

# Role of sociodemographic, obstetric history and planning of pregnancy in predicting short interpregnancy interval among antenatal mothers in Klang, Selangor

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## ABSTRACT

**Introduction:** Short Interpregnancy interval (IPI) is defined as the interval between the live birth outcome and the next pregnancy conception of less than 24 months. It has been linked to adverse maternal and perinatal outcomes. The objective of this study was to determine the prevalence and the predictors of short IPI among antenatal mothers.

**Methods:** A cross-sectional study was conducted among 452 antenatal mothers attending health clinics in Klang in April 2018. Probability sampling was used and data was collected by using a validated self-administered questionnaire. The dependent variable of the study was short IPI and the independent variables were sociodemographic, obstetric history and planning of pregnancy. Analysis of data collected in the study was performed by using IBM Statistical Package for Social Science (SPSS) version 24.

**Results:** The prevalence of short IPI found in this study was 48%. Seven identified predictors of short IPI were: age less than 25 years old (Adjusted Odd Ratios; AOR 12.16, 95%CI: 4.72, 31.30), age of 26 to 30 years old (AOR 5.20, 95%CI: 2.62, 10.32), age of 31 to 35 years old (AOR 2.90, 95% CI: 1.50, 5.64), higher education (AOR 2.11, 95% CI: 1.34, 3.34), parity more than three (AOR 3.12, 95% CI: 1.42, 6.84), irregular menstruation (AOR 2.17, 95% CI: 1.40, 3.37) and unintended pregnancy (AOR 2.88, 95% CI: 1.88, 4.40).

**Conclusion:** Innovative programmes, for example by making IPI information available through online resources, could effectively target young mothers as the younger generation prefers quick, easily-accessible and reliable information.

## KEY WORDS:

*Short interpregnancy interval, predictors, sociodemographic, obstetric history, planning of pregnancy*

## INTRODUCTION

Short interpregnancy interval (IPI) has become a particular concern to many in the field of public health due to its effects on maternal and child health outcomes. Both the World Health Organization (WHO) and The United Nations Children's Fund (UNICEF) have advocated two years of

breastfeeding duration and recommended that a woman who is planning her next pregnancy should allow at least 24 months to pass before the next conception in view of the adverse effects of short IPI on pregnancy outcomes.<sup>1</sup> Maternal health implications that have been reported to be caused by short IPI include bleeding, postpartum hemorrhage, premature rupture of membrane and anemia, while implications in child health that have been reported to be caused by short IPI include stillbirth, miscarriage, neonatal mortality, small for gestational age, preterm birth, low birth weight and under five mortality.<sup>1,2</sup> The WHO has classified that short IPIs of less than 18 months have the highest risks of adverse maternal and child health outcomes, whilst short IPIs ranging from 18 to 24 months generally have the least risks of adverse maternal and child health outcomes.<sup>1</sup> Malaysia defined short IPI as less than 24 months following the recommendations by both the WHO and UNICEF.

In Malaysia, a study that was conducted in Terengganu among 86 married couples reported that a prevalence of short IPI of less than 24 months was 36.0%.<sup>3</sup> Another study conducted among nursing staff in Kelantan reported that 41.1% respondents had short IPIs of less than 15 months.<sup>4</sup> Family planning plays a big role in controlling both the total fertility rate and limiting birth. In 1966, the Parliament of Malaysia endorsed the Family Planning Act to set up the National Family Planning Board entrusted with the responsibility to develop policies and programmes on family planning.<sup>5</sup> At present, the main providers of family planning services in Malaysia are the Ministry of Health, the National Population and Family Development Board (NPFDB) and the Federation of Reproductive Health Associations, Malaysia (FRHAM).<sup>6</sup> In addition, family planning services are also provided by private clinics and over the counter pharmacies. Furthermore, reproductive health and family planning education are incorporated in the national schooling system for both primary and secondary levels.<sup>6</sup>

Many factors contribute to short IPI such as age, ethnicity, education level, employment status of husband, parity, practice of family planning, breastfeeding duration, sex of the preceding child, knowledge of IPI and family planning, menstrual cycle pattern, history of miscarriage, illicit drugs abuse, smoking, body mass index, survival status and multiple birth of the preceding child and unplanned

