# DELIVERY OUTCOME FOLLOWING PREVIOUS CAESAREAN BIRTH IN TWO DIFFERENT INTER-DELIVERY INTERVALS: A COMPARATIVE CROSS-SECTIONAL STUDY

BY

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A dissertation submitted in fulfilment of the requirement for the degree of Master of Obstetrics & Gynecology

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# ABSTRACT

The aim of this study was to determine the success rate of VBAC in women with inter-delivery interval below and above 19 months, apart from comparing the maternal morbidity and the fetal outcome between the two groups. This is a cross-sectional study that was conducted in the Obstetrics & Gynaecological Department Hospital Tengku Ampuan Afzan, Kuantan Pahang from June 2013 until June 2015. The sample populations were women with singleton foetus with cephalic presentation and had one previous caesarean section. Those who had a vaginal birth after the previous caesarean section and those who were not suitable for VBAC were excluded from the study. The collected data were analyzed using IBM SPSS Statistics 20. Chi-square and Fisher exact tests were employed for categorical variables, and the Independent-samples t-test was used for continuous variables. Multivariate analysis was done using binary logistic regression to evaluate the association of VBAC success with inter-delivery interval and other potential confounding factors. A *P* value of $< 0.05$ was considered statistically significant. Of the 590 women, 300 of them were randomly chosen for analysis. Sixty of them were in the group A (inter-delivery interval of less or equal than 19 months) while 240 patients were in the group B (inter-delivery interval more than 19 months). In this study, the shorter the inter-delivery interval, the higher success rate of VBAC (78.3% versus 55% for group A and group B respectively). There was no difference in terms of maternal morbidities of the two groups. The rate of uterine rupture or dehiscence were also of no significant difference for both groups (0.0% versus 0.4%; $p = 0.632$). No significant perinatal outcome was also observed. As a conclusion, in our population, the VBAC success of inter-delivery interval of less than 19 months were comparable to the inter-delivery interval of more than 19 months with no significant association with maternal and neonatal morbidity. Therefore, these results may be helpful to obstetricians in term of counseling and recommending patients with short inter-delivery interval for a trial of vagina delivery after caesarean section. The aim to reduce caesarean section rates and its associated morbidity is possible to be achieved.

# APPROVAL PAGE

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| | |
|---|---|
| ACOG | American Congress of Obstetricians and Gynecologists |
| BMI | Body mass index |
| CI | Confidence interval |
| CS | Caesarean section |
| ICU | Intensive care unit |
| IDI | Inter-delivery interval |
| LSCS | Lower segment caesarean section |
| NICHD | National Institute of Child Health and Human Development |
| NICU | Neonatal intensive care unit |
| OR | Odds ratio |
| O2 | Oxygen |
| PPH | Primary postpartum haemorrhage |
| RCOG | Royal College of Obstetricians and Gynecologists |
| SD | Standard deviation |
| SVD | Spontaneous vertex delivery |
| TOLAC | Trial of labour after caesarean |
| VBAC | Vaginal birth after caesarean |

# CHAPTER ONE

# INTRODUCTION

## 1.1 INTRODUCTION

The perception of the apparent safety of caesarean section procedure has resulted in a worldwide increase in caesarean rate and Malaysia is of no exception (Al-Kadri, Al-Anazi, and Tamim 2015, Leone, Padmadas, and Matthews 2008, Vogel et al. 2015). It has been stated that the caesarean section rate in Malaysian public hospitals has increased from 10.5% in the year 2000 to 15.7% in the year 2006 (Ravindran 2008). However, the apparent safety of the caesarean has masked the long term outcome of the caesarean to the mothers which include placenta previa, placenta cretas, adhesions and chronic pelvic pain (Bodelon et al. 2009, Kennare et al. 2007, Ventura Laveriano and Redondo, 2013, Creanga et al. 2015). Not only are the mother affected, but the babies are also affected in the long run, i.e. increase in autism and risk of developing obesity, asthma, and type 1 diabetes when they get older (Chien et al. 2015); (Blustein and Liu 2015).

Many factors contributed to the increasing trend of opting for caesarean section which include medico-legal issues, the increasing use of electronic fetal heart rate monitoring, and the reduced training in operative vaginal and vaginal breech deliveries. Other factors include caesarean based on maternal request as well as elective repeat caesarean delivery, which occur worldwide especially in the developed countries (American College of Obstetricians & Gynecologists, 2013). Ehtisham et al. in their study found that previous caesarean sections were the most common

indication of repeat caesarean with 30.9%, followed by fetal distress 15.2% and non-progress of labour 13.9% (Ehtisham and Akhtar Hashmi, 2014).

