

## ORIGINAL ARTICLE

## KNOWLEDGE OF PRE-PREGNANCY CARE AMONG WOMEN WITH HIGH RISK PREGNANCY IN PERAK, MALAYSIA: WHAT ARE THE FACTORS?

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## ABSTRACT

Pre-pregnancy care is an important approach for maternal and child health. This study aimed to determine the knowledge about pre-pregnancy care and factors associated with good pre-pregnancy care knowledge among women with high risk pregnancy in Kinta, Perak. A cross-sectional study was conducted among women diagnosed as high-risk pregnancy in governmental health clinics in Kinta. Stratified random sampling was applied and interviewer-guided questionnaires were administered. A proforma and the validated Pre-pregnancy Care Knowledge and Practice Questionnaire were used, consisting of 21 items on knowledge. Good pre-pregnancy care knowledge was defined as those with the total score of more than 12. Logistic regression analysis was conducted using SPSS software. Of the 490 women, their mean age was 29.98 (SD 5.51) years. Less than half (48.6%) had good knowledge of pre-pregnancy care. Education level and attended pre-pregnancy care services were significantly associated with good pre-pregnancy care knowledge. Compared to women with secondary and below education, those with tertiary education had two times odds of having good pre-pregnancy care knowledge (Adjusted odds ratio 2.06; 95% CI: 1.41, 3.03;  $p < 0.001$ ). Compared to women who never attended pre-pregnancy care services, those who had attended were almost 2.5 times higher odds of having good pre-pregnancy care knowledge (Adjusted odds ratio 2.46; 95% CI: 1.59, 3.83;  $p < 0.001$ ). The pre-pregnancy care knowledge of women with high risk pregnancy in this study was still unsatisfactory. The area with a lacking of knowledge and the significant factors should be focused to improve pre-pregnancy care knowledge and utilization.

**Keywords:** Pre-pregnancy care; knowledge; high risk pregnancy; pre-pregnancy care services.

## INTRODUCTION

Every woman should receive quality antenatal care throughout pregnancy, which includes health promotion, screening and diagnosis, and disease prevention in order to save and improve lives, healthcare utilization and quality of care<sup>1</sup>. However, women who started antenatal care late may lead to delay in detecting and managing possible risk factors and medical problems. Thus, improving maternal health before conception through pre-pregnancy care is increasingly recognised as an important public health strategy. Pre-pregnancy care is defined by the World Health Organization as “...the provision of biomedical, behavioural and social health interventions to women and couples before conception occurs. It aims at improving their health status and reducing behavioural and individual and environmental factors that contribute to poor maternal and child health outcomes...”<sup>2</sup>. Pre-pregnancy care was associated with reduced risk of preterm birth, low birth weight, as well as maternal and neonatal complications<sup>3</sup>. Thus, pre-pregnancy care should be targeted to all women, in addition to the routine antenatal care that they received after conception.

All women in reproductive age group should receive pre-pregnancy care. Women with medical

problems or risk factors should receive pre-pregnancy care to plan their pregnancy and optimize their health conditions at least three months prior to conception<sup>4</sup>. Among the pre-pregnancy risk factors include 1) women aged less than 18 or above 35 years old, 2) having negative lifestyle conditions such as smoking, high risk sexual behaviour and overweight/obesity, and 3) specific risk factors of obstetric history, medical history, medications, surgical history, family history, social history, and vaccination<sup>5</sup>. A study conducted in Selangor, Malaysia found that 68.8% of women screened in pre-pregnancy clinics had at least one risk factor; with 35.0% were overweight and obese, and 14.0% had anaemia<sup>6</sup>. If these risk factors are not adequately intervened prior to conception, the women will enter pregnancy state with various health problems. Among women who attended primary health clinics for antenatal follow-up in Selangor, 28.0% of them were classified as high risk pregnancy, following the risk assessment system of Malaysian Ministry of Health<sup>5,7</sup>. Therefore, pre-pregnancy care should be emphasized to reach all women in the reproductive age group.

