SHORT INTER-PREGNANCY INTERVAL; ITS ASSOCIATED FACTORS AND RELATED PREGNANCY OUTCOMES AMONG ADMITTED PATIENTS AT MNAZI MMOJA HOSPITAL – ZANZIBAR

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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

October, 2024

CERTIFICATION

The undersigned certifies that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: ***"Short interpregnancy interval; its associated factors and related pregnancy outcomes among admitted patients at Mnazi Mmoja Hospital – Zanzibar"*** in partial fulfillment of the requirement for the degree in Master of Medicine in Obstetrics and Gynecology of the Muhimbili University of Health and Allied Sciences.



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Prof Projestine Muganyizi

(Supervisor)

Date: _____

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Date: _____

DECLARATION AND COPYRIGHT

I, **Amney Suleiman,** declare that this **dissertation** is my original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature: …… Date: …….....

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DEDICATION

I dedicate this dissertation to my late father, Mr. Suleiman Mbarouk Rashid.

ABSTRACT

Background: Short inter-pregnancy interval is associated with adverse outcomes that contribute towards maternal and neonatal morbidity and mortality. As we strive to advocate for adoption of the WHO inter-pregnancy interval in Zanzibar, we need to understand the detrimental effects in our local settings if not maintained within the recommended range.

Aim: To determine the prevalence of short inter-pregnancy interval, its associated factors, and related pregnancy outcomes among women admitted at Mnazi Mmoja Hospital.

Methodology: A total of 424 women were enrolled in an analytical cross-sectional study between October and December 2023. Structured questionnaires were used for data collection. SPSS Version 23 was used for data analysis. Logistic regression analysis was used to determine the measure of effect of the association between variables, estimated at 95% confidence interval and 5% level of significance.

Results: The prevalence of short IPI was 35.6% with median age of 30 years, IQR [26-34]. Regarding use of family planning methods, non-use was significantly associated with increased odds of IPI (aOR=2.06, 95% CI=1.26-3.38). Likewise, compared with the older age group, the odds of short IPI was significantly increased with the younger women aged 25-29 (aOR=1.91, 95% CI=1.07-3.41) and 30-34 (aOR=1.99, 95% CI=1.12-3.54). In comparison with normal IPI, short IPI was associated with increased risk for stillbirth (aOR=2.38, 95% CI = 1.29-4.39), low birth weight (aOR=4.19, 95% CI = 2.62-6.71), premature babies (aOR=5.04, 95% CI = 2.84-8.91), NICU admissions (aOR=2.27, 95% CI = 1.33-3.86), maternal anemia (aOR=1.66, 95% CI = 1.09-2.54) and preterm labor (aOR=5.21, 95% CI = 3.07-8.83).

Conclusion: More than a third of women at Mnazi Mmoja Hospital in Zanzibar practiced short IPI. As short IPI is a modifiable risk factor, adverse pregnancy outcomes can be prevented by addressing factors hindering adherence to the recommended IPI, particularly FP use.

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LIST OF ABBREVIATIONS

ANC	-	Antenatal Care
DBP	-	Diastolic Blood Pressure
DM	-	Diabetes Mellitus
GA	-	Gestational Age
HDP	-	Hypertensive Disorder of Pregnancy
IPI	-	Inter Pregnancy Interval
KCMC	-	Kilimanjaro Christian Medical Centre
MMH	-	Mnazi Mmoja Hospital
MMR	-	Maternal Mortality Rate
MNH	-	Muhimbili National Hospital
MUHAS	-	Muhimbili University of Health and Allied Sciences
NICU	-	Neonatal Intensive Care Unit
NMR	-	Neonatal Mortality Rate
PPROM	-	Preterm Pre-labor Rupture of Membrane
PROM	-	Pre-labor Rupture of Membrane
SBP	-	Systolic Blood Pressure
SDG	-	Sustainable Development Goals
SGA	-	Small for Gestation Age
TDHS	-	Tanzania Demographic Health Survey
WHO	-	World Health Organization

DEFINITION OF TERMS

Apgar score is defined as a standardized score used as part of the newborn assessment which includes color, heart rate, reflexes, muscle tone, and respiration.

Early Neonatal Death is defined death of a neonate occurring in the first 7 days of life.

Hypertensive disorder of pregnancy is defined as a SBP ≥140mmHg and/or a DBP ≥90mmHg occurring in pregnancy.

Inter-pregnancy interval is defined as the time a woman is not pregnant between one live birth or loss of pregnancy and the next pregnancy.

Low birth weight is defined as a birth weight of less than 2500g.

Maternal anemia is defined as a hemoglobin level of less than 11g/dl in the third trimester.

Preeclampsia is defined as an increase in blood pressure to at least 140/90 mm Hg after the 20th week of gestation combined with proteinuria (protein excretion, at least 0.3 g per 24 hours).

Pre-labor rupture of membranes is defined as rupture of membrane before onset of labor but beyond 37 weeks of pregnancy.

Prematurity is defined as neonates born at less than 37 weeks gestation.

Preterm labor is defined as the presence of uterine contractions of sufficient frequency and intensity to effect progressive effacement and dilatation of the cervix.

Preterm pre-labor rupture of membranes is defined as rupture of membrane before onset of labor but before 37 weeks of pregnancy.

Post-partum hemorrhage is defined as blood loss of more than 500mL following vaginal delivery or more than 1000mL following cesarean delivery

1.0 INTRODUCTION

1.1 Background

Inter-pregnancy interval (IPI) is the lapse of time between the birth or termination of one pregnancy and the conception of the subsequent pregnancy. It is the duration in which a woman will not be pregnant after giving birth or having an abortion. Recommendations for birth spacing made by international organizations based on available information and studies for several years is for waiting at least 24 months but not more than 59 months after the last pregnancy (1, 2).

The World Health Organization (WHO) held a technical consultation and scientific review of birth pacing which has recommended an interval of at least 24 months between live birth and the next pregnancy (1) while others have argued that IPI of 3–5 years further reduces the risk for adverse maternal outcomes (3). Following a live birth, the recommended interval before attempting the next pregnancy, which is the birth-to-pregnancy interval, is at least 24 months and at least 6 months after a miscarriage or induced abortion to reduce risks of adverse maternal and perinatal outcomes (4).

Optimal IPI can ensure optimal health for both mother and infant (5) whereas sub-optimal IPI has been associated with several maternal morbidities and mortality (6). Poorly spaced pregnancies have been documented worldwide to result in adverse maternal and child health outcomes (7). Evidence showing a relationship between shorter birth intervals and high infant and child mortality has been established globally (8). In addition, extant evidence shows that closely spaced pregnancies are linked to low birth weight, intrauterine growth retardation, preterm delivery (9, 10). Longer intervals have been proven to reduce fertility and consequently result in beneficial effects on population size (11).

Short pregnancy interval has been associated with increased risk of both maternal and fetal morbidities and mortalities including but not limited to post-partum hemorrhage, pre-labor rupture of membrane, hypertensive disorders of pregnancy, preterm labor, maternal mortality, low birth weight, low APGAR score, increased risk of neonatal ICU admission and perinatal death (7, 12). Evidence shows that short IPI is associated with adverse maternal

and perinatal outcomes worldwide but the situation is detrimental in developing countries (1, 10).

