MATERNAL AND PERINATAL OUTCOMES AMONG WOMEN WITH SHORT INTER–PREGNANCY INTERVAL DELIVERED AT MUHIMBILI NATIONAL HOSPITAL, TANZANIA

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By

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A Dissertation Submitted in (Partial) Fulfillment of the Requirement for the Degree of Master of Medicine in Obstetrics and Gynaecology of the

Muhimbili University of Health and Allied Sciences
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CERTIFICATION

The undersigned certify that he has read and here by recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled ***"Maternal and perinatal outcomes among women with short inter – pregnancy interval delivered at Muhimbili National Hospital, Tanzania"*** in (partial) fulfillment of the requirements for the degree of Master of Medicine (Obstetrics and Gynaecology) of Muhimbili University of Health and Allied Sciences**.**

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Dr. Ali Said

Supervisor

_____

Date

DECLARATION AND COPYRIGHT

I, **Lobikieki Mathias Kissambu,** declare that this **dissertation** is my own original work and has not been presented and will not be presented to any other university for similar or any other degree award.

Signature……..…….. Date …….…….

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DEDICATION

I dedicate this thesis to my parents, Mr. and Mrs. Mathias Ole Kissambu for their plenty support and prayers throughout my studies.

ABSTRACT

Background: Pregnancy exposes a woman to physiological changes and increased demand to ensure adequate nutritional and oxygen supply to the growing fetus. Women should have an optimal time to recover from physiological stress of the preceding pregnancy and lactation before they conceive again. With regard to birth spacing, the Tanzanian standard antenatal clinic card (RCH4) indicates only an IPI of more than 10 years as a high risk pregnancy and does not consider short IPI as a high risk pregnancy despite having adverse pregnancy outcomes. Categorizing women with non-optimal IPI as high risk group is an important step to improve awareness of adherence to standard birth spacing.

Objective: To compare maternal and perinatal outcomes of short inter-pregnancy interval and normal inter pregnancy interval among women delivered at Muhimbili National Hospital (MNH) Tanzania.

Methods: This was a hospital based prospective cohort study conducted at MNH from July to December 2016. Parturient women aged 20 to 34 years with singleton pregnancy at ≥28 weeks of gestation and immediate preceding live birth, admitted in MNH labour ward were included in the study whereby 420 women and their newborns completed seven days postpartum follow up. Exposed group were 140 women and un-exposed group were 280 women. Non probability convenience sampling method was used to recruit study participants whereby each exposed woman who met the inclusion criteria was matched for age with two eligible unexposed women from the study population who met the inclusion criteria during study duration and delivered next to the exposed candidate. Structured questionnaire was used to collect information. Data analysis was done using SPSS software (IBM SPSS Statistics version 20.0) Results were summarized in form of proportions for categorical variables and in forms of mean and standard deviation for continuous variables. Chi square test was used to compare significance of association for categorical variables with a cut-off P value of less than 0.05; Binary logistic regression models were used to estimate the relative risk (RR) at 95%

confidence interval for maternal and perinatal adverse outcomes across the two matched groups.

Results: Compared with normal IPI, women with short IPI were at higher risk of having PPROM (RR 3; 95% CI 1.90-4.718), PROM (RR 2.58; CI 95% 1.578-4.229), preterm labour (RR 1.44; 95% CI 1.055-1.983) and HDP (RR 2.44; 95% CI 1.356-4.405). Newborns from women with short IPI were at increased risk of low birth weight (RR 2.74; 95% CI 1.986-3.778), prematurity (RR 2.82; 95% CI 1.974-4.029), low APGAR score at 5^{th} minute (RR 1.78; 95% CI 1.280, 2.478) and perinatal deaths (RR 2.54; 95% CI 1.187-5.460).

Conclusion: The findings suggest that, IPI less than 18 months was associated with poor maternal and perinatal outcomes compared with IPI 18 to 35 months.

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ABBREVIATIONS

HDP	Hypertensive Disorders of Pregnancy
HTSP	Healthy Timing and Spacing of Pregnancy
IPI	Inter-Pregnancy Interval
MAP	Mean Arterial Blood Pressure
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Sciences
NICU	Neonatal Intensive Care Unit
PPH	Postpartum Hemorrhage
PPROM	Preterm Pre-labour Rupture of Membranes
PROM	Pre-labour Rupture of Membranes
RCH	Reproductive and Child Health
SPSS	Statistical Package for Social Sciences
USAID	United States Agency for International Development
VBAC	Vaginal Birth after Caesarean Section

OPERATIONAL DEFINITION OF TERMS

Inter-pregnancy interval (Birth-to-pregnancy interval): Is the period from delivery of the previous infant to conception of the current pregnancy calculated from the first date of the last normal menstrual period.

Short inter-pregnancy interval: Is the period less than 18 months from delivery of the previous infant to conception of the current pregnancy calculated from the first date of the last normal menstrual period.

Normal inter-pregnancy interval: Is the period between 18 to 35 months from delivery of the previous infant to conception of the current pregnancy calculated from the first date of the last normal menstrual period.

Long inter-pregnancy interval: Is the period longer than 35 months from delivery of the previous infant to conception of the current pregnancy calculated from the first date of the last normal menstrual period.

Adverse maternal outcomes: Occurrence of any of the following; anemia in pregnancy, early rupture of membranes, spontaneous preterm labour, hypertensive disorders of pregnancy, obstructed labour, Caesarean section delivery and postpartum hemorrhage.

Adverse perinatal outcomes: Occurrence of any of the following; Low birth weight, prematurity, low APGAR scores, stillbirth, NICU admission and early neonatal death.

APGAR score: Is a numerical expression of an infant's condition determined at 60 seconds (1 minute) and at 5 minutes after birth based on heart rate, respiratory effort, muscle tone, reflex irritability and color. At 1st minute, the score of 7 or more out of 10 indicates that the baby is in good condition whereas the score below 7(Low APGAR score) indicates the baby is in poor to bad outcome condition.

Anemia in pregnancy: Defined as hemoglobin levels below 11g/dl in a pregnant woman.

Perinatal Mortality: The sum of fetal deaths including stillbirths (≥28 weeks of gestation) and neonatal deaths occurring between birth and the seventh day of life outside the uterus.

Early neonatal death: Death of a newborn during the first week of life.

Postpartum Hemorrhage: Is the amount of uterine or genital tract bleeding following delivery of a baby up to six weeks postpartum estimated as more than 500mls and more than 1000mls for vaginal and caesarean section delivery respectively.

Premature Rupture of Membranes: Is the spontaneous rupture of membranes evidenced by escape of amniotic fluid through the vaginal canal any time beyond 28 weeks of gestation but before onset of labour.

Preterm labour: Is the onset of labour occurring before 37 completed weeks of gestation.

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1. INTRODUCTION AND LITERATURE REVIEW

1.1 INTRODUCTION

Inter-pregnancy interval (IPI) is defined as the period from delivery of the previous infant to conception of the current pregnancy calculated from the first date of the last normal menstrual period.[1]

Pregnancy exposes a woman to physiological changes that lead to increased demand to sustain adequate supply of oxygen and nutrient to the growing fetus. This results to subnormal maternal nutrients storage capacity. Mothers with short interval between pregnancies are deprived of sufficient time to replenish nutrients that have been consumed during the previous pregnancy resulting in a poor nutrition status and risk for developing adverse pregnancy outcome. IPIs shorter than 18 months and longer than 35 months are significantly associated with increased risk of adverse maternal and perinatal outcomes.[2] There is robust evidence from many studies including meta-analysis that after full term or pre-term delivery, IPIs of less than 18 months and more than 5 years are associated with increased risk of poor perinatal and maternal outcomes.[3,4]

The actual pathophysiology of adverse pregnancy outcomes due to short IPI has not yet been established and it has been widely debated [5–7] However, possible explanations are “Maternal depletion syndrome” which proposes that close succession of pregnancies preclude maternal body adjustment to physiological stresses of the previous pregnancy and subsequent lactation which may or may not be evidenced clinically.[8,9] Another theory is the mechanism explained for long IPI termed as “Physiological regression hypothesis” that, there is a gradual loss of the physiological adaptation from the previous pregnancy whereby the mother returns to state of “primigravida”[10,11] Together, these hypotheses imply the importance of optimal IPI for the body’s physiological recovery time that should not be exceeded to devoid the physiological adaptations. The alternative view is that IPI has been challenging due to variation in birth outcomes that might be explained by risk factors that vary greatly between women but tend to persist between pregnancies such as genetic predisposition, lifestyle or social factors.[12,13]

