศึกษาสำรวจแบบติดตามระยะยาวที่คลินิกฝากครรภ์ของโรงพยาบาล ในสามจังหวัดชายแดนภาคใต้ของประเทศไทย ตั้งแต่เดือนมกราคมถึงกันยายน 2558 มีกลุ่มตัวอย่างหญิงตั้งครรภ์อายุครรภ์ไตรมาสที่ 2 และ 3 จำนวน 295 คน โดยใช้วิธีการสุ่มตัวอย่างแบบเจาะจง รวบรวมข้อมูลโดยใช้แบบสอบถามที่มีค่าความถูกต้องของเครื่องมือเท่ากับ 0.82 ตัวแปรอิสระนำเสนอด้วยเปอร์เซ็นต์ ค่าเฉลี่ย (SD) ใช้สถิติวิเคราะห์ถดถอยโลจิสติกเพื่อประเมินปัจจัยที่เกี่ยวข้องการรับประทานยาเม็ดเสริมธาตุเหล็กไม่ต่อเนื่อง ผลการศึกษาพบว่าความชุกของการรับประทานยาเม็ดเสริมธาตุเหล็กไม่ต่อเนื่องเท่ากับร้อยละ 42 สาเหตุหลักคือ หญิงตั้งครรภ์ไม่ให้ความสำคัญในการรับประทานยา ร้อยละ 20 ของกลุ่มตัวอย่างขาดความรู้เกี่ยวกับประโยชน์ของยาเม็ดเสริมธาตุเหล็ก อายุครรภ์ ระดับการศึกษา การบริโภคอาหารตามคำแนะนำ และความเข้าใจในประโยชน์ของยาเม็ดเสริมธาตุเหล็ก มีความสัมพันธ์อย่างมีนัยสำคัญกับการรับประทานยาเม็ดเสริมธาตุเหล็กไม่ต่อเนื่อง ความชุกของการรับประทานยาเม็ดเสริมธาตุเหล็กไม่ต่อเนื่องในพื้นที่อยู่ในระดับสูง โปรแกรมการให้ความรู้ด้านสุขภาพที่เกี่ยวข้องกับประโยชน์ของยาเม็ดเสริมธาตุเหล็กและการบริโภคอาหารที่ถูกต้องเหมาะสมในระหว่างตั้งครรภ์ควรได้รับการส่งเสริมสนับสนุนโดยเฉพาะอย่างยิ่งในกลุ่มหญิงตั้งแต่เริ่มตั้งครรภ์

คำสำคัญ: ไม่ต่อเนื่อง ยาเม็ดเสริมธาตุเหล็ก หญิงตั้งครรภ์ จังหวัดชายแดนภาคใต้ของประเทศไทย

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Abstract

This research aimed to evaluate the situation and determine the associated factors of the non-adherence to iron supplements among pregnant women during the services of ante-natal care clinics. The hospital-based longitudinal survey was conducted in three provinces of southernmost Thailand from January to September 2015. Two-hundred and ninety-five PW with 2nd and 3rd trimester of gestational age were recruited by purposive sampling methods. The self-administered questionnaire was used to collect data. Alpha's Cronbach of an instrument's validity was 0.82. Independent variables described as the percentage, mean (SD). Logistic regression was utilized to assess the associated factors of the non-adherence to iron supplements. The prevalence of non-adherence to iron supplements was 42%. The main cause of the non-adherence was the PW did not give attention to taking iron supplements during their pregnancy. About one-fifth of participants showed a lack of knowledge regarding the benefits of iron supplements. Gestational age, educational levels, food intake, and understand in iron supplements' benefits were significantly associated with the non-adherence to iron supplements. The prevalence of non-adherence to iron supplements in the southernmost provinces of Thailand was high. The health education program toward the iron supplements' benefits and food intake during pregnancy should be advocated, especially among women in early gestational pregnancy.