Inter-birth intervals of 3-5 years in duration, and preceding inter-birth intervals of less than 24 months in duration are associated with significantly higher risks of early neonatal mortality, and interbirth intervals of less than 36 months are associated with significantly higher risks of late neonatal mortality, post-neonatal mortality, and child mortality (13, 14). A previous systematic review and meta-analysis found that an inter-pregnancy interval of less than 6 months is associated with 40% higher odds of preterm birth, 61% higher odds of low birth weight, and 26% higher odds of small for gestational age in the subsequent pregnancy (14).

Different theories particularly maternal depletion theory and physiological regression theory link inter-pregnancy interval with adverse maternal outcomes (6, 13). The hypothetical causal mechanisms that were described according to a systematic review of 58 observational studies on the association of short IPI and adverse pregnancy outcomes were maternal nutritional depletion, folate depletion, cervical insufficiency, vertical transmission of infections, suboptimal lactation related to breastfeeding-pregnancy overlap, sibling competition, transmission of infectious diseases among siblings, incomplete healing of uterine scar from previous cesarean delivery and abnormal healing of endometrial blood vessels. These theories have shown an association with adverse maternal outcomes that play a major role in maternal and neonatal morbidity and mortality rates (2, 13, 14).

The National Survey of Family Growth in the US using 12,279 women from 2006 to 2010 observed an average IPI of 34 months, however, 35% of the children were conceived within 18 months of the prior birth (15). Likewise, from 1995 to 2010, 10236 pregnancy data taken in waves showed that 31% of pregnancies had a short IPI of less than 12 months however, and odds of short IPI were observed more in those who were 35 years old and older compared to those who were 20 to 29 years old (16). The prevalence of short IPI ranged from 40.9% in Ethiopia (17), 49.7% in Ghana (18), 25% in Kenya (19) and 52.4% in Uganda (20). A recent analysis of data from 52 Demographic and Health Surveys (DHS) from 44 developing countries found that children born with a preceding birth to-pregnancy interval of less than six months have a mortality risk two to three times greater than children with an interval of

36 to 47 months at equivalent ages (21). The 2022 Tanzania Demographic Health Survey has established that at least 17% of IPI are short in Tanzania Mainland and 23% in Zanzibar (22) as well as 22% in a cross-sectional study done in ANC clinic in Mnazi Mmoja Hospital in Dar es Salaam (23).

The IPI in Zanzibar remains within the recommended interval of 24 to 60 months, however, it has been reduced from 34 months in 2000 to 32.7 months in 2022 (22, 24). Available data shows the prevalence of short IPI in Zanzibar is 23.4% and this reduction is marked through Zanzibar and Pemba if the decrease is not maintained the IPI is warranted to reach less than 24 months which is not recommended by the WHO (1, 22).

Globally, it was estimated that 25% of births still occur at intervals of less than 24 months. Most of the cases of short birth intervals were observed in Central Asia at 33%. Sub-Saharan Africa had short birth intervals at 20% (25). A study of fertility transition in sub-Saharan Africa shows that the median birth interval at birth order two was 35 months which was longer than in Asia and Latin America of 25 months (26). Though the sub-Saharan African picture shows optimal median birth intervals, individual countries were observed to be having differences in birth intervals. Demographic and Health Survey (DHS) reports show most of the countries having a significant number of births occurring at short intervals. Most countries in Africa including Uganda do not report about long birth intervals probably because it is not happening frequently. In East Africa, Kenya and Tanzania had almost similar birth intervals of less than 24 months of 18% (27) and 19% (28), respectively.

It is estimated that 20–35% of maternal deaths can be prevented by adhering to recommended IPI (29). Short pregnancy interval is also a risk factor for preterm birth (30). Short pregnancy intervals can cause preterm birth by increasing the risk of cervical insufficiency and infection (31). Preterm birth is prevalent in up to 5% to 7% of live births in urbanized countries (32). It has been reported that the rate of preterm birth <37 weeks was higher in women with short pregnancy intervals <12 (20.1%) compared with normal pregnancy intervals (7.7%) (33).

1.2 Problem Statement

Not much information is known about the burden of short inter-pregnancy interval in Zanzibar, along with its adverse effects on maternal and fetal outcomes. As compared to the WHO recommended IPI of 24 to 59 months, those with short IPI are at higher risk of poor fetal and maternal outcomes like pre-eclampsia, PROM, preterm labor, low birth weight, neonatal admissions to ICU, and early neonatal deaths. The pattern of short IPI and its associated maternal and fetal outcomes in Zanzibar is unknown.

Furthermore, a previous study shows the prevalence of short IPI in Zanzibar to be 23.4% higher than that in Tanzania mainland which is 16.7% with little being known about the potential impact of it on pregnancy outcomes. Even though the IPI remains within the recommended range in Zanzibar, studies have shown that there has been a trend towards a decline from 34 months in 2005 to 32.7 months in 2022. If the decline is not maintained, the IPI is warranted to reach below the recommended interval. This challenge is multiplied by the low use of family planning at 28% (modern method 17% and traditional method 11%) in Zanzibar compared to the national level which is at 38% (modern method 32% and traditional method 6%) (22).

Moreover, there are limited studies done in Zanzibar directly about short IPI and the associated maternal and fetal outcomes. More studies about short IPI have been done and focused on Tanzania's mainland to represent a general overview of the magnitude of short IPI and related effects. This study aims to create a direct focus on Zanzibar to determine the association between short IPI and pregnancy outcomes among the Zanzibar population.

Therefore, this study has assessed the pattern of adverse maternal (preeclampsia, hypertension, PROM, preterm labor, anemia) and fetal (low birth weight, low Apgar score, neonatal admission to ICU, early neonatal death and prematurity) outcomes related to short IPI as well as associated factors among women admitted at Mnazi Mmoja Hospital in Zanzibar.