Birth spacing has become one of the important health promotion strategies for mothers and children in the recent decades in developing countries through various family planning methods. The relation between IPI and perinatal health is receiving increasing attention to sustain better maternal and child health. Worldwide, more than 76milion perinatal deaths occur annually, of which 98% occur in developing countries.[14] Short IPI is associated with increased risk of maternal adverse pregnancy outcomes including anemia, preterm labor, premature rupture of membranes, preeclampsia, postpartum hemorrhage, uterine rupture in VBAC whereas the major adverse perinatal and neonatal outcomes include prematurity and low birth weight, low APGAR score, still birth, congenital malformations, increased length of hospital stay, stillbirths and neonatal mortality which can secondarily result from adverse maternal outcomes.[12,15–18]

Women frequently want to know when is the ideal time at which they can conceive after previous delivery by caesarean section or when they had poor outcome in the previous pregnancy such as stillbirth or neonatal death. According to WHO technical consultation report on birth spacing and USAID, the key healthy timing and spacing of pregnancy basis recommends that; firstly, after a live birth, the interval before attempting the next pregnancy should be at least 24 months (this is equivalent to a 33 month birth-to-birth interval);secondly, after a spontaneous or induced abortion, the minimum interval to next pregnancy should be at least six months and thirdly, to delay first pregnancy until at least 18 years of age.[1,18]

Family planning plays a big role to control unwanted pregnancies and maintain a good postpartum period until the body has replenished the physiological state. Perhaps if some of these unwanted pregnancies were avoided by maintaining an optimal IPI, adverse pregnancy outcomes could have been avoided as well. To avoid short IPI, health care providers have emphasized the importance of providing information and access to family planning services during the postpartum period.[18,19]

1.2 LITERATURE REVIEW

Short inter pregnancy interval remains a strong predictor of the risk of adverse birth outcomes regardless the cause. Worldwide, the prevalence differs according to different populations. The association between short IPI and adverse birth outcomes is strong and consistent widely irrespective of whether the risk of adverse birth outcomes is increased by short IPI or by the maternal factors correlated with short IPI.[19,20]

In rural Bangladesh, the risk of having a short IPI increases by 11% with each additional year of age. Women with Parity of four or more were associated with 72% decrease in the odds of a short IPI compared to a parity of one at the start of the IPI. The likelihood of a short IPI decreased 5% for every year that a woman's first pregnancy was delayed. Women with secondary education or higher had a 26% increased likelihood of a short IPI compared with primary educated women.[21] Another study in Rufiji, Tanzania showed that among 15–49 years old women, one in every two inter-birth intervals is poorly spaced. The study population however had significant variations by socio-demographic and behavioral characteristics of mothers and newborns. Of the 15,373 inter-birth intervals, 48.4% were below the WHO recommended minimum length of 33 months between two live births. Women who were younger, had low education levels, had multiple births from the preceding pregnancy, non-health facility delivery of the preceding birth, in-migrant resident, multiparity and being married were more likely to be non-adhered to birth spacing WHO standards.[22]

The typical profile of a woman at risk for short IPI is the one with history of irregular menstruation or spontaneous or induced abortion or with a history of early neonatal death or fetal death.[4,15] Owonikoko et al in their study at a tertiary health institution in south-west Nigeria found that, pregnant women with at least one previous delivery attending antenatal clinic had the mean (±standard deviation) age 27.4±0.6 and the majority (76%) were multiparous.

Vaginal delivery (91%) and live birth (86.9%) were reported in the last pregnancy.[23] Prenatal care affects subsequent health behaviors including use of well child care and breastfeeding. Such behavioral changes may improve maternal postpartum health and confer an array of long term protective effects. This was evidenced by a study in New Jersey that asked on whether prenatal care affects optimal subsequent birth spacing.[24]

According to the 2015-16 Tanzania Demographic and Health Survey and Malaria Indicator Survey, the contraceptive prevalence rate (CPR) among currently married women is 38%. The unmet need for family planning among married women has declined slightly over time, from 28% in 1991-92 to 22% in 2015-16[25] In a hospital-based study conducted in Dar es salaam, Tanzania[26] It was found that, Modern family planning does not promote adherence to timing and spacing of pregnancy among women seeking antenatal services at Muhimbili National Hospital and Past obstetric experience was key to women's decisions on spacing.

Anemia in relation to short IPI can be explained by maternal depletion in both macro- and micronutrients for the subsequent pregnancy. During pregnancy, there is a decreased maternal serum and erythrocyte concentration of folate from the fifth month of gestation onwards and remain low for a long time after delivery. Therefore, women who become pregnant before complete replenishment of folate have higher risk of iron and folate deficiency at the time of subsequent conception and during pregnancy.[5,8,9]

The time to recover from the inflammatory changes from the previous pregnancy has been posed as a mechanism to explain poor maternal and infant outcomes, specifically early rupture of membranes and subsequent preterm labour.[4,27] Getahun et al., found that the risk of recurrent PPROM was elevated in women (especially African-Americans) with IPI of less than18 months.[28] The Latin America and the Caribbean multi-Country retrospective cross sectional study, found an increased risk of PROM with both short and long IPI where the risk was more significant with very short (<6months) IPI.[6] Another study in Missouri revealed that when controlling for potential confounders, patients with short IPI had a 20.3 fold higher odds of experiencing PPROM in a subsequent pregnancy.[16]

Rodrigues et al found an increased risk of early (<34 weeks) preterm labour and there was no evidence of late (<37 weeks) preterm birth in women with short IPI. It was found that, short IPIs occurred in 22.0% of early preterm, 5.3% of late preterm and 6.7% of term deliveries. They reported a strong crude association between short IPI and early preterm delivery. No such association was found for late preterm delivery. A short IPI significantly increased the risk of early spontaneous preterm labour. Same findings were observed for early preterm premature rupture of membranes.[29] In Scotland, Smith et al found that short IPI (< 6 months) was an independent risk factor for extremely preterm delivery and moderately preterm delivery.[30] Data from a 1995–2007 birth cohort in Louisiana showed that births from short IPI pregnancies are at 15% increased risk of being preterm.[31] Other studies have reported significant higher rates of spontaneous preterm delivery in women with short IPI across various settings including higher to the lower income regions.[3,12]

The cardiovascular adaptation from a first pregnancy has been hypothesized to have ongoing benefits contributing to lowered risk of HDP in the second pregnancy particularly gestational hypertension and preeclampsia. Analysis of data on the effect of IPI on mean arterial blood pressure (MAP) in consecutive pregnancies was concluded that, MAP falls by 2mmHg for a very short IPI. This difference decreases as the IPI increases and disappears from IPI above 2years however, the lower MAP in second pregnancy is shortly persistent.[32] The decrease in MAP between two consecutive pregnancies is negatively correlated with length of IPI.[33]The decline of blood pressure in the second pregnancy can also be explained by the contribution of biological memory of the cardiovascular system.[34] Recent data associates this phenomena with a decreased levels of anti-angiogenic factors.[32] The risk of preeclampsia/eclampsia in parous women with short IPI was approximately half of that in nulliparous women but it returns to the level of nulliparous women after an IPI six years.[6,35] Both IPI shorter than 12 months and longer than 72 months are associated with preeclampsia, there was no significant association between IPI and eclampsia.[36] In a systematic review of six observational studies involving approximately one million pregnancies, most studies reported an increased risk with increased IPI suggesting a dose-response relationship. The risk of preeclampsia increased by at least

10% for each one year increase in IPI since last delivery and after 5-10 years the risk approaches that of nulliparous women.[4]

Short IPI with concurrent maternal depletion status interferes with normal process of endometrial blood vessels remodeling following delivery resulting to increased risk of postpartum hemorrhage.[6] One study in India showed that, the risk of postpartum hemorrhage (PPH) is high in women who conceived after 24 months and least in 13 – 18 months and 19 – 24 months group.[37] These findings were similar to the study by Conde-Agudelo et al. which also showed no significant association between incidence of PPH and short IPI.[4] Another maternal hemorrhage which was reported to be associated with short IPI were uterine rupture in women attempting a vaginal birth after previous caesarean delivery (VBAC) and abruptio placenta.[4,38]

The relationship between IPI and adverse birth outcomes in three different populations using different study designs in Utah and Michigan states, it was concluded that; after controlling for maternal risk factors, IPI departing from 18-23 months in any direction (short or long IPI) demonstrated a J-shaped relationship between IPI and adverse perinatal outcomes.[7] In Perth, Australia; the matched design showed that there was weaker effect of short IPI on preterm birth and low birth weight in contrary to other studies. However, pregnancies that followed a short IPI had a relatively higher incidence of low birth weight and preterm birth in the unmatched model.[12] A meta-analysis on 67 relevant studies concluded that; infants born to women with IPI less than 6months had 77% odds for preterm birth and twice the risk for low birth weight compared with infants born to women with IPI 18 – 23 months. Women with IPI 6 – 17 months were 8% to 23% more likely to give birth to infants with those adverse outcomes.[4]