Keywords: Non-adherence, Iron supplements, Pregnant women, Southernmost provinces of Thailand

Introduction

Anaemia is an important health problem worldwide and affects over half of pregnant women (PW) in developing countries and at least 20-40% in industrialized countries (Balarajan, Ramakrishnan, Ozaltin, Shankar & Subramanian, 2011; McLean, Cogswell, Egli, Wojdyla & de Benoist, 2009; Stevens et al., 2013; WHO, 2008; WHO, 2009). According to the World Health Organization (WHO), anaemia is defined as the condition of a maternal haemoglobin (Hb) level, which is less than 11 mg/dl and less than 10.5 mg/dl during the second trimester (WHO, 2008). An estimated 123 million of reproductive age women worldwide are pregnant each year (United Nations, Department of Economic and Social Affairs, Population Division, 2016). Anaemia during pregnancy

is considered the second leading cause of disability in the world, and it has become one of the most serious global public health problems (WHO, 2008).

Maternal anaemia is related to a variety of adverse pregnancy outcomes (Kozuki, Lee & Katz, 2012; Sekhavat, Davar & Hosseinidezoki, 2011; Xiong, Buekens, Alexander, Demianczuk & Wollast, 2000; Zhang, Ananth, Rhoads & Li, 2009). Women who experienced anaemia during pregnancy had a significantly higher risk of giving birth to low birth weight (LBW) babies, preterm birth, perinatal mortality, and neonatal mortality with 1.31, 1.63, 1.51 times the risk, respectively, compared to normal maternity (Rahman et al., 2016). The main cause of maternal anaemia is haemodilution. The contributing factors of haemodilution were poor nutrition including iron and folic acid deficiency, infectious diseases such as malaria, genetic haemoglobin disorders, etc. The second and third trimesters of pregnancy were at a high risk of deficiency in iron because of physiological haemodilution during pregnancy (Balarajan et al., 2011). This is related to the foetus's growth and an increase in the body's need for iron (Chathurani et al., 2012; Senadheera, Goonewardene & Mampitiya, 2017; Xiong et al., 2000). Therefore, iron supplements were introduced for pregnant women to meet the nutrient requirements following the recommended dietary allowance (RDA). WHO guides to prevent maternal anaemia for pregnant women (PW) by providing daily oral iron supplementation with 30 mg to 60 mg of elemental iron (WHO, 2012). Iron supplements are taken throughout the time of pregnancy and should begin as early as possible (WHO, 2012; WHO 2016).

The iron supplements recommended for PW were to prevent maternal anaemia, and other poor pregnancy outcomes such as puerperal sepsis, low birth weight, and preterm birth (Nisar, Dibley & Aguayo, 2016). Many previous studies have revealed that iron supplements led to a significant reduction in the prevalence of anaemia and iron deficiency (Nisar et al., 2016; Pena-Rosas & Viteri, 2006). Concerning the iron supplements, iron prophylaxis is likely to increase the birth weight of a new-born baby, as the iron supplements produced significant beneficial effects on the health of a mother and have the potential for reducing perinatal mortality. However, low adherence to the iron supplements program is highly likely to occur among PW in rural areas in various countries around the world (McLean et al., 2009; Stevens et al., 2013; WHO, 2008).

The report of attendance of PW in Thailand at the 4th ante-natal care (ANC) was more than 80% (Department of Health, 2019). In fact, the prevalence of maternal anaemia should decline when

PW follows the recommended daily iron supplements. Meanwhile, the report of the central public health office revealed that ANC clinics have provided more than 95% of PW with iron supplements. In contrast to the previous statement, the prevalence of maternal anaemia of these women at the second trimester was found to be at a high level. This did not seem to change in the southernmost region of Thailand (Department of Health, Ministry of Public Health Thailand. (2019a). According to the local health office, the coverage of ANC attendance during pregnancy in the southernmost provinces was according to the national standard, but the prevalence of anaemia and LBW did not decline (Pattani Public Health Center. 2019; Yala, Provincial Public Health Office, 2019; Narathiwat Provincial Public Health Office, 2019). These results may not conform to the reports of the public sectors' performance since the prevalence of maternal anaemia in these provinces did not seem to be reduced. It can be hypothesized that some barriers could affect the adherence of iron supplements among the PW during the second trimester in the three southernmost provinces of Thailand. Therefore, this project aimed to evaluate the situation and determine the associated factors of non-adherence to iron supplements. The results of this study could be a piece of evidence to understand the cause of non-adherence to iron supplements problem with the local areas. These study results would apply to be a solution for local healthcare practitioners who take care of PW in the three southern border provinces of Thailand. Also, this study may be very worthwhile and useful for health promotion domestically and internationally.

Materials and Methods

Study Design

The hospital-based longitudinal study was designed to assess the prevalence and factors associated with non-adherence to iron supplements during the time of pregnancy. The study conducted in three provinces of southernmost of Thailand from January to September 2015. The data collection process was permitted by the directors of the participating hospitals. All eligible participants were given an explanation of the project's process and signed a consent form. To protect study participants and ensure that the study procedure followed concerns for human subjects, the project was approved by the Ethics Committee of the Faculty of Medicine, Princess of Naradhiwas University (Med PNU 01-2557, project code: 031-014-24-2556).

Study Setting

The study was conducted in Pattani, Yala, and Narathiwat, the southernmost provinces of Thailand where consist of the population was 725,104, 536,330, and 808,020 (Department of Provincial Administration, Ministry of the Interior, 2019). According to the provincial report, The maternal anaemia prevalence was 18.4%, 14.6%, 15.1%, and LBW prevalence was 6.7%, 8.3%, 7.6%, respectively (Pattani Public Health Center. 2019; Yala, Provincial Public Health Office, 2019; Narathiwat Provincial Public Health Office, 2019). Most of the populations in the southernmost provinces of Thailand were Muslims; thus, their society, culture, language, lifestyle, and health beliefs were different from those of people in other regions of the country.

Eligible hospitals were the district public hospitals with 30 beds of inpatient service and with 40,000 – 60,000 population for health services. Three district public hospitals in each province were selected to be data collecting sites by using simple cluster sampling. In Pattani province, there are nine district hospitals, and three of those were chosen, namely, Nong Chik, Yaring and Sai Buri. In Yala province, three of the eight district hospitals were chosen, namely, Raman, Bannang Sata and Than To. In addition, three of 13 district hospitals in Narathiwat were chosen: Tak Bai, Bacho and Yi-ngo. The chosen areas presented high anaemia, prevalence, and soil-transmitted helminths (STH) infestation among general people. Meanwhile, the coverage of 4th ANC attendance in the PW of these areas was higher than 82% during the last five years (Department of Health, Ministry of Public Health Thailand. (2019b); Pattani Public Health Center. 2019; Yala, Provincial Public Health Office, 2019; Narathiwat Provincial Public Health Office, 2019).

Study Sample and Sampling Methods

The population of the study was PW in the three southernmost provinces of Thailand. The eligible samples were the Thai PW who lived in the study settings for more than a year, were at a gestational age of 12-40 weeks, and were a client of an ANC clinic of a district public hospital in the study setting. Those with a high-risk pregnancy and those who did not continue ANC service were not eligible participants. In addition, women with mental problems and those unwilling to participate in the study were also excluded from the study. PW were recruited to be the study participants by purposive sampling methods. About 5-10 eligible PW were sampling at ANC clinic by local research

assistance nurses. The research team invited the PW who were eligible and chosen to participate in the study as presented in Figure 2.

The sample size calculation was based on the proportion of maternal anaemia with the formula of $z\alpha_{/2}(P*Q)/d^2$. The following calculation was used to determine the sample size: the previous data of the maternal anaemia proportion during the second trimester PW (27%), Type I error $z\alpha_{/2}$ of 1%, design effect of 2, the precision of 9% and power of 0.8. With an estimated 10% of incomplete information, the total sample size was 359 PW. The recruitment of study participants was terminated after the total that had been calculated was met.

Instrument and validity

Self-administered questionnaire: The study data were gathered and applied using a uniform self-administered questionnaire, which was designed by the research team and approved content validity by three expertises. The Item-Objective Congruence (IOC) of content validity after modified was 0.77 and Alpha's Cronbach of instrument's validity was 0.82. There were five parts of the five pages of the study questionnaire form. The preface was the project title and general guidance on completing the form. The first part of the questionnaire consisted of 15 questions, which inquired about personal information such as age, religion, occupation, gestation age, education level, income, family member, weight, height, and live child. It was completed with tick marks, and the text filled in by the participant. The second part was 7 questions which related to responding of adherence to iron supplements such amount, knowledge of benefit, and the problem of taking. The 6 questions of the fourth part requested the taken iron supplements practices and the final part was data of laboratory and physical examination. The participants could use free text to fill in their related information. All personal gathering process was under the support and advice of the research team for the competed data.