1.3 Conceptual Framework

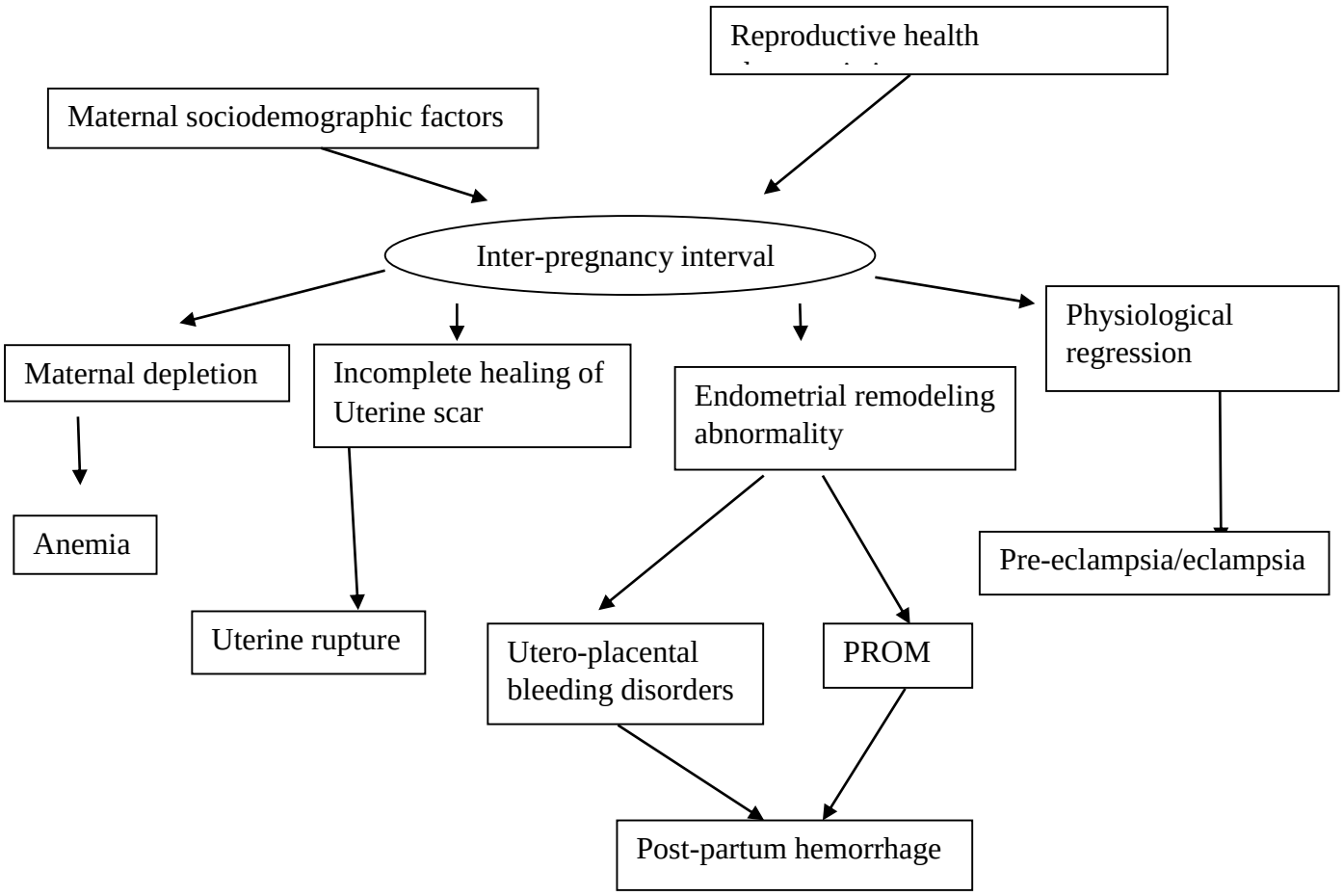


Figure 1 Conceptual Framework

Self constructed framework showing interactions of socio-demographics and reproductive health characteristics towards inter pregnancy interval. The framework also shows the physiological changes related to inter-pregnancy interval and the associated feto-maternal outcomes.

1.4 Study Rationale

Since little is known about the burden of adverse maternal and fetal outcome related to short IPI, the study findings will be able to determine the magnitude and provide data on short IPI and its associated factors, adverse maternal and fetal outcome among women admitted at Mnazi Mmoja Hospital in Zanzibar.

Studies frequently ignore the inverse relationship that exists between maternal and off-spring outcomes. If a mother is delivered early to prevent complications of pre-eclampsia, the risk of maternal mortality may be lowered but that of offspring mortality is increased as a result of prematurity, addressing this issue requires the simultaneous assessment of both outcomes.

Since the well-being of pregnant women is of importance as their well-being reflects the well-being of a born child, thus the gap in information and knowledge has major implications to policy makers, research, health education and advocacy. Hence the knowledge gained after this study will help provide the knowledge required on the possible adverse pregnancy outcomes in women with short IPI.

Additionally, after delivery, they can be provided with knowledge on family planning, the consequences that are associated with lack of adherence to family planning with extra focus on maternal and perinatal outcomes due to short IPI as well as the inter-pregnancy care that the health care providers can give to provide support.

1.5 Research Question

This study intended to answer the following questions: -

1.5.1 Main research question

1. What is the effect of short inter-pregnancy interval among women delivering at Mnazi Mmoja Hospital in Zanzibar?

1.5.2 Specific Research Questions

1. What is the prevalence of short inter-pregnancy interval among women admitted at Mnazi Mmoja Hospital in Zanzibar?
2. What are the factors associated with short inter-pregnancy intervals among women admitted at Mnazi Mmoja Hospital in Zanzibar?
3. What are the adverse pregnancy (feto-maternal) outcomes related to short inter-pregnancy interval among women admitted at Mnazi Mmoja Hospital in Zanzibar?

1.6 Research Objectives

1.6.1 Broad Objective

To determine the prevalence of short inter-pregnancy interval, its associated factors and related pregnancy (feto-maternal) outcomes among women admitted at Mnazi Mmoja Hospital in Zanzibar.

1.6.2 Specific Objectives

1. To determine the prevalence of short inter-pregnancy interval among women admitted at Mnazi Mmoja Hospital in Zanzibar.
2. To determine factors associated with short inter-pregnancy interval among women admitted at Mnazi Mmoja Hospital in Zanzibar.
3. To determine the short-term fetal outcomes related to short inter-pregnancy interval among women admitted at Mnazi Mmoja Hospital in Zanzibar.
4. To determine the maternal outcomes related to short inter-pregnancy interval among women admitted at Mnazi Mmoja Hospital in Zanzibar.

2.0 LITERATURE REVIEW

2.1 Prevalence of IPI and associated factors

High fertility rates are common in low-income countries, leading to a shortened interval in time between pregnancies, inhibiting full recovery of the status quo of the mother prior to next conception. The duration of short IPI is variable across nations and maybe influenced by fertility patterns, population, and health policies, as exemplified in the United States of America to be of less than 18 months and as shown by Gemill et al study with 35% of the 2,253 pregnancies to be conceived within 18 months of a prior birth, with women aged 15 – 19 years having a higher likelihood of short IPI (35). Another study across Latin America from 1990 to 2009 showed the median inter-pregnancy interval at 28 months (IQR 15–51) with 17.4% having IPI of less than 12 months and 25.6% with IPI between 12 to 23 months making a total of 43% with IPI below 24 months (36). However, the case is not the same within the continent, as Gebremedhin AT et al study showed that 60.5% of the women had short IPI of less than 24 months (37).

Regarding the classification of mothers according to IPI, studies have shown variation across categories and age distribution, a cohort study by Ting et al 2020 in Guangdong Province, China showed that 31.8% of the women had IPI of less than 18 months, 61.4% of mothers aged 20 to 24 years were observed to have a shorter IPI of less than 6 months (38). Similarly, Hanley GE et al study between 2000 and 2015 in British Columbia, Canada showed that 4%, 22%, and 32% of deliveries occurred after an IPI of 0–5 months, 12–17 months, and 24–59 months respectively (39).

Distribution of inter pregnancy interval differs even within low-income countries across the continents due to variations in family and community influences determining birth spacing. As it can be seen from a study done in six low and lower-middle income countries, the proportion of those with short IPI varied from 3.4% in the Zambia to 19.8% in the Pakistan. The percentage of women with long IPI varied from 4.1% of women in the DRC to 23.9% of women in the Zambia. The overall median IPI was 32 (24, 45) months, ranging from 27 months in the Pakistan sites to 43 months in the Zambia site (40). The case was similar in

Egypt by Mahfouz EM et al showed that 34.2% of women had IPI of less than 18 months (42).