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pregnancy.<sup>5,7-12</sup> In a study conducted in a developed country found that postponement of childbearing among older mothers aged 31 to 49 years old has been linked to short IPI compared to mothers aged 26 to 30 years old (Adjusted Odds Ratio, AOR 1.65, 95%CI: 1.09, 2.41).<sup>7</sup> These highly-educated women with successful careers have their first child at an older age and may intentionally cause short IPI due to their shortened reproductive years. Most of the time, high socioeconomic risks such as low education level and low economic status are associated to poor health outcomes to mothers including short IPI. Evidence has shown that mothers (OR 4.28, 95%CI: 2.91, 6.29) and husbands (OR 2.01, 95%CI: 1.42, 2.83) with low education level,<sup>8</sup> low economic status (OR 5.27, 95%CI: 2.92, 9.51)<sup>8</sup> and not working mothers (AOR 1.83, 95%CI: 1.33, 2.54)<sup>7</sup> may involuntarily cause short IPI as compared to their counterparts with higher education level, employment and high economic status.<sup>3,5</sup> Their unfortunate conditions limit their access to healthcare services including family planning, resulting in poor knowledge of sexual and reproductive health, leading to less fertility control and poor health seeking behaviour.

Obstetric history of mothers such as parity, menstrual cycle pattern, history of miscarriage and history of multiple births in the last pregnancy can cause short IPIs.<sup>7-10</sup> Evidence from a study conducted in Ethiopia reported that mothers without history of miscarriage in their last pregnancies (OR 1.09, 95%CI: 0.41, 2.90) showed lack of association with short IPIs of less than 27 months compared to mothers with history of miscarriages.<sup>8</sup> Studies conducted in both the United States of America (USA) (OR 1.21, 95%CI: 0.86, 1.71) and Denmark (AOR 1.86, 95%CI: 1.10, 3.14) reported that mothers with high parity were more associated to short IPI as compared to low parity mothers.<sup>7,9</sup> A similar study in Denmark reported that irregular menstruation had significant association with short IPIs of less than nine months compared to mothers who have regular menstruation (AOR 2.12, 95%CI: 2.12, 3.85).<sup>7</sup> In addition, a study in Tanzania found that if the preceding child was a multiple birth there was a strong protective factor for short IPIs of less than 24 months (OR 0.76, 95%CI: 0.59, 0.97).<sup>10</sup> Both positive fertility history and the desire to be pregnant again post-miscarriage may cause short IPI. In addition, uncertainty of fertile period which happens to women with irregular menstrual cycle pattern can lead to short IPI as there is a high chance of unplanned conception happening during peak fertility time.<sup>7</sup>

Short IPI also depends on the planning of pregnancy which includes knowledge of family planning and IPI, practice of family planning and intentional pregnancies.<sup>7,8,10-12</sup> A cohort study conducted in Nepal showed that there was a significant difference between short IPI of less than 15 months and level of knowledge of family planning methods ( $p=0.049$ ).<sup>10</sup> Yohannes et al., in 2011 reported that non-use of contraception among Southern Ethiopian mothers before conception was significantly associated with short IPI of less than 27 months compared to mothers that used contraception (OR 1.56, 95%CI: 1.10, 2.21).<sup>12</sup> In addition, Kaharuzza et al., reported that in Denmark unplanned pregnancy was strongly associated with short IPIs of less than nine months as compared to planned pregnancy (AOR 2.12,

95%CI: 2.12, 3.85).<sup>7</sup> The finding is consistent with a study that was conducted by Hailu & Gulte in Arba Minch District, Ethiopia which reported that unintended pregnancy had significant association with short IPIs of less than 27 months compared to planned pregnancy (OR 2.73, 95%CI: 1.94, 3.84).<sup>8</sup> It is important to highlight that social desirability and cultural norm may have an impact to the aforementioned factors of short IPI.<sup>13,14</sup>

At present, research pertaining to factors of short IPI such as sociodemographic, obstetric history, knowledge of family planning and IPI, practice of family planning and intentional pregnancy are scarce in Malaysia. Therefore, it will be insightful to study the prevalence of short IPI and factors associated with short IPI in the country. This study aims to determine the role of sociodemographic, obstetric history and intentional pregnancy in predicting short interpregnancy interval among antenatal mothers in Klang, Selangor.