Low APGAR score is among adverse perinatal outcome resulting from short birth intervals. The theory behind this can rely on the fact that the fetus may not have good reserves due to maternal nutritional depletion thus becomes easily asphyxiated with rigorous labour. A study by Geidam et al. in Nigeria revealed that short IPI was significantly associated with lower 5th

minute APGAR score.[39] In one analysis from the Alberta, it was found that, apart from significant association of both short and long IPI with low birth weight and preterm birth long IPI was associated with low APGAR score at 1st minute, low arterial blood gases, need for resuscitation, NICU admission and perinatal death while short IPI had limited association to NICU admission and perinatal deaths in both crude and AORs.[40] One retrospective cohort study of primiparous women in US showed that short IPI was associated with adverse perinatal outcomes including low APGAR score at 5th minute and neonatal admissions to NICU.[41]

In a review of data from 52 demographic and health surveys in developing countries (Tanzania inclusive), the risk of mortality by preceding birth to pregnancy interval is U shaped with the lowest point at reference group (36 – 47 months). All interval groups of less than 24 and above 47 months were found to have adjusted relative risks (ARR) that were significantly higher than that of the reference group. The IPIs above the reference group have risks that are 20% - 79% higher.[42] In Morogoro, Tanzania using longitudinal health and demographic data collected from Ifakara Health and Demographic Surveillance System (HDSS); short IPI (<33 months) was associated with increased risk of neonatal mortality compared with long IPI of 33 months or more.[43] Da Vanzo et al. in Matlab, found that, the relative odds of stillbirth after an IPI less than 6months following a live birth were1.61fold in the preceding pregnancy compared with women with IPI 27 to 50 months when other covariates are controlled.[44] One Swedish nationwide study showed that, short IPI appear not to be causally associated with increased risk of stillbirth and early neonatal death, whereas long IPI were associated with increased risk of stillbirth and possibly early neonatal death.[45]

2. HYPOTHETICAL FRAME WORK

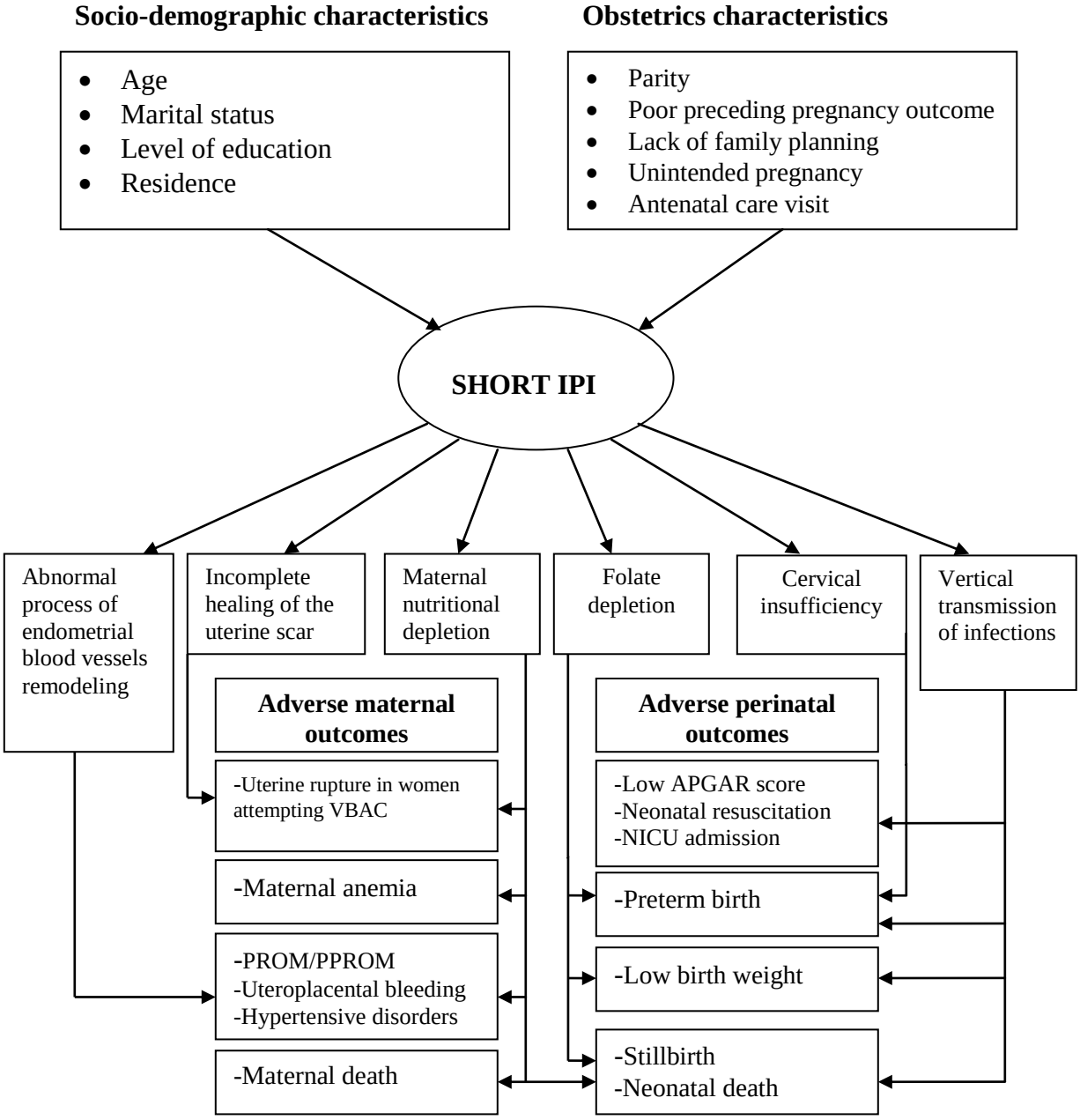


Figure: 1. Hypothetical causal mechanisms proposed for the association between short IPI and the increased risk of adverse maternal and perinatal outcomes. Adopted from Conde-Agudelo et al.[4]

3. PROBLEM STATEMENT

Short IPI has been considered as a risk factor for poor pregnancy outcome due to inadequate time to resume the normal body's physiological functions. Poor birth spacing, increased number of child bearing at old age or delayed first parity and poor preceding pregnancy outcome has led to mistimed and un-intended pregnancies and subsequent short IPI. Defining short and long inter pregnancy interval as a high risk pregnancy needs to be addressed clearly as they carry major impact in promoting health of mothers and babies. The Tanzanian standard antenatal care card (RCH4) indicates only long IPI of more than 10years as a high risk pregnancy and does not consider short IPI as a risk pregnancy despite having adverse pregnancy outcomes.

4. RATIONALE OF THE STUDY

This study will enhance establishment of protocol for early identification of women who are at risk of short IPI and improve awareness and adherence to family planning and subsequent optimal birth spacing.

To improve ANC by including year of last delivery in the RCH4 card so as to pinpoint women with short IPI as high risk and counseling them on potential adverse pregnancy outcomes and thus, preventing them during pregnancy, delivery and postnatal periods.

5. RESEARCH QUESTION AND HYPOTHESIS

5.1 Research question

What is the difference in pregnancy outcomes between women with short IPI and women with normal IPI at MNH?

5.2 Null Hypothesis

There is no difference in pregnancy outcomes between women with short IPI and those with normal IPI at MNH from July to December 2016.

6. RESEARCH OBJECTIVES

6.1 Broad objective

To compare maternal and perinatal outcomes among women with short IPI and normal IPI delivered at MNH, Tanzania.

6.2 Specific objectives:

6.2.1 To determine maternal socio-demographic and obstetric factors associated with short IPI.

6.2.2 To compare maternal outcomes among women with short IPI to those with normal IPI delivered at MNH labour ward in terms of presence or absence of PROM, PPROM, preterm labor, hypertensive disorders of pregnancy, mode of delivery and postpartum haemorrhage from July to December 2016.

6.2.3 To compare perinatal outcomes among new-borns of women with short IPI and normal IPI delivered at MNH labour ward in terms of APGAR scores at first and fifth minute of delivery, birth weight, presence or absence of prematurity, admission to NICU and perinatal death from July to December 2016.

7. METHODOLOGY

7.1 Study design

This was a prospective cohort study involving 420 parturient women at ≥ 28 weeks of gestation where 140 women with short IPI were matched and compared with 280 women with normal IPI for maternal and perinatal outcomes at MNH, July to December 2016.

