ASSOCIATION BETWEEN THE LENGTH OF INTERPREGNANCY INTERVAL AND PREGNANCY OUTCOMES IN WOMEN WITH ONE PREVIOUS CAESERIAN SECTION UNDERGOING A REPEAT CAESERIAN DELIVERY AT TERM AT PUMWANI MATERNITY HOSPITAL BETWEEN 2014 AND 2018

A CROSS-SECTIONAL STUDY

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This dissertation is my original work, carried out with guidance from my supervisors. It has not been presented for any academic award in any other university and references made to work done by others has been cited.

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DEDICATION

To The Almighty God for His renewed mercies every day.

LIST OF ABBREVIATIONS AND ACRONYMS

CI:	Confidence Interval
KDHS:	Kenya Demographic and Health Survey
IPI:	Inter pregnancy interval
LMIC:	Low and Middle-Income Countries
HTSP:	Healthy Timing and Spacing of Pregnancy
PCH:	Pumwani County Hospital
LMP:	Last menstrual period
OR:	Odds Ratio
SD:	Standard deviation
SOGC:	Society of Obstetricians and Gynecologists-Canada
SPSS:	Statistical Package for Social Scientists
CS	Caesarian section

DEFINITION OF OPERATIONAL TERMS

Caesarean Section: Surgical procedure for the delivery of babies involving incisions through the abdomen and the uterus usually performed when a vaginal delivery would put the baby's or the mother's life at risk.

Inter Pregnancy Interval (IPI): spacing between a birth and the beginning of next pregnancy; birth to pregnancy interval

Short inter pregnancy interval: Interval of less than 24 months in line with WHO recommendation of IPI of at least 24 months (1)

Long inter pregnancy interval: Interval of 60 months and above as in most studies (2,3)

Intermediate inter pregnancy interval: Interval of between 24 months and 59 months

Adverse outcome: A harmful or unwanted event that affects the fetus or the mother

Early perinatal death: Death in the first 24 hours of life

Inter delivery interval (IDI) or birth-to-birth interval: the period between consecutive live births. The calculation of the BTB interval can be the same for two women even though one woman conceives only twice during the interval and the other conceives multiple times since BTB ignores abortions and foetal deaths.

Inter-outcome interval (IOI): Inter-outcome interval is defined as the interval between one pregnancy outcome and the next, regardless of pregnancy outcome.

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ABSTRACT

Background: A caesarean section (CS) is a life-saving surgical procedure when certain complications arise during pregnancy and labour. However, it is a major surgery and is associated with immediate maternal and perinatal risks and may have implications for future pregnancies as well as long-term effects that are still being investigated. The use of CS has increased dramatically worldwide in the last decades particularly in middle- and high-income countries.(4) Short or long interpregnancy interval(IPI)contributes to adverse maternal and neonatal outcomes in both low and high-income countries. World Health Organization (WHO) recommends IPI of at least 24 months to lower the risk of maternal and perinatal adverse outcomes in line with the United Nations International Children's Emergency Fund (UNICEF) recommendation of at least 24 months for breastfeeding. The definitions for short and long inter pregnancy interval (IPI) have not been standardized. An IPI less than 6 months is most often associated with adverse outcomes, but some studies have reported correlations with adverse outcome for a short IPI ranging from less than three months to less than 18 months. A long IPI has been defined as an IPI ≥60 months. To contribute to existing knowledge on the subject in low and medium income countries, this study was done.

Objective: To determine the association between the length of interpregnancy interval and pregnancy outcomes in women with one previous caesarian section undergoing a repeat caesarian delivery at term in Pumwani Maternity Hospital Between 1st January 2014 and 31st December 2018.

Methodology: This was a cross-sectional study that was conducted among participants who had delivered at Pumwani Maternity Hospital via a repeat caesarian section between 1st January 2014 and 31st December 2018. Files of 625 participants were retrieved. IPI was calculated based on the time interval between the previous caesarian section delivery and the beginning of the subsequent pregnancy which was taken as the date of the last normal menstrual period recorded or extrapolated from an early trimester obstetric scan. The files were categorized into short(n=170) intermediate(n=384) and long (n=121) IPIs. Data was abstracted on sociodemographic and reproductive characteristics and maternal and neonatal outcomes. Continuous variables were summarized as mean with standard deviations or medians with interquartile range and compared with T test. Categorical variables were summarized as frequencies and proportions and compared using Chi square and Fischer. Multi variate logistic regression was used to evaluate the association between IPI and maternal and neonatal outcomes after adjusting for potential confounders. A P value of 0.05 was considered significant.

Results: The demographic and reproductive characteristics of participants were comparable across the three IPI groups other than their education level. The odds of being a college graduate was 4.7 times higher when IPI was <24 months. The prevalence of adverse maternal outcomes such as PPH and pre-eclampsia was low and comparable across the three IPI groups. Neonatal outcomes were comparable apart from congenital anomalies, whose occurrence was significantly higher when the IPI was long.

Conclusion: Maternal outcomes are comparable across short, intermediate and long interpregnancy intervals following a repeat caesarean section at term. Neonatal outcomes are comparable across the three interpregnancy interval categories after a repeat caesarean section at term, however there are higher odds of congenital anomalies after a long interpregnancy interval.

Recommendations: Women who are undergoing a repeat caesarian section at term due to one previous caesarian section have comparable maternal outcomes following short, intermediate and long interpregnancy intervals. Long interpregnancy interval was associated with congenital malformations and this is an area requiring further research.

CHAPTER ONE

1 Introduction

1.1 Background

The WHO recommends that the interval between a woman's previous delivery and her subsequent pregnancy should be a minimum of 24 months (1). Long and short interpregnancy intervals(IPI) increase health risks for both mother and infant while IPI of at least 24 months is an important determinant of maternal health and pregnancy outcomes. Previous studies in low and high-income countries have shown that both short and long IPIs are associated with adverse maternal and neonatal outcomes.(5) Particularly short IPI is linked with greater risks of perinatal, infant and child mortality, preterm birth, low birth weight and fetal growth restriction.(6)

Short IPI has been linked to congenital malformation, maternal anemia, premature rupture of membranes, abruption placenta, placenta previa, and uterine rupture in women with subsequent normal deliveries after a previous CS delivery. A report of the WHO technical consultation on birth spacing (7) noted that there is relatively little evidence available about the relationship between maternal mortality and birth-spacing intervals and that this should be borne in mind for future research. Unfortunately, in-depth studies on relationship between inter-pregnancy interval after a precious CS section and maternal and perinatal adverse outcomes are few in Africa to the best of our knowledge.

High fertility rate is associated with short IPIs (8) and the maternal depletion syndrome, a condition where the body fails to replenish its macro and micro nutrient stores (9) . The poor breastfeeding practices in women with a short inter pregnancy interval results into poor growth in children (10). Pre-term births and low birth weight could result in developmental issues such as cerebral palsy, mental retardation, and poor nutritional status. The bulk of these adverse pregnancy outcomes are associated with short intervals. However, studies have also associated long intervals with outcomes such as pre-eclampsia. A systemic review and meta-analysis by O'Neill et al. (2013) associated increased waiting times with the risk of sub-fertility in women after a previous CS pregnancy(11).
IPI of parturient has an association with maternal and neonatal outcomes so as to offer this group of women an evidence-based advice.