There are several sociodemographic factors being predictors associated with short IPI, such as maternal age, lower educational level, lack of family planning use and resources among others. By looking at Sub-Saharan Africa, Belachew TB et al found that the prevalence of short IPI was 58.74%, with the significant associated factors being women's educational status; primary education (AOR = 0.88; 95% CI: 0.86,0 .91), working (AOR = 0.91; 95% CI: 0.88, 0 .93), classified as rich wealth index level (AOR = 0.90; 95% CI: 0.88, 0.93), having six and above ideal number of children (AOR = 2.25; 95% CI: 2.22, 2.30) and contraceptive non users (AOR = 3.01; 95% CI: 2.93, 3.07) (41).

With the emphasis on family planning, as the pillar for controlled birth spacing, a study in rural Uganda, showed that 52.4% of the women had birth intervals below 24 months with the median birth interval of 22 months (IQR 15- 33), as compared to their counterparts; the prevalence of short IPI was 81% lower among women who always use contraceptive (COR = 0:19, 95% CI: 0.09-0.39, P <0:001), Women aged 15-24 years were 4 times more likely to have short IPI (AOR = 4:39, 95% CI: 1.49-12.93, P = 0:007), and those aged 25-34 years were 3 times more likely to have short IPI (AOR = 3:39, 95% CI: 1.18- 9.74, P =0:024) (20). Across Africa, another community study in Ethiopia showed that 39.5% did not use contraceptive methods, 21.7% having unintended pregnancy, 9.6% had no ANC visit. The prevalence of short IPI (< 24 months) was 40.9% with the median (IQR) IPI of 29 (18-48) months (17).

World Health Organization has recommended birth spacing interval, but however the practice is not the same and the goals have not yet been achieved, as shown by Lilungulu et al study in Tanzania showed that 33.3% had short IPI (43). A study done to view the levels and correlates of non-adherence to WHO recommended inter-birth intervals in Rufiji, Tanzania showed the median IPI of 33.4 months with 48.4% below the WHO recommended minimum length of 33 months between two live births. The proportion of short IPI was highest (76%) among youngest (15–19) women, 52%, 46% and 38% among women with no education, primary education and secondary as the identified significant associated factors (12).

By further analyzing the situation in Tanzania, the prevalence of short varied across regions due to sociocultural differences in tribes, city development, and supporting health infrastructure. At the city center of Tanzania, Dar es Salaam, Kikula AI et al showed the proportion of women with short IPI to be 22.14% with higher odds of short IPI being found in women aged less than 25 years having more than twice the odds than those with 30-34 years, non-contraceptive users with twice the odds (a prevalence of 75%) as compared to those who used, breastfeeding for less than 6 months tripled the odds and those who had a dead antecedent child were more than three than those with a live antecedent child (44). In northern Tanzania, short and long IPI occurred in 19.42 % and 14.31 % respectively with a median IPI of 36 months women with shorter IPIs were more likely to be young (<19 years), employed, and with higher education attainment than referent group (45).

2.2 Short Ipi Association with Adverse Maternal Outcomes

2.2.1 Maternal Anemia

Short intervals between pregnancies are linked to numerous adverse health outcomes to the mother and the fetus. The matter is pertinent to public health and clinical practice because they are independently linked to an increased risk of adverse perinatal and maternal outcomes. With regards to maternal anemia, short IPI provides insufficient time for nutrient repletion from the previous pregnancy, particularly folate and iron deficiency, thus anemia is a common adverse event as can be shown by Mahfouz EM et al study that 61.5% of women with IPI of less than 24 months had anemia (42), Lilungulu et al study with the prevalence of anemia among those with short IPI was 94% as compared to 27.7% among those with normal IPI with a significantly higher risk for anemia (RR = 3.4; 95% CI 2.8 − 4.1) compared to normal IPI women (43).

The distribution of anemia may be different across nations possibly from other factors influencing anemia in pregnancy apart from IPI, like low economic status and maternal illnesses as shown by Saral et al in Menisa, Turkey showed that 55.0% of women had IPI of less than two years and among those with short IPI, 36.7% had anemia with hemoglobin value of less than 11.0g/dl (46). A Descriptive cross-sectional study by Shrestha et al at

Nepal, among 550 women with a prevalence of anemia of 25% among those with IPI of less than 24 months. Short IPI had also an increased risk of anemia (OR=27.6; 95% CI=1.3-582) as compared to the normal IPI (47).

2.2.2 Hypertensive Disorders

Short IPI can increase the risk of hypertensive disorders in pregnancy as mainy explained by inadequate time for the body to have recovery from the physiological stress, which leads to persistent vascular and metabolic changes. Additionally, the body's ability to adapt to demands of new pregnancy might be compromised, increasing the likelihood of developing hypertensive disorders. As shown by Lilungulu et al study in Tanzania showed that preeclampsia was seen in 18.0% of short IPI as compared to 2.7% of normal IPI with the risk of preeclampsia was higher among short IPI as compared to normal IPI (RR = 6.8; 95% CI 3.1 – 14) (43). A retrospective population-based cohort study done between 1980 and 2015 among 103,909 women who delivered two or three consecutive singletons in Western Australia showed the prevalence of preeclampsia to be 17.0% among those with IPI of less than 18 months (37) which was similar to the systemic review done in 2006 by Conde Agudelo et al (14).

On the contrary, the study by Leah Anku Sanga et al at KCMC to assess the inter-pregnancy interval and associated adverse maternal outcomes among women who delivered at Kilimanjaro Christian Medical Centre in Tanzania, 2000-2015, short IPI was significantly associated with lower risk of preeclampsia. Women with short IPI had 29% lower odds of having preeclampsia as compared to those with optimal IPI (aOR: 0.71, 95%CI: 0.52, 0.97) (48).

2.2.3 Preterm Labor

Short IPI can increase the risk of preterm labor because the mother's body may not have enough time to fully recover and restore the necessary physiological conditions required for a healthy pregnancy, as the uterine environment may still be healing with insufficient endometrial repair and suboptimal condition for sustaining full term pregnancy. By looking at Shrestha et al at Nepal study, 30.4% had preterm labor among those with short IP with the risk of low birth weight (<2500 g) babies being higher in short inter-pregnancy interval of

fewer than 18 months (OR=8.7; 95% CI=1.3-56.3) (47). A retrospective cohort study on the dataset of the Netherlands Perinatal Registry showed the prevalence of preterm birth among those with short IPI to be 55.1% (49).

Considering the distribution of preterm labor among those with short IPI, a study in Tanzania showed that preterm delivery was 29.3% in short IPI than in women with normal IPI. The study showed that women with short 10 times more risk of delivering preterm babies as compared to those with normal IPI (RR = 9.8; 95% CI 4.9-19.5) (43).

2.2.4 PPROM and PROM

A shorter IPI can lead to PROM due to inadequate strengthen of uterine lining resulting to weakened amniotic membranes, making them more susceptible to rupture. The proportions may vary due to distribution from maternal factors like comorbidities, as Conde-Agudelo and Belizán et al study with PROM more significantly higher among women who had short IPI of 60% (2) where as a study done in Nepal by Shristhu et al showed that the prevalence of PROM was 2.7% among those with short IPI (47) and a study by Lilungulu et al to assess the spectrum of maternal and perinatal outcomes among 450 women at Bugando Medical Centre showed that 45.3% of women with short IPI had premature rupture of membranes as compared to 3.3% of those with normal IPI (43).

2.2.5 Post-Partum Hemorrhage

PPH in those with short IPI can be due weakened uterine muscles and reduced ability of uterus to contract effectively after delivery. A study by Hamdela B et al in urban South Ethiopia found out that more than half (66%) of primary postpartum hemorrhage was attributed to IPI of less than 24 months. In this study, women who had a pregnancy within 24 months after the preceding childbirth were nearly three times (AOR = 2.97, 95% CI: 1.6, 5.7) more likely to experience primary PPH as compared to those who had 24 – 60 months' intervals (50).

By looking at Tanzania, Lilungulu et al in a cohort study done in Bugando, Tanzania that included 450 women who gave birth to singleton showed postpartum hemorrhage was 19.3% in short IPI as compared to 3.3% of those with normal IPI. Women with short IPI were nearly

six times at higher risk for postpartum hemorrhage as compared to those with NIPI (RR = 5.8; 95% CI 2.9 − 11.6) (43).

2.3 Short Ipi Association with Adverse Fetal Outcomes

2.3.1 Low Birth Weight

Low birth weight is common among those with short IPI, this can be explained inadequate replenishing of essential nutrients and recover from the physiological demands from the previous pregnancies mostly nutritional deficiencies. A cohort study by Ilyas S et al at Lahore revealed that the mean value of birth weight of the baby was 2625.63± 584.54 grams, with low birth weight being observed in 14.38% cases and all were from short IPI group. The study results revealed that 73.9% of cases with low birth weight were in patients below 30 years (51). Shrestha et al study showed that the risk of low birth weight (<2500 g) babies was higher in short IPI with a prevalence of 38.7% and those with IPI of less than 18 months were nearly 9 times more likely to have low birth weight babies as compared to those with normal IPI (OR=8.7; 95% CI=1.3-56.3) (47).

The proportions are similar even in developed countries as shown by a retrospective cohort study in Netherlands by Koullali et al showed that 72.6% of babies with low birth weight were among those with short IPI and those with short IPI had 2.7 times higher risk of having low birth weight babies (OR, 2.69; 95% CI, 1.79–4.03) (49). A prospective study at Fayoum, Egypt by Mahfouz EM et al showed that low birth weight represented about one-third (29.2%) of the neonates born to participants with short IPI as compared to a lower percent of LBW neonates born to the study women with optimal IPI and those with longer IPI (5.1% and 2.0%, respectively). The mean birth weight was significantly higher in neonates born to study women with IPI of more than 59 months was 3.16 ± 0.39 and IPI of 24–59 months was 3.08 ± 0.39 than those with interval of less than 24 months 2.64 ± 0.44 (42).

The distribution of proportions in Tanzania is shown by Mahande et al on effect of inter pregnancy interval on adverse pregnancy outcomes in northern Tanzania as compared with the reference group, showed that low birth weight was 11.97 % which is higher as compared to 8.4% in women with short normal IPI. Women with short IPI were more likely to have low birth weight infant (adjusted OR, 1.61; 95 % CI: 1.34– 1.72) as compared to those with

normal IPI (45). Another study showed that there were more babies born with low birth weight among women in short IPI group 26.7% as compared to 4.0% of the normal IPI. Women with short IPI were nearly 7 times more likely to have low birth weight babies as compared to those with normal IPI (RR = 6.7; 95% CI 3.6 − 12.3) (43).

2.3.2 Prematurity

Several factors are linked to prematurity for short IPI, as explained by physiological regression theories. A cohort study by Ilyas S et al at Lahore among 320 women revealed that overall preterm deliveries were observed in 20.9% of the women, in which 68% of the preterm deliveries were from the short IPI group and 31.3% were from normal IPI group (51).

In the study done in Bugando by Lilungulu et al with 450 women, showed that prematurity was 29.3% among those with short IPI which is higher as compared to 3.0% of those with normal IPI (43). This was explained to be related to the high prevalence of anemia and PROM (43). In the Kilimanjaro region in Tanzania, Mahande et al study showed that 11.97% of the women with short IPI had preterm birth as compared to 8.5% among those with normal IPI (45).

2.3.3 Low Apgar score

A comprehensive approach is used to assess the Apgar score of the newborn, studies have shown that a low score is associated with short IPI. By looking population-based retrospective study in Ohio from 2006 to 2011 to assess the influence of IPI on neonatal morbidity found out that 42.8% of low Apgar score of below 7 at 5^{th} minute were in the group of short IPI (52). A Study done in Morogoro by Mosha et al on looking at the factors influencing pregnancy outcomes in Morogoro Municipality, Tanzania showed that there is an increasing chance of low Apgar score when there was an inter-pregnancy interval of fewer than 12 months (53) and cohort study by Lilungulu et al showed that babies with low Apgar score were 25.6% in short IPI than in women with normal interval (43).

2.3.4 Neonatal admission to ICU and early neonatal death

Neonatal ICU admissions among infants born to mothers with short IPI is caused by several factors like prematurity, low birth weight, nutritional deficiencies and low Apgar score among others. A systematic review including five databases and a systematic review from 1966 to 2017 showed that after matching for maternal age and at least one socio economic factor, there were no direct associations between short IPI and neonatal admission to the ICU in high resource settings (54). But however, in developing countries, a retrospective Cohort study that used data from the perinatal information system database of 894476 women delivering singleton infants in Latin America from 1990 to 2009 showed that short IPI was associated with significant neonatal death (55). Shrestha et al study showed that neonatal ICU admissions were more when IPI was <18 months which was (16.6%) (47).

By further analyzing the developing countries, a study by Bauserman et al, that analyzed data from women enrolled in the NICHD Global Network Maternal Newborn Health Registry (MNHR) from 2013 through 2018 in six low and middle-income countries showed that women with a short IPI had an increased risk of neonatal mortality (RR = 1.89 [1.74, 2.05]) and neonatal hospitalization (RR = 1.24 [1.11, 1.38]) (40). A retrospective cohort study using maternally-linked data from the Kilimanjaro Christian Medical Centre (KCMC) birth registry enrolling a total of 17,030 singlet births from women who delivered singleton infants at KCMC from 2000 to 2010 showed that those with short IPI had a higher prevalence of perinatal death of 4.14% as compared to 2.92% of those with normal IPI (45).

3.0 METHODOLOGY

3.1 Study design

An analytical cross-sectional study was conducted at a tertiary hospital in Zanzibar.

3.2 Study duration

Data collection was done in a period between October and December 2023.

3.3 Study area

This study was conducted at Mnazi Mmoja Hospital (MMH) located in Unguja island of Zanzibar, established in 1955. MMH is a tertiary level referral and teaching hospital in Zanzibar. The hospital offers multi-specialty services with both in-patient and out-patient facilities, attending about 74,000 outpatients and 27,000 inpatients per year. The maternity wing has approximately 12,000 deliveries per year with an average of 30 deliveries per day.

3.4 Study population

The study population included all women admitted to the maternity ward for delivery at MMH during the study period.

The following inclusion and exclusion criteria will be used to obtain the study population

3.4.1 Inclusion criteria

1. All consented women admitted for delivery at MMH with a gestation age $\geq$ 28 weeks during the study time.
2. Women above the age of 18 years.
3. Women with prior abortion.
4. Women with documented LNMP date on the RCH card.

3.4.2 Exclusion criteria

1. Women with pre-existing chronic diseases like DM, Hypertension, and Sickle cell disease.
2. Women who do not remember their previous pregnancy outcome month.

3. Women with multiple gestation of the index pregnancy.

3.5 Sample size

The calculated sample size was 422, but 424 participants were enrolled.

The sample size was calculated using the Kish-Leslie formula as shown below: -

$$N = \frac{Z^2P\ (100-P)}{\mathcal{E}^2}$$

Whereby:

N = minimum sample size required

Z = standard normal deviation set at 1.96 (corresponding to confidence level of 95%)

P = Prevalence of adverse pregnancy outcome (combined fetal and maternal). A prevalence of 45% shall be used based on a 2015 study done at Bugando (43).

Ɛ = marginal error to be used of 5.0%

$$N = \frac{1.96^2 \times 45.0\ (100 - 45.0)}{5.0^2}$$

N = 380

By taking into account of the study power of 90% and a non-response rate of 10%, the final sample size will be calculated using the formula:

$$N = \frac{(nX\ 100)}{(100 - f)}$$

$$N = \frac{(380 \times 100)}{(100 - 10)}$$

N = 422

Thus, the sample size calculated is 422.

3.6 Sampling method and enrollment of study participants

Initially, women that delivered at MMH from the previous day were identified and recruited at the post-natal wards before time of discharge, through consecutive sampling technique until sample size was achieved. A total of 1331 study participants were identified and recruited, 907 were excluded (148 due to failure to consent, 61 aged younger than 18 years, 209 women with pre-existing chronic disease like DM, Hypertension, and Sickle cell disease, 367 did not remember their previous delivery or abortion month, 38 had multiple

gestation of the index pregnancy and 84 were those without documented LNMP date on the RCH card). A total number of 424 participants were enrolled in the study.

3.7 Study variables

3.7.1 Independent variables

These were the identified associated factors of short IPI and the related pregnancy (feto-maternal) outcomes among women admitted for delivery at MMH. They included: -

- Socio-demographic factors (marital status, age, education level, occupation, area of residence and religion)
- Obstetric-related factors (parity, outcome of last pregnancy, ANC contacts, planned pregnancy, family planning usage and method of family planning used)

The outcomes were divided into adverse maternal and fetal outcomes.

The adverse maternal outcomes were: -

- Post-Partum Hemorrhage (absent or present with regard to estimated post-delivery blood loss (ie; >500mls post vaginal delivery or > 1000mls post cesarean delivery)
- Maternal Anemia (absent or present with regard to hemoglobin level above or below 11g/dl)
- Pre-labor Rupture of membranes and Preterm pre-labor rupture of membranes (absent or present defined as PROM (If GA is ≥ 37 weeks) or PPROM (If GA is < 37 weeks))
- Pre-term labor (absent or present if the onset of labor occurs before or after 37 completed weeks of gestation)
- Hypertensive disorders (absent or present defined as a SBP ≥140mmHg and/or a DBP ≥90mmHg occurring in pregnancy)

The adverse fetal outcomes were: -

- Low birth weight (absent or present defined as birth weight below or above 2500g)
- Prematurity (absent or present determined based on Ballard's score)
- Low Apgar score (absent or present defined as score of less or above 7 at the 5^{th} minute)

- Early Neonatal Death (absent or present defined as death within 24 hours post-delivery)
- Neonatal admission to Intensive Care Unit (absent or present depending on the admission to NICU)

37.2 Dependent variables

Short inter-pregnancy interval, which was taken as time a woman is not pregnant of less than 24 months if prior pregnancy outcome was a live/still birth and less than 6 months if prior pregnancy outcome was abortion.

3.8 Data collection methods

A standard structured questionnaire was used as a research tool. It consists of five sections: The first section was on socio-demographics; the second section on the obstetrics factors; the third section on past obstetric history; the fourth section on adverse maternal outcomes; the fifth section on adverse fetal outcomes.

All women recruited for the study were given a Swahili version consent form for signing, the interviewer used the structured questionnaire to obtain information from the study participant, RCH card, partograph, and patient file for data collection. The delivery card and partograph at the facility were used to obtain information on the newborn condition at birth (alive or stillbirth), birth weight, and Apgar score. Data on the prematurity status was taken from the neonate's file from the neonatal wards. The maternal data was obtained from the participants (socio-demographic factors such as; marital status, level of education, residence, religion, and occupation as well as obstetrics factors such as; planned pregnancy, month of prior pregnancy outcome, problems during prior pregnancy, outcome of last pregnancy, family planning use and the method used), RCH card (LNMP, parity, living, abortion, GA, number of ANC visits, antenatal BP, last Hb measured) and partograph together with the patient's file (anemia, PROM/PPROM, preterm labor, hypertensive disorder of pregnancy, mode of delivery, PPH as well as NICU). The feto-maternal outcomes were collected from the wards for those who were not discharged within 24 hours and a phone call follow-up for those discharged less than 24 hours. The maternal and fetal outcomes were considered as either being present (yes) or absent (no) as obtained from the patient's files.

3.9 Data management and analysis

Data were checked for consistency, validity and missing information. Analysis was done using SPSS version 23. Descriptive statistics were used to summarize categorical variables using frequency and percentages together with median and IQR as the measures of central tendency for continuous variables. A chi square and fisher's exact tests were used to show distribution of various maternal and fetal characteristics across the IPI categories and the sociodemographic and obstetric factors associated with short IPI. The rates of adverse pregnancy outcomes were estimated for each IPI. Bivariable and multivariable logistic regression analysis were used to determine measure of effect of the association between variables (age group, level of education, and family planning use) with p value <0.2, whereby odds ratio was estimated according to each pregnancy outcome (maternal and fetal outcome), estimated at 95% confidence interval and 5% level of significance after adjusting for confounders and observing for interactions.

3.10 Ethical clearance

Ethical clearance was obtained from the MUHAS research and publication committee with reference number DA.282/298/01.C/1833. The permission to conduct the study was obtained from ZAHREC (Zanzibar Health Research Ethics Council) with reference number 200171427523375720132 1 and the Director of training and research of MMH. Informed consent to participate in the study was sought from potential study participants. Confidentiality and privacy were guaranteed. Participation was voluntary. Patients who refused to participate in the study were still entitled to standard care and consent can be withdrawn at any time.

3.11 Dissemination plan

The study results will be submitted to Muhimbili University for partial fulfillment of Masters of Medicine in Obstetrics and Gynecology. The results will also be disseminated to ZAHREC (Zanzibar Health Research Ethics Council) and the Director of training and research of MMH, the Teaching, Research, and Consultancy Coordination Unit of MNH and thereafter disseminated to the Dean School of Medicine and to the Director of Postgraduate Studies.

The University and the principal author will hold the copyright of the research findings and they will be published in the local and/or international journals

4.0 RESULTS

4.1 Socio-demographic and obstetric characteristics among women admitted at Mnazi Mmoja Hospital in Zanzibar (N = 424)

The study included 424 women admitted at Mnazi Mmoja Hospital, recruited for a duration of 3 months from October to December 2023. The study population predominantly consisted of women aged 25 – 29 and 30 - 34 years, comprising 125 (29.5%) and 131 (30.9%) and with the median age in years (IQR) of 30 (26, 34). Nearly all of the women admitted for delivery were either married or living with a partner 416 (98.1%). Over three quarters, 329 (77.6%) had secondary level of education or higher and residing in urban 335 (79.0%). Predominantly were Muslims accounting 401 (94.6%) and over four fifth of the participants were unemployed 371 (87.5%).

With regards to obstetrics characteristics of the women admitted at MMH, nearly three quarter 307 (72.4%) were multiparas and only 13 (3.1%) had attended at least eight ANC contacts during their pregnancy. Majority of the participants, about three quarters 329 (77.6%) planned to conceive in their index pregnancy. On the outcome of the last pregnancy, majority 374 (88.2%) had normal deliveries. Family planning was used by majority 341 (80.4%) with natural methods being the most commonly used by over three quarters 283 (83.0%) (Table 1).

Table 1: Socio-demographic and obstetric characteristics among women admitted at Mnazi Mmoja Hospital in Zanzibar

Variable	Frequency (n)	Percent (%)
Median age [IQR] = 30 [26-34] years		
Median IPI [IQR] = 28 [20-32]month		
Age group (years)		
18 – 24	65	15.3
25 – 29	125	29.5
30 – 34	131	30.9
≥ 35	103	24.3
Marital status		
Single	8	1.9
Married / living with partner	416	98.1
Level of education		
No formal to primary	95	22.4
Secondary and above	329	77.6
Residence		
Urban	335	79.0
Rural	89	21.0
Religion		
Muslim	401	94.6
Christian	23	5.4
Occupation		
Employed	53	12.5
Unemployed	371	87.5
Parity		
Multipara	307	72.4
Grand multipara	117	27.6
ANC contact		
< 8	411	96.9
≥ 8	13	3.1
Planned pregnancy		
No	95	22.4
Yes	329	77.6
Outcome of last pregnancy		
Perinatal death	20	4.7
Infant death	21	5.0
Abortion	9	2.1
Normal	374	88.2
Family planning use		
No	83	19.6
Yes	341	80.4
Method of family planning used		
Modern	58	17.0
Natural	283	83.0

4.2 Overall prevalence of short inter-pregnancy interval among women admitted at Mnazi Mmoja Hospital in Zanzibar with participant's socio-demographic and obstetric characteristics

The overall prevalence of short inter-pregnancy interval of women admitted at Mnazi Mmoja Hospital in Zanzibar was found to be 35.6% (151/424) (Figure 1). The significant differences in the proportions of short IPI with participant's socio-demographic and obstetric characteristics were observed in age and family planning. In this case, participants aged 25-29 and 30-34 were found to have a higher proportion of short IPI of 39.2% (49/125) and 39.7% (52/131) respectively as compared to those aged greater or equal to 35 years 25.2% (26/103) (p=0.080). Furthermore, the proportion of short IPI among the participants who were not practicing family planning was seen to be greater 51.1% (45/88) when compared to those who were practicing 31.5% (106/336) (p=0.001). Finally, the differences of short IPI observed in marital status, level of education, residence, religion, occupation, parity, planned pregnancy, outcome of last pregnancy and family planning method were not significant ($p > 0.05$). (Table 2).

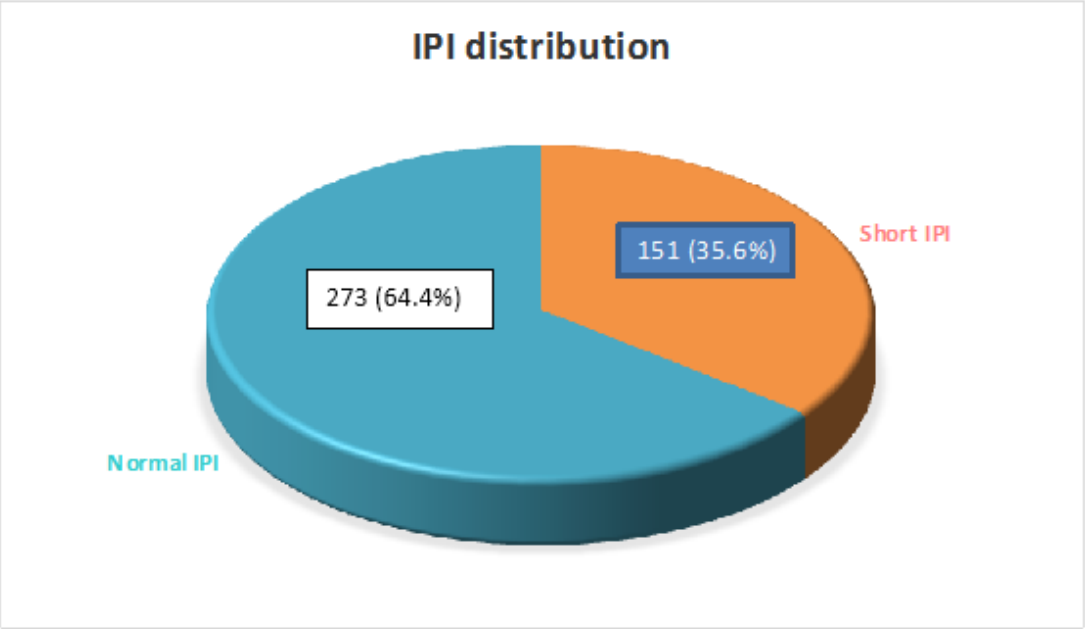


Figure 2: Prevalence of short inter-pregnancy interval among women admitted at Mnazi Mmoja Hospital in Zanzibar

Table 2: Distribution of short inter-pregnancy interval among women admitted at Mnazi Mmoja Hospital in Zanzibar with participant's socio-demographic and obstetric characteristics (N = 424)

Variable	Total	Inter-pregnancy intervals		*p* - value
		Normal, n(%)	Short, n (%)	
Age group (years)				
18 – 24	65	41 (63.1)	24 (36.9)	0.080
25 – 29	125	76 (60.8)	49 (39.2)	
30 – 34	131	79 (60.3)	52 (39.7)	
≥ 35	103	77 (74.8)	26 (25.2)	
Marital status				
Single	8	6 (75.0)	2 (25.0)	0.527
Married/ living partner	416	267 (64.2)	149 (35.8)	
Level of education				
No formal to primary	95	54 (56.8)	41 (43.2)	0.081
Secondary and above	329	219 (66.6)	110 (33.43)	
Residence				
Urban	335	211 (63.0)	124 (37.0)	0.242
Rural	89	62 (69.7)	27 (30.3)	
Religion				
Muslim	401	257 (64.1)	144 (35.9)	0.594
Christian	23	16 (69.6)	7 (30.4)	
Occupation				
Employed	53	31 (58.5)	22 (41.5)	0.338
Unemployed	371	242 (65.2)	129 (34.8)	
Parity				
Multipara	307	198 (64.5)	109 (35.5)	0.940
Grand-multipara	117	75 (64.1)	42 (35.9)	
ANC visit				
< 8	411	263 (64.0)	148 (36.0)	0.396
≥ 8	13	10 (76.9)	3 (23.1)	
Planned pregnancy				
No	95	62 (65.3)	33 (34.7)	0.840
Yes	329	211 (64.1)	118 (35.9)	
Outcome of last pregnancy				
Perinatal death	20	10 (50.0)	10 (50.0)	0.397
Infant death	21	15 (71.4)	6 (28.6)	
Abortion	9	7 (77.8)	2 (22.2)	
Normal	374	241 (64.4)	133 (35.6)	
Family planning				
No	88	43 (48.9)	45 (51.1)	**0.001**
Yes	336	230 (68.5)	106 (31.5)	
Family planning methods				
Natural	283	173 (61.1)	110 (38.9)	0.262
Modern	58	40 (69.0)	18 (31.0)	

4.3 Bivariable and Multivariable logistic regression for the factors associated with short IPI (N = 424)

Bivariable logistic regression analysis revealed that age and family planning, were significantly associated with short IPI among women admitted at Mnazi Mmoja Hospital (Table 3).