It is important to take some steps to reduce the increasing number of the caesarean section rate. This can be done by reducing the primary caesarean section of the virgin abdomen, encouraging external cephalic version or assisted breech delivery in suitable candidates as well as encouraging vaginal birth after caesarean (VBAC) delivery. In 1999, The American Congress of Obstetricians and Gynecologists (ACOG) had taken a preliminary step to address the rising rate of caesarean section by recommending VBAC to women with no contraindications for vaginal birth provided that it should be performed in institutions equipped to respond to emergencies where physicians are able to perform cesareans immediately (American College of Obstetricians & Gynecologists, 1999).

VBAC is a relatively safe procedure for properly chosen and selected candidate. The success rate of VBAC is consistently high, ranging from 60 to 80 percent, whereas the risk of uterine rupture is low, at less than one percent (Cunningham et al. 2010). Many studies have been conducted in the attempt to develop prediction models in order to encourage VBAC and predict the risk of a uterine rupture or unsuccessful trial of labor. Indeed, many factors may influence the success rate of VBAC which include favourable Bishop's score, previous vaginal birth and spontaneous labour (Shanks and Cahill 2011, Madaan et al. 2011). Some studies also claimed that inter-delivery interval plays a significant role in VBAC success rate but Madaan et al. did not find any association between inter -delivery interval and the outcome of the trial of labour. None of these risk factors including the inter-delivery interval is sufficiently reliable to be clinically useful for prediction of uterine rupture following the trial of labour after caesarean delivery (TOLAC).

Magnetic resonance imaging study found that post hysterotomy of the lower segment of the uterus took at least 6-9 months to be restored or healed (Dicle et al. 1997). Therefore we took the 19 months as the cut off points of the inter-delivery interval for our study (9 months postpartum plus 10 months of gestation) (Huang et al. 2002).

We hypothesized that VBAC success rate for an inter-delivery interval less than 19 months is as high as more than 19 months, and the risk of uterine rupture is low in properly managed and monitored parturient. We are looking at the safety aspect to encourage VBAC in those <19 months and >19 months, taking into account the long term effects of the repeat caesarean section in subsequent pregnancy. Thus, the present study was carried out to compare the outcome of pregnancy and rate of successful VBAC in patients with two different inter-delivery intervals (≤19 months and > 19 months) with prior caesarean delivery and no VBAC. Apart from that, this study also aims to measure the maternal and fetal outcomes in these two groups.

## 1.2 OBJECTIVES

Primary outcome: to determine the successful rate of VBAC in women with inter delivery interval below and above 19 months.

Secondary outcome:

i. To compare the maternal morbidity in between the two groups.

ii. To determine the fetal outcome in both groups.

## 1.3 RESEARCH HYPOTHESIS

i. There should be no significant difference in terms of delivery outcome in group with inter-delivery interval ≤19 months and >19 months.

ii. Maternal complications are comparable in both two groups.

# CHAPTER TWO

# LITERATURE REVIEW

Every pregnant woman hopes to deliver a healthy baby by all means possible, either vaginally or via caesarean section. However, in a patient with a previous history of caesarean section, either mode of delivery has significant risks either to the mother, baby or both such that the decision becomes more challenging. Mark et al. found that a trial of labour in women with a history of caesarean delivery is associated with an increased risk of adverse perinatal outcomes and a higher rate of maternal adverse events, compared to those who had repeated elective caesarean delivery (Landon et al. 2004). However, in an analyzed World Health Organization global survey data 2005 on maternal and perinatal health, researchers found that women with caesarean deliveries experienced severe maternal complications compared with vaginal deliveries, 6% and 2 % respectively (London, 2008).

There are multiple factors that may contribute to successful VBAC, which include maternal age, prior antenatal care, prior vaginal delivery, estimated birth weight of the baby and prior caesarean indication (Bujold et al. 2004, Eskandar, 2012). In 2002, Huang et al. studied the inter-delivery interval for the success of VBAC. He found there was lower success rate of VBAC if the inter-delivery interval was less than 19 months especially if the labour was induced (Huang et al. 2002).