In Malaysia, pre-pregnancy care was formalized into the health care services since 2002<sup>5</sup>. In general, the target groups were 1) prospective couples intending to get married, 2) married

women who planned for a pregnancy, and 3) women in the reproductive age group. Those with medical problems and risk factors were included as the specific target groups. Screening, identification and appropriate management and referral of the risk factors and medical problems were the main activities under this service. Since pre-pregnancy care has been introduced for almost ten years in all government health clinics in Malaysia, it is important to identify the women's knowledge related to it. Furthermore, knowledge has been shown to be an important factor influencing women to utilize the service<sup>8-9</sup>.

Even though women involved in a qualitative study in UK knew about pre-pregnancy activities such as quitting smoking and consuming healthy diet, the information was not at the forefront of their minds and only expressed upon prompting<sup>10</sup>. In Ethiopia, 35.4% of reproductive-aged women have heard about pre-pregnancy care, with only 17.3% had good knowledge<sup>9</sup>. Among women with chronic health conditions, their knowledge on pre-pregnancy care benefits, information sources and availability of the service were found to have significant gaps<sup>11</sup>. The main source of information was the health care providers<sup>9,12</sup>. However, another study in Ethiopia found almost half of the health care providers had poor knowledge about pre-pregnancy care<sup>13</sup>.

In Malaysia, a qualitative study conducted among married women in reproductive age group found that majority of the respondents had heard about pre-pregnancy care, but a handful of them did not know the existence of this services in government clinics or hospitals<sup>14</sup>. Interviews conducted with health care providers also highlighted their concerns that women were unaware or having lack of knowledge on pre-pregnancy issues that subsequently acted as a barrier to pre-pregnancy care<sup>15</sup>. Thus, it is important to explore the level of knowledge among women regarding pre-pregnancy care, and specifically identify the areas that were lacking, to facilitate further improvement of the current health promotion strategies. This is of value considering the limited information on pre-pregnancy care knowledge among women in Malaysia. Furthermore, focusing on women with high risk pregnancy was crucial, acknowledging the burden of chronic diseases and other risk factors among women in Malaysia. It is hoped that pre-pregnancy care practice will also be improved and subsequently lead to better maternal and child health outcomes. This study aimed to determine the knowledge of women with high risk pregnancy about pre-pregnancy care and the factors associated with good pre-pregnancy care knowledge.

## METHODS

### Study design and population

This is a cross-sectional study conducted from March 2016 to March 2017 in Kinta district, Perak. Kinta has multiracial population with almost equal proportion of Malay, Chinese and Indian ethnicities. The study was conducted in all 14 governmental health clinics with maternal and child health services in this district.

The study was registered with National Medical Research Register (ID number: NMRR15-1959-28396). Ethical approval was obtained from the Human Research Ethics Committee Universiti Sains Malaysia (USM/JEPeM/15090296) and Medical Research & Ethics Committee, Ministry of Health Malaysia [(7)KKM/NIHSEC/P15-1580], which complies with the Declaration of Helsinki.

The study population was women diagnosed as high risk pregnancy during their first antenatal check-up (booking visit) in governmental health clinics in Kinta District during the study period. The criteria of high risk pregnancy are based on the presence of any of the following<sup>5</sup>: i.Current or previous history of hypertension, diabetes, cardiovascular disease, congenital heart disease, thyroid disease, connective tissue disease, systemic lupus erythematosus, chronic kidney disease, preeclampsia or gestational diabetes.ii.Overweight and obesity.iii.Severe anemia in previous or current pregnancy (haemoglobin level is less than 7 g/dl).iv. Age  $\leq$ 19 years or more than 35 years, which is more likely to be associated with morbidities and mortality.

The exclusion criteria were women who were not able to communicate in either the Malay or English language, or those with known mental health problems.

### Sample size and sampling method

Sample size was calculated to answer all the objectives. The biggest sample size was derived from single proportion formula. Taking a precision of 0.05 at a 95% confidence interval, the required sample size determined by a single proportion formula based on 51.9% women with good pre-pregnancy care knowledge was 495 (including 30% possibility of non-response rate)<sup>16</sup>

A stratified random sampling with number of samples proportionate to size was used. There are 14 health clinics with maternal and child health services, and the estimated number of high risk pregnancy cases in each clinic ranged from 40 to 100 cases per year. The proportion of selected respondents was based on the percentages of high risk pregnancy obtained from the registration. They ranged from a minimum of 30 respondents

to a maximum of 45 respondents randomly selected from every health clinic.

### Research tool and data collection

A proforma and the Pre-pregnancy Care Knowledge and Practice Questionnaire were used<sup>17</sup>. The Malay language questionnaire was developed in another state in Malaysia with the same population ethnic background. The Cronbach's alpha of the validated questionnaire was 0.79. Permission was obtained from the author prior to its use.

There were 21 items in knowledge domain, assessing the following: a) examples of conditions classified as high risk pregnancy (4 items), b) risk of poor birth spacing (4 items), c) recommended duration of birth spacing (3 items), d) diet during pregnancy (4 items), e) effect of smoking (1 item), f) folic acid supplementation (1 item), g) risk of maternal anaemia (4 items). They used a three-point Likert scale (yes/no/not sure) response options, with a score of "1" for correct answers, and incorrect and not sure responses were scored "0". The total score of more than 12 was categorized as good pre-pregnancy care knowledge and 12 or less was considered as poor knowledge<sup>17</sup>.

In addition, a proforma which consists of socio-demographic data, obstetric information and pre-pregnancy care information was also used, to obtain data on the factors associated with good pre-pregnancy care knowledge. The pre-pregnancy care information assessed whether they have ever received advice on pre-pregnancy care, referred for pre-pregnancy care services, and attended the services at least once prior to the current pregnancy.

During data collection, the selected women were informed about the study and their written consent were obtained. The interviewer-guided questionnaires were administered at a convenience place in the health clinics. In average, the questionnaire took about 15 minutes to be answered by the respondents.

### Statistical analysis

Data was entered and analysed using IBM SPSS statistics version 22 software. All data were tabulated for descriptive statistics. The categorical variables were summarized in frequency (n) and percentage (%). The numerical variables were described in mean and standard deviation (SD) or median and interquartile range (IQR) depending on normality of distribution. The percentage of women with good pre-pregnancy care knowledge was calculated.

Logistic regression analysis was used to determine factors associated with good pre-pregnancy care knowledge. The dependent variable was good knowledge, and the independent variables were socio-demographic characteristics, obstetric data, and pre-pregnancy care information. The associations between each of these variables with the dependent variable were assessed using simple logistic regression analysis. All variables with  $p < 0.25$  from this univariable analysis, or clinically significant variables were selected based on Forward LR and Backward LR methods into multiple logistic regression analysis. The final model was presented with adjusted odds ratio and 95% confidence interval (CI), Wald statistics and p-value. The level of significance was set at p-value of less than 0.05.

## RESULTS

Table 1 shows the socio-demographic characteristics of 490 respondents in this study. Their mean age was 29.98 (SD 5.51) years, with the youngest being 16 years old and the eldest was 43 years old. The majority of the respondents were from Malay ethnicity, 347 (70.8%). Ninety-eight percent of them were married, and more than half (55.7%) were employed. The median distance from their resident places to the health clinic was 3.50 (IQR 2.50) km.

Table 2 presents obstetric characteristics of the respondents. Seventy-four percent of them had their first antenatal visit at or before 12 gestational weeks. A majority of them, 331 (67.6%) were parity 1 to 4, while 151 (30.8%) were nulliparous women. Fifty-five percent of the respondents had previous history of pregnancy complications, of which around 35% experienced miscarriage, gestational diabetes mellitus and lower segment caesarean section, respectively. Almost 40.0% of them had an unplanned pregnancy, with only 24.9% practised family planning prior to this pregnancy.

The mean (SD) score for knowledge of pre-pregnancy care was 12.21 (3.92). Less than half of the respondents had good knowledge of pre-pregnancy care, 238 (48.6%). Table 3 presents the percentages of correct responses for each item assessing knowledge of pre-pregnancy care. Around 80.0% of the respondents answered correctly on items assessing diet during pregnancy. Majority of them (93.0%) knew that smoking can cause harm to the baby. However, around 30.0% of the respondents wrongly answered that birth spacing of one year is recommended, as well as almost 60.0% of them stated that it is recommended to space birth for more than five years. In addition, more than half of them did not know the conditions considered as high risk pregnancy, especially maternal

underweight (70.4%), teenage pregnancy (48.4%) and advanced maternal age (44.1%).

Simple logistic regression analysis showed that education level, employment status, monthly household income, family planning practice, received advice on pre-pregnancy care, referred for pre-pregnancy care services, and attended pre-pregnancy care services were significantly associated with good pre-pregnancy care knowledge (Table 4). All variables with  $p < 0.25$  from this univariable analysis were selected for multiple logistic regression analysis using Forward LR and Backward LR methods. These variables include education level, employment status, monthly household income, parity, previous history of pregnancy complications, family planning practice, received advice on pre-

pregnancy care, referred for pre-pregnancy care services, and attended pre-pregnancy care services.

After controlling for other variables, education level and attended pre-pregnancy care services were significantly associated with good pre-pregnancy care knowledge (Table 5). Compared to women with secondary and below education, those with tertiary education had two times odds of having good pre-pregnancy care knowledge (Adjusted OR 2.06; 95% CI: 1.41, 3.03;  $p < 0.001$ ). Compared to women who never attended pre-pregnancy care services, those who had attended were almost 2.5 times higher odds of having good pre-pregnancy care knowledge (Adjusted OR 2.46; 95% CI: 1.59, 3.83;  $p < 0.001$ )

**Table 1: Socio-demographic characteristics of the respondents (n=490)**

Variables	n (%)
<b>Age (year)</b>	29.98 (5.51) <sup>a</sup>
Less than 20	18 (3.7)
20 to 35	396 (80.8)
More than 35	76 (15.5)
<b>Ethnicity</b>	
Malay	347 (70.8)
Chinese	65 (13.3)
Indian	74 (15.1)
Others	4 (0.8)
<b>Marital status</b>	
Unmarried	9 (1.8)
Married	481 (98.2)
<b>Education level</b>	
Secondary and below	313 (63.9)
Tertiary	177 (36.1)
<b>Employment status</b>	
Unemployed	217 (44.3)
Employed	273 (55.7)
<b>Monthly household income (RM)</b>	3000.00 (3000.00) <sup>b</sup>
Less than 5000	353 (72.3)
5000 to 10,000	119 (24.4)
More than 10,000	16 (3.3)
<b>Distance from health clinic (km)</b>	3.50 (2.50) <sup>b</sup>
<b>Transportation problems to health clinic</b>	
Yes	59 (12.0)
No	431 (88.0)

<sup>a</sup>mean (SD), <sup>b</sup>median (IQR)

**Table 2: Obstetric characteristics of the respondents (n=490)**

Variables	n (%)
Gestational age at booking (weeks)	10.00 (5) <sup>a</sup>
12 weeks and below	364 (74.3)
More than 12 weeks	126 (25.7)
Parity	1.00 (2.00) <sup>b</sup>
Nulliparous	151 (30.8)
Parity 1 to 4	331 (67.6)
Parity 5 and above	8 (1.6)
Previous history of pregnancy complications	
No	217 (44.3)
Yes	273 (55.7)
Types of pregnancy complications* (n=273)	
Miscarriage	98 (35.9)
Induced abortion	1 (0.4)
Ectopic pregnancy	7 (2.6)
Gestational diabetes mellitus	96 (35.1)
Pregnancy-induced hypertension	46 (16.8)
Congenital heart disease	2 (0.7)
Cardiovascular disease	1 (0.4)
Thyroid disease	8 (2.9)
Renal disease	3 (1.1)
Postpartum haemorrhage	1 (0.4)
Perinatal death	9 (3.3)
Congenital malformation	3 (1.1)
Instrumental delivery	30 (11.0)
Caesarian section	82 (30.0)
Planned pregnancy	
No	192 (39.2)
Yes	298 (60.8)
Family planning practice prior to current pregnancy	
No	368 (75.1)
Yes	122 (24.9)

**Table 3: Correct responses for knowledge of pre-pregnancy care (n=490)**

Items	n (%)
1. Risk for high risk pregnancy	
a) Age below 18 years	253 (51.6)
b) Small body size	145 (29.6)
c) First pregnancy at age 35 years and above	274 (55.9)
d) Twin pregnancy	325 (66.3)
2) Risk of poor birth spacing	
a) Maternal anaemia	353 (72.0)
b) Congenital malformation	126 (25.7)
c) Premature labour	196 (40.0)
d) Postpartum haemorrhage	235 (48.0)
3) Recommendation for good birth spacing practices	
a) One year	352 (71.8)
b) Between 2 to 4 years	439 (89.6)
c) More than 5 years	215 (43.9)
4) Knowledge of diet during pregnancy	
a) eat a balanced diet but more frequently than non-pregnant women	437 (89.2)
b) eat a diet with higher iron content	427 (87.1)
c) eat a diet with higher calcium content	425 (86.7)
d) eat less fat	353 (72.0)
5) Smoking causes harm to the baby	458 (93.5)
6) Folic acid supplementation and risk reduction of congenital malformation	344 (70.2)
7) Risk of maternal anaemia for baby	
a) low birth weight	291 (59.4)
b) pale	231 (47.1)
c) increased appetite	53 (10.8)
d) increased blood pressure	51 (10.4)



Table 4: Factors associated with good pre-pregnancy care knowledge, using simple logistic regression analysis (n=490)

Variable	Good pre-pregnancy care knowledge		b	Crude OR (95% CI)	p-value
	Yes n (%)	No n (%)			
Age (year)					
< 20 and > 35	43 (18.1)	51 (20.2)		1	
20 to 35	195 (81.9)	201 (79.8)	0.14	1.15 (0.73, 1.81)	0.542
Ethnicity					
Others	2 (0.8)	2 (0.8)		1	
Malay	175 (73.5)	172 (68.3)	0.02	1.02 (0.14, 7.31)	0.986
Chinese	27 (11.4)	38 (15.0)	-0.34	0.71 (0.09, 5.36)	0.740
Indian	34 (14.3)	40 (15.9)	-0.16	0.85 (0.11, 6.36)	0.874
Education level					
Secondary and below	131 (55.0)	182 (72.2)		1	
Tertiary	107 (45.0)	70 (27.8)	0.75	2.12 (1.46, 3.09)	<0.001
Employment status					
Unemployed	90 (37.8)	127 (50.4)		1	
Employed	148 (62.2)	125 (49.6)	0.51	1.67 (1.17, 2.40)	0.005
Monthly income (RM)					
Less than 5000	159 (66.8)	194 (77.6)		1	
5000 to 10,000	70 (29.4)	49 (19.6)	0.56	1.74 (1.14, 2.66)	0.010
More than 10,000	9 (3.8)	7 (2.8)	0.45	1.57 (0.57, 4.31)	0.382
Parity					
Nulliparous	66 (27.7)	85 (33.7)		1	
Para 1 and above	172 (72.3)	167 (66.3)	0.28	1.33 (0.90, 1.95)	0.151
Gestational age at booking					
> 12 weeks	63 (26.5)	63 (25.0)		1	
12 weeks and below	175 (73.5)	189 (75.0)	-0.08	0.93 (0.62, 1.39)	0.710
Previous pregnancy complications					
No	95 (39.9)	122 (48.4)		1	
Yes	143 (60.1)	130 (51.6)	0.35	1.41 (0.99, 2.02)	0.059
Planned pregnancy					
No	92 (38.7)	100 (39.7)		1	
Yes	146 (61.3)	152 (60.3)	0.04	1.04 (0.73, 1.50)	0.816
Family planning practice					
No	162 (68.1)	206 (81.7)		1	
Yes	76 (31.9)	46 (18.3)	0.74	2.10 (1.38, 3.20)	0.001
Received advice on pre-pregnancy care					
No	150 (63.0)	191 (75.8)		1	
Yes	88 (37.0)	61 (24.2)	0.61	1.84 (1.24, 2.71)	0.002
Referred for pre-pregnancy care services					
No	175 (73.5)	212 (84.1)		1	
Yes	63 (26.5)	40 (15.9)	0.65	1.91 (1.22, 2.97)	0.004
Attended pre-pregnancy care services					
No	161 (67.6)	212 (84.1)		1	
Yes	77 (32.4)	40 (15.9)	0.93	2.54 (1.64, 3.91)	<0.001