Data Collection Procedure

The proposal was submitted to the directors of the selected hospitals for approval. ANC nurses and staff were invited to facilitate this study. The research assistant team at each hospital was comprised of 1-2 nurses or health officers within antenatal care clinics and 1-2 health volunteers. They obtained training to inform the purposes, methods, and procedure of the study as well as their tasks and payment.

All of the PW who came for treatment at ANC clinics of the study hospitals were invited to participate in the study by research assistant nurses. The procedures of the study were explained to them, and they signed a consent form. The eligible PW were assigned to answer a self-administered questionnaire to collect the data related to demographic characteristics, obstetric care, health beliefs, iron supplements taken, side effects, and maternal health knowledge. The health volunteers supported the translation and recheck the completion of the questionnaire. The PW who were the participants of this study continued to receive standardized services such as physical examinations, the blood concentration test, and iron supplements until delivery by local ANC clinics.

Main Outcome Measures

The main outcome of this study was non-adherence to iron supplements among the PW. The adherence measures followed WHO Guidelines. Daily iron and folic acid supplementation in PW was categorized into two levels. The participants of this study who had taken less than 80% of iron supplements were categorized to be non-adherent (WHO, 2012, 2016). The measurement of non-adherence was calculated based on the number of iron supplement tablets that PW had taken. The denominator was the total iron supplement tablet that they received from ANC for two months.

Independent Variables

Socio-demographic and personal data included age, religion, educational level, occupation, family income, household size, weight, and height. The obstetric data were gestational age, gravidity, parity, the first Hb at 12 weeks, and the second Hb at 32 weeks. The PW with a gestational age of 14-28 weeks were classified as the second trimester and more than 28 weeks was the third trimester. The Hb concentration was determined using an automated haematology analyser, Mindray BC-5300/5380, and ABX Pentra ES 60, which following standard procedures. The first Hb was collected from ANC record data, and the second Hb was longitudinal data which was repeated after 20 weeks from the first measurement. Services provided for the taking of iron supplements were distributing the tablets, giving instructions, and monitoring of side effects causes for non-adherence and perceptions towards the benefits of the iron supplements.

Following daily food intake recommendations was the practice of eating in quantities recommended among PW. The measurement was separated into three categories; less than 50%, 51-80%, and more than 80%. The practice was compared to the recommended dietary allowance (RDA),

which was the average daily level of intake sufficient to meet nutrient requirements. Direct side effects focused on signs and symptoms which were the main side effect of iron supplements such as dizziness, nausea, fatigue, vomit, and rash. Benefit perception was the ability to understand and make good judgments about the benefits of iron supplements for pregnancy health. This variable was classified into three levels; first, second, and third priority benefits, which were related to the high, medium, and low level of important benefit. The benefit perception variable was discussed as a variable that conveyed an understanding of the iron supplement benefits. PW who had no benefit perception regarding iron supplements at all three levels of priority were classified to have a poor understanding of the benefits of iron supplements.

Statistical Analysis

A computer program was used for processing the data analysis. The computer software Epidata version 3.1 was used for data processing, data input, data correction, data completion, and data analyzed by the R program. Socio-demographic characteristics, obstetric variables, services for providing and taking iron supplements, side effects, and maternal health knowledge were independent variables that were described as the percentage, the mean and the standard deviation (SD). The model analysis assumption was the binary outcome. Factors were not repeated measurements or matched data. Logistic regression was utilized to discover the association of socio-demographic characteristics, health beliefs and behavior, ANC services, side effects, and maternal health knowledge to non-adherence in PW. The multicollinearity among the independent variables was tested. A stepwise backward elimination technique was employed for these analyses.

Results

Participant Characteristics

From the 302 PW who met the eligible criteria, 295 (97.7%) completed the self-administration questionnaire and became the participants of the study as Figure 1. Eighty-seven, 102, and 106 PW were recruited from Pattani, Yala and Narathiwat province, respectively. Approximately, half of the participants were aged between 27 and 40 years, parity was between the 2nd and 3rd, and gestational age was between 12 and 26 weeks. Only one-third of the PW had a low haemoglobin level at the first 12-week visit. The personal characteristics of the participants are presented in Table 1.