7.2 Study area

The study was conducted at MNH maternity block – labour ward and neonatal ward (NICU) from July to December 2016. MNH is the largest referral and teaching hospital for Muhimbili University of Health and Allied Sciences (MUHAS) located in Dar es Salaam Tanzania. The Department of Obstetrics and Gynaecology is one among the six departments of the directorate of surgical services. The department takes care of both inpatients (admitted) and outpatients (attending clinics). Obstetric unit receives referrals from Dar es Salaam's regional hospitals (Amana, Temeke and Mwananyamala), Coast region (Tumbi, Mkuranga and Bagamoyo) and occasionally patients from other regions. Deliveries per day range from 20 to 40 (Average 900 deliveries per month). Health care providers in the maternity unit include consultants, specialists, residents, registrars, intern doctors, nurse officers and nurse midwives. The labour ward has four rooms with a minimum of 17 delivery beds where pregnant women above 28 weeks of gestation who are in labour are admitted for delivery. On admission the nurse midwife is the first to see the patient and records patient particulars in the partogram including a brief history, antenatal record, past obstetric history, any risks identified and vital signs. Initial obstetric examination is then done by resident doctor or registrar on call including pelvic examination and decision on the route of delivery is made instantly. For women whom spontaneously vaginal delivery is anticipated, routine monitoring of labour continues in accordance with the partogram. For women who are in active phase of labour fetal heart rates are recorded every 30minutes together with maternal contractions. Cervical dilatation and fetal descent are assessed by vaginal examination after every 4 hours. Labour is monitored continuously until the woman delivers. Intervention can be done depending on the trend of labour during monitoring where labour can be augmented, assisted vaginal delivery or

emergency caesarean section can be done when indicated. Women who deliver by spontaneous vertex or uncomplicated breech are observed in labour ward for 2hours before being transferred to the postnatal ward for observation and discharged home after 24hours. Those who had complications during labour or delivered by caesarean section are transferred to the postnatal ward for further management and/or post-operative care, whereas preeclampsia or eclampsia and critically sick are admitted to preeclampsia ward or obstetrics ICU respectively. These patients are treated according to the standard protocol and monitored until they are stable to be transferred to general wards or when delivery is needed, progress of labour is monitored and delivery is conducted within the preeclampsia ward same as in labour ward.

The neonatal ward is within the maternity block because it has essential obstetrics role as it cares for premature and sick neonates as well as neonates who are born by caesarean section or very sick mothers until their mothers have recovered from anaesthesia or have become stabilized for nursing mother care.

Delivered women with antepartum, intrapartum or postpartum complications are followed up through their respective post-natal clinics as outpatients throughout the puerperal period.

7.3 Study population

Parous women with short and normal IPI at gestational age ≥28 weeks calculated from the first date of the LNMP, admitted at MNH labour ward during the study period in the first stage of labour.

Exposed group was those with IPI less than 18 months (short IPI) whereas unexposed group was those with IPI 18 to 35 months (normal IPI).

7.4 Inclusion criteria

7.4.1 Parous women with singleton pregnancy at ≥28 weeks of gestation admitted in MNH labour ward and delivered during the study period.

7.4.2 Women whose immediate preceding pregnancy was live birth.

7.5 **Exclusion criteria**

7.5.1 Age < 20 and > 34 years. Both adolescent and advanced maternal ages are high risk pregnancies therefore potential for adverse outcomes.

7.5.2 Women admitted with other chronic diseases including Sickle cell disease, Diabetes mellitus, cardiac diseases, mentally disabled and advanced AIDS.

7.5.3 Women who were too sick to voluntarily consent and women who refused to participate in the study.

7.6 Study duration

Data were collected for six months, from July to December 2016.

7.7 Sample size

The study aims at detecting the difference in outcomes among the two groups identified. According to Khoshnood et al. 1998[46] the proportion of women with short IPI expected to develop adverse outcome were 20% higher than the controls at 95% confidence level. After obtaining the standardized difference, The Kirkwood and Sterne formula[47] for two group comparative studies was used to estimate the sample size.

$$n = \frac{(Z_\alpha + Z_\beta)^2 \times P(1-P)}{(P_0 - P_1)^2}$$

Where;

n = Minimum required sample size

Z_α= Level of significance α set at 0.05 for 95% confidence level corresponding to Z_α 1.96

Z_β = Power of this study was 90% therefore, from the statistical table Z_β was = 1.28

P_0 = Proportion of exposed group expected to develop adverse outcomes. In this study it was considered to be 50%.

Since the study aimed at detecting the difference in proportion of women expected to develop adverse outcomes among the two groups identified.

P_1 = Proportion of unexposed group expected to develop adverse outcomes. The difference in the outcomes between the two groups was considered to be 20% then P_1 was 30%.

The mean proportion (P) was therefore;

$$P = \frac{[(P_0 + P_1)]}{2} = \frac{(0.5 + 0.3)}{2} = 0.4$$

The sample size was adjusted for non-response or lost follow up by assuming the non-response rate to be 10%

$$N = \frac{[(1.96 + 1.28)^2 \times 0.4(1 - 0.4)]}{(0.5 - 0.3)^2} \times \frac{100\%}{(100\% - 10\%)}$$

The estimated minimum sample size was 140 for each group.

Basing on 1:2 matching, the short IPI group was 140 and the normal IPI group was 280 summing to total minimum sample size (N) of 420.

7.8 Sampling technique

Non probability convenience sampling technique was used to select parturient women with short IPI upon admission to labour ward. Each exposed woman who met the inclusion criteria was then matched for age with two eligible unexposed women from the study population who met the inclusion criteria admitted to labour ward during study duration and delivered next to the exposed candidate.

7.9 Data collection procedure and follow up

Eligible recruited participants were given verbal consent and those who agreed to participate in the study were interviewed and followed up until they delivered whereby maternal and perinatal outcomes were recorded before and immediately after delivery. Further follow up was made from the time of delivery until seven days postpartum to detect maternal and early neonatal complication or death.

Follow up was made physically in postnatal and neonatal ward/NICU to women and their babies who were not discharged home within the first week of delivery. These women and their babies were tracked every day in their respective wards by the investigator until they were discharged or have completed seven days. Study participants who were discharged home before 7 days after delivery, follow up was conducted at the postnatal clinics on day seven for those who delivered by caesarean section and through mobile phone for those who had vaginal delivery.

Data was collected by principal investigator and three research assistants from labour ward (including the IPPM labour room) daily in the morning before 10am, afternoon before 2pm and evening before 8pm. The principal investigator reviewed the questionnaires for completeness every day at 8pm, correct any mistakes before the woman was discharged and make the follow up plan.

7.10 Data collection tool

Structured questionnaire was used to collect information from the participants. The questionnaires were made in English language and translated into Kiswahili. RCH4 card, referral notes and partogram supplemented other information of interest. Each questionnaire was given its unique identification number and each questionnaire consists of five parts. The first part inquired on Socio-demographic characteristics such as age, marital status, level of education and residence. The second part inquired about the index obstetrics characteristics like gravidity, parity, gestation age, pregnancy intention, number of ANC visits and complication detected during antenatal care. Third part inquired about Past obstetric history including duration from last delivery, outcome of preceding pregnancy and practice of family planning method. The fourth part recorded the following maternal outcomes of the current pregnancy; mode of delivery and indication for operative delivery, antenatal complications, anemia determined by last antenatal hemoglobin level <11 g/dl, hypertensive disorders of pregnancy, PROM or PPROM, preterm labour and postpartum hemorrhage. The last part recorded perinatal outcomes in terms of APGAR scores at 1^{st} and 5^{th} minutes, prematurity (based on Ballard's score), birth weight, admission to neonatal wards/NICU for more than 24hour, newborn condition at birth and occurrence of early neonatal death.

7.11 Training of Research assistants

Three research assistants (two nurse-midwives from labour ward and one medical student) were trained for one day. The aim was to know how to calculate IPIs and to make them aware of the protocol and conduct of the study. After training, assistants were able to; identify the study participants, apply the use of inclusion and exclusion criteria, consent the participants and administer questionnaires.

7.12 Data analysis

Data were cleaned and entered into statistical software. Analysis was done using SPSS software (IBM SPSS Statistics version 20.0) Results were summarized in form of proportions for categorical variables and in forms of mean and standard deviation for continuous variables.

Chi squared test was used to compare categorical variables whereby significance of association between short IPI and adverse maternal and perinatal outcomes was valid at P value less than 0.05; Binary logistic regression models and descriptive statistics analysis were used to estimate the relative risk (RR) and the 95% confidence interval for maternal and perinatal adverse outcomes across the two matched groups.

7.13 Ethical Issues

7.13.1 Ethical clearance and permission

Ethical clearance was obtained from the Senate Research and Publication Committee of the Muhimbili University of Health and Allied Sciences.

Permission to conduct the study was sought from the relevant authorities and the Executive Director of MNH.

7.13.2 Ethical consideration

The participants were assured that their decision to join the study was voluntary and medical care would not be affected by their participation or non-participation in this study.

Explanation about the study was taken together with informed verbal consent by the study participants before enrollment and their personal information were secured with confidentiality.

Participants who developed adverse pregnancy outcomes were managed accordingly with regard to available management protocols and counseling on optimal birth spacing was done to all participants.

All women participated in the study were offered an informed choice of family planning and counseled on optimal birth spacing.

8. RESULTS

This prospective cohort study compared two groups of women recruited in the study (short IPI and normal IPI) whereby 420 women and their newborns completed seven days postpartum follow up and included in the analysis. Short IPI group were 140 and normal IPI group were 280 participants. Follow up was made physically in the postnatal and neonatal wards to women and their babies who were not discharged home within the first week of delivery respectively and through phone and postnatal clinic for those who were discharged home before seven days **(figure 2).**

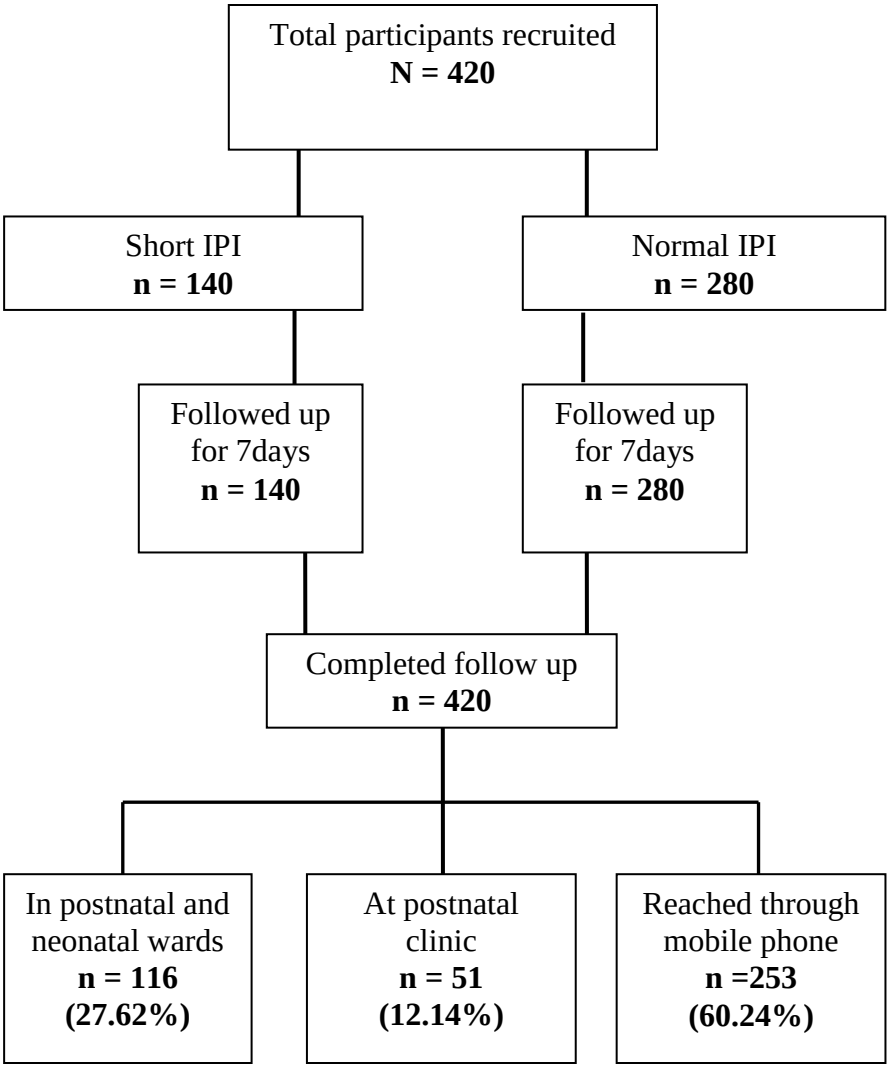
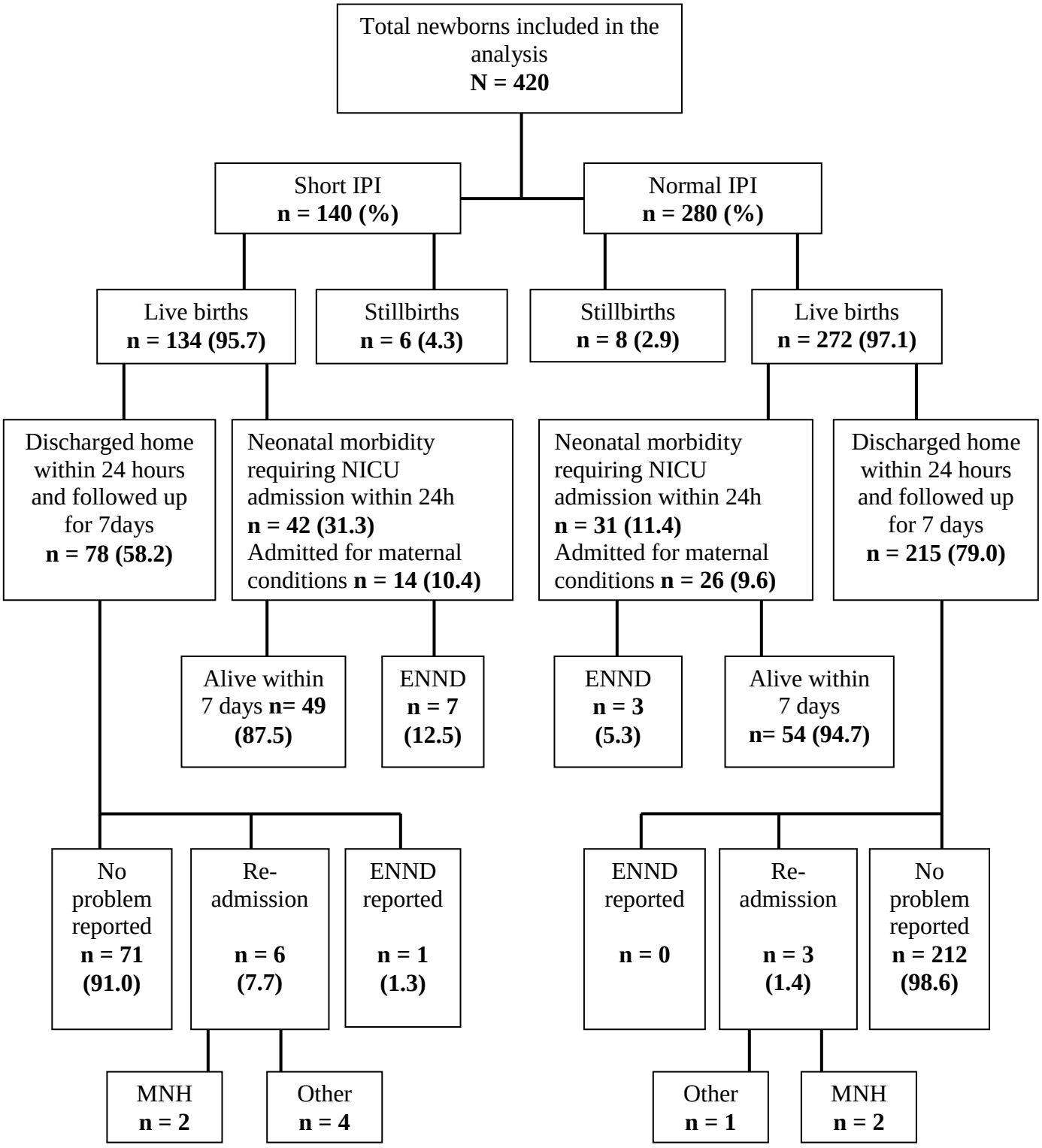


Figure: 2. Shows schematic flow of study participants recruited and followed up.

Figure3. Schematic distribution of perinatal outcomes among newborns of women with short IPI and normal IPI followed up for seven days postpartum.



Socio-demographic characteristics of the study participants

Table: 1. Socio-demographic characteristics among women with short IPI and normal IPI

Variable	overall value	Study groups		P value
		Short IPI (n=140) n(%)	Normal IPI (n=280) n(%)	
Age (years)				
Mean ± Standard deviation	29.07±4.021	29.09±4.063	29.06±4.007	
Age groups				
20-24	67(100)	22(32.8)	45(67.2)	0.715
25-29	142(100)	51(35.9)	91(64.1)	
30-34	211(100)	67(31.8)	144(68.2)	
Marital status				
Married	375(100)	123(32.8)	252(67.2)	0.503
Not married	45(100)	17(37.8)	28(62.2)	
Educational level				
Primary and secondary	297(100)	109(36.7)	188(63.3)	0.023*
College/University	123(100)	31(25.2)	92(74.8)	
Residence				
Urban	373(100)	121(32.4)	252(67.6)	0.274
Rural	47(100)	19(40.4)	28(59.6)	

*There was a significant effect in the levels of education to the IPIs across the two groups. Marital status other than married were all considered as not married. Rural residence was considered those women coming from the areas outside Dar es Salaam **(Table 1).**

Maternal obstetrics characteristics

Table: 2. Maternal obstetrics characteristics among women with Short IPI and Normal IPI

Variable	Inter pregnancy interval		P value
	Short IPI n (%)	Normal IPI n (%)	
Parity			
≤4	102(31.3)	224(68.7)	0.098
Above 4	38(40.4)	56(59.6)	
Number of ANC visit			
Less than 4 visits	39(30.7)	88(69.3)	0.453
4 or more visits	101(34.5)	192(65.5)	
Previous pregnancy outcome			
Alive baby	114(31.8)	245(68.2)	0.096
Neonatal/infant death	26(42.6)	35(57.4)	
Pregnancy intention			
Planned	92(29.0)	225(71.0)	0.001*
Unplanned	48(46.6)	55(53.4)	
Family planning practice after previous delivery			
Yes	60(24.8)	182(75.2)	<0.001*
No	80(44.9)	98(55.1)	

*Statistically significant at p-value <0.05

Majority of women with normal IPI who practiced family planning reported to have pregnancy intention whereas in the short IPI group, majority of women who did not practice family planning reported to have pregnancy intention **(Table2).**

Relative risks obtained from the cohorts as summarized in tables 3 and 4 below.

Table 3: Distribution of maternal outcomes among women with short IPI and normal IPI delivered at MNH.

Variable	Inter pregnancy interval		Relative risk	P value
	Short IPI n (%)	Normal IPI n (%)	95% CI	
PROM				
Present	31(22.1)	24(8.6)	2.58[1.578 – 4.229]	< 0.001
Absent	109(77.9)	256(91.4)	1.0	
PPROM				
Present	39(27.9)	26(9.3)	3.00[1.90 – 4.718]	< 0.001
Absent	101(72.1)	254(90.7)	1.0	
Preterm labor				
Present	47(33.6)	65(23.2)	1.44[1.055 – 1.983]	0.024
Absent	93(66.4)	215(76.8)	1.0	
HDP				
Present	22(15.7)	18(6.4)	2.44[1.356 – 4.405]	0.002
Absent	118(84.3)	262(93.6)	1.0	
Mode of delivery				
Caesarean section	57(40.7)	89(31.8)	1.14[0.983 – 1.331]	0.07
Vaginal delivery††	83(59.3)	191(68.2)	1.0	
Postpartum hemorrhage				
Present	11(7.9)	12(4.3)	1.29[0.870 – 1.925]	0.129
Absent	129(92.1)	268(95.7)	1.0	

††Vaginal delivery included spontaneous vertex delivery, assisted breech delivery and vacuum delivery.

Occurrence of PPROM and subsequent preterm labour was observed in the majority of women who had preterm labour in the short IPI group than the same co-morbidity in the normal IPI group **(Table 3).**

Table 4: Distribution of perinatal outcomes among newborns of women with short IPI and normal IPI delivered at MNH.

Variable	Inter pregnancy interval		Relative risk	P value
	Short IPI n (%)	Normal IPI n (%)	95% CI	
Birthweight (Grams)				
Less than 2500	63(45)	46(16.4)	2.74[1.986 – 3.778]	< 0.001
2500 and above	77(55)	234(83.6)	1.0	
Prematurity				
Present	55(39.3)	39(13.9)	2.82[1.974 – 4.029]	<0.001
Absent	85(60.7)	241(86.1)	1.0	
1st minute APGARscore†				
Less than 7	38(28.4)	28(10.3)	1.69[1.267 – 2.258]	< 0.001
7 and above	96(71.6)	244(89.7)	1.0	
5thminute APGARscore†				
Less than 7	33(24.6)	22(8.1)	1.781[1.280 – 2.478]	< 0.001
7 and above	101(75.4)	250(91.9)	1.0	
NICU admission†				
Yes	42(31.3)	31(11.4)	2.178[1.694 – 2.800]	<0.001
No	92(68.7)	241(88.6)	1.0	
Perinatal death				
Present	14(10)	11(3.9)	2.54[1.187 – 5.460]	0.013
Absent	126(90)	269(96.1)	1.0	

†Stillbirths excluded

The APGAR scores at first and fifth minute and admission to NICU were run in regression model for RR estimation and chi squared test after excluding the stillbirths.

Newborns who were admitted to NICU/Neonatal ward without any condition but due to maternal illness were followed up as normal babies and were not regarded as perinatal morbidity requiring NICU admission **(Table 4)**.

9. DISCUSSION

The overall mean age of study participants was 29.07±4.021 years. Half of the study population was aged 30 – 34 years. This implies that most women in this age group had primarily short IPI and the normal IPI women were matched to them. Delayed first pregnancy has shown to escalate short IPI in this age group. Level of education depicts significantly to influence the IPI. Increasing education status has shown to improve emphasis on birth spacing. There was no significant difference found in the parity among the two groups. Similar to our findings, in rural Bangladesh, the risk of having a short IPI increases by 11% with each additional year of age. Women with parity of four or more were associated with 72% decrease in the odds of a short IPI compared with a parity of one at the start of the IPI. In contrast, women with secondary education or higher had a 26% increased likelihood of a short IPI compared with primary educated women.[21] Similar observation was reported in Rufiji, Tanzania.[22] A community-based study in Nepal showed that multiparous women were found to have a short preceding IPI less than 24 months. High gender disparity has been explained as the associating factor and thus these women did not have full control of their own reproductive life.[48]

With regard to family planning and pregnancy intention, higher proportion of women with normal IPI who used family planning reported to have pregnancy intention whereas in the short IPI group, majority of women who did not use family planning reported to have pregnancy intention. In a small proportion, despite short IPI, pregnancy was reported to be intended. Previous adverse pregnancy outcome including infant loss predicts subsequent short IPI. A hospital based study in Dar es salaam found that, modern family planning did not promote adherence to timing and spacing of pregnancy among women seeking antenatal services at MNH and past obstetric experience was key to women's decisions on spacing.[26]

Women with short IPI had at least twice the risk of PROM and PPROM compared with women in the normal IPI group. Partial recovery from inflammatory effects of previous delivery has been postulated as the underlying reason. Various studies have shown similar effect of IPI on preterm rupture of membranes.[5,13] Conde-Agudelo et al in six Latin American

countries found an increased risk of PROM with both short and long IPI and the risk was more significant with very short (<6months) IPI.[6]

Consistent with previous studies, this study found a significant higher risk of spontaneous preterm delivery (<37 weeks) among women with short IPI than the reference group. The study did not find a significant difference in the onset of spontaneous preterm labour (early vs late) in women with short IPI. Most of spontaneous preterm labour (82%) in short IPI women was concurrent with PPROM whereas, only half of this proportion was observed in the normal IPI group. Rodrigues et al found an increased risk of early (<34 weeks) preterm labour and there was no evidence of late (<37 weeks) preterm birth in women with short IPI.[29] In Scotland, Smith et al found that short IPI (< 6 months) was an independent risk factor for extremely preterm delivery and moderately preterm delivery.[30] Other studies have reported significant higher rates of spontaneous preterm delivery in women with short IPI across various settings including higher to the lower income regions.[3,12,31] Despite these similar findings, many studies have concentrated more on effects of very short IPI (<6months) thus the potential of having poor outcome is more high compared to this study.

Regarding the spectrum of hypertensive disorders of pregnancy (HDP), we found that the risk of having HDP for women with short IPI was more than twice as high as the risk of HDP compared with normal IPI women. Other risk factors such as change paternity, black race, family history and recurrences of HDP may have led to findings against other settings studies however, prompt abnormal endometrial blood vessels remodeling following antecedent delivery may play the role in occurrence of HDP in women with very short IPI (<6 months).Consistently with this study, Mignini et al found that IPI <12 months is associated with preeclampsia.[36] Mikolajczyk et al found a decrease in the risk of HDP (mainly preeclampsia) in parous women due to fall in mean arterial blood pressure (MAP) for a very short IPI.[32] In a systematic review of six studies, Conde-Agudelo et al found that most studies suggested an increased risk of preeclampsia by ten percent for each one year increase in IPI.[5]

Short IPI women had more than twice as likely as those with normal IPI to have delivered a premature and/or low birth weight baby. The higher risk in short IPI group can be explained by the increased adverse pregnancy outcome on maternal side which was observed earlier. Maternal depletion syndrome has been explained as the associated risk of premature and low birth weight babies. In Australia, Ball et al found a weaker effect of short IPI on preterm birth and low birth weight in the matched design in contrary to other studies. However, with the unmatched model, pregnancies that followed a short IPI had a relatively higher incidence of low birth weight and preterm birth.[12] A meta-analysis on birth spacing and risk of adverse perinatal outcomes on 67 relevant studies reviewed by Conde – Agudelo et al. concluded that, infants born to women with IPI less than 6months had higher odds of preterm birth and low birth weight compared with infants born to women with IPI 18 – 23 months. Even after ORs adjustment, the pooled AORs were lower than the unadjusted but the associations remained statistically significant.[5]

Another finding was that, after excluding the stillbirths, one-third of babies had low APGAR score (LAS) less than 7 at fifth minute of birth in women with short IPI. This was three times more than the proportion of babies with LAS in mothers with normal IPI. LAS at first and fifth minute shows similar trend across the two groups. The proportions of newborns admitted to NICU within 24 hours of birth and those who were readmitted after being discharged were higher in short IPI than in normal IPI group. These findings were consistent with a hospital based study in Nigeria which revealed that short IPI was significantly associated with lower APGAR score at fifth minute.[39] Another study in US showed that short IPI was associated with adverse perinatal outcomes including low APGAR score at fifth minute and neonatal admissions to NICU.[41]

The risk of perinatal deaths in newborn of women with short IPI was twice as high as the risk of perinatal deaths in newborns of normal IPI women. These were contributed by higher proportions of adverse maternal and subsequent perinatal complications with short IPI. Complications of prematurity and very low birth increased the likelihood of perinatal deaths. Still births accounted for nearly half of perinatal deaths in short IPI women. Similarly, results

from large demographic and health surveys (DHSs) data from 52 countries between 2000 – 2005 (Tanzania inclusive), Rutstein et al showed that the risk of mortality by preceding birth to pregnancy interval is U-shaped with the lowest point at reference group (36 – 47 months). All interval groups outside the period of 24 – 47 months were found to have adjusted relative risks (ARR) that are significantly higher than that of the reference group.[42] Da Vanzo et al study in Bangladesh found that, the relative odds of stillbirth after an IPI less than six months following a live birth were higher compared with IPI 27 to 50 months when other covariates are controlled.[44]

10. STUDY LIMITATIONS

Some women were not able to remember their first date of LNMP and lack of at least one early trimester obstetric ultrasound which resulted to difficulty calculating the IPI.

Complications from previous delivery specifically reasons for Caesarean delivery and causes of neonatal death were difficult to obtain from some of women thus made it difficult to establish other potential risks for poor pregnancy outcomes.

11. CONCLUSION

The findings from this study suggest that, IPI less than 18 months was associated with poor maternal and perinatal outcomes compared with IPI of 18 to 35 months.

12. RECOMMENDATIONS

Improving ANC by including year of last delivery in the RCH4 card and address women with short IPI as high risk and inform them on potential adverse pregnancy outcomes and thus, preventing them during pregnancy, delivery and postnatal periods.
Health care providers should encourage women through preconception counseling to enable them make informed decisions about their reproductive choices as to the timing of subsequent pregnancies through the use of an effective family planning methods to minimize the potential of unplanned and/or closely spaced pregnancies.

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14. APPENDICES

APPENDIX I: Informed consent – English version

Maternal and perinatal outcomes among women with short inter-pregnancy interval delivered at MNH, Tanzania, 2016.

Dear Madam

Greetings;
My name is Dr. Lobikieki Mathias Kissambu, a resident in the department of Obstetrics and Gynecology at Muhimbili University of Health and Allied Sciences. I would like to conduct the study mentioned above as a necessary requirement for fulfillment of my postgraduate studies.

Purpose

To compare maternal and perinatal outcomes among women with short inter-pregnancy interval and those with normal inter pregnancy interval delivered at MNH from July - December 2016.

This study requests you to participate so that important information can be obtained from you.

Confidentiality:

All information collected on questionnaires will be entered into computer with identification number and not your name. The questionnaires will be handled carefully to maintain confidentiality.

Risk:

There will be no risk associated with this study.

Participation

Your participation in this study is voluntary and therefore any decision you make will be respected. If you agree to participate in the study, you will be interviewed by me. If you choose not to participate in the study, you will continue to receive all services that are normally provided in our hospital without any bias.

Do you agree?

Participant agrees…….. Participant does NOT agree……

I, _____have read/been informed of the contents of this form and understood its meaning; hence, I do agree to participate in this study.

Signature_____ (Participant), Date_____

Signature_____ (Researcher), Date_____

APPENDIX II: Ridhaa ya Kukubali Kushiriki Kwenye Utafiti–Kiswahili Version

Utafiti kuhusu matokeo hasi kwa mama na mtoto katika hospitali ya Taifa Muhimbili kwa akina mama wanaobeba ujauzito ndani ya muda mfupi baada ya kujifungua.

Salaaam!

Mimi naitwa Dr. Lobikieki Mathias Kissambu; ni mwanafunzi wa uzamili Chuo Kikuu cha Sayansi za Afya Muhimbili, idara ya magonjwa ya akina mama na uzazi. Ninafanya utafiti huu kama hitaji la lazima ili niweze kumaliza masomo yangu. Pia matokeo ya utafiti huu yatasaidia kufahamu kwa undani zaidi kuhusu tatizo hili na matokeo yake kuboresha zaidi tiba yake.

Jinsi ya kushiriki

Kama utakubali kushiriki katika utafiti huu, nitakuhoji maswali machache yanayohusu jamii kama vile umri, jinsia, kazi na kadhalika. Pia nitakuuliza kuhusu hali yako ya ujauzito wa sasa na matokeo baada ya kujifungua.

Madhara/usiri

Hakuna madhara yoyote yanayotegemewa kutokana na utafiti huu.Taarifa za ugonjwa wako zitatunzwa kwa kutumia herufi maalum na si jina lako ili kuheshimu utu wako.

Uhuru wa kushiriki

Kushiriki kwenye utafiti ni hiari yako.

Unaweza kujitoa wakati wowote. Kama utachagua kutoshiriki, utaendelea kupata huduma kama kawaida hapa hospitalini bila upungufu wowote.

Faidayautafiti

Ukishiriki kwenye utafiti huu, utapata fursa ya kufahamu kwa undani ukubwa wa tatizo linaloweza kutokea, jinsi ya kujikinga na pia utapata ushauri wa kitaalamu kwa kipindi chote cha utafiti muda wowote unapohitaji.

Taarifa

Kuna kamati ya kusimamia udhibiti wa utafiti huu.

Endapo unahitaji kupata maelezo kuhusu haki zako au taarifa,wasiliana na Dr. Lobikieki Mathias Kissambu, +255769004737 au Dr. Ali Said +255714490933 wa chuo kikuu cha Afya na tiba Muhimbili ambaye ndiye msimamizi wangu. Kama una swali lolote kuhusu haki yako kama mshiriki wasiliana na Dr. Joyce Masalu, ambaye ni mkurugenzi wa bodi ya utafiti chuo kikuu cha Afya na Tiba Muhimbili, kwa S.L.P 65001 Dar es Salaam.

Baada ya maelezo hayo, Je unakubali kushiriki kwenye utafiti? (weka alama) ya vema, Ndiyo.....Hapana.....

Mimi ....., nimeelezwa na nimesoma maelezo

haya. Maswali yangu yamejibiwa.

Nimekubali kushiriki katika utafiti huu.

Sahihi ya Mshiriki..... Tarehe…….

Sahihi ya Mtafiti ..... Tarehe……

Appendix III: Questionnaire – English version

Please read carefully and fill in the blanks or tick (√) against the appropriate letter:

Questionnaire number _____ Date of admission _____ Follow up _____

Patient's file no. _____ Phone no. _____

PART 1: Socio-demographic characteristics

1. Age_____
2. Marital status
   a. Married ☐
   b. Other ☐
3. Level of education
   a. No formal education ☐
   b. Primary ☐
   c. Secondary ☐
   d. Higher level ☐
4. Residence
   a. Urban ☐
   b. Rural ☐

PART 2: Obstetrics characteristics

5. Gravida _____ Parity _____ Abortion _____ Living _____
6. Is the current pregnancy planned?
   a. Yes ☐
   b. No ☐
7. Gestational age calculated from the 1st date of the last normal menstrual period
   a. 28 to less than 32 weeks ☐
   b. 32 to less than 34 weeks ☐
   c. 34 to less than 37 weeks ☐
   d. 37 weeks and above ☐
8. Number of ANC visits _____
9. Antenatal Blood Pressures: a. Elevated ☐ b. Normal ☐

10. Any maternal illness(es) known or diagnosed during antenatal care

    a. Chronic hypertension b. Diabetes mellitus c. Sickle cell disease

    d. Heart diseases e. Mental illness f. PMTCT ONE

    g. Febrile illness eg. Malaria, UTIh. Other specify .....

    i. NIL

PART 3: Past obstetrics history

11. Duration from last delivery

    a. Less than 6 months ☐

    b. 6 to less than12 months ☐

    c. 12 to less than 18 months ☐

    d. 18 to 35 months ☐

12. Problem(s) during past pregnancy(ies)

    a. None ☐

    b. Hypertensive disorders ☐

    c. Gestational diabetes ☐

    d. PROM/Preterm delivery ☐

    e. C/S delivery ☐

13. Outcome of last delivery

    a. Early neonatal death ☐

    b. Infant death ☐

    c. Normal baby ☐

    d. Congenital anomaly ☐

14. Family planning method used after previous pregnancy?

    a. Yes ☐

    b. No ☐

15. If yes, what method?

    a. Natural methods ☐ Eg. Calendar, coitus interruption, rhythm

    b. Modern methods ☐ Eg. Hormonal contraceptives,loop, LAM, barriers

PART 4: Maternal outcomes

16. Anemia in pregnancy (Recently checked from 28 weeks of gestation or if not checked during antenatal draw blood for HB estimation)
    a. Absent if hemoglobin level 11g/dl and above ☐
    b. Present if hemoglobin level Less than 11g/dl ☐
17. PROM (If GA is ≥ 37 weeks) or PPROM (If GA is < 37 weeks)
    a. Absent ☐
    b. Present ☐
18. Preterm labor (If onset of labour occurs before 37 completed weeks of gestation)
    a. Absent ☐
    b. Present ☐
19. Hypertensive disorders of pregnancy
    a. Absent ☐
    b. Present ☐
20. Mode of delivery
    a. SVD ☐
    b. Assisted vaginal delivery ☐
    c. Caesarean section ☐
21. If caesarean section delivery, give reason(s).....
22. Postpartum hemorrhage measured by estimated post-delivery blood loss (ie; >500mls post vaginal delivery or > 1000mls post caesarean delivery)
    a. Absent ☐
    b. Present ☐

PART 5: Perinatal outcomes

23. Newborn condition at birth
    a. Normal baby ☐
    b. Congenital anomaly ☐
    c. Stillbirth ☐

24. APGAR score at 1st minute
    a. 7 and above ☐
    b. Less than 7 ☐
25. APGAR score at 5 minutes
    a. 7 and above ☐
    b. Less than 7 ☐
26. Birth weight
    a. 2500gm and above ☐
    b. 1500gm to < 2500gm ☐
    c. Less than 1500gm ☐
27. Prematurity (determined based on Ballard's score)
    a. Absent ☐
    b. Present ☐
28. Baby admitted to NICU for more than 24hours
    a. No ☐
    b. Yes ☐
29. Early neonatal death
    a. Absent ☐
    b. Present ☐
30. Follow-up plan
    a. In the ward
    b. At post-natal clinic
    c. Phone contact
    d. Lost follow up
31. Special observation during follow-up

Appendix IV: Dodoso – Kiswahili version

Tafadhali soma kwa makini kisha weka alama ya vema (√) kwenye sehemu iliyoachwa wazi au kwenye kisanduku.

Namba ya dodoso _____ Tarehe_____ Namba ya simu _____

Namba ya usajili_____ Ufatiliaji_____

SEHEMU YA KWANZA: Taarifa ya kijamii

1. Umri _____
2. Hali ya ndoa
   a. Sijaolewa ☐
   b. Nimeolewa ☐
   c. Tumetengana ☐
   d. Tunaishi pamoja ☐
3. Kiwango cha elimu
   a. Elimu ya msingi ☐
   b. Elimu ya sekondari ☐
   c. Elimu ya chuo kikuu ☐
   d. Sijasoma ☐
4. Mahali unapoishi
   a. Mjini ☐
   b. Kijijini ☐

SEHEMU YA PILI: Hali ya ujauzito wa sasa

5. Mimba ya ngapi?_____ Uzao wa ngapi? _____
6. Ujauzito huu wa sasa umepangwa?
   a. Ndiyo ☐
   b. Hapana ☐
7. Umri wa mimba
   a. Wiki 28 hadi 31 ☐
   b. Wiki 32 hadi 33 ☐
   c. Wiki 34 hadi 36 ☐
   d. Wiki 37 na zaidi ☐
8. Umehudhuria kliniki ya wajawazito mara ngapi _____
9. BP wakati wa mahudhurio ya kliniki a. Kawaida ☐ b. Imepanda ☐
10. Mama ana ugonjwa wowote wa kudumu au wa kuambukizwa . a. Shinikizo la damu b.Kisukari c. Seli mundu d. Magonjwa ya moyo e. Magonjwa ya akili f. VVU g. Homa za Malaria, UTI h. Magojwa mengine Taja.....
    i. Hakuna ugonjwa wowote **(Aondolewe kwenye utafiti kama ametiki "a - h")**

SEHEMU YA TATU: Taarifa ya uzazi

11. Muda tokea tarehe ya kujifungua mimba ya mwisho kabla ya hii
    a. Chini ya miezi 6 ☐
    b. Miezi 6 hadi 11 ☐
    c. Miezi 12 hadi 17 ☐
    d. Miezi 18 hadi 35 ☐
12. Matatizo yaliyojitokeza katika mimba zilizotangulia
    a. Hakuna ☐
    b. Shinikizo la damu au kifafa cha mimba ☐
    c. Kisukari kiletwacho na mimba ☐
    d. Kuvunja chupa mapema au kuzaa mtoto njiti ☐
13. Matokeo ya mimba iliyopita baada ya kujifungua
    a. Kifo cha mtoto mchanga (umri wa siku saba au kabla) ☐
    b. Kifo cha mtoto chini ya mwaka mmoja ☐
    c. Mtoto wa kawaida asiye na tatizo lolote ☐
    d. Mtoto mwenye ulemavu ☐
14. Umetumia uzazi wa mpango baada ya kujifungua?
    a. Hapana ☐
    b. Ndiyo ☐
15. Kama ndiyo, taja
    a. Njia za asili ☐ kalenda, siku za hatari,
    b. Njia za kisasa ☐ vidonge vya majira, sindano, kitanzi, kipandikizi, kondom

SEHEMU YA NNE: Matokeo ya ujauzito wa sasa kwa mama

16. Amepata pungufu wa damu (angalia kadi ya klinik, kama haijajazwa mama apimwe damu)
    a. Wingi wa damu (HB) 11g/dl au zaidi ☐
    b. Wingi wa damu (HB) chini ya 11g/dl ☐
17. Umevunja chupa kabla ya wiki 37 au kabla ya uchungu kuanza
    a. Hapana ☐
    b. Ndiyo ☐
18. Umeanza uchungu kabla ya wiki 37
    a. Hapana ☐
    b. Ndiyo ☐
19. Umepata shinikizo la damu wakati wa ujauzito au kifafa cha ujauzito
    a. Hapana ☐
    b. Ndiyo ☐

20. Njia ya kujifungua
    a. Kawaida ☐
    b. Vakyumu ☐
    c. Upasuaji ☐
21. Kama ni njia ya upasuaji taja sababu .....
22. Ametokwa damu nyingi mara baada ya kujifungua
    a. Hapana ☐
    b. Ndiyo ☐

SEHEMU YA TANO: Matokeo ya ujauzito wa sasa kwa mtoto

23. Hali ya mtoto mara baada ya mama kujifungua
    a. Hana tatizo ☐
    b. Mlemavu ☐
    c. Mtoto amezaliwa mfu ☐
24. "APGAR score" dakika ya kwanza
    a. 7 au zaidi ☐
    b. Chini ya 7 ☐
25. "APGAR score" dakika ya 5
    a. 7 au zaidi ☐
    b. Chini ya 7 ☐
26. Uzito wa mtoto mara baada ya kuzaliwa
    a. Gramu 2500 au zaidi ☐
    b. Chini ya gramu 2500 ☐
27. Mtoto njiti
    a. Hapana ☐
    b. Ndiyo ☐
28. Mtoto amelazwa wodi ya watoto wachanga kwa zaidi ya saa24 baada ya kuzaliwa?
    a. Hapana ☐
    b. Ndiyo ☐
29. Mtoto amefariki ndani ya siku 7 baada ya kuzaliwa?
    a. Hapana ☐
    b. Ndiyo ☐
30. Ufatiliaji wa mtoto ndani ya siku 7 baada ya kuzaliwa
    a. Wodi ya watoto au wazazi
    b. Kliniki ya wazazi
    c. Simu ya mkononi
    d. Amepoteza ufatiliaji
31. Jaza taarifa muhimu wakati wa ufuatiliaji wa mama na mtoto katika jedwali