One needs to aim of achieving successful VBAC at the lowest morbidity risk to the mother and fetus. A known serious morbidity of VBAC is uterine rupture. In the same year as the study by Huang et al., Bujold investigated the risk of uterine rupture. He stated that there were 2-3 fold increase of uterine rupture at the inter-delivery

interval of <24 months but it significantly increased if they were less than 18 months in his later study (Bujold et al. 2002) (Bujold and Gauthier, 2010).

The Royal College of Obstetricians and Gynecologists green-top guideline stated that the risk of uterine rupture for women who planned for VBAC deliveries and came to the hospitals with spontaneous labour was 36/10,000 (Green-top Guidelines, 2007). However, the risk was double when labours were augmented and the inter-delivery interval were < 18 months (Shipp et al. 2001).

Our preliminary study of the incidence of women who came for the trials of labour in Hospital Tengku Ampuan Afzan in the year 2012 is about 3-4% of total admission and out of that 66% of them had successful VBAC. However, very limited number had inter-delivery interval of < 19 months and some of them most probably opt for repeat caesarean section.

# CHAPTER THREE

# METHODOLOGY

This is a cross-sectional study that was conducted in the Obstetrics & Gynaecological Department Hospital Tengku Ampuan Afzan, Kuantan Pahang from June 2013 until June 2015. The sample population were women with singleton foetus with cephalic presentation and had one previous caesarean section. Those who had a vaginal birth after the previous caesarean section and those who were not suitable for VBAC – those with suspected weak uterine scar (other than transverse scar at lower segment or Caesar wound infection) and suspected cephalo-pelvic disproportion – were excluded from the study.

The patients were then categorised into two groups based on inter-delivery less (group A) or more than 19 months (group B). The inter-delivery interval is counted as time in months between the index trial of labour and prior caesarean delivery (Huang et al. 2002). The demographic maternal and neonatal data, data concerning the course of the delivery and information about the post-partum event were reviewed and recorded. The data were collected at the point of patient's admission to the labour room and onward. We examined both maternal and perinatal complications following the delivery of the current pregnancy. The maternal complications include uterine rupture or dehiscence, primary postpartum haemorrhage (either requiring emergency blood transfusion or not), hysterectomy and ICU admission. Perinatal complications include poor APGAR score of ≤6 at one minute of life, and NICU admission.

Ethics approval was obtained from Medical Research and Ethics Committee, Ministry of Health Malaysia [NMRR-14-1582-21771 (IIR)].

Sample size for this study was calculated using PS: Power and Sample size calculation software with level of significance = 0.05, power of study = 0.8, ratio = 4, proportion of outcome in the group with an inter-delivery interval >19 months = 80%, & proportion of the outcome in the group with an inter-delivery interval ≤19 months = 60%. The twenty percents difference was taken based on the discussion with experts in the field. Therefore, the minimum estimated sample required (n) = 60 for the group with an inter-delivery interval ≤19 months. So, the final sample size required = 300. Group matching in terms of parity was done for this study.

Statistical Analysis

Chi-square and Fisher exact tests were used for categorical variables, and the Independent-samples *t*- test was used for continuous variables. Multivariate analysis was conducted using binary logistic regression to evaluate the association of VBAC success with inter-delivery interval and other potential confounding factors. A *P* value of < 0.05 was considered significant. Statistical analysis was accomplished using IBM SPSS Statistics 20.