Table 5: Factors associated with good pre-pregnancy care knowledge, using multiple logistic regression analysis (n=490)

Variable	b	Adjusted OR (95% CI)	p-value
Education level			
Secondary and below		1	
Tertiary	0.72	2.06 (1.41, 3.03)	<0.001
Attended pre-pregnancy care services			
No		1	
Yes	0.90	2.46 (1.59, 3.83)	<0.001

## DISCUSSION

The age range of the respondents in this study was between 16 years old and 43 years old. There were 18 respondents (3.7%) with the age of 19 years and below, and 76 (15.5%) aged more than 35 years old. Various studies have shown the association between teenage pregnancy and advanced maternal age with adverse maternal and neonatal outcomes, including preterm delivery, eclampsia, postpartum haemorrhage and fetal distress<sup>13,18</sup>. Therefore, educating and empowering women are important to prevent too early, too late or too close pregnancies. One of the important strategies to achieve optimal timing and spacing of pregnancies is through pre-pregnancy care.

More than half of the respondents already had previous history of pregnancy complications. These women should prioritize the pre-pregnancy care and optimize their conditions before embarking into another pregnancy. Nonetheless, some high risk women were keen to get pregnant despite knowing the possible risks, and refuse for pre-pregnancy care or contraception use<sup>19</sup>. Focus group discussions with women who had chronic health conditions found that obese women generally did not perceive their increased risk for pregnancy-related complications, and obesity did not influence their pregnancy intentions<sup>20</sup>.

This study also demonstrated a low percentage of family planning use prior to the current pregnancy. Similarly, 80.8% of women who attended pre-pregnancy screening were found not practising contraception despite having risk factors<sup>6</sup>. This highlights an unmet need for family planning among women with pregnancy risk factors. It is closely linked to the issue of unplanned or unintended pregnancy. Almost 40.0% of women in this study had an unplanned pregnancy. Unplanned pregnancy is an important public health issue. A study in Sarawak showed that 55.0% of women never planned their pregnancies before, and unplanned pregnancy was expressed as one of the main barriers of pre-pregnancy care services<sup>19</sup>. Similarly, the major cause of lack of pre-pregnancy care expressed by women in Iran was unplanned pregnancy<sup>21</sup>. However, some women did not view unintended pregnancy as a result of inadequate contraceptive use, but related it with fate or decision of God<sup>20</sup>. This perception and belief need to be tackled in order to improve family planning practice and pre-pregnancy care.

Using the same questionnaire, a study conducted among pregnant women in another state in Malaysia found an almost similar percentage (51.9%) of the respondents who had good pre-pregnancy care knowledge<sup>16</sup>. Our study also showed that almost half of the women had poor knowledge. However, 61% of the population whom the questionnaire was first utilized were reported

to have high score in knowledge on pre-pregnancy care<sup>17</sup>. The possible explanation can be related to the difference in ethnic groups of the respondents. Their study only included Indian population residing in Selangor, whereas majority of our respondents were Malay. Nevertheless, the authors concluded that the level of knowledge among their study population was still low<sup>17</sup>. The inadequate knowledge of pre-pregnancy care was also demonstrated from other countries, including Nepal, where 51.0% of antenatal mothers had inadequate pre-pregnancy care knowledge, and majority of them had an average knowledge<sup>22-23</sup>.

Likewise, as found in our study, many women did not have adequate knowledge regarding optimal duration of birth spacing, risk of poor birth spacing, and the factors classified as high risk pregnancy<sup>16</sup>. Only 5% of reproductive age women in a study in Nepal were able to provide correct answer regarding the recommended minimum gap between two children<sup>23</sup>. Therefore, it is a need to highlight the risk of short and long birth spacing, in order to encourage women to have optimal birth spacing. One of the ways is to have adequate access to quality family planning services, which is also provided through pre-pregnancy care services.

It is important for all women, especially those in the reproductive age group, to have good pre-pregnancy care knowledge. Our study found that women with tertiary education and those who had attended pre-pregnancy care services were more likely to have good pre-pregnancy care knowledge. The association between educational level and pre-pregnancy care knowledge was demonstrated in other studies as well<sup>12,24</sup>. A community-based study among reproductive age women found that women with higher education level were more likely to have knowledge on pre-pregnancy care<sup>25</sup>. Therefore, health promotion on pre-pregnancy care should focus on all women, with more emphasis on those in lower educational group.

In addition, women who had the experience of attending pre-pregnancy care services before were found to be more knowledgeable on pre-pregnancy care. Knowledge of pre-pregnancy care may be acquired through experience or education<sup>16</sup>. Those who had been exposed and utilized the service might obtain the important and relevant information, thus their knowledge on pre-pregnancy care were better. The major source of information on pre-pregnancy care was from the health care providers, and they should be well-equipped with updated and correct information to be able to disseminate it to the general population<sup>9</sup>.

The findings from this study are beneficial for the improvement of the current health services. Knowing the level of knowledge, it is clear that pre-pregnancy care services should be made

informed and accessible to all levels of the community. Disseminating information for the improvement of pre-pregnancy care knowledge should be achieved through various channels, including collaboration with the community and non-governmental organizations. Tackling the issue of unmet need for family planning is very important, and ensuring optimal birth spacing should be prioritized in every relevant program at the health clinics. In addition, pre-pregnancy care knowledge and family planning should be clearly highlighted during pre-marital courses. Apart from that, more research can be conducted to develop an effective and comprehensive module for pre-pregnancy care knowledge, with involvement of various stakeholders and suited for different level of population.

#### Limitation

This study was conducted among women who came for their antenatal booking in governmental health clinics. The findings might not represent those who went to government hospitals and private clinics or hospitals. Those women might have different level of knowledge related to pre-pregnancy care. Furthermore, the women in this study might already be exposed to some information related to pre-pregnancy during this booking visit. In addition, some knowledge items in the questionnaire could be assessed in more detail to get a clearer picture of their knowledge. Nevertheless, this study provides important insights into the general understanding of their knowledge and the associated factors. Further exploration of these findings can be conducted in future research.

#### CONCLUSION

The knowledge of women with high risk pregnancy about pre-pregnancy care was still unsatisfactory. There were high proportion of them who were not aware of the recommended duration of birth spacing, the risk of poorly spaced birth, and the pregnancy conditions classified as high risk. The factors significantly associated with good pre-pregnancy care knowledge were women who received tertiary education and attended pre-pregnancy care services before.

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#### Conflict of interest

The authors declare no potential conflict of interest.

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