## METHODS AND MATERIALS

### Study design and sampling

A cross-sectional study was conducted in the District of Klang in the Selangor state of Peninsular Malaysia. The district has a composition of multiethnic dwellers consisting of 49.7% Malays, 28.7% Chinese and 21.1% Indians, reflecting an almost similar composition as the general Malaysian population.<sup>14</sup> The study was carried out in all the ten government health clinics in the Klang district that provided maternal and child health services (MCH). The inclusion criteria used was antenatal mothers with second or higher order of index pregnancy who attended health clinics in April 2018. Respondents were randomly selected using stratified proportional sampling. The probability of selection from a stratified clinic was directly proportional to a size measure that depends on the proportion of antenatal mothers in a clinic to the total number of antenatal mothers in all ten clinics in Klang. Each clinic has a different population in which each of them has its own identified characteristics. Then, systematic random sampling with the  $k$  interval of three which was calculated by dividing the total number of antenatal mothers in each clinic with its number of samples ( $n$ ). Two proportions formula was applied to calculate the sample size and after adjustments for 20% non-response, the final sample size calculated as 559.<sup>16</sup>

Interpregnancy interval was measured as the time period starting from the last menstrual period of the index pregnancy until the preceding birth.<sup>13</sup> In this study, the definition of pregnancies with short IPIs followed the recommendation as set by WHO. The recommendations stated how short IPI should be defined for both live birth outcome and non-live birth outcome in the preceding pregnancy as described below:

- i. Live birth outcome: the interval between the live birth outcome and the next pregnancy conception is less than 24 months and
- ii. Non-live birth outcome: the interval between the non-live birth (miscarriage) outcome and the next pregnancy conception is less than six months.

Previous studies that used birth interval, birth spacing, and inter-outcome intervals included the pregnancy period, unlike IPI that measures only non-pregnancy state post birth. Hence, the durations of birth interval, birth spacing, and inter-outcome interval reported in those studies are deducted here by nine months so that they can be compared to IPI measurements.

The independent variables in this study were grouped into three factors namely sociodemographic, obstetric history and planning of pregnancy. For sociodemographic factors, the variables included age, marital status, ethnicity, antenatal mother's and husband's education and employment status, and household income. For obstetric history, the variables included parity, menstrual cycle pattern, history of miscarriage and multiple birth in the last pregnancy. Regular menses were defined by four characteristics which were a cycle range anywhere around 21 to 35 days, at least two days up to seven days of bleeding, red bright colour bleeding and 25 to 80 ml of bleeding in a cycle. Irregular menses were defined as vaginal bleeding that did not have at least the first description of the regular periods.<sup>17</sup> In addition, knowledge of family planning and IPI, practice of family planning and intentional pregnancy were grouped as planning of pregnancy factors. Practice of family planning was measured by history of recent use of contraception prior to index pregnancy conception (such as pills, IUCD, injection, implanon or condom).<sup>11</sup> Intentional pregnancy was defined as antenatal mothers who desired to have more children prior to conception of index pregnancy.<sup>11</sup>

#### Study instrument

A questionnaire was used to collect information from respondents. The initial part of the questionnaire was a Sociodemographic section that consisted of eight questions, on age, marital status, ethnicity, education, employment status, husband's education level and employment status, and household income. The Obstetric History section had four questions that collected information on parity, history of miscarriage in the last pregnancy, history of multiple birth in the last pregnancy and menstrual cycle pattern. The Planning of Pregnancy questions included questions about knowledge of family planning and IPI (total of 15 questions), practice of family planning (one question) and intentional pregnancy (one question). Part of the questions in the Knowledge of Family Planning and IPI subsection were based on a study that was conducted by Nazri Shafei et al., in 2012 and Renjhen et al., in 2010.<sup>3,18</sup> For this subsection, the categorical responses were Yes, No and Do Not Know. Correct answers were awarded a score of one, and wrong answers or Do Not Know were awarded a score of zero. The minimum score was zero and the maximum score was 15. The total score of all the statements were divided by 15 and converted into percentages. The results were grouped into poor knowledge (respondents who scored <80%) and good knowledge (respondents who scored ≥80%).<sup>3</sup>

#### Quality control

Responses from the questionnaire were cross-checked with the information in the antenatal book to ensure the consistency of the answers given. (For example, age, ethnicity, employment status, husband employment status, last menstrual period, estimated due date, past obstetric history

and others). In this study, the content of the questionnaire was validated by the experts in the field and face validity was conducted on ten antenatal mothers from the Bukit Kuda Health Clinic. Internal reliability of the questionnaire were conducted among 34 antenatal mothers in the Bukit Kuda Health Clinic. Interpregnancy interval and parity reported a value of above 0.9 for intraclass correlation (ICC). The results of Cohen's Kappa were above than 0.7 value for menstrual cycle pattern, history of miscarriage, history of multiple birth in the last pregnancy, practice of family planning and intentional pregnancy. In addition, the reliability test of Cronbach's Alpha was 0.8 for responses to questions in the Knowledge of Family Planning and IPI subsection that employed Likert scale responses.