CHAPTER TWO

2 Literature Review

2.1 Effects of Inter-Pregnancy Interval (IPI) on Pregnancy

Inter-pregnancy interval(IPI) is a matter of clinical concern due to its association with multiple health adverse outcomes for the mother and neonate (7,8,9). Some studies have suggested that the shortest IPI period can be less than 6 months and the longest IPI to be more than five years after a cesarean birth. However, IPI of 24 months has been considered as optimal (12,14).A short IPI increases the risk of many adverse maternal and perinatal outcomes. Small for gestational age, maternal anemia, and uterine rupture are some of the common complications (3,12). Poorly timed pregnancies (<12 months IPI and more than 24 months IPI) can increase health risks for mother and infant while optimal IPI is a major determinant of maternal health and pregnancy outcomes (12,14).

Studies in low and high income countries have suggested that short and long IPIs may be associated with adverse perinatal outcomes(12,14,15). Short IPI has been linked to greater risks of maternal mortality, perinatal mortality, preterm birth and low birth weight(16,17,18,19,20). Short IPIs are also linked with congenital malformations, premature rupture of membranes, abruption placenta, placenta previa, and uterine rupture, particularly in women with previous caesarean section delivery attempting vaginal delivery (1,3,7,8,9,10). These adverse outcomes are associated with morbidity and mortality for newborns and infants(11,12). Babies born prematurely or with low weight have a high risk of developing respiratory distress and chronic lung disorders in the long term(23,24). Long IPI on the other hand may be associated with preeclampsia, and or eclampsia (1,15).

2.2 Factors that affect Interpregnancy Interval (IPI)

In the past decade, birth spacing has been the major health promotion strategy in the developing countries. This health promotion strategy has relied on interpregnancy interval (IPI) to influence the outcome of pregnancy and birth(26). Perinatal mortality has also been observed as poor obstetric care indicator (26,27). By 2006, about 4 million out of 130 million (3%) of infants born worldwide died during the first four weeks of life. Over three million (2.3%) were still born (28). More than 76 million perinatal deaths occur annually worldwide, 98% of which are in developing countries (29).

Factors associated with IPI include poor nutrition of women, poor child spacing, maternal age (less than 15 years and over 35 years), inadequate prenatal care, economic status, availability of family planning, culture, political and religious aspects, lifestyle behaviors like smoking, and weight and

outcome of previous pregnancy (8,26,27,28). Ideal pregnancy spacing has been recommended to achieve better perinatal outcomes. Researchers, however, have argued on whether the relationship is due to confounding by other risk factors(33). The disagreements are based on the fact that short intervals between pregnancies merely designate women already at higher reproductive risk, either because of underlying disorders, socioeconomic status, and lifestyle factors (35,36,37). Limitations such as small sample size, lack of control of confounding factors, and use of birth interval instead of the IPI as the measure of birth spacing also fuel disagreements (4,34, 35).

2.3 Caesarean Sections and Inter-pregnancy Interval

Over the past three decades, rates of Caesarean delivery have increased worldwide (37,38). It has been observed that there could be some associations between Caesarean delivery and sub-fertility because of infection at the site of the wounds, scar adhesion, and placental bed disruption (39). Moreover, the likelihood of women with a Caesarean delivery having a subsequent pregnancy and or a longer pregnancy interval compared to women with a vaginal delivery is relatively low, even after adjustment for parity (48,49). Other studies refute this claim (42,43). Unfortunately, all over Africa research studies on appropriate interpregnancy interval after a caesarean section are few.

2.4 Interpregnancy interval and congenital anomalies

Both long and short IPI have been associated with congenital anomalies. Statistically significant associations were observed for folate independent anomalies and not folate dependent anomalies. Mechanisms of development of congenital anomalies have been explained including postpartum nutritional stress and hormone imbalance but the folate depletion analysis appears to be the most commonly cited. Serum studies have shown that women in late pregnancy and early postpartum are relatively folate depleted. Low serum folate in pregnancy has also been associated with fetal growth restriction and premature births

2.5 WHO and Society Recommendation for Spacing after a Live Birth after a Live Birth

The recommended interval before attempting the next pregnancy is at least 24 months in order to reduce the risk of adverse maternal, perinatal, and infant outcomes (5). Data presented at the WHO technical working group in Geneva Switzerland in June 2005 considered various maternal, infant and child health outcomes. For each outcome, different IPI were associated with highest and lowest risks. IPI of six months or shorter were associated with elevated risk of maternal mortality. Birth to pregnancy interval (BTP) interval of around 18 months or shorter are associated with elevated risk of infant, perinatal and perinatal mortality, low birth weight, small size for gestational age, and pre-

term delivery. Some “residual” elevated risk might be associated with the interval 18–27 months, but interpretation of the degree of this risk depended on the specific analytical techniques used in a meta-analysis. Otherwise, the evidence to discriminate within the interval of 18–27 months was limited. Further analysis was requested to clarify this point. This additional work will be considered at a future date. RCOG recommends an interpregnancy interval of 18 months after a caesarean section. To the best of our knowledge, we did not come across any other society guidelines that addresses interpregnancy interval after caesarean delivery

2.6 Rationale

There is limited data on the effect of IPI after a CS on subsequent pregnancy outcomes in LMIC and an evidence-based guideline is required to address women who conceive shortly after CS. The findings from the study is set to help add information in future restructuring of health policies and further strengthen the healthy timing and spacing of pregnancy an intervention to help women with previous caesarian section delivery space their pregnancies to achieve healthiest outcomes. The study results form a basis of prospective studies that will look into outcomes after various interpregnancy interval on the health of the mother, the infant and the child.

2.7 Research question

Is there an association between the length of interpregnancy interval and pregnancy outcomes in women with one previous caesarian section undergoing a repeat caesarian delivery at term?

2.8 Broad objective

To determine the association between the length of interpregnancy interval and pregnancy outcomes in women with one previous caesarian section undergoing a repeat caesarian delivery at term

2.8.1 Specific objectives

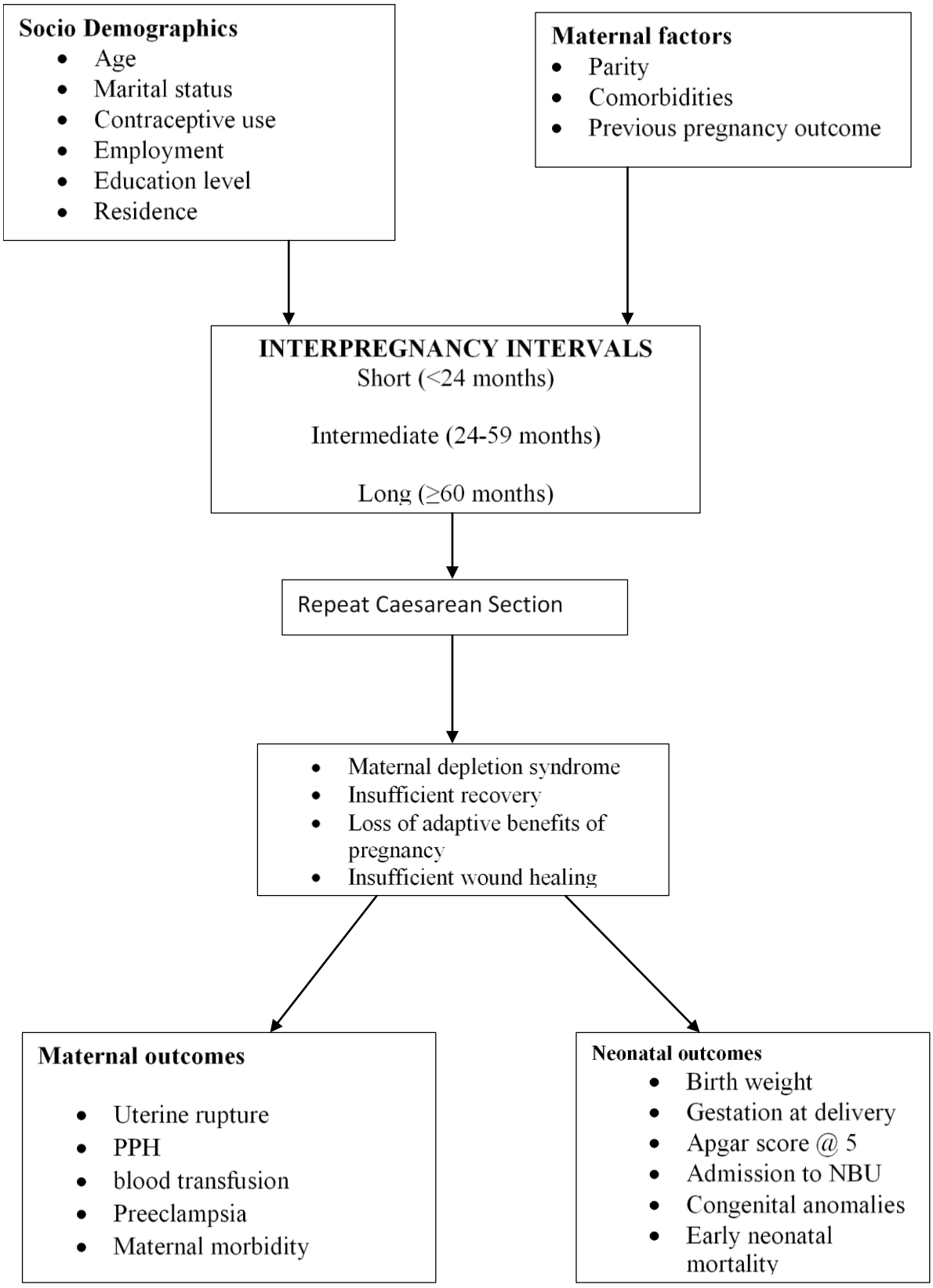
Among women undergoing a repeat caesarian delivery at term after a short, intermediate and long interpregnancy interval to:

- Compare proportion of women with adverse maternal outcomes
- Compare proportion of women with adverse neonatal outcomes

2.9 Conceptual Framework

Women with an increasing, age, married, and use contraceptives tend to have a longer IPI, while those with poor pregnancy outcomes are more likely to conceive with a short period. A short IPI has also been associated with an elevated risk of maternal mortality with BTP intervals of ≤18 months elevating the risk of low birth weight, perinatal mortality, and pre-term delivery. A short interval of 18–27 months has also been observed to predispose women to CS deliveries after adjusting for parity (39) and thus adverse complications such as uterine rupture and anemia.

Figure 1 Conceptual Framework


Socio Demographics
Age
Marital status
Contraceptive use
Employment
Education level
Residence
Maternal factors
Parity
Comorbidities
Previous pregnancy outcome
INTERPREGNANCY INTERVALS
Short (<24 months)
Intermediate (24-59 months)
Long (≥60 months)
Repeat Caesarean Section
Maternal depletion syndrome
Insufficient recovery
Loss of adaptive benefits of pregnancy
Insufficient wound healing
Maternal outcomes
Uterine rupture
PPH
blood transfusion
Preeclampsia
Maternal morbidity
Neonatal outcomes
Birth weight
Gestation at delivery
Apgar score @ 5
Admission to NBU
Congenital anomalies
Early neonatal mortality

CHAPTER THREE

3 METHODOLOGY

3.1 Study Design

A cross sectional study to determine the association between short, intermediate and long interpregnancy intervals(IPI) and maternal and neonatal outcomes among women undergoing a repeat Caesarean delivery after one previous caesarian section between 1st January 2014 to 31st December 2018 in Pumwani Maternity Hospital(PMH)

3.2 Study Site and Setting

This study was conducted at Pumwani Maternity Hospital. Situated four kilometers east of the Nairobi central business district, it is one of the largest maternity hospitals in Kenya with 24,000 deliveries yearly. This is equivalent to 60% of all births in Nairobi. Pumwani has 150 neonatal cots and 60 beds in its labor ward. Patients are mainly low-income earners from Nairobi County and Kiambu County. Average stay of postoperative patients in this hospital is five days. The hospital performs repeat caesarian delivery on mothers with previous caesarian deliveries and does not have a standard protocol on the appropriate interpregnancy interval after a caesarian section.

3.3 Study Population

Women with one previous CS delivery admitted for a repeat caesarian delivery at term in PMH between January 2014 and December 2018.

3.3.1 Inclusion Criteria

- Mothers with one previous CS delivery
- Mothers who delivered subsequently at PMH at term via a repeat CS

3.3.2 Exclusion Criteria

- Women with multi fetal gestation
- Women with uncontrolled medical conditions in pregnancy
- Women who had a miscarriage prior to a repeat CS

3.4 Sample Size Determination

$n = (p\text{^}2\ xp(1-p))/d\text{^}2$ (Cochran's, 1977)

Where: p = prevalence of pre term birth in IPI <24 months (12.57%), 24-59 months (18.56%) and ≥60 months (10.16%) (Mahande and Obure, 2016)
Z= Standard normal variate (1.96 for 95% confidence level)
d= Absolute error (5%).

Each IPI was considered an independent group and sample sizes determined as follows:

Short <24 months: $n=1.96^2 x 0.1257\ (1-0.1257)/0.005^2$ = 163 participants
Intermediate 24-59 months: $n=1.96^2 x 0.1856\ (1-0.1856)/0.005^2$ = 223 participants
Long ≥60 months: $n=1.96^2 x 0.1016\ (1-0.1016)/0.005^2$ = 148 participants

To get a representative sample for our study with 80% power, 1269 files were recruited. Five hundred and ninety-four (594) were excluded and among these, 464 had more than one previous CS deliveries, 18 had medical conditions in pregnancy while 112 had incomplete data.675 were enrolled for the study and all these files were later analysed.

3.5 Sampling Procedure

A simple random sampling technique was used to select our study participants. Trained records officer retrieved the archived files of women who delivered at Pumwani Hospital from 2014-2018 via a repeat CS after one previous CS delivery and their IPIs ascertained. Files were grouped according to their IPIs (<24 months, 24-59 months, and ≥60 months) and file numbers in each group entered in separate Excel sheets. To recruit study participants' files, simple random sampling was used. File numbers in each group were uploaded into a QuickCalcs random number generator (https://www.graphpad.com/quickcalcs) and the program used to select file numbers randomly. In < 24 months IPI group, 170 patient files were selected randomly. In the 24-59 and ≥60-month group, 384 and 121 files were selected randomly. The selected files were retrieved and secondary data was recorded on participant information sheets.

3.6 Data Management

3.6.1 Data Variables

Dependent variable was adverse maternal and neonatal outcomes after a previous CS birth as highlighted in table 1 below. Maternal outcomes included the length of hospital stay, need for blood transfusion, pre-eclampsia/eclampsia and abruption of the placenta. Neonatal outcomes such as congenital abnormalities of babies, birth weight, and occurrence of stillbirths, early neonatal mortality which was considered death within the first 24 hours of life was evaluated. The IPI of patients was the key independent variables

Table 1: Outcome measures

Dependent variable	**Independent Variables**
Maternal outcomes	
	IPI (<24, 24-59, and ≥60)
Uterine rupture	Parity
PPH	Type of previous CS
Length of hospital stay	Education level
Need for Blood transfusion	Age of mother
Pre-eclampsia/eclampsia	Gestation period
Maternal mortality	Duration of stay in hospital
Neonatal outcomes	
	IPI (<24, 24-59, and ≥60)
Still birth	Type of previous CS
Apgar score	Education level
Birth weight	Age of mother
Congenital anomalies	Gestation period
Early perinatal mortality	Duration of stay in hospital

3.7 Data Collection

The Principle Investigator (PI) and trained research assistants retrieved theatre records and follow-up records of patients and an information sheet (Appendix 1) used to capture study data. The information sheet was designed to be in four main sections. The first section captured the socio-demographic characteristics of women to include their marital status, age, parity, and outcome of their previous deliveries among others. Additionally, their level of education and other relevant socio-demographic characteristics in their files was also captured. Part two of the information sheet captured the data on the maternal outcomes after the repeat CS to include development of PPH, need for blood transfusion and hospital stay among others. We used ultrasound reports and the LNMP dates to calculate the parturient gestation period before recording on the information sheet. Part three covered neonatal outcomes that included the APGAR scores, birth weight, need for NBU admission among other outcomes.