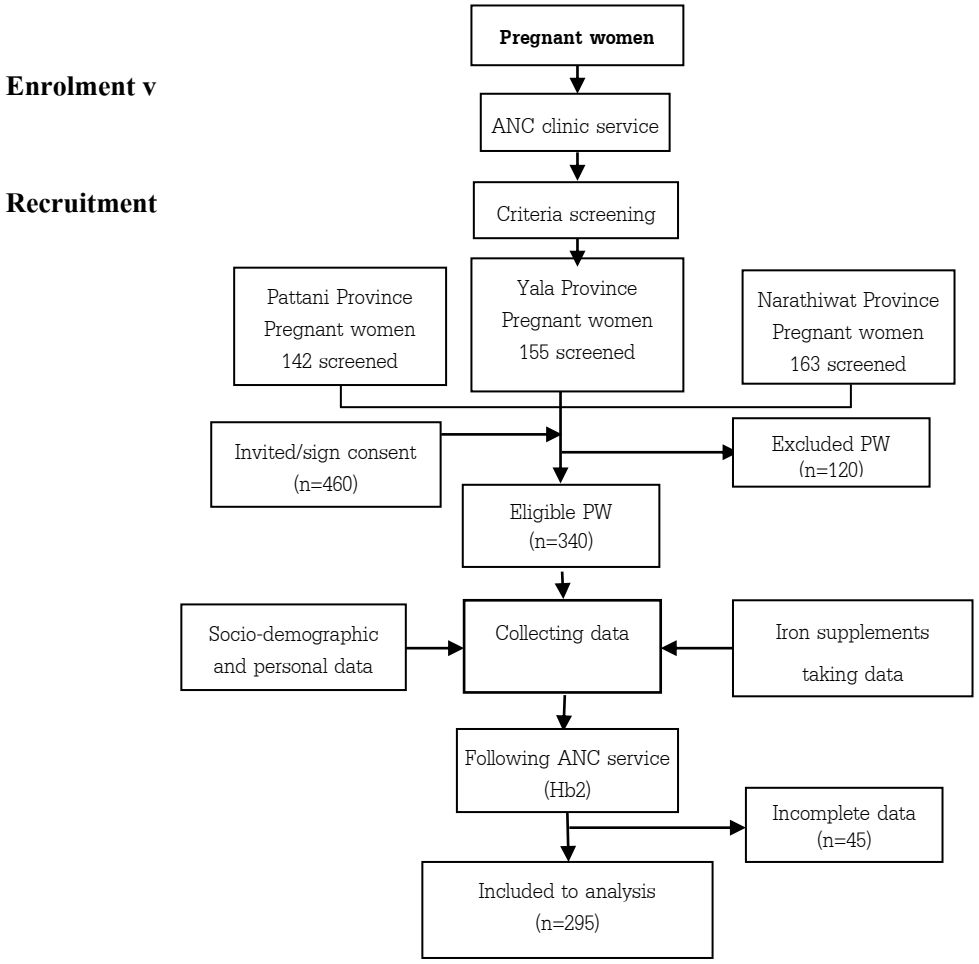

Figure 1 Flow diagrams of the screened and recruited participants

Table 1 Description of participants characteristics (n = 295)

Factors	n	(%)
Provinces		
Pattani	87	(29.5)
Yala	102	(34.6)
Narathiwat	106	(35.9)
Age (Years) $\bar{x}$(SD)= 27.7(6.2)		
≤20	33	(11.2)
21-30	159	(53.9)
31-40	92	(31.2)
>40	11	(3.7)

Table 1 (Continue)

Factors	n	(%)
Gestation at enrolment (weeks) $\bar{x}$(SD)= 26.7(7.9)		
12-26	142	(48.1)
27-40	153	(51.9)
Parity $\bar{x}$(SD)=2.8(5.5)		
1^{st}	95	(32.2)
2^{nd}-3^{rd}	136	(46.1)
4^{th}-5^{th}	49	(16.6)
$>5^{th}$	15	(5.1)
Occupations		
Housewife	151	(51.2)
Labourer	66	(34.2)
Others (farmers/government employees/traders)	78	(14.6)
Religions		
Islam	281	(95.3)
Buddhism	14	(4.7)
Education		
Primary school	83	(28.1)
Secondary school/Certificate	156	(52.9)
Higher than secondary school	56	(19.0)
Family income (baht/month) $\bar{x}$(SD)= 11,603.4(11,066.9)		
$\leq$8,000	168	(56.9)
8,001-12,000	49	(16.6)
12,001-20,000	44	(14.9)
>20,000	34	(11.5)

Table 1 (Continue)

Factors	n	(%)
Number of children (aged<6 years; Persons)		
$\bar{x}$(SD)= 0.7(0.3)		
None	139	(47.1)
1-2	146	(49.5)
>2	10	(3.4)
Household size (Persons) $\bar{x}$(SD)=5.1(2.3)		
2-3	81	(27.5)
4-5	111	(37.6)
6-8	79	(26.8)
>9	24	(8.1)
Body mass index (BMI) $\bar{x}$(SD)=22.2(9.5)		
<18.4	59	(20.0)
18.5-22.9	142	(48.1)
>30	94	(31.9)
1st Hb at 12 weeks (g/dl) $\bar{x}$(SD)=11.5(1.0)		
<11.0	73	(24.7)
11.0-12.0	138	(46.7)
>12.0	84	(28.6)
2nd Hb at 32 weeks (g/dl) $\bar{x}$(SD)=10.8(1.0)		
<10.5	104	(35.3)
10.5-11.0	68	(23.0)
>11.0	123	(41.7)

Iron Supplements Taking and Non-adherence

The iron supplement was ferrous fumarate (FBC plus 200 mg) which was provided at the ANC of the hospitals in each province. Most of the PW obtained 30 tablets (86.4%) and medical instructions (95.6%) at each visit. Three hundred and forty-seven PW (42.0%) were classified in the

non-adherence to iron supplements group. Meanwhile, 5 PW (1.7%) were ignored. About benefit perception, approximately one fifth (16.9%) of the PW were without knowledge regarding the benefits of the iron supplements. Concerning the level of ability to understand and make good judgments about the benefit of the tablets, prior knowledge of PW about the benefits of iron supplements increased haemoglobin levels (66.4%). However, most of the PW were unable to explain the second and the third level of prior knowledge of the benefits of iron supplements (63.4% and 93.2%, respectively). Although 77.3% reported no side effects, some participants found adverse effects such as a skin rash. The important cause of the incomplete taking of iron supplements in the PW was not giving attention to taking pills during pregnancy (70.8%). See Table 2.

Table 2 Description of iron supplements intakes (n = 295)

Iron supplement	n	%
Obtained (per visit) $\overline{x}$(SD)=34.1(12.4)		
None	2	0.7
30 tablets	255	86.4
60 tablets	33	11.2
>60 tablets	5	1.7
Getting instructions		
No	13	4.4
Yes	282	95.6
Quantity taking level		
NO	5	1.7
<50%	48	16.3
50-80%	71	24.1
>80%	171	58.0
Medication taking		
Non-adherence	124	42.0
Adherence	171	58.0

Table 2 (Continue)

Iron supplement	n	%
Benefit perception		
First priority		
Unknown	50	16.9
Increase haemoglobin	196	66.4
Keep baby healthy	25	8.5
Others (safe birth /strength bone /good appetite /well sleep	24	8.2
Secondary priority		
Unknown	187	63.4
Increase haemoglobin	62	21.0
Keep baby healthy	23	7.8
Others (safe birth /strength bone /good appetite /well sleep	23	7.7
Third priority		
Unknown	275	93.2
Increase haemoglobin	7	2.4
Keep baby healthy	12	4.1
Safe birth	1	0.3
Direct side effect		
No	233	77.3
Yes	62	22.7
Non-adherence causes		
Not realized the importance of pill	209	70.8
Nauseated/vomiting/fatigue	59	20.0
Dysphagia	12	4.1
Others (Forget to carry /constipation /diarrhoea / Rash allergic	15	5.1

Table 2 (Continue)

Iron supplement	n	%
Following daily food intakes recommendation		
<50%	18	6.1
50%	87	29.5
50%-80%	101	34.2
>80%	89	30.2
Understand iron supplements benefits		
Good	124	42
Poor	171	58

Non-adherence Risk Factors of Iron Supplements

Table 3 shows the first model of the logistic regression predicting factors for non-adherence to iron supplements. Gestational periods, education levels, following daily food intake recommendations, and understanding of the benefits of iron supplements were associated with non-adherence to the iron supplements as presented in the final model.

Table 3 Variables of first and final model of non-adherence to the iron supplements prediction

Variables of the first model	Variables of the final model
- Age group	- Gestation age
- Occupation	- Education Levels
- Educational levels	- Following daily food intakes
- Family income	recommendation
- Family members	- Understand iron supplements benefits
- Live child	
- BMI	
- Parity	
- Gestation age	
- Following daily food intakes recommendation	
- Understand iron supplements benefits	

During the second trimester (14-28 weeks), the PW had a two times higher chance of non-adherence to iron supplements than in the third trimester (>28 weeks) ($p < 0.05$). The study disclosed that the PW with higher than a secondary educational level has a lower chance than those with only a secondary level of education or lower ($p < 0.05$). Moreover, more than 80% of the PW who followed daily food intake recommendations showed a 10 times lower chance of non-adherence to iron supplements than those following daily food intake recommendations <50% ($p < 0.05$). Additionally, the PW with a poor understanding about the benefits of the iron supplements had a 205 times more chance of non-adherence to iron supplements than those who knew and understood about them ($P < 0.001$) as shown in Table 4.

Table 4 Final model results of non-adherence to the iron supplements prediction

Factors	Risk of non-adherence to the iron supplements		
	Crude OR (95%CI)	Adj. OR (95%CI)	p-value (Wald's test)
Gestation age			
>28 weeks (Ref)	1	1	-
12-28 weeks	1.45 (0.91,2.32)	2.12 (1.05,4.27)	0.036*
Education Levels			
Primary (Ref)	1	1	-
Secondary/Certificated	1.30(0.76,2.23)	1.23 (0.54,2.82)	0.619
Higher than secondary	0.57(0.28,1.19)	0.34 (0.13,0.92)	0.032*
Following daily food intakes recommendation			
<50% (Ref)	1	1	-
50%	1.02 (0.37,2.82)	0.42 (0.07,2.41)	0.330
50%-80%	0.80 (0.29,2.19)	0.34 (0.06,1.89)	0.217
>80%	0.41 (0.15,1.16)	0.15 (0.03,0.89)	0.037*
Understand iron supplements benefits			
Good (Ref)	1	1	-
Poor	151.88 (36.14,638.25)	205.55 (46.08,916.92)	< 0.001**
Log-likelihood		-102.797115	
AIC		221.594229	

Discussion

Two-fifth (42.0%) of the PW in this study were non-adherent to iron supplements. One fifth (16.9%) of the PW were without knowledge regarding the benefits of the iron supplements. The majority of the participants were without side effects from iron supplements. Not realizing the importance of the pill and non-compliance to take the medicine were the main causes of the non-adherence to iron supplements. Iron supplement adherence during pregnancy showed inconsistency to the second haemoglobin level. The factors associated with the non-adherence to iron supplements were gestational period, educational level, following daily food intake recommendations, and understanding the benefits of the iron supplements.

There were previous studies which were conducted in Nigeria, Senegal, Iran, Cambodia and Ethiopia on the associated factors of adherence to the iron supplements among PW. There was a wide range of adherence rates of iron supplement intakes from 47.0% to 87.0%, which was different than this study (Dairo & Lawoyin, 2006; Gebreamlak, Dadi & Atnafu, 2017; Lacerte et al., 2011; Seck & Jackson, 2008; Ugwu, Olibe, Obi & Ugwu, 2014; Yekta, Ayatollahi, Pourali & Farzin, 2008). The conflicting results can be explained by the fact that the sample size and gestation age of participants vary across studies. Mis-understanding was the main factor influencing non-adherence to the iron supplements in this study and the studies conducted in Senegal and Iran (Seck & Jackson, 2008; Yekta et al., 2008). Meanwhile, the studies in Senegal, Nigeria, and Ethiopia showed that the experience of side effects and forgetfulness were the influencing factors of non-adherence (Gebreamlak et al., 2017; Seck & Jackson, 2008; Ugwu et al., 2014). Therefore, personal characteristics were important factors that affected adherence to iron supplements. The other important factor was ANC services, which are the responsibility of the government agency. Thus, health education and the quality of ANC services encouraged the PW to complete the iron supplements (Gebreamlak et al., 2017; Lacerte et al., 2011; Seck & Jackson, 2008).

The results of this study showed that the gestational period affects adherence to iron supplements. The second trimester of pregnancy has a two times higher chance of non-adherence to the iron supplements than the third one. These findings were in agreement with the studies conducted in Turkey and southern Taiwan (Chou, Kuo & Wang, 2008; Nazik & Eryilmaz, 2014). These findings can also be explained by the pregnancy mechanism process during the second trimester of pregnancy,

which is still in the hormone changing stage. In the normal progression of pregnancy, many symptoms were experienced. Morning sickness, nausea-vomiting, fatigue, and pregnancy-related discomforts occurred mostly in the second trimester of PW (Chou et al., 2008; Nazik & Eryilmaz, 2014). The adherence to iron supplements during this time might be problematic as a result.

The educational level was found to be a promoting factor in the adherence of iron supplements in the PW. The higher than secondary school education level PW had about 0.5 times less likely to be non-adherent to the iron supplements compare to that were primary school education level. This was in agreement with another study conducted in southern Ethiopia that found that people with a higher educational status were more compliant to consuming iron-folate tablets (Sadore et al., 2015). Similarly, two studies in southern Ethiopia and India revealed that a higher educational level of PW resulted in a lower prevalence of anaemia (Bentley & Griffiths, 2003; Lebso, 2017). It is reasonable to explain that it is their knowledge that encouraged them to be in a healthy condition. It is also possible that PW with a higher education level has a better understanding of iron supplements than those with low education. However, the secondary school education level showed a barely different result. The secondary school education level PW has about 1.2 times higher to non-adherent to the iron supplements compare to those who were primary school education level. This phenomenon can be explained that compulsory education in these areas is not enough to make the knowledge and understanding of the health-related. Besides the compulsory education administration, the government sector should provide education that has more course content related to health.

Concerning following daily food intake recommendations, the study found that it affects adherence to iron supplements. The PW who followed more than 80% of daily food intake recommendations had a 10-fold lower chance of non-adherence to iron supplements than the PW who followed less than 50% of the recommendations. This finding was consistent with previous studies in Ethiopia and China which found that women with undernutrition were significantly associated with anaemia (Abay, Yalew, Tariku & Gebeye, 2017; Xu et al., 2016). The result shows that following the recommendation of daily food intake contributed to the complete nutrition required during pregnancy. This finding might be explained that food available supply in the three southern border provinces is abundant. These PW might think that it could decrease their risk of anaemia. So, it was the possibility that iron supplements might not be necessary for their opinion.

In addition, understanding the benefits of iron supplements showed a significant association with the chance of non-adherence to the iron supplements during pregnancy. The PW with a poor level of understanding about them were 205 times more likely to discontinue the iron supplements than those who understood them well. The results of this study were in congruence with the studies in many countries in Africa and Asia where the level and direction of understanding–influenced adherence to the iron supplements (Seck & Jackson, 2008; Yekta et al., 2008). The understanding of the benefits of the iron supplements in those studies also related to other factors such as; the number of prenatal visits, quality of ANC services, and the insistence of midwives. However, the chance of non-adherence to the iron supplements of this result was very high when we compare it to the studies in Africa and Asia. This result of a huge difference might be caused by differences in the number of groups, including the regression model analysis with large numbers of samples that could be influencing to high values.

The PW in rural areas of the southernmost provinces of Thailand had poor knowledge regarding the benefits of iron supplements, and they had a low adherence rate to it. Not realizing the importance of the pill was the main cause of non-adherence to iron supplements during pregnancy. Iron supplementation adherence during pregnancy was inconsistent with the second haemoglobin level. The factors associated with non-adherence to the iron supplements were gestational period, educational level, following daily food intake recommendations, and understanding the benefits of iron supplements. According to the findings of this study, the medical and public health policymakers should access and improve the quality ANC clinic in local hospitals. Especially, health education and health practices during pregnancy need to be developed by encouraging nurses and midwives to improve the understanding of pregnancy health.

However, this study was a preliminary study using a self-assessment method for the data collection on the intake of iron supplements and conducted in nine district hospitals. Due to the variety of education levels in the local population, some PW might find it difficult to communicate in Thai formal language. The data on compliance with iron supplements of this study was derived from a self-administered questionnaire. The accuracy of the data might be questionable due to recall bias on the intake of iron supplements. Using integrated methods to assess compliance may strengthen the results of further study, including finding the social-cultural factors.

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