#### Statistical analysis

Statistical Package of Social Sciences System (SPSS) version 24 was used to analyse the data collected from the questionnaires. Descriptive statistics of the variables were performed which included the frequency, percentage, mean, minimum, maximum and standard deviation values. Normality test was conducted for the data distribution of each variable before statistical test was done. Age in years, monthly household income, knowledge of family planning and IPI values were transformed from continuous data to categorical data. Next, Chi square test and multiple logistic regression were both conducted to observe for any significant association and to determine the predictors of short IPI. The  $\alpha$  level was set as less than 0.05 and confidence interval of 95% with Adjusted Odds Ratio that did not include one, to determine the predictors of short IPI.

#### Ethical consideration

Ethical clearance was attained from the National Medical Research and Ethics Committee, Ministry of Health Malaysia (Reference no: NMRR-18-158-39594 (IIR)) and the Ethics Committee for Research Involving Human Subjects of Universiti Putra Malaysia (Reference no: JKEUPM-2018-129). Before proceeding with data collection, a written consent was received from each antenatal mother to ensure that all the information was given willingly by the respondents as well as to inform them that the information was used only for research purposes and would be kept confidential.

#### RESULTS

A total of 559 questionnaires were distributed but only 452 questionnaires were completed, yielding a response rate of 81%. The remaining 107 questionnaires were consented but were not completed by the respondents. The mean age of respondents was 31.04±4.68 years with a minimum age of 19 years old and a maximum age of 43 years old. All the respondents were married (100%), majority were Malay (79%), had tertiary education (50%), were housewives (45.1%), had husbands who had secondary education (52.7%) or worked in the private sector (65.9%), and had household incomes between RM2,000 and RM2,999 (38.1%) (Table I). Sociodemographic characteristics of the non-responders are shown in Table II where the majority did not respond to the household income question (55 non-responders) followed by age (seven non-responders), husband's education and employment status (both with two non-responders) and employment status (one non-

Table I: Sociodemographic characteristics of the antenatal mothers in Klang, Selangor (n=452)

Characteristics	Mean $\pm$ SD	n (%)
<b>Age (year)</b>	31.04 $\pm$ 4.68	
<b>Marital Status</b>		
Married		452 (100)
Single		0 (0)
<b>Ethnicity</b>		
Malay		357 (78.9)
Chinese		26 (5.8)
Indian		43 (9.5)
Others		26 (5.8)
<b>Education</b>		
No Formal Education		2 (0.4)
Primary Education		16 (3.6)
Secondary Education		208 (46.0)
Tertiary Education		226 (50.0)
<b>Husband Education</b>		
No Formal Education		4 (0.8)
Primary Education		24 (5.3)
Secondary Education		238 (52.7)
Tertiary Education		186 (41.2)
<b>Employment Status</b>		
Housewife		204 (45.1)
Self-employed		23 (5.1)
Government Servant		73 (16.2)
Private		151 (33.4)
Retiree or Pensioner		1 (0.2)
<b>Husband Employment Status</b>		
Unemployed		1 (0.2)
Self-employed		90 (19.9)
Government Servant		63 (14.0)
Private		298 (65.9)
Retiree or Pensioner		0 (0)
<b>Household Income per month</b>	3836.78 $\pm$ 2168.22	
< RM 1000		0 (0)
RM 1000 – RM1999		79 (17.5)
RM 2000 – RM2999		93 (20.6)
RM 3000 – RM3999		87 (19.2)
RM 4000 – RM4999		59 (13.1)
> RM 5000		134 (29.6)

responder). The mean age of the non-responders was 32.35 $\pm$ 5.51 years. Majority of them were married (98.1%), Malay (75.7%), had secondary education (52.3%), were housewives (41.5%), had husbands who had secondary education (58%) or worked in the private sector (53.3%), and had household incomes above RM5,000 (28.8%).

Table III shows the correct responses to questions on knowledge of family planning and IPI. The majority of the respondents answered correctly the question "The minimum interval time between the last birth and next pregnancy is two years" and "Condom is a sheath made up from a soft rubber material". Both questions had 87.4% (n=395) of correct answers from respondents. The least correctly answered in the IPI category was "Mothers who are pregnant with interpregnancy interval more than 5 years are at higher risk to deliver a premature baby" with 18.4% (n=83). Under the family planning category, the least correctly answered

question was "Calendar method is a reliable method when having unprotected sexual intercourse during her fertile period for prevention of pregnancy" with 24.6% (n=111). In this study, the majority of the respondents had poor knowledge (87.6%) and only 12.4% had good knowledge of family planning and IPI.

Table IV summarises the bivariate analysis of sociodemographic, obstetric history and planning of pregnancy with short IPI. From eight sociodemographic variables studied, age ( $\chi^2=38.772$ , df=3, p-value<0.001) and education ( $\chi^2=6.462$ , df=1, p-value=0.011) showed significant association with short IPI. Marital status was removed from further analysis in the bivariate as all respondents were married. Findings from Chi square analysis results of obstetric history revealed that two out of the four variables had significant association with short IPI. They were parity and menstrual cycle pattern with p-value<0.001, df=3 and

**Table II: Sociodemographic characteristics of the non-responders (n=107)**

Characteristics	Mean ± SD	n (%)
<b>Age (year)<sup>a</sup></b>	32.35 ± 5.51	
<b>Marital Status</b>		
Married		105 (98.1)
Single		2 (1.9)
<b>Ethnicity</b>		
Malay		81 (75.7)
Chinese		6 (5.6)
Indian		12 (11.2)
Others		8 (7.5)
<b>Education</b>		
No Formal Education		0 (0)
Primary Education		2 (1.9)
Secondary Education		56 (52.3)
Tertiary Education		49 (45.8)
<b>Husband Education<sup>b</sup></b>		
No Formal Education		1 (1.0)
Primary Education		1 (1.0)
Secondary Education		61 (58.0)
Tertiary Education		42 (40.0)
<b>Employment Status<sup>c</sup></b>		
Housewife		44 (41.5)
Self-employed		11 (10.4)
Government Servant		13 (12.3)
Private		38 (35.8)
Retiree or Pensioner		0 (0)
<b>Husband Employment Status<sup>d</sup></b>		
Unemployed		1 (1.0)
Self-employed		28 (26.7)
Government Servant		20 (19.0)
Private		56 (53.3)
Retiree or Pensioner		0 (0)
<b>Household Income per month<sup>e</sup></b>	3709.42 ± 2208.92	
< RM 1000		0 (0)
RM 1000 – RM1999		12 (23.1)
RM 2000 – RM2999		9 (17.3)
RM 3000 – RM3999		11 (21.2)
RM 4000 – RM4999		5 (9.6)
> RM 5000		15 (28.8)

<sup>a</sup>Age is missing 7 responses

<sup>b</sup>Husband's education is missing 2 responses

<sup>c</sup>Employment status is missing 1 response

<sup>d</sup>Husband's employment status is missing 2 responses

<sup>e</sup>Household income per month is missing 55 responses

$\chi^2=22.446$ , and p-value 0.03, df=1 and  $\chi^2=8.971$  respectively (Table IV). For planning of pregnancy, only intentional pregnancy ( $\chi^2=22.918$ , df=1, p-value<0.001) had significant association with short IPI.

Independent variables from bivariate analysis with p-values of less than 0.2519 were tested for predictors. Findings from the multicollinearity test did not show high intercorrelation between the independent variables. The 'Backward LR' method was selected for the final model as it produced a parsimonious model. The final model containing all predictors was statistically significant ( $\chi^2=95.989$ , df=9, p-value<0.001) and fit the Hosmer and Lemeshow goodness of

fit test ( $\chi^2=7.213$ , df=8, p-value=0.514). The variance of short IPI was 26% (Nagelkerke R squared) and data correctly classified about 70.4%.

Findings from multiple logistic regression revealed seven predictors of short IPI which were age less than 25 years old (AOR 12.159, 95%CI: 4.723, 31.301), age of 26 to 30 years old (AOR 5.197, 95%CI: 2.616, 10.324), age of 31 to 35 years old (AOR 2.904, 95%CI: 1.495, 5.641), higher education (AOR 2.113, 95%CI: 1.337, 3.341), parity more than three (AOR 3.119, 95%CI: 1.422, 6.841), irregular menstruation (AOR 2.172, 95% CI: 1.401, 3.368) and unintended pregnancy (AOR 2.875, 95%CI: 1.878, 4.400) (Table V).

**Table III: Correct responses to question on knowledge of family planning and IPI of the antenatal mothers in Klang, Selangor (n=452)**

No	Items	n	%
<b>Interpregnancy Interval</b>			
1.	Pregnant mothers with interpregnancy interval less than 2 years are high risk pregnancy	289	63.9
2.	Mothers who are pregnant with interpregnancy interval more than 5 years are at higher risk to deliver a premature baby	83	18.4
3.	An interpregnancy interval which is too close does not allow mother's body to provide enough nutrition to the fetus.	293	64.8
4.	Per-vaginal bleeding during pregnancy can happen to mothers with too short interpregnancy interval (less than 6 months).	193	42.7
5.	The minimum interval time between last birth and next pregnancy is 2 years.	395	87.4
<b>Family Planning</b>			
1.	The most suitable age for a woman to have a baby is between 20 to 35 years old.	394	87.2
2.	Injectable contraception is administered every 2 to 3 months depending on its type.	282	62.4
3.	Intrauterine contraceptive device is made of plastic with various shapes and sizes.	137	30.3
4.	Condom is a sheath made up from a soft rubber material.	395	87.4
5.	The use of condom can provide protection against sexually-transmitted diseases such as AIDS.	351	77.7
6.	Condom must be removed immediately after ejaculation when the penis is still erected.	113	25.0
7.	Calendar method is a reliable method when having unprotected sexual intercourse during her fertile period for prevention of pregnancy.	111	24.6
8.	During ovulation (fertile period), a woman will have a vaginal discharge which is colourless and smooth.	259	57.3
9.	Only those with regular cycles can use calendar method.	286	63.3
10.	The intrauterine device is placed in the womb.	230	50.9

## DISCUSSION

The prevalence of short IPIs (48%) among antenatal mothers attending health clinics in Klang was higher compared to the previous studies conducted in the US, Denmark, Demographic Health Survey (DHS) report and other studies that were done in Malaysia. The DHS survey that was conducted in 72 developing countries recorded a 24.6% average percentage of short IPI of less than 15 months<sup>20</sup>, the study conducted in the USA reported a 29.6% prevalence of short IPIs of less than 18 months<sup>21</sup> and the study conducted in Denmark reported that 4.8% of the mothers studied had short IPIs of less than nine months.<sup>7</sup> A previous study in Kelantan, Malaysia<sup>4</sup> reported that 41.1% of the respondents had short IPIs of less than 15 months and a more recent study in Terengganu<sup>3</sup> reported 36% of women studied had short IPIs of less than 24 months. These differences can be attributed to the cut off points for short IPI, sample population and sociocultural practices. Short IPI in this study was defined as 24 months, following the recommendation by both WHO and UNICEF. In comparison, the study conducted in the USA defined short IPIs to be less than 18 months while the study in Denmark defined short IPI to be less than nine months. In addition, since this study had respondents from different ethnicities, there were differences in breastfeeding practice, contraception use, cultural belief in family planning and knowledge of contraception that could have influenced the result.<sup>22,23</sup> Furthermore, Klang is considered as an urban city where the majority of educated women were working, which can influence local mothers to shorten their breastfeeding practice due to the preference of urban women to rely on formula milk as well as due to difficulties in allocating time to breastfeed or to express breast milk.<sup>23</sup>

### Predictors

Analysis of the trend of age group showed that young mothers were likely to have short IPIs and the likelihood of it decreased as the age of an antenatal mother increased.

Findings from these results are in contrast to the study conducted in Denmark where mothers of older age had a higher risk of short IPI of less than nine months.<sup>7</sup> In women age and fertility are always being associated in the ability to procreate compared to men.<sup>24</sup> This is particularly important as a woman's ovarian reserve which depends on the quality and quantity of oocytes is affected by the age of women.<sup>25</sup> As age increases, women face more gynaecological and obstetric problems such as miscarriage, congenital abnormalities, pre-eclampsia and genetic disorders which explains why most antenatal mothers avoid to get pregnant at a later age.<sup>25</sup> On the other hand, younger antenatal mothers usually lack sexual and reproductive health education and experience on family planning and are likely in the phase where they prefer to increase the family size on top of being more fertile than older antenatal mothers.

This study showed that higher education was a predictor for short IPI. However, a study that was conducted in Arba Minch District, Ethiopia reported that antenatal mothers with no formal education were significantly associated with short IPIs as compared to those who had attended formal education.<sup>8</sup> It is hypothesized that education has always been one of the important factors that can affect socioeconomic status and behaviour in fertility.<sup>26</sup> Women with higher education levels are always motivated to enhance their knowledge but sources of their knowledge might not be proper and not validated especially in the present world where knowledge is easily obtained. This is portrayed from the knowledge results where 87.6% of the antenatal mothers had poor knowledge on IPI and family planning despite half of them had at least tertiary level education.

This study found that high parity antenatal mothers were associated with short IPI. The finding is comparable to a study that was conducted in the USA where mothers with three parity and above were associated with short IPI.<sup>9</sup> It is

**Table IV: Association between sociodemographic, obstetric history and planning of pregnancy and short interpregnancy interval of the antenatal mothers in Klang, Selangor (N=452)**

Variables	Short Interpregnancy Interval		Test Statistics		
	Yes N= 217 (%)	No N= 235 (%)	X <sup>2</sup>	df	p-value
<b>Age group</b>					
19 to 25 years old	34 (70.8)	14 (29.2)	38.772	3	< 0.001*
26 to 30 years old	99 (59.3)	68 (40.7)			
31 to 35 years old	62 (41.1)	89 (58.9)			
> 35 years old	22 (25.6)	64 (74.4)			
<b>Ethnicity</b>					
Malay	177 (49.6)	180 (50.4)	1.679	1	0.195
Non-Malay <sup>b</sup>	40 (42.1)	55 (57.9)			
<b>Education</b>					
Lower Education <sup>c</sup>	95 (42.0)	131 (58.0)	6.462	1	0.011*
Higher Education <sup>d</sup>	122 (54.0)	104 (46.0)			
<b>Employment</b>					
Working	119 (48.2)	128 (51.8)	0.023	1	0.879
Not Working	98 (47.8)	107 (52.2)			
<b>Husband Education</b>					
Lower Education <sup>c</sup>	119 (44.6)	148 (55.4)	2.427	1	0.119
Higher Education <sup>d</sup>	98 (53.0)	87 (47.0)			
<b>Husband Employment</b>					
Working	217 (48.1)	234 (51.9)	NA	1	0.520a
Not Working	0 (0)	1 (100.0)			
<b>Household Income</b>					
RM 1000 – RM1999	38 (48.1)	41 (51.9)	0.769	4	0.943
RM 2000 – RM2999	45 (48.4)	48 (51.6)			
RM 3000 – RM3999	45 (51.7)	42 (48.3)			
RM 4000 – RM4999	27 (45.8)	32 (54.2)			
> RM 5000	62 (46.3)	72 (53.7)			
<b>Parity</b>					
1	116 (60.4)	76 (39.6)	22.446	3	< 0.001*
2	52 (36.4)	91 (63.6)			
3	27 (38.0)	44 (62.0)			
>3	22 (47.8)	24 (52.2)			
<b>History of Miscarriage</b>					
Yes	25 (56.8)	19 (43.2)	1.516	1	0.218
No	192 (47.1)	216 (52.9)			
<b>Multiple Birth in the Preceding Child</b>					
Yes	2 (66.7)	1 (33.3)	NA	1	0.610 a
No	215 (47.9)	234 (52.1)			
<b>Menstrual Cycle Pattern</b>					
Regular	116 (42.3)	158 (57.7)	8.971	1	0.003*
Irregular	101 (56.7)	77 (43.3)			
<b>Knowledge of Family Planning and IPI</b>					
Poor	193 (48.7)	203 (51.3)	0.680	1	0.410
Good	24 (42.9)	32 (57.1)			
<b>Practice</b>					
Yes	73 (42.7)	98 (57.3)	3.117	1	0.077
No	144 (51.2)	137 (48.8)			
<b>Intentional Pregnancy</b>					
Intended	85 (37.0)	145 (63.0)	22.918	1	< 0.001*
Unintended	132 (59.5)	90 (40.5)			

<sup>a</sup>Fisher's Exact Test

\* Significant at P < 0.05

<sup>b</sup>Non-Malay include Chinese, Indian and Others

<sup>c</sup>Lower education includes those who have no formal education, primary education, secondary education, SPM and STPM.

<sup>d</sup>Higher education includes those who have diploma, degree, master and PhD.

Table V: Predictors of short interpregnancy interval of the antenatal mothers in Klang, Selangor (N=452)

Variable	SE	Wald	P - value	Adjusted Odds Ratio	(95% CI)	
					Upper	lower
<b>Age Group</b>		32.366	<0.001*			
19 to 25 years old	0.482	26.813	<0.001*	12.159	4.723	31.301
26 to 30 years old	0.350	22.144	<0.001*	5.197	2.616	10.324
31 to 35 years old	0.339	9.901	0.002*	2.904	1.495	5.641
>35 years old				1		
<b>Education</b>						
Lower Education <sup>a</sup>				1		
Higher Education <sup>b</sup>	0.234	10.262	0.001*	2.113	1.337	3.341
<b>Parity</b>		10.117	0.018*			
1	0.258	3.028	0.082	1.567	0.945	2.599
2				1		
3	0.331	0.082	0.774	1.100	0.575	2.102
>3	0.401	8.055	0.005*	3.119	1.422	6.841
<b>Menstrual Cycle</b>						
Regular				1		
Irregular	0.224	12.011	0.001*	2.172	1.401	3.368
<b>Intentional Pregnancy</b>						
Intended				1		
Unintended	0.217	23.653	<0.001*	2.875	1.878	4.400
Constant	0.405	49.792	<0.001*	0.058		

<sup>a</sup> Lower education includes those who have no formal education, primary education, secondary education, SPM and STPM.

<sup>b</sup> Higher education includes those who have diploma, degree, master and PHD.

\* Significant at P < 0.05

also in line with the study conducted by Kaharuza et al. in Denmark that reported mothers with three children were strongly associated with short IPIs.<sup>7</sup> Mothers with high parity are usually young at first birth, a decision that is influenced by education, culture practice and perspective as well as fertility history.<sup>27</sup> Mothers who marry early usually have a lower education level and are able to focus on building a family instead of their careers, while mothers with high education level are likely to postpone childbearing as they focus more on their careers. Furthermore, culturally, the Malay community believes that a woman will gain respect in the community if she is able to maximize her fertility<sup>14</sup> which encourages high parity. In terms of fertility history, high parity mothers are hypothesized as fertile women with good reproductive health which results in high chances of successful conception.<sup>28</sup>

Women with irregular menstrual cycle patterns have difficulties to predict their fertile period as compared to women with regular menstrual cycle patterns. This study revealed that irregular menstrual cycle pattern was shown to be a determinant of short IPI. The finding is in line with the study conducted by Kaharuza et al. in Denmark that reported irregular menstruation had significant association with short IPIs of less than nine months compared to mothers who had regular menstruation.<sup>7</sup> Irregular menstruation increases the chance of having coitus during the ovulation period although the woman did not plan to get pregnant. In contrast, women with regular menstrual cycle pattern are able to identify their fertile period and estimate their peak fertility time to conceive and when fecundability success rate is low after ovulation<sup>29</sup>, leading to better family planning.

Unintended pregnancy was one of the predictors of short IPI which is in congruent to the study conducted by Kaharuza et al. in Denmark which reported that unplanned pregnancy was strongly related to short IPIs of less than nine months as compared to planned pregnancy.<sup>7</sup> Hailu & Gulte in Arba Minch District, Ethiopia also reported that mothers with unintended pregnancy had significant association with short IPIs compared to their counterparts who planned their pregnancies.<sup>8</sup> Factors contributing to unintended pregnancies include non-use of contraception services, family planning access and contraception failure.<sup>30</sup> Women who have higher socioeconomic risks usually have poor knowledge on sexual and reproductive health and may have difficulty in controlling their fertility especially when they are dependent on their partner for source of living such as food, shelter and income.<sup>7</sup>

The study reported here used a large sample size which yielded reliable results with better precision and power. This reduced type II statistical error thus reducing the chances of getting false negative results. However, the study had its limitations. It was unable to distinguish between antenatal mothers that exclusively breastfed their child and antenatal mothers that mixed breastfeeding and formula milk. It should also be emphasized that this study was conducted in only one district which was Klang. Therefore, the results could be generalised to populations living in the central region of Peninsular Malaysia but not to other populations with different sociodemographic backgrounds.

## CONCLUSION

This study reveals that short IPI in Klang is an issue concern with a prevalence of 48%. The strongest predictor of short IPI is mothers with age less than 25 years old followed by age of 26 to 30 years old, more than three parity, age of 31 to 35 years old, unintentional pregnancy, irregular menstrual cycle pattern and higher education.

It is recommended that a national surveillance system on interpregnancy interval be developed so that data from Malaysia can be compared with other countries. Analyses of relationships between short IPI and maternal past medical condition, type of delivery in the preceding pregnancy, enabling environment for breastfeeding and policy pertaining to family planning will also be useful and are recommended for future related research. Meanwhile for service, IPI information should made available through several points of contact. Young mothers can be effectively targeted by introducing hotline counselling and by making the relevant information available online. These approaches suit the young, millennial mothers who prefer quick and reliable information.

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