3.8 Data Analysis

Data was analyzed using version 21 of Statistical Package for Social Scientists (SPSS) software. Data was extracted from information sheets, entered into SPSS, and cleaned for analysis. The means and median of continuous data was computerized. Categorical data was summarized into graphs and the Chi square test used to compare occurrence of maternal and fatal categories across different IPIs. To test the association between continuous outcomes and different IPI groups, the Shapiro Wilke Test was first used to determine the distribution of data. The T-test was used to analyze parametric data and Man Whitey U test non-parametric data. Statistical significance was determined by analyzing Odds Ratios, t-statistics, and P values. A P value<0.05 was significant.

3.9 Strengths

Pumwani hospital has the largest maternal unit in Kenya. It caters to manly medium to low income earners. Our study covered a matter of public health importance. To the best of our knowledge, few studies have tested the effect of IPI birth after CS even though it forms part of WHOs policy on child and maternal health (MCH). Whether IPI is a significant independent factor that influences maternal outcome is important because mothers have some level of control over their desired inter pregnancy interval by using available long and short term family planning options

3.10 Limitations

The files of patients lacked a few important variables and to cater for the loss, we adjusted our minimum sample size by a factor of 10% recruiting 675 participant files. We were also forced to generate secondary data such as gestation age from more than one document.

3.10.1 Ethical Clearance

Permission to carry out this study was sought from Kenyatta National Hospital/University of Nairobi ERC, and Pumwani ethics review board. Since this study was done between 2014-2018, application for waiver of consent was made during the Ethic Review process. The information of all participants was kept confidential and no personal identifying information such as names and identification numbers were recorded. The files were color coded and numbered and no personal information was transferred The participants did not suffer any risk since data was extracted from hospital records and the participants bared no cost.

CHAPTER FOUR

4 RESULTS

4.1 Flow Chart

A review of the files of 17,410 who delivered at the Pumwani hospital between January 2014 and December 2018 yielded 1269 patients who delivered through a caesarean section (CS) after a previous CS delivery. Data of the 1269 women were screen for eligibility and women who had more than one previous CS delivery (n=464), medical conditions in pregnancy (n=18), and incomplete data [>20% (n=112)] excluded (total excluded was 594). In total, 675 patients were recruited in the study [70 (25.2%) with an IPI <24 months, 384 (56.9%) 24-59 months, and 121 (17.8) >60 months] and their demographic, medical, and reproductive data reviewed and analyzed (Figure 1). Six hundred and thirty-six (94.2%) were married. A majority 56.3% (380/675) had primary education and a parity of 1-3 84.6% (571/675). Six hundred and sixteen (91.3%) underwent an elective CS, while 437 (65.7%) had a live birth in the previous CS birth.

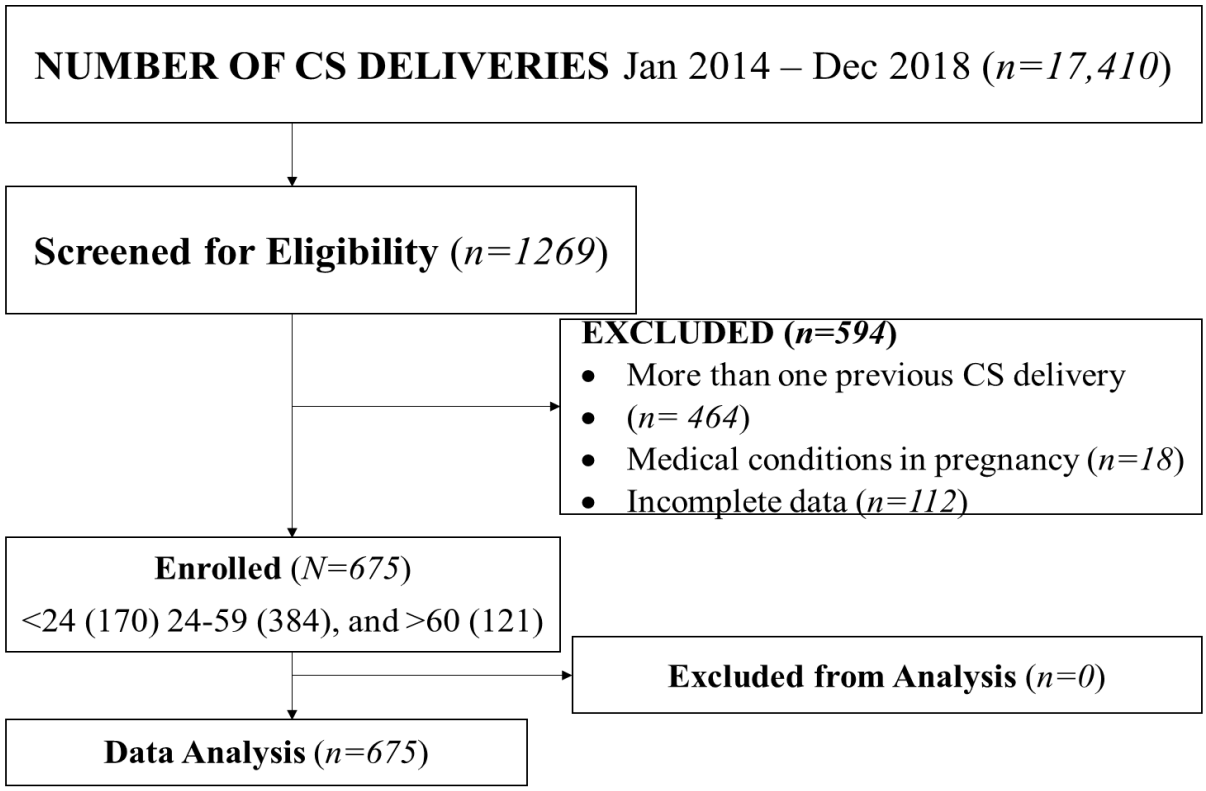


Figure 1: Flow chart

4.2 Demographic Characteristics

4.2.1 Short (<24 months) and Intermediate (24-59 months) IPI

The mean age was 26.74 ± 5.0 years among women with a short IPI and 26.95 ± 4.3 years an intermediate IPI. A majority of women with a short (88.8%) and intermediate IPI (94.3%) were age group 19-30 years, while only 1.8% and 0.5% were age <19 years. Even though women with a short IPI 94.7% (160/169) than intermediate IPI 94.3% (362/384) were more likely to be married, the odd of being married 1.1(0.48-2.4) did not vary statistically (p=0.86). With no education as a reference, the Odds of having a college or university education was 4.7 times higher when IPI was short than intermediate (p=0.01), while the odds of having a primary education and secondary level education was 0.41(0.15-1.1) and 1.0 (0.38-2.8), when IPI was short than intermediate, but did not differ statistically (p>0.05). The odds of having 1-3 children was lower (0.3(0.28-0.4)) when women had a short IPI 90.6% (154/170) than an intermediate IPI 90.6% (154/170), p<0.01).

In <24 months IPI group and 24-59 IPI groups, the prevalence of stillbirths was 14.2% (20/141) and 5.2 (13/251) respectively with the odds of a stillbirth in a previous birth being three times higher when women had a short than an intermediate IPI (OR (95% CI) = 3.0 (1.5-6.3), p<0.01). More women with an intermediate IPI 92.2% (354/384) than a short IPI 90.5% (152/168) were scheduled for an emergency caesarean section even though the difference was not significant (p=0.50). More women with an intermediate IPI 97.7% (374/383) than a short IPI 97.0% (163/168) had attended ANC, with the odds of attending less than four ANC being 1.8 higher when women had a short IPI (p<0.01). However, women who had a short IPI were 4.3 times likelier to start ANC after first trimester (p<0.01). Mean gestation was statistically lower when women had a short IPI (37.62 ± 1.6 weeks) than intermediate IPI (37.97 ± 1.4 weeks): t= -2.54, p=0.01 (Table 3).

Table 2. Demographic and obstetrics characteristics of women with short and intermediate IPI after one previous CS

		IPI (Months)				
Characteristics		<24 (N=170)	24-59 (N=384)	OR	95% CI	P
Age	<19	3 (1.8)	2 (0.5)			Ref
	19-34	151 (88.8)	362 (94.3)	0.4	0.23-1.0	0.13
	>34	16 (9.4)	20 (5.2)	0.7	0.33-1.6	0.51
Marital status	Married	160 (94.70)	362 (94.3)	1.1	0.48-2.4	0.86
	Single	9 (5.3)	22 (5.7)			Ref
	Missing	1	0			
Education	None	7 (4.1)	11 (2.9)			Ref
	Primary	65 (38.5)	250 (65.1)	0.4	0.15-1.1	0.06
	Secondary	76 (45.0)	116 (30.2)	1.0	0.38-2.8	0.95
	Tertiary	21 (12.4)	7 (1.8)	4.7	1.3-17	0.01
	Missing	1	0			
Parity	1 to 3	154 (90.6)	379 (98.7)	0.3	0.28-0.4	<0.01
	4+	16 (9.4)	5 (1.3)			Ref
Outcome prev. CS	Live	121 (85.8)				Ref
	Still	20 (14.2)	13 (5.2)	3.0	1.5-6.3	<0.01
	Missing	29	133			
Repeat CS	Elective	16 (9.5)				Ref
	Emergency	152 (90.5)	354 (92.2)	0.8	0.43-1.5	0.50
	Missing	2	0			
ANC visits	Yes	163 (97.0)	374 (97.7)	0.7	0.26-2.4	0.66
	No	5 (3.0)	9 (2.3)			Ref
	Missing	2	1			
No ANC visits	Less than 4	45 (28.8)	68 (18.2)	1.8	1.2-2.8	<0.01
	4 or more	111 (71.2)	305 (81.8)	0.5		Ref
	Missing	14	11			
Gestation (first ANC)	1st Trimester	85 (57.4)	317 (85.2)			Ref
	After First	63 (42.6)	55 (14.8)	4.3	2.8-6.6	<0.01
	Missing	22	12			

4.2.2 Long (60+ months) and intermediate (24-59 months) IPI

The mean age was higher among women with a long IPI (29.69 ± 4.3 years) than an intermediate IPI (26.95 ± 4.3 years), but not statistically significantly (t= -0.512, p=0.60). The odds of being >34 than 19-34 was lower when IPI was long but not significantly (OR (95%CI=0.4 (0.32-0.6, p=0.05). More women with a long IPI 94.3% (362/384) than an intermediate IPI 94.2% (114/121) of women with an IPI 60+ months and 94.3% (362/384) were married, even though the 0.1% difference was not statistically significant (p>0.05). With no education as a reference, the odds of having a college or university level of education was 1.6 higher when IPI was long than intermediate, but not statistically significantly (p=0.63). The odds of having a primary education was low (OR (95% CI) =0.95 (0.26-3.5)) while secondary level education was high (OR (96% CI=1.6 (0.42-5.9)) when IPI

was long, but not statistically significantly (p>0.05). The odds of having 1-3 children was 0.8 times lower when women had an intermediate IPI than a long IPI but not significantly (p=0.77).

The odds of having a stillbirth during a previous pregnancy 0.70 times lower when IPI was long but not statistically significantly (p=0.58). Around 90.9% (110/121) women with long IPI and 92.2% (354/384) an intermediate IPI were scheduled for an emergency caesarean section. Even though the odds of undergoing an emergency repeat CS was 0.85 times lower when IPI was high than intermediate, the difference was not statistically significant (p=0.50). The mean gestation was shorter (37.82 ± 1.6 weeks) for women with a long IPI than an intermediate IPI (37.97 ± 1.4 weeks) even though the 0.35-week difference was not statistically significant (t= -2.54, p=0.07). Fewer women with a long IPI 95.9% (116/121) than an intermediate IPI 97.7% (374/383) had attended ANC even though the odds of attendance did not vary statistically (p=0.70).

Table 3. Demographic and obstetrics characteristics of women with long and intermediate IPI after one previous CS

		IPI (Months)				
Characteristics		60+ (N=121)	24-59 (N=384)	OR	95% CI	P
Age	<19	0 (0.0)	2 (0.5)			Na
	19-34	103 (85.1)	362 (94.3)			Ref
	>34	18 (14.9)	20 (5.2)	0.4	0.32-0.6	0.05
Marital status	Married	114 (94.2)	362 (94.3)	0.9	0.41-2.4	0.98
	Single	7 (5.8)	22 (5.7)			Ref
Education	None	3 (2.5)	11 (2.9)			Ref
	Primary	65 (53.7)	250 (65.1)	0.9	0.26-3.5	0.07
	Secondary	50 (41.3)	116 (30.2)	1.6	0.42-5.9	0.49
	Tertiary	3 (2.5)	7 (1.8)	1.6	0.24-10	0.63
Parity	1 to 4	119 (98.3)	379 (98.7)	0.8	0.25-2.7	0.77
	4+	2 (1.7)	5 (1.3)			Ref
Outcome prev. CS	Live	78 (96.3)	238 (94.8)	1.4		Ref
	Still	3 (3.7)	13 (5.2)	0.7	0.20-2.5	0.58
	Missing	40	133			
Repeat CS	Elective	11 (9.1)	30 (7.8)	1.2		Ref
	Emergency	110 (90.9)	354 (92.2)	0.8	0.41-1.7	0.65
ANC visits	Yes	116 (95.9)	374 (97.7)	0.5	0.18-1.7	0.29
	No	5 (4.1)	9 (2.3)			Ref
	Missing	0	1			
No. of ANC visits	Less than 4	22 (19.8)	68 (18.2)	1.1	0.65-1.9	0.70
	4 or more	89 (80.2)	305 (81.8)			Ref
	Missing	10	11			
Gestation (first ANC)	Ist Trimester	91 (82.0)	317 (85.2)			Ref
	After First	20 (18.0)	55 (14.8)	1.3	0.72-2.2	0.40
	Missing	10	12			

4.2.3 Short (<24 Months) and Long (60+ Months) IPI

The mean age was lower among women with a short IPI (26.7 ± 5.1 years) than a long IPI (29.7 ± 4.3 years) with the 3-year mean difference being statistically significant (t= -5.19, p<0.01). Approximately 1.26 times more women with a short than long IPI were likely to be age >34 years (p=0.16), while 94.7% (160/169) and 94.2% (114/121) respectively were married [OR=1.1(0.39-3.0), p=0.86]. With no education as a reference, the Odds of having a college or university level of education was 3.0 (0.49-18) when IPI was <24 months than 60+ months (p=0.22). The odds of having a primary level education and secondary level education was 0.43(0.11-1.7), p=0.22 and 0.65 (0.16-2.6), p=0.54 respectively among women with an IPI <24 months than 60+ months.

Fewer women with a short IPI (90.6% (154/170)) than a long IPI (98.3% (119/121)) had a parity of 1-3 children (OR (95% CI) = 0.63(0.52-0.77), p<0.01). The odds of having a stillbirth during a previous pregnancy was 4.3 times higher when women had a short IPI (14.2% (20/141)) than a long IPI (9.1% (11/121)), p=0.01. Fewer women with a short IPI (90.5% (152/168)) were scheduled for an emergency caesarean section than those with a long IPI (90.9% (110/121)), but not statistically significantly (p=0.50). The mean gestation was lower (37.6 ± 1.6 weeks) for women with a short IPI than a long IPI (38.0 ± 1.4 weeks) with the 0.4 week mean difference being significant (t= -2.05, p=0.04). More women with a short IPI (97.0% (163/168)) of women with an IPI <24 months and 95.9% (116/121) with a 60+ IPI had attended ANC during pregnancy, OR=1.4(0.40-5.0), p=0.59. However, the odds of attending 4+ ANCs was 0.61(0.34-1.1), p=0.09 when the IPI of women was <24 months. Moreover, the odds of attending ANC after the first trimester was 3.4 (1.9-6.0) when IPI was <24 months 42.6 (63/148) than 60+ months 18.0% (20/111) (Table 1).

Table 4. Demographic and obstetrics characteristics of women with short and long IPI after one previous CS in PMH (N=291)

Characteristics		IPI (Months) <24 (N=170)	IPI (Months) 60+ (N=121)	OR	95%	P
Age	<19	3 (1.8)	0 (0.0)			Na
	19-34	151 (88.8)	103 (85.1)			Ref
	>34	16 (9.4)	18 (14.9)	1.26	0.87-1.83	0.16
Marital status	Married	160 (94.70)	114 (94.2)	1.1	0.39-3.0	0.86
	Single	9 (5.3)	7 (5.8)			Ref
	Missing	1	0			
Education	None	7 (4.1)	3 (2.5)			Ref
	Primary	65 (38.5)	65 (53.7)	0.4	0.11-1.7	0.22
	Secondary	76 (45.0)	50 (41.3)	0.6	0.16-2.6	0.54
	Tertiary	21 (12.4)	3 (2.5)	3.0	0.49-18	0.22
	Missing	1	0			
Parity	1 to 3	154 (90.6)	119 (98.3)	0.63	0.52-0.77	<0.01
	4+	16 (9.4)	2 (1.7)			Ref
Outcome prev. CS	Live	121 (85.8)	78 (96.3)			Ref
	Still	20 (14.2)	3 (3.7)	4.3	1.2-15.0	0.01
	Missing	29	40			
Repeat CS	Elective	16 (9.5)	11 (9.1)			Ref
	Emergency	152 (90.5)	110 (90.9)	0.9	0.42-2.1	0.90
	Missing	2	0			
ANC visits	Yes	163 (97.0)	116 (95.9)	1.4	0.40-5.0	0.59
	No	5 (3.0)	5 (4.1)			Ref
	Missing	2	0			
No.of ANC visits	Less than 4	45 (28.8)	22 (19.8)	1.6	0.92-2.9	0.09
	4 or more	111 (71.2)	89 (80.2)			Ref
	Missing	14	10			
Gestation (first ANC)	1st Trimester	85 (57.4)	91 (82.0)			Ref
	After First	63 (42.6)	20 (18.0)	3.4	1.9-6.0	<0.01
	Missing	22	10			

4.3 Maternal Outcomes

4.3.1 Short and Intermediate

A short and intermediate IPI did not influence maternal outcomes significantly. Even though the odds of having a blood transfusion and developing preeclampsia were 1.7 times and 1.1 times higher when IPI was short, the difference was not significant ($p>0.05$). On the other hand, the occurrence of uterine ruptures and post-partum haemorrhage (PPH) was 0.7 and 0.9 times low when IPI was short than intermediate, but not statistically significantly ($p>0.05$) (Table 5).

The mean duration of admission was 4.87 ± 2.2 days for women with a short IPI and 4.00 ± 0.77 days for women with an intermediate IPI. As such, parturient with a short IPI had a longer hospital stay of about 0.871 days – the difference being significant: t= 6.67, p<0.01 (Table 5).

Table 5. Comparison of maternal outcomes between short and intermediate IPI after one CS

	IPI (months)				
Outcomes	<24	24-59	OR	95% CI	P
Uterine rupture	1 (0.6)	3 (0.8)	0.7	0.07-7.3	0.80
PPH	6 (3.5)	15 (3.9)	0.9	0.34-2.4	0.83
blood transfusion	9 (5.3)	12 (3.1)	1.7	0.72-4.2	0.21
Preeclampsia	1 (0.6)	2 (0.5)	1.1	0.10-13.	0.92
Maternal mortality	2 (1.2)	7 (1.8)	0.6	0.13-3.1	0.57
Length of stay in days (mean(SD))	4.87 (2.27)	4.00 (0.77)	t= 6.67		<0.01

4.3.2 Long (60+ months) and intermediate (24-59 months) IPI

A long versus intermediate IPI did not influence the maternal outcomes significantly. Although the odds of having a blood transfusion and having uterine ruptures were 1.1 time higher when IPI was long than intermediate, the relationship was not statistically significant (p>0.05). The odds of PPH [0.63(0.18-2.2)] and maternal mortality [0.91(0.19-4.4)] were lower when IPI was long than intermediate but not statistically significantly (p>0.05). The mean duration of admission was 4.13 ± 1.3 days for women with a long IPI and 4.00 ± 0.77 days' fan intermediate IPI. The mean difference in duration of admission when IPI was long versus intermediate (0.13 days) was not statistically significant: t= 1.3, p=0.18 (Table 6).

Table 6. Comparison of maternal outcomes between long and intermediate IPI after one CS

	IPI (Months)				
Outcomes	60+	24-59	OR	95% CI	P
Uterine rupture	1 (0.8)	3 (0.8)	1.1	0.11-10	0.96
PPH	3 (2.5)	15 (3.9)	0.6	0.18-2.2	0.46
blood transfusion	4 (3.3)	12 (3.1)	1.1	0.34-3.3	0.92
Preeclampsia	0 (0.0)	2 (0.5)	-	-	-
Maternal mortality	2 (1.7)	7 (1.8)	0.9	0.19-4.4	0.90
Length of stay in days (mean (SD))	4.13 (1.33)	4.00 (0.77)	t=1.32		0.18

4.3.3 Short (<24 Months) and Long (60+ Months) IPI

Having a short IPI than a long IPI did not influence maternal outcomes significantly. Although the odds of having a blood transfusion and developing PPH were 1.6 times and 1.4 times higher when IPI was short than long, the relationship was insignificant (p>0.05). Conversely, the odds of uterine rupture (OR (95% CI =0.7(0.04-11) and maternal mortality OR (95% CI=0.71(0.0-5.1), were lower when the IPI of women was short but not statistically significantly (p>0.05). The mean duration of admission was 4.9 ± 2.2 days for women with IPI <24 months and 4.1 ± 1.3 days for women with an IPI 60+ months. The mean difference in duration of admission at IPI <24 months and IPI 60+ months was 0.8 days: t= 3.20, p=0.01 (Table 7).

Table 7. Comparison of maternal outcomes between short and long IPI after one previous CS

	IPI (Months)				
Outcomes	<24	60+	OR	95% CI	P
Uterine rupture	1 (0.6)	1 (0.8)	0.7	0.04-11	0.80
PPH	6 (3.5)	3 (2.5)	1.4	0.35-5.9	0.61
blood transfusion	9 (5.3)	4 (3.3)	1.6	0.49-5.4	0.41
Preeclampsia	1 (0.6)	0 (0.0)	-	-	-
Maternal mortality	2 (1.2)	2 (1.7)	0.7	0.09-5.1	0.73
Length of stay in days (mean (SD))	4.9 (2.3)	4.1 (1.3)	t=3.20		0.01

4.4 Neonatal Outcomes

4.4.1 Short and Intermediate IPI

The odds of having a stillbirth was 0.96 times lower when IPI was short than intermediate, but not statistically significantly (p=0.92). However, even though women with a short IPI were 2.1, 1.5, and 1.4 times likelier to bear underweight babies, premature babies, and babies with a poor Apgar score than those with intermediate IPI, delivery by CS after a short IPI from a subsequent CS birth did not predispose neonates to adverse outcomes statistically significantly (p>0.05). The odds of macrosomia 0.4 (0.08-1.7) and congenital abnormalities 0.4 (0.04-3.1) were lower when the IPI was short than intermediate, but not statistically significantly (p>0.05) (Table 8).

Table 8. Comparison of neonatal outcomes between short and intermediate IPI after one CS

		IPI (Months)				
		<24 (N=170)	24-59 (N=384)	OR	95% CI	P
Birth outcome	Still	8 (4.7)	19 (4.9)	0.9	0.41-2.2	0.92
	Live	160 (94.1)	365 (95.1)			Ref
	EPD	2 (1.2)	0 (0.0)			Na
Birth weight	<2500	22 (12.9)	26 (6.8)	2.1	1.1-3.8	0.12
	2500-4000	146 (85.9)	347 (90.4)			Ref
	>4000	2 (1.2)	11 (2.9)	0.4	0.09-2.0	0.28
Apgar scores	<7	25 (14.7)	43 (11.2)	1.4	0.80-2.3	0.24
	7-10	145 (85.3)	341 (88.8)			Ref
Congenital abnormalities		1 (0.6)	6 (1.6)	0.4	0.04-3.1	0.34
NBU admission		38 (22.4)	66 (17.2)	1.4	0.89-2.2	0.15
Asphyxia		24 (14.1)	40 (10.4)	1.4	0.82-2.4	0.20
RDS		5 (2.9)	8 (2.1)	1.4	0.46-4.4	0.53
NNS		1 (0.6)	2 (0.5)	1.1	0.10-13	0.92
Prematurity		8 (4.7)	12 (3.1)	1.5	0.61-3.8	0.35
Low birth weight		7 (4.1)	26 (6.8)	0.6	0.25-1.4	0.22
Macrosomia		2 (1.2)	12 (3.1)	0.4	0.08-1.7	0.17

4.4.2 Long (60+ months) and intermediate (24-59 months) IPI

Approximately, 95.0% (115/121) women with a long IPI and 95.1% (365/384) an intermediate IPI had a live birth. The odds of having a stillbirth was comparable [OR (95% CI) =1.0(0.39-2.6), p=0.99]. Around 86.8% (105/121) with a long IPI and 90.4% (347/384) an intermediate IPI bore babies with a normal weight (2500-4000 grams). With normal weight as a reference, the odds of having low birth weight and macrosomia was 1.5 times and 1.2 times higher when IPI was long, but not statistically significantly (p>0.05). However, the odds of prematurity [OR (95% CI) = 2.5(1.0-6.1)] and congenital anomalies [OR (95% CI) = 3.3(1.0-10.0)] were higher with a long than an Intermediate IPI (P<0.05). However, even though IPI was not a predictor for prematurity after controlling for age [OR (95% CI) = 2.0 (0.81-5.25), p=0.12], a long than intermediate IPI was a predictor for congenital anomalies [OR (95% CI)=3.5(1.0-12.0) p=0.03] (Table 9).

Table 9. Comparison of neonatal outcomes between long and intermediate IPI after one CS

Outcome		IPI (Months) 60+ (N=121)	24-59 (N=384)	OR	95% CI	P
Birth outcome	Still	6 (5.0)	19 (4.9)	1.0	0.39-2.6	0.99
	Live	115 (95.0)	365 (95.1)			Ref
Birth weight	<2500	12 (9.9)	26 (6.8)	1.5	0.74-3.1	0.24
	2500-4000	105 (86.8)	347 (90.4)			Ref
	>4000	4 (3.3)	11 (2.9)	1.2	0.37-3.9	0.75
Apgar scores	<7	12 (9.9)	43 (11.2)	0.8	0.44-1.7	0.69
	7-10	109 (90.1)	341 (88.8)			Ref
Congenital anomalies		6 (5.0)	6 (1.6)	3.3	1.0-10.0	0.03
NBU admission		23 (19.0)	66 (17.2)	1.1	0.67-1.9	0.64
Asphyxia		9 (7.4)	40 (10.4)	0.6	0.33-1.5	0.33
RDS		5 (4.1)	8 (2.1)	2.0	0.65-6.3	0.21
NNS		0 (0.0)	2 (0.5)			Na
Prematurity		9 (7.4)	12 (3.1)	2.5	1.0-6.1	0.03
Low birth weight		13 (10.7)	26 (6.8)	1.7	0.82-3.3	0.15
Macrosomia		4 (3.3)	12 (3.1)	1.1	0.34-3.3	0.92

4.4.3 Short (<24 Months) and Long (60+ Months) IPI

About 94.1% (160/170) women with an IPI <24 months and 95.0% (115/121) with a 60+ IPI had a live birth. With this group as a reference, the odds of having a stillbirth 0.93 times lower when IPI was short than long, even though not statistically significantly (p=0.93). A majority of women with a short IPI [85.9% (146/170)] and long IPI [86.8% (105/121)] bore babies of a normal (2500-4000 grams), but the odds of macrosomia 1.3 times higher when IPI was short than long, p=0.22. A short IPI lowered the risk of congenital anomalies significantly (p=0.01). However, after controlling for age, a short IPI lowered the odds of congenital anomalies [OR (95% CI) = 0.36 (0.12-1.07)] but not statistically significantly (p=0.067) (Table 10).

Table 10. Comparison of neonatal outcomes between short and long IPI after one previous CS

Outcome		IPI (Months) <24 (N=170)	IPI (Months) 60+ N=121)	OR	95% CI	P
Birth outcome	Still	8 (4.7)	6 (5.0)	0.9	0.32-2.8	0.93
	Live	160 (94.1)	115 (95.0)			Ref
	EPD	2 (1.2)	0 (0.0)			Na
Birth weight	<2500	22 (12.9)	12 (9.9)	1.3	0.62-2.8	0.46
	2500-4000	146 (85.9)	105 (86.8)			Ref
	>4000	2 (1.2)	4 (3.3)	0.3	0.0-2.0	0.22
Apgar scores	<7	25 (14.7)	12 (9.9)	1.2	0.9-1.51	0.22
	7-10	145 (85.3)	109 (90.1)			Ref
Congenital anomalies		1 (0.6)	6 (5.0)	0.1	0.0-0.96	0.01
				1.2		
NBU admission		38 (22.4)	23 (19.0)		0.69-2.2	0.48
Asphyxia		24 (14.1)	9 (7.4)	2.0	0.91-4.6	0.07
RDS		5 (2.9)	5 (4.1)	0.7	0.20- 2.5	0.58
NNS		1 (0.6)	0 (0.0)			Na
Prematurity		8 (4.7)	9 (7.4)	0.6	0.23-1.6	0.32
Low birth weight		7 (4.1)	13 (10.7)			Na
Macrosomia		2 (1.2)	4 (3.3)	0.3	0.06-1.9	0.38

4.5 Regression analysis

4.5.1 Short and Intermediate

Regression analysis shows no statistically significant relationship between having a short and intermediate IPI and occurrence of congenital anomalies [AOR (95% CI) = 0.363, p=0.351].

							95% CI for EXP(B)	
	B	S.E.	Wald	df	P	Exp(B)	Lower	Upper
Age	0.068	0.093	0.527	1	0.468	1.070	0.891	1.285
IPI	-1.013	1.085	0.872	1	0.351	0.363	0.043	3.047
Constant	4.385	3.089	2.015	1	0.156	80.22		

4.5.2 Long and Intermediate IPI

After controlling age, a long than intermediate IPI increased the Odds of congenital anomalies by 3.59 times [AOR (95% CI) = 3.59(1.07-12.07), p=0.039].

							95% CI for EXP(B)	
	B	S.E.	Wald	df	P	Exp(B)	Lower	Upper
Age	0.033	0.070	0.217	1	.641	1.033	0.901	1.185
IPI	1.280	0.618	4.282	1	.039	3.595	1.070	12.079
Constant	0.717	2.416	0.088	1	.767	2.048		

4.5.3 Short and Long IPI

Regression analysis shown no statistically significant relationship between having a short and long IPI and occurrence of congenital anomalies [AOR (95% CI) = 0.36(0.12-1.07, p=0.06].

							95% CI for EXP(B)	
	B	S.E.	Wald	df	P	Exp(B)	Lower	Upper
Age	-0.060	0.084	0.508	1	0.476	0.942	0.799	1.110
IPI	-1.011	0.551	3.365	1	0.067	0.364	0.124	1.072
Constant	7.788	2.759	7.969	1	0.005	2412.66		

CHAPTER FIVE

5 DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

5.1 Discussion

The study was done to determine the association between short, intermediate and long interpregnancy intervals (IPI)and maternal and neonatal outcomes following a repeat caesarian section delivery at Pumwani Maternity Hospital. The files of patients with a short (<24 months), intermediate (24 -59 months), and long (60 and above months) IPI were reviewed and the outcomes of mother and neonates in the three groups compared using statistical techniques. Overall, the demographic characteristics of women were comparable between IPI groups and replicated other studies. A majority of participants were age group 20-34 years, married, and had a primary level of education. As in the study by Casey et al. (44)in the USA, no significant difference between the reproductive outcomes of parturient such as the parity and ANC attendance was evident. Over 97% of participants with a short or long IPI attended ANC, which might have contributed to the reassuring reproductive outcomes reported in our study. Gemmil and Lindberg set out to investigate the prevalence and correlates of short interpregnancy intervals in the United States and reported contrary results with women age 15-19 years old being more likely to have a shorter IPI than elderly patients statistically significantly. Moreover, women with a shorter IPI after a previous delivery by a CS more likely to have a tertiary level of education.(45)

The study evaluated the occurrence of adverse maternal outcomes such as post-partum hemorrhage (PPH), pre-eclampsia, requirement for blood transfusion, and maternal mortality after a repeat caesarian section delivery. Eleven deaths were reported over the duration of the study, seven of which had intermediate IPI, two short, and two long IPIs. Occurrence of adverse maternal outcomes such as PPH and preeclampsia were also low and did not vary significantly across the three IPI groups. However in Tanzania, Mahande and Obure reporting a statistically significant relationship between short and long IPIs and an increased risk of adverse pregnancy outcomes (2)but unlike in this study where intermediate IPI was defined as an IPI 24-59 months long, Mahande and Obure had a definition of 24-36 months, which might have influenced the results. The longer IPI group was defined as 37-59 months, which was different as well.

The study also sought to determine whether having short, long, or intermediate IPI after a CS birth predisposes neonates to adverse outcomes during a subsequent CS birth at term. The neonatal outcomes were largely similar with the incidence of live births reported to be 94.1%, 95.1%, and 95.0% among women with short, intermediate, and long IPI. Birth weight were within the normal

range while the need for NBU admission and occurrence of asphyxia and respiratory distress were minimal and similar across the IPI groups. However, the incidence of congenital anomalies was found to be higher when IPI was long versus intermediate and short, after controlling confounders. This was statistically significant. A case control study by Kwon et al (47) found similar results in 2012, with women with an IPI ≥60 months having a significantly higher risk of delivering an infant with a birth defect than when IPI was 8-23 months or less than six months. As such, even though maternal and neonatal outcomes following a repeat caesarian section at term is comparable for mothers with a short, long and intermediate IPI, congenital anomalies were found to have higher odds in neonates born at term following a repeat caesarean delivery.

5.2 Conclusion

- Maternal outcomes are comparable across short, intermediate and long interpregnancy intervals after a repeat caesarean section at term

- Neonatal outcomes are comparable across short, intermediate and long interpregnancy interval following a repeat caesarean section at term. However, there is a higher odds of congenital malformations following a long interpregnancy interval

5.3 Recommendations

- Women who are undergoing a repeat caesarean section at term due to one previous caesarean section have comparable maternal outcomes.

- Long interpregnancy interval was associated with congenital anomalies and that is an area that requires further research.

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APPENDICES

Appendix 1: Information Sheet

COMPARISON OF INTER-PREGNANCY INTERVAL AFTER ONE PREVIOUS CAESAREAN SECTION AND MATERNAL AND NEONATAL OUTCOMES AT PUMWANI COUNTY HOSPITAL OVER A 5-YEAR PERIOD (2013-2017)

PARTICIPANT INFORMATION SHEET

Hospital: PUMWANI HOSPITAL Study Number……

PART 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS

1. Age in years…….

2. Marital Status
☐Married
☐Single
☐Divorced
☐Widowed

3. Education Level:
☐None
☐Primary
☐Secondary
☐College

4. Parity:
☐Primigravida
☐1-3
☐4 and above

PART 2: OBSTETRIC HISTORY OF WOMEN

5. Type of past cesarean section:
☐Elective
☐Emergency

6. Interpregnancy Interval (IPI) in months …… ☐<24months
☐>24months

7. ANC visits
☐Yes
☐No

IF YES:

(a) Number of ANC visits
☐Less than 4
☐Four or more

(b) Gestation at first ANC visit:
☐First trimester
☐After first trimester

8. Gestation at birth (weeks): …… ☐Preterm
☐Term

9. Duration of admission (days): …….

PART 3: MATERNAL OUTCOMES

10. Patient had adverse outcomes: ☐Yes
☐No

IF YES:

(a) Uterine rupture ☐Yes
☐No

(b) PPH ☐Yes
☐No

(c) Blood Transfusion: ☐Yes
☐No

(d) Preeclampsia: ☐Yes
☐No

(e) Postpartum pain: ☐Yes
☐No

d) Abruption of placenta: ☐Yes
☐No

PART 5: NONATAL OUTCOMES

Outcome of pregnancy: ☐Stillbirth
☐Baby Alive

Neonate has adverse outcomes: ☐Yes
☐No

COMOBIDITIES:

(a) Asphyxia: ☐Yes
☐No

(b) RDS: ☐Yes
☐No

(c) NEC: ☐Yes
☐No

(d) NNS: ☐Yes
☐No

(e) NNY: ☐Yes
☐No

Other comorbidity (specify.....…….....