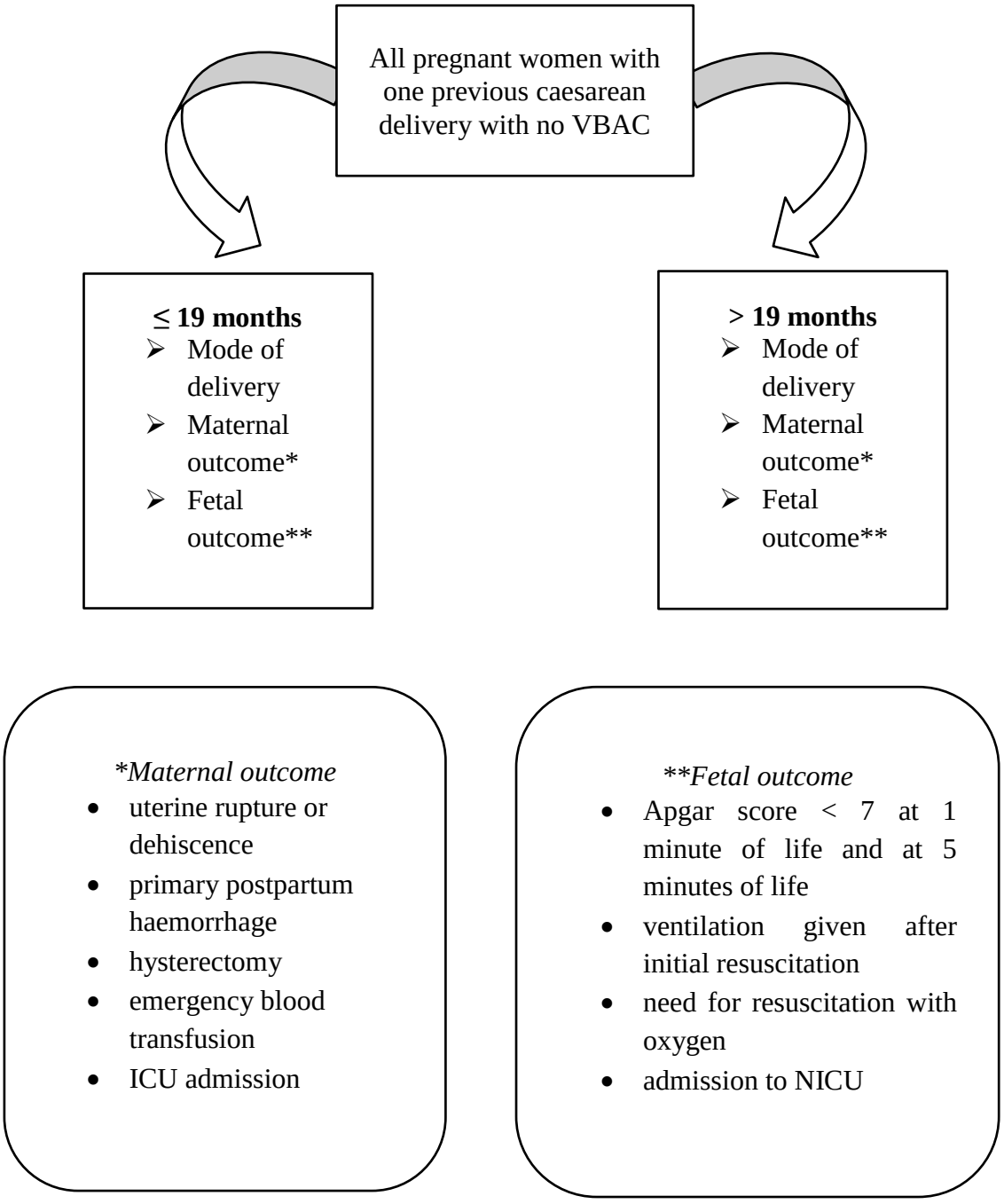


Figure 3.1 Flow chart of research protocol

# CHAPTER FOUR

# RESULTS AND FINDINGS

A total of 590 women attempted trials of labour with the inclusion study criteria were recruited during the study period. Sixty of them were in the group A (inter-delivery interval of less or equal than 19 months) while 530 patients were in the group B (inter-delivery interval more than 19 months). In group B, only 240 patients were randomly selected using SPSS software, matched in terms of parity with group A; in order to achieve 20% difference with power of study = 0.8 and ratio = 4. Therefore, the total samples analyzed in this study were 300 cases.

Table 4.1 summarizes maternal demographics and clinical characteristics of these two groups. Group A women were significantly younger. Methods of induction of labour were significantly different in these two groups whereby less pharmacological and more mechanical methods were favorable in group A. Patients in group B had significantly higher rate of taking intrapartum analgesia either epidural or other methods such as pethidine, nubaine or enthonox.