On multivariable logistic regression analysis, the factors that were independently associated with short IPI among women admitted at Mnazi Mmoja Hospital were age and family planning. The odds of having short IPI was 1.91 and 1.99 times higher (aOR=1.91, 95% CI=1.07-3.41, *p*=0.029) and (aOR=1.99, 95% CI=1.12-3.54, *p*=0.019) among women with an age of 25-29 and 30-34 respectively as compared to those with age above or equal to 35 years. Lastly, the odds of having short IPI was 2.06 times higher among those who were practicing family planning (aOR=2.06, 95% CI=1.26-3.38, *p*=0.004) compared to those who were not practicing family planning (Table 3).

Table 3: Bivariable and Multivariable logistic regression of the factors associated with short IPI (N = 424)

Variable	Short IPI	BIVARIABLE LR		MULTIVARIABLE LR	
		cOR (95% CI)	*p*-value	aOR (95% CI)	*p*-value
Age group (years)					
18 – 24	24 (36.9)	1.73(0.89-3.39)	0.108	1.69(0.85-3.35)	0.131
25 – 29	49 (39.2)	1.91(1.08-3.38)	**0.027**	1.91(1.07-3.41)	**0.029**
30 – 34	52 (25.2)	1.95(1.11-3.43)	**0.021**	1.99(1.12-3.54)	**0.019**
≥ 35	26 (25.2)	Ref		Ref	
Level of education					
No formal to primary	41 (43.2)	1.51 (0.95-2.41)	0.082	1.38 (0.85-2.24)	0.108
Secondary and above	110(33.43)	Ref		Ref	
Family planning					
No	45 (51.1)	2.27(1.41-3.36)	**0.001**	2.06 (1.26-3.38)	**0.001**
Yes	106 (31.5)	Ref		Ref	

*cOR and aOR represent crude odds ratio and adjusted odds ratio respectively

4.4 Fetal and maternal adverse outcome among women with short IPI and normal IPI

With regards to fetal adverse outcome, the significant difference in the proportions of women with short IPI who gave birth to stillbirth babies 16.6% (25/251) and normal IPI women who gave birth to stillbirth babies 7.7% (21/273) was seen in this study (p=0.005). Likewise, the difference in proportions among women with short IPI who gave birth to low-birth-weight babies 40.4% (61/151) and women with normal IPI who gave birth to low-birth-weight babies 13.9% (38/273) was found to be significant (p<0.0001). Moreover, significant differences on the proportion of women with short IPI 28.8% (43/151) and normal IPI 7.3% (20/273) who gave birth to prematurity babies was significant (p<0.0001). Also, significant differences on the proportion of women with short IPI whose babies were admitted to NICU 22.5% (34/151) and normal IPI 11.4% (31/273) whose babies were admitted to NICU was observed to be significant (p<0.002) (Table 4).

With regards to maternal adverse outcome, the significant difference in the proportions of women with short IPI who developed anemia 70.2% (106/251) and normal IPI women developed anemia 58.6% (160/273) was seen in this study (p=0.018). Also, the difference in proportions among women with short IPI who gave birth to preterm babies 34.4% (52/151) and women with normal IPI who gave birth to preterm babies 9.2% (25/273) was found to be significant (p<0.0001). Moreover, significant differences on the proportion of women with short IPI who developed hypertension 17.2% (26/151) and normal IPI 31.9% (87/273) who developed hypertension was observed to be significant (p<0.002) (Table 4).

Table 4: Fetal and maternal adverse outcome among women with short IPI and normal IPI

OUTCOMES	Inter-pregnancy intervals		p - value
	Normal, n (%)	Short, n (%)	
FETAL VARIABLES			
New born condition			
Alive	252 (92.3)	126 (83.4)	**0.005**
Stillbirth	21 (7.7)	25 (16.6)	
APGAR Score at 5 min			
Normal	215 (90.7)	129 (91.5)	0.800
Low	22 (9.3)	12 (8.5)	
Birth weight			
Normal	235 (86.1)	90 (59.6)	**<0.0001**
Low	38 (13.9)	61 (40.4)	
Prematurity			
Absent	253 (92.7)	108 (71.5)	**<0.0001**
Present	20 (7.3)	43 (28.5)	
Admission to NICU			
No	242 (88.6)	117 (77.5)	**0.002**
Yes	31 (11.4)	34 (22.5)	
Neonatal death			
Absent	266 (97.4)	148 (98.0)	0.708
Present	7 (2.6)	3 (2.0)	
MATERNAL VARIABLES			
Anemia			
Absent	113 (41.4)	45 (29.8)	**0.018**
Present	160 (58.6)	106 (70.2)	
Preterm			
No	248 (90.8)	99 (65.6)	**<0.0001**
Yes	25 (9.2)	52 (34.4)	
PROM			
Absent	253 (92.7)	135 (89.4)	0.247
Present	20 (7.3)	16 (10.6)	
Hypertension			
No	186 (68.1)	125 (82.8)	**0.001**
Yes	87 (31.9)	26 (17.2)	
PPH			
Absent	245 (89.7)	143 (94.7)	0.079
Present	28 (10.3)	8 (5.3)	
TOTAL	**273 (64.4)**	**151(35.6)**	

4.5 The odds ratios of fetal and maternal adverse outcome among women with short IPI and normal IPI

With regards to fetal adverse outcome, the odds of women with short IPI to give birth to stillbirth babies was 2.38 times higher as compared to those with normal IPI (OR=2.38, 95% CI = 1.29-4.39). Women with short IPI had 4.19 times higher odds for giving birth to baby having low birth weight compared to women with normal IPI (OR=4.19, 95% CI = 2.62-6.71). Also, women with short IPI had 5.04 times higher odds for giving birth to the prematurity babies compared to women with normal IPI (OR=5.04, 95% CI = 2.84-8.91). The odds of babies born by women with short IPI to be admitted to NICU was 2.27 times higher compared to babies born by women with normal IPI (OR=5.04, 95% CI = 1.33-3.86) (Table 5)

With regards to maternal adverse outcome, women with short IPI had 1.66 times higher odds of having anemia compared to women with normal IPI (OR=1.66, 95% CI = 1.09-2.54). The odds of women with short IPI to give birth in preterm was 5.21 times higher compared to women with normal IPI (OR=5.21, 95% CI = