

**OBSTETRICS PERFORMANCE OF WOMEN WITH  
PROLONGED INTER-PREGNANCY INTERVAL (I-PI):  
A COMPARATIVE CROSS-SECTIONAL STUDY**

**BY**

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## Contents

<i>Contents</i>	<i>Page</i>
<b>List of tables</b>	i
<b>List of figures</b>	ii
<b>Abbreviations and glossary</b>	iii - iv
<b>Acknowledgement</b>	v - vi
<b>Abstrak (Versi Bahasa Malaysia)</b>	vii - viii
<b>Abstract (English Version)</b>	ix - x
<b>1.0 Introduction</b>	1- 8
<b>1.1 About HUSM</b>	1- 4
<b>1.11 Hospital Universiti Sains Malaysia</b>	1- 2
<b>1.12 The Obstetrics and Gynaecology                 Department</b>	3- 4
<b>1.2 Study Introduction</b>	5- 8
<b>2.0 Literature Review</b>	9- 14
<b>2.1 Inter-pregnancy Interval</b>	9-10
<b>2.2 Labour dystocia</b>	11- 12
<b>2.3 Pre-eclampsia</b>	13
<b>2.4 Perinatal Outcome</b>	14
<b>3.0 Objectives</b>	15- 21
<b>3.1 General and Specific Objectives</b>	15
<b>3.2 Hypothesis</b>	16
<b>3.3 Definition of Operation Terms</b>	17-21
<b>4.0 Methodology</b>	22- 31
<b>4.1 Study Setting</b>	22
<b>4.2 Study Design</b>	23
<b>4.3 Study Population</b>	24
<b>4.4 Sample Size Calculation</b>	25
<b>4.5 Inclusion/ Exclusion Criteria</b>	26

<b>4.6</b>	<b>Study Period</b>	26
<b>4.7</b>	<b>Sampling Methods/ Data Collection</b>	27-28
<b>4.8</b>	<b>Flow Chart</b>	29
<b>4.9</b>	<b>Statistical Analysis</b>	30
<b>4.10</b>	<b>Ethical Approval</b>	31
<b>5.0</b>	<b>Results</b>	32- 60
<b>5.1</b>	<b>Demographic Data</b>	33- 35
<b>5.2</b>	<b>Reproductive Outcome</b>	36- 38
<b>5.3</b>	<b>Labour and Delivery Performance</b>	39- 42
<b>5.4</b>	<b>Maternal Outcome</b>	43- 45
<b>5.5</b>	<b>Feotal Outcome</b>	46- 50
<b>5.6</b>	<b>Simple and Multiple Logistic Regression Analysis</b>	51- 60
<b>6.0</b>	<b>Discussion</b>	61- 69
<b>6.1</b>	<b>Demographic Data</b>	63- 64
<b>6.2</b>	<b>Labour and Delivery Performances</b>	65
<b>6.3</b>	<b>Maternal Outcome</b>	66- 68
<b>6.4</b>	<b>Fetal Outcome</b>	69
<b>7.0</b>	<b>Conclusion</b>	70- 71
<b>8.0</b>	<b>Limitation</b>	72
<b>9.0</b>	<b>Recommendation</b>	73
<b>10.0</b>	<b>References</b>	74- 82
<b>11.0</b>	<b>Appendix</b>	83- 102
<b>11.1</b>	<b>Ethical Approval</b>	83
<b>11.2</b>	<b>Patient's Proforma/ Data Collection Sheet</b>	84- 90
<b>11.3</b>	<b>Consent Form English Version</b>	91- 95
<b>11.4</b>	<b>Consent Form Malay Version</b>	96- 102

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## List of Tables

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<i>Table</i>	<i>Content</i>	<i>Page</i>
I	Obstetrics and gynaecology clinic schedule	3
II	Delivery statistics/ record in HUSM from January 2013 to January 2014	4
1	Distribution of socio-demographic data	33
2	Reproductive characteristics of patients	36
3	Labour and delivery parameters of patients	39
4	Previous History Of Caesarean Section Among Patient Delivered By Ceasarean Section	41
5	Maternal complications or outcomes among patients	43
6	Fetal Outcome among the patients	46
7	Previous Hisotry Of Pre-term Delivery Among Women Delivered pre-term	49
8	Simple logistic regression model of associated factors with prolonged I-PI (simple logistic regression)	51
9	Associated factors of Prolonged I-PI by simple and multiple logistic regression model	53
10	Factors associated with labour dystocia	55
11	Factors associated with pre-eclampsia	57
12	Factors associated with post-partum haemorrhage	59

## List of Figures

---

<i>Table</i>	<i>Content</i>	<i>Page</i>
1	Contraception Methods of Choice among Women Using Contraception	37
2	Reason for Prolonged Spacing among Women with I-PI $\geq$ 60 months	38
3	Indication of Caesarean section among women with I-PI $\geq$ 60 months	42
4	Reasons for Admission to NICU/ SCN	50

## Abbreviations

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ACOG	- American College of Obstetricians and Gynaecology
AS	- Apgar score
AFI	- Amniotic fluid index
APEX	- Accelerated Programme for Excellence
BMI	- Body mass index
BPD	- Bi-parietal diameter
BPP	- Biophysical profile
CI	- Confidence Interval
CPD	- Cephalo-pelvic Disproportion
CTG	- Cardiotocography
DM	- Diabetes Mellitus
ECG	- Electrocardiography
EDD	- Expected date of delivery
FIGO	- International Federation of Gynaecology and Obstetrics
FHR	- Fetal heart rate
FKC	- Fetal kick chart
HIE	- Hypoxic ischaemic encephalopathy
HPT	- Hypertension
HUSM	- Hospital Universiti Sains Malaysia
IOL	- Induction of labour
I-PI	- Inter-pregnancy Interval
IUCD/IUD	- Intrauterine contraceptive device/ Intrauterine device
LSCS	- Lower segment Caesarean section

NICE	- National Institutes for Health and Care Excellence
NICU	- Neonatal Intensive Care Unit
OCP	- Oral contraceptive pills
POA	- Period of amenorrhoea
RCOG	- Royal College of Obstetrics and Gynaecology
RDS	- Respiratory distress syndrome
SCN	- Special care nursery
SPSS	- Statistics Programme for Social Sciences
SROM	- Spontaneous rupture of membrane
TBL	- Total blood loss
TTN	- Transient tachypnoeic of newborn
U.S	- United States of America
US	- Ultrasound
USM	- Universiti Sains Malaysia
WHO	- World Health Organization
gm	- grams
kg	- kilograms
bpm	- beats per minute

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**Dr Anizah Aishah Rosli**  
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# **ABSTRACT**

**PRESTASI OBSTETRIK WANITA DENGAN SELANG ANTARA KEHAMILAN YANG PANJANG (I-PI): SATU KAJIAN PERBANDINGAN KERATAN RENTAS**

Anizah Aishah Rosli, Che Anuar Che Yaakob, Mohd Pazudin Ismail

**LATAR BELAKANG:** Tempoh selang antara kehamilan (I-PI) telah dilaporkan mempengaruhi keputusan kehamilan dan kelahiran anak. Kami menjalankan kajian untuk menilai faktor-faktor yang berkaitan dengan I-PI dan kesan pada ibu dan janin.

**OBJEKTIF:** Untuk menentukan samaada wanita dengan selang antara kehamilan yang panjang ( $I-PI \geq 60$  bulan) dikaitkan dengan prestasi obstetrik yang buruk seperti 'labour dystocia', pre-eklampsia, pendarahan selepas bersalin dan kesan ke atas janin seperti kelahiran pra matang, berbanding wanita dengan tempoh selangan kehamilan antara 18-59 bulan.

**KAEDAH:** Satu kajian keratan rentas selama 12 bulan yang telah dijalankan di HUSM dari 1 Mac 2013 sehingga 28 Febuari 2014. Kumpulan kajian terdiri daripada 2 kumpulan iaitu, wanita yang hamil dengan selang antara kehamilan  $\geq 60$  bulan, manakala kumpulan kawalan terdiri daripada wanita yang hamil, dengan tempoh antara kehamilan 18 hingga 60 bulan. Subjek dari kumpulan kajian dan kawalan dipilih mengikut kriteria kajian ini. Terdapat sebanyak 272 pesakit yang diambil dalam tempoh kajian dijalankan dengan jumlah yang sama, iaitu 126 pesakit bagi setiap cabang.

Analisis regresi logistik 'Univariate' dan 'multivariate' digunakan untuk menganggarkan nisbah kemungkinan dan selang keyakinan 95% digunakan sebagai platform bagi mengira perkaitan risiko mengandung antara selang berpanjangan dengan risiko-risiko mengandung seperti 'labour dystocia', pre-eklampsia, pendarahan selepas bersalin dan kelahiran pra-matang.

**KEPUTUSAN:** Wanita dengan selangan antara kehamilan yang panjang (I-PI  $\geq$  60 bulan) adalah lebih cenderung untuk mengalami 'labour dystocia' (OR 1.92, 95% CI 1.09, 3.38 OR terlaras 1.86, 95% CI 1.03, 3.38;  $p= 0.049$ ) berbanding dengan wanita di dalam kumpulan kawalan. Wanita dengan selangan antara kehamilan yang panjang (I-PI  $\geq$  60 bulan) juga mempunyai kecenderungan yang lebih tinggi untuk mendapat pre-eklampsia ( $p = 0.049$ ), pendarahan selepas bersalin ( $p= 0.039$ ) dan kelahiran pra matang, tetapi tidak mencapai tahap signifikan ( $p= 0.455$ ), berbanding wanita dari kumpulan kawalan. Wanita berusia merupakan faktor utama yang mempunyai kaitan yang amat ketara dengan selangan antara kehamilan yang panjang (I- PI  $\geq$  60 bulan) dan 'labour dystocia', pre-eklampsia dan pendarahan selepas bersalin.

**PENUTUP:** Wanita dengan selang antara kehamilan yang panjang (I- PI  $\geq$  60 bulan) dikaitkan dengan kesan kehamilan yang negatif ke atas ibu iaitu "labour dystocia", pre-eklampsia dan pendarahan selepas bersalin. Hasil kajian ini mendapati wanita dengan selang antara kehamilan yang panjang mempunyai kaitan yang signifikan dengan prestasi obstetrik dan kesan kehamilan yang buruk.

**OBSTETRICS PERFORMANCE OF WOMEN WITH PROLONGED INTER-PREGNANCY INTERVAL (I-PI): A COMPARATIVE CROSS-SECTIONAL STUDY**

Anizah Aishah Rosli, Che Anuar Che Yaakob, Mohd Pazudin Ismail

**BACKGROUND:** The inter-pregnancy interval (I-PI) has been reported to influence the outcome of pregnancy and birth. This study was to evaluate the associated factors of I-PI and the impact of I-PI on maternal and fetal outcomes.

**OBJECTIVE:** To determine whether prolonged inter-pregnancy interval (I-PI  $\geq$  60 months) is associated with higher incidence of adverse obstetrics outcomes, namely labour dystocia, pre-eclampsia, post-partum haemorrhage and fetal outcome such as prematurity compared to inter-pregnancy interval 18-59 months.

**METHODS:** A 12 months prospective cross-sectional study in HUSM from 1<sup>st</sup> March 2013 to 28<sup>th</sup> February 2014 was conducted. The study group consisted of pregnant women, with inter-pregnancy interval more than 60 months and the control group consisted of pregnant women, with inter-pregnancy interval between 18 to 60 months. Both the study and control group were screened and selected according to the study's criteria. There were a total of 272 patients recruited in the duration of the study, with equal number of 126 patients in each arm. Univariate and multivariate logistic regression analysis was used to estimate odds ratio and 95% confidence interval for risk

of inter-pregnancy interval such as labour dystocia, pre-eclampsia, postpartum haemorrhage and prematurity.

**RESULTS:** Women with prolonged inter-pregnancy interval (I-PI  $\geq$  60 months) were more likely to have labour dystocia (OR 1.92, 95% CI 1.09, 3.38; adjusted OR 1.86, 95% CI 1.03, 3.38;  $p=0.049$ ) as compared to control group. Higher association of prolonged I-PI  $\geq$  60 months with pre-eclampsia ( $p=0.049$ ) and primary postpartum haemorrhage ( $p=0.039$ ). However, there were less number of prematurity ( $p=0.455$ ) seen among the study group. Advance maternal age was significantly noted to have direct association with prolonged I-PI, labour dystocia, pre-eclampsia and primary postpartum haemorrhage.

**CONCLUSION:** A prolonged inter-pregnancy interval (I-PI  $\geq$  60 months) is associated with adverse pregnancy and maternal outcome namely labour dystocia, pre-eclampsia and primary postpartum haemorrhage. The results of this study show an association of prolonged I-PI with adverse pregnancy and maternal outcome.

# **INTRODUCTION**



## **1.0 INTRODUCTION**

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### **1.1 About Hospital USM**

#### **1.11 Hospital Universiti Sains Malaysia (Hospital USM)**

Hospital Universiti Sains Malaysia (Hospital USM) is one of the teaching and referral hospital for people in the East Coast of Peninsular Malaysia. The hospital provides an excellent quality of service and is well equipped with the latest technology.

The hospital aims to provide the best care for each patient by applying the values of quality in its performance and to satisfy customers' expectations in order to achieve the standard of a charter hospital as entrusted by the government. The university is also committed to provide adequate facilities with the state of the art technology in order to ensure that graduates are given the right exposure to be skillful and competent.

In 1983, Hospital USM equipped with 36 bed hospital and over the years has gradually increased to a 747-bed service hospital. Over the past 25 years, it has achieved excellent improvements despite being situated in the East Coast of Peninsular Malaysia. Over the course of the past few Malaysian Plans, Hospital USM has managed to be both a service and clinical research centre of excellence with the establishment of new buildings, services and units.

Universiti Sains Malaysia (USM) was selected as an APEX Universiti on 3<sup>rd</sup> September 2008, thus giving Hospital USM more accountability as a health campus and USM as a whole to increase its impact and presence in the national and international fields of research and publications.

### 1.12 The Obstetrics and Gynaecology Department, Hospital USM

The postgraduate program in Hospital USM started in 1991 and the first Masters of Medicine candidates graduated in June 1995. The Department of Obstetrics and Gynaecology is headed by Prof Madya Dr Shah Reza Johan Noor and currently have ten consultants/ lecturers and 26 medical officers and house-officers.

Since 1997, the whole department had occupied the new building which includes the labour room (1 Berlian), 2 antenatal wards (2 Akik and 2 Baiduri), and a postnatal ward (2 Topaz). The gynaecology ward (1 Utara) is still in the main hospital building.

The Obstetrics and Gynaecology clinic is situated on the ground floor of the new building. The clinic schedules are as shown in Table I below.

**Table I: Obstetrics and gynaecology clinic schedule**

DAY	MORNING	AFTERNOON
SUNDAY	Antenatal (Team A & B)	Gynaecology (Team A & B)
MONDAY	Combined Clinic Multiple/ Twin Clinic Menopause	Molar Clinic Oncology Clinic (1 <sup>st</sup> Week Of Each Month) Colposcopy Clinic (Team C & D)
TUESDAY	Antenatal (Team C & D)	Gynaecology (Team C & D)
WEDNESDAY	Infertility Urogynaecology	Postnatal Colposcopy Clinic (Team A & B)
THURSDAY	Booking Clinic	CME/ Clinical Case Presentation Pre-Operative Discussion

The delivery rate in this hospital is about 7000 to 8000 per year. High risk delivery contributes to 50-60 % of the total deliveries. This is in line with the unit role as tertiary and referral centre. There is an average of 500 – 650 deliveries per month, of which caesarean section rate is 10-15% monthly. Table II below shows 10 months delivery statistics from March 2013 to January 2014.

**Table II: Delivery statistics/ record in Hospital USM from January 2013 to December 2013**

MONTHS	TOTAL SVD	TOTAL CEASAREAN SECTION		TOTAL (%)	TOTAL DELIVERY
		EMLSCS	ELLSCS		
<b>JAN 2013</b>	477	81	39	120 (20.1)	597
<b>FEB 2013</b>	449	68	33	101 (18.4)	550
<b>MARCH 2013</b>	490	74	38	112 (18.6)	602
<b>APRIL 2013</b>	441	71	44	115 (20.7)	556
<b>MAY 2013</b>	550	89	51	140 (20.3)	690
<b>JUNE 2013</b>	531	50	60	110 (17.2)	641
<b>JULY 2013</b>	495	70	63	133 (21.2)	628
<b>AUG 2013</b>	576	64	48	112 (16.3)	688
<b>SEPT 2013</b>	532	67	32	99 (15.6)	631
<b>OCT 2013</b>	539	60	45	105 (16.3)	644
<b>NOV 2013</b>	496	76	48	124 (20.0)	620
<b>DEC 2013</b>	546	76	52	128 (19.0)	674

Total delivery for the year 2013 was 7529 deliveries with 6130 (81.4%) delivered vaginally and 1399 (18.6%) via caesarean section.

## **1.2 Study Introduction**

There have been few studies that look into the effect and association of inter-pregnancy interval towards maternal and fetal outcome. Many studies have shown that prolonged inter-pregnancy interval (I-PI) were associated with increased risk of labour dystocia. (Zhu BP et al., 2006)

Zhu BP et al. (1999) examined long intervals, compared to intervals less than 2 years, from 1994- 2002. The study found that the prevalence of labour dystocia was approximately 21% among all births. Further studies by same researcher also showed that long intervals was associated with increasing odds of dystocia compared to intervals less than 2 years (OR=1.5 for 10+ years). (Zhu BP et al., 2005)

Labour dystocia or prolonged labour is one of the common delivery complications and has been found to contribute to the higher incident of operative vaginal delivery and delivery by emergency caesarean section (CS) (Gifford DS et al., 2000). It is responsible for approximately 40% of all caesarean deliveries in United States and half of the repeat caesarean. (Gregory KD et al., 1998)

Labour dystocia is one of the nightmares among the obstetrician as it is related to series of complications not only to the mother such as postpartum haemorrhage but also to the fetus such as respiratory depression, birth asphyxia, birth trauma and the worst would be fetal death.

The term labour dystocia has been used interchangeably with dysfunctional labour, failure to progress (lack of progressive cervical dilatation or lack of descent of the fetal head), and cephalo-pelvic disproportion (CPD). Some authors use dystocia to describe women needing operative vaginal delivery or caesarean section (ACOG, 2003), while others used the term to also describe labour where augmentation was needed regardless of subsequent mode of delivery. (Treacy A et al., 2006)

Therefore, for the study purposes, a woman is labelled exclusively as having labour dystocia when immediate operative vaginal delivery or caesarean section is indicated for a patient with prolonged second stage and poor progress and when augmentation is needed for prolonged first stage of labour.

From our observation and most of other observational studies revealed that these women with prolonged I-PI, their labour performance behaves like a primigravida in labour. Therefore, some clinician felt that prolonged I-PI carries special risks to the mother and more likely to experience adverse obstetrics outcome such as pre-eclampsia or eclampsia and fetal birth weight and prematurity.

Moreover, the course of labour itself is influence by many factors including current or preceding pregnancy co-morbidities and prolonged I-PI. Women who has been resting for long from a pregnancy is said to have loss the protective effect of previous pregnancy, particularly with regards to risk of pre-eclampsia. Study by Conde-Agudelo A et al. (2007) quoted that long intervals (more than 5 years) are associated with risk of pre-eclampsia. Other studies also have reported similar findings. (Herman et al, 1997; Greene et al, 1998)

There were few high quality studies that look into the impact of I-PI maternal and fetal outcome. With regards to effect of prolonged I-PI to fetal outcome, interestingly increase I-PI was associated with increase in birth weight and reduced in risk of having small babies. One important study by Elena FA et al (2000) concluded that women with intervals over 59 months were 12–45% more likely to have very premature and moderately premature infants than women with interval of 18–59 months.

Inter-pregnancy interval also are affected by a complex range of risk factors including the reproductive history and social and culture norms. Many studies before talks about optimal spacing between pregnancy and generally accepted interval refer to 2-3 years between pregnancies (WHO, 2007). The improvement in promoting birth spacing and advance in contraception and reproductive health services can be one of the reasons why women nowadays opted to rest long before embarking into another pregnancy.

On the other hand, putting the blame on contraception for prolonged interval between pregnancies can be wrong. From observations, it has been shown that many of the women with prolonged interval between pregnancies were mostly at advance maternal age. Some of these women had a taught that with advanced age, fertility rate was also reduced and most pregnancy that occurs at advanced age after long rest period was unplanned.

Most of the data on effect of I-PI was very old data that might differ now as more women start to space out the pregnancy for various reasons and could also be due to infertility. Therefore, the aim of this study is to proof the hypothesis that women with prolonged I-PI ( $\geq 60$  months) are associated with labour dystocia. From this study also we hope to compare possible obstetric outcomes (maternal and fetal) among women with prolonged I-PI and comparing to women with inter-pregnancy interval 18-59 months (control group).

Hopefully, by the end of the study, some recommendations can be made in terms of counselling the women with prolonged I-PI and recommending the best option of labour care for these women. Finally, we also hope to evaluate the impact of prolonged I-PI on maternal and fetal outcomes and whether I-PI is an independent risk factor for perinatal outcomes or whether I-PI is associated with maternal characteristics that affect perinatal outcome.



# **LITERATURE REVIEW**

## **2.0 LITERATURE REVIEW**

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### **2.1 Inter-pregnancy interval (I-PI)**

There has been debate about what are the best intervals between pregnancy that can give best outcome for the mother and foetus. New evidence suggested that three to five years interval may offer greater health benefits. (DaVanzo, 2004; Conde-Agudelo et al., 2000) On the other hand, the family planning programs promoted that two years interval between birth of infant as most beneficial as this will allow more time to fully recover from previous pregnancy and delivery. (National Research Council, 1989) This recommendation was considered consistent with WHO/ UNICEF recommendation of breastfeeding for at least 2 years. (WHO, 2007; UNICEF, 2004)

Statements from The Summer Population Reports (2000) also agreed that inter-pregnancy interval longer than two years were beneficial for the mother and the foetus. Women with longer pregnancy intervals were unlikely to suffer from anaemia and third trimester bleeding and less likely to experience fetal growth restriction and premature delivery. A recent analysis of data from Matlab, Bangladesh (1982) also pointed that women with short or very long inter-pregnancy intervals are associated with significant higher risk of maternal complications. (DaVanzo et al., 2004)

There are multiple ranges of factors that may influence the decision towards birth spacing, including social, cultural norms and behaviours of individuals making the choice of contraception and use of other reproductive health services.

Maternal socio-economic factors such as education and employment status may have influence maternal awareness on the birth spacing. In Korea, there was a study reported that highly educated women had tendency of shorter duration in their inter-pregnancy interval compared to those who are lower. (Bumpass et al., 1986)

The maternal employment also plays an important role in choice of spacing between pregnancies, however evidence less clear. Some settings showed that employed mothers are associated with shorter spacing. To be more accurate perhaps the nature of works is more important as women in modern sectors and more formal work are likely to be related to longer intervals between pregnancies. (Mturi, 1997; Setty-Venugopal et al., 2002)

Maternal age may have an impact on choice of duration of pregnancy intervals. In general, mature mothers have a tendency to have longer interval to subsequent pregnancy (Sharmin S et al., 1996; Setty-Venugopal et al., 2002). The reasons could be due to mature mother are later in their childbearing and more likely to be less fertile which leads to longer pregnancy interval, and some of them may have already achieve desired family size by that age and hence plan for longer pregnancy interval.

In recent study, Conde-Agudelo and Belizán et al. (2000) showed that both maternal mortality and some maternal morbidity indicators are significantly associated with the durations of inter-pregnancy intervals. Maternal mortality was 2.5 times higher among women who had an inter-pregnancy interval of less than six months (for index pregnancies that last nine months, this corresponds to an inter-birth interval of 15 months) than among women having an inter-pregnancy interval of 18-23.

## **2.2 Labour dystocia**

The word dystocia has various meaning and definition. Dystocia of labour is defined as difficult labour or abnormally slow progress of labour. Other terms that are often used interchangeably with dystocia are dysfunctional labour, failure to progress (lack of progressive cervical dilatation or lack of descent), and cephalo-pelvic disproportion (CPD). Recognized complications of dystocia include fetal death, respiratory depression, hypoxic ischemic encephalopathy (HIE), and brachial nerve damage. Prolonged intervals between pregnancies, primigravida birth, and multiple births have also been associated with increased risk for labour dystocia. Approximately, one fifth of human labours have dystocia. (Zhu BP et al., 2006)

Labour dystocia was evaluated and recorded by the midwives or the doctors. According to the hospital guidelines, dystocia is defined as progression of <1 cm dilatation of the cervix per hour in the active phase of the first stage (defined as 3–4 cm dilatation of the cervix and regular contractions until a cervix dilatation of 10 cm).

Dystocia in the second stage is recorded if the expulsion phase lasts more than 60 minutes for both nulliparous and multiparous women. Dystocia in the second stage is also recorded if the second stage lasts longer than 2 hours for nulliparous women without epidural or multiparous women with epidural, or more than 3 hours for nulliparous women with epidural or more than 60 minutes for multiparous women without epidural. (NICE, 2007)

The diagnosis of dystocia should not be made prior to the active phase of labour until the cervix in a nulliparous women is at least 3cm dilated, 80-90% effaced; 3-4 cm dilated and 70-80% effaced in parous women. (SOGC, 1995)

Among parous women, a diagnosis of delay should be made when it has lasted 1 hour and women should be referred to a healthcare professional trained to undertake an operative vaginal birth if birth is not imminent. (NICE, 2007)

Gregory KD et al. (1998) reported that labour dystocia is responsible for approximately 40% of all caesarean deliveries in the U.S. and half of repeat caesareans. While research conducted in Michigan by Zhu BP et al. (2003) examined long intervals, compared to intervals less than 2 years, from 1994- 2002, found that the prevalence of labour dystocia was approximately 21% among all births. Further study by Zhu BP et al. (2005) also showed that long intervals were associated with increasing odds of dystocia compared to intervals less than 2 years (OR=1.5 for 10+ years).

There is not much known about how biological and genetic factors may affect birth intervals. Every woman is different in its varying capacity to conceive or carry a pregnancy to term. The mother's health and nutritional status at the start of a pregnancy may be important factor that may influence the outcome of the pregnancy, her ability to breastfeed, and the health of the baby especially early in infancy. There can also be other household and familial influences that can have direct effects on birth spacing.

### **2.3 Pre-eclampsia**

Parous women with long intervals of pregnancy are similar to nulliparous women with regard to risk of pre-eclampsia, suggesting that the protective effect for pre-eclampsia acquired by a woman through a previous birth is lost after a long interval. Few studies have shown similar findings.

One large study from Latin America by Conde-Agudelo A et al. (2000) found that the rate of pre-eclampsia among nulliparous women was similar to that of parous women who conceived five or more years after a previous birth (6.5 percent versus 6.6 percent, respectively). Pre-eclampsia, postpartum haemorrhage and gestational diabetes mellitus were not associated with short inter-pregnancy intervals. Conde-Agudelo A et al. (2000) also concluded that pre-eclampsia, eclampsia, and third trimester bleeding were higher among women who had an inter-pregnancy interval of 60 months or longer.

Later in 2007, Conde-Agudelo, Rosas-Bermudez, and Kafury-Goeta again confirmed that long intervals (longer than 5 years) are associated with an increased risk of preeclampsia.

One of the things observed by Herman et al. (1997) in his study was that longer inter-pregnancy intervals were significantly associated with greater weight gain between pregnancies. Greene et al. (1998) also had concluded the similar findings.

## **2.4 Perinatal outcome**

Every year nearly 11 million children die before their fifth birthday; 99 percent of these deaths occur in developing countries (UNICEF, 2004). The relationship between short birth intervals and high infant and child mortality has been established in a wide range of populations. (Miller et al., 1992; Rutstein, 2000, 2003)

One cross-country analysis study by Rutstein, (2000) has shown that very long intervals (at least five years in length) are associated a slight increase in mortality. Rates of infant and child mortality would be 5.8- 9.4 % lower if all inter-pregnancy intervals were 3-5 years in duration.

Increasing inter-pregnancy interval was associated with increase in birth weight and decrease in risk of small for gestational age. There was a mitigating effect of folic acid supplementation on the relationship of inter-pregnancy interval with birth weight and small for gestational age. (Van Eijsden et al., 2008)

The relationship between long inter-pregnancy intervals and prematurity are also important, but few studies have analysed their relationship. One of the studies by Elena FA et al. (2000) did show that women with intervals over 59 months were 12–45% more likely to have very premature and moderately premature infants than women with intervals of 18–59 months. Finally, it is not known whether inter-pregnancy interval is an independent risk factor for perinatal outcomes or whether inter-pregnancy interval is associated with maternal characteristics that affect perinatal outcome.

# **OBJECTIVES**



### 3.0 OBJECTIVES

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#### 3.1 General and Specific Objectives

##### General Objective

To identify the characteristic and associated factors of pregnant patients with prolonged inter-pregnancy interval (I-PI  $\geq$  60 months) admitted to Hospital USM

##### Specific objectives:

- i. To identify the characteristic of patient with prolonged I-PI ( $\geq$  60 months) compare to control group.
- ii. To identify the labour performance (i.e. labour dystocia), maternal co-morbidities (i.e. pre-eclampsia, postpartum haemorrhage) and fetal outcome (i.e. prematurity) of patient with prolonged I-PI admitted to Hospital USM compared to control group.
- iii. To evaluate social demographic factors such as age, race, BMI, level of education and previous pregnancy performance and associated factors of patient with prolonged I-PI ( $\geq$  60 months).

### **3.2 Hypothesis**

Women with prolonged inter-pregnancy interval  $\geq 60$  months are associated with labour dystocia as compared to women with inter-pregnancy interval 18-59 months (control group).

### **3.3 Definition of Operation Terms**

- ***Maternal Age:*** Completed years at time of delivery
  
- ***Gestational age:*** Estimated from the date of last menstrual period and amended by means of ultrasonography in some women in week 16-20 (for those who are unsure of dates)
  
- ***The body mass index:*** Weight (kg)/ height (m)<sup>2</sup> (before pregnancy), categorized as;
  - Underweight (BMI< 18.5);
  - Normal (BMI = 18.5- 24.9);
  - Overweight (BMI=25- 29.9);
  - Obese (BMI> 30) (WHO, 2004)
  
- ***Term pregnancy:*** Gestational age from 37 completed weeks of gestation to 42 weeks
  
- ***Pre-term pregnancy:*** Gestational age less than 37 weeks of gestation
  
- ***Post-term pregnancy:*** Pregnancy, which exceeds 294 days from the 1<sup>st</sup> day of the last menstrual periods (FIGO 1980)

- ***Inter-pregnancy interval:*** The time elapsed between the woman's last delivery and the date of the last menstrual period for the index pregnancy or calculated as length of time between this preceding pregnancy and last menstrual period before the index pregnancy. (Conde-Agudelo et. al. 2000). The interval were computed in years or weeks and later converted to months. Inter-pregnancy interval was categorised into prolonged I-PI and optimal inter-pregnancy interval.

  - Optimal inter-pregnancy interval: interval of preceding pregnancy and current pregnancy of duration between 18 to 59 months.
  - Prolonged inter-pregnancy interval: interval of preceding pregnancy and current pregnancy of  $\geq 5$  years duration or  $\geq 60$  months.
  
- ***Establish active labour:*** A physiological process without medical or surgical intervention characterised by regular uterine contraction, dilatation of the cervix and descend of the presenting part resulting in the expulsion of the foetus. The cut-off point of cervical dilatation is  $\geq 4$ cm.

- ***Latent phase:*** A period of time, not necessarily continuous, when there are painful contractions and there is some cervical change, including cervical effacement and dilatation up to 4cm (NICE, 2007). In this study, for standardization the diagnosis of latent phase is only there is documented contraction of 1: 15 minutes either by cardiotocogram (CTG) or manually time by attending doctor (medical officer or house officer) with evidence of cervical dilatation of at least 1 cm and 0.5 – 1cm cervical effacement.
  
- ***Active phase:*** A period of time where there are regular painful contractions and there is progressive cervical dilatation from 4cm (NICE, 2007)
  
- ***2<sup>nd</sup> stage of labour:*** From full dilatation of cervix to the delivery of the foetus
  
- ***Induction of labour:*** Initiation or augmentation of the process of parturition by mechanical or pharmacological methods

- ***Labour dystocia:***

Prolonged labour and failure to progress (lack of progressive cervical dilatation or lack of descent of the fetal head) of which augmentation of labour is needed regardless of subsequent mode of delivery. (Treacy A et al., 2006).

Failure to progress is further divided into; (NICE, Intrapartum care; 2007)

- Poor progress of first stage of labour, defined as less than 2 cm progress of cervical dilatation in 4 hours after the cervix is dilated to 4cm or slowing in progress of labour
- Poor progress of second stage, defined as active pushing at second stage more than one hour and birth is not imminent resulting in operative vaginal delivery or caesarean section.

and usually this patient end up with either an operative vaginal delivery or delivery by emergency caesarean section (CS).

- Apgar score:*** A method of determining an infant's condition at birth by screening heart rate, respiratory effort, muscle tone, reflex irritability and colour. The infants is rated from 0 to 2 on each of the five items, the highest possible being 10

Apgar Score	0	1	2
Heart rate (beats/min)	Absent	Less than 100	More than 100
Respiratory effort	Absent	Slow, irregular	Good cry
Muscle tone	Limp	Some flexion	Active action
Reflex/irritability	No response	Grimace	Cry
Colour	Pale	Body pink, extremities blue	All pink

- Pre-eclampsia:*** Pregnancy-induced hypertension in association with proteinuria (> 0.3 g in 24 hours), +/- oedema and virtually any organ system may be affected. While, severe hypertension is confirmed with a diastolic blood pressure  $\geq$  110 mmHg on two occasions or systolic blood pressure  $\geq$  170 mmHg on two occasions and that, together with significant proteinuria (at least 1 g/litre), this constitutes severe pre-eclampsia. (RCOG, 2006)
- Eclampsia:*** The occurrence of one or more convulsions super-imposed on pre-eclampsia. (RCOG, 2006)