Table 4.1 Patient's Clinical Characteristics

| | **≤ 19 months (*n* = 60)** | **> 19 months (*n* = 240)** | ***p* value** |
|---|---|---|---|
| Mean IDI (months) | 16.3 ± 2.2 | 46.2 ± 23.3 | - |
| Maternal age (y) | 28.1 ± 4.1 | 29.4 ± 4.5 | *0.042* |
| Gestational age (wk) | | | 0.484 |
| • ≥ 40 | 33.3 | 41.7 | |
| • 37 – 39 | 61.7 | 54.6 | |
| • > 37 – 33 | 5.0 | 3.8 | |
| No. of previous deliveries | | | 1.000 |
| • Para 1 | 20.0 | 80.0 | |
| • Para 2 - 4 | 20.0 | 80.0 | |
| • Para ≥ 5 | 20.0 | 80.0 | |
| Maternal race | | | 0.318 |
| • Malay | 90.0 | 85.0 | |
| • Non Malay | 10.0 | 15.0 | |
| BMI ($kg/m^2$) | 25.4 ± 5.1 | 26.0 ± 5.5 | 0.449 |
| BMI ($kg/m^2$) | | | 0.194 |
| • Overweight & Obese | 43.3 | 52.7 | |
| • Normal | 56.7 | 47.3 | |
| Indication of previous CS | | | 0.148 |
| • Failure to progress | 8.3 | 22.1 | |
| • Non reassuring fetal status | 53.3 | 40.8 | |
| • Fetal malpresentation | 16.7 | 21.2 | |
| • Antepartum haemorrhage | 3.3 | 5.0 | |
| • Suspected macrosomia | 6.7 | 2.5 | |
| • Failed instrumentation | 1.7 | 0.4 | |
| • Multiple pregnancy | 3.3 | 1.2 | |
| • Maternal causes | 5.0 | 5.0 | |
| • Others | 1.7 | 1.7 | |
| Previous baby's weight delivered by CS (kg) | 2.92 ± 0.68 | 2.98 ± 0.57 | 0.509 |

Data are presented as mean ± standard deviation (SD) or %

Table 4.2 presents the outcome of pregnancy and delivery of both groups. Surprisingly, the shorter the inter-delivery interval, the higher the success rate of VBAC (78.3% versus 55% for group A and group B respectively).

In the subanalysis of women whose labour were induced, we detected no difference in the success rate of VBAC between the two groups (57.1% [8 of 14] versus 39.0% [32 of 82]; $p = 0.20$); but with a significant difference in the methods used for induction. Mechanical methods were used more in the group A compared to prostaglandin in the group B. However, in patients who underwent spontaneous labour, group A were more likely to have successful VBAC compared to group B (84.8% [39 of 46] versus 63.3% [100 of 158]; $p = 0.006$).

There was no difference in terms of maternal morbidities of the two groups. The rate of uterine rupture or dehiscence were of no significant difference between both of the groups (0.0% versus 0.4%; $p = 0.632$). There were no women identified to have uterine rupture although four patients were suspected of scar dehiscence and all of them were from group B. One patient was incidentally found to have scar dehiscence during caesarean for poor progress of labour but she remained asymptomatic. She was a primiparous with no previous vaginal delivery and had inter-delivery interval of more than 19 months.

Table 4.2 Comparison of Pregnancy and Delivery Outcome by Inter-delivery Interval

| | **≤ 19 months (*n* =60 )** | **> 19 months (*n* = 240 )** | ***p* value** |
|---|---|---|---|
| Induction of labour | 23.3 | 34.2 | 0.108 |
| Methods of induction | | | *0.022* |
| • Prostaglandin | 7.7 | 47.6 | |
| • Mechanical | 53.8 | 26.8 | |
| • Others | 38.5 | 25.6 | |
| Analgesia | | | *0.009* |
| • Epidural | 6.7 | 8.3 | |
| • Others | 48.3 | 66.7 | |
| • None | 45.0 | 25.0 | |
| Oxytocin use | 28.3 | 39.6 | 0.107 |
| Mode of delivery | | | *0.001* |
| • Vaginal | 78.3 | 55.0 | |
| • LSCS | 21.7 | 45.0 | |
| Vaginal delivery | | | |
| • SVD | 89.4 | 84.8 | 0.443 |
| • Instrumental | 10.6 | 15.2 | |
| Indication for instrumental | | | 0.245 |
| • Fetal distress | 60.0 | 85.0 | |
| • Prolonged second stage | 40.0 | 10.0 | |
| • Shortened second stage | 0.0 | 5.0 | |
| Indication for LSCS | | | 0.972 |
| • Failure to progress | 61.5 | 51.9 | |
| • Non reassuring fetal status | 38.5 | 39.8 | |
| • Cord prolapse | 0.0 | 0.9 | |
| • Bleeding placenta previa | 0.0 | 0.9 | |
| • Suspected scar dehiscence | 0.0 | 3.7 | |
| • Failed instrumentation | 0.0 | 1.9 | |
| • Maternal causes | 0.0 | 0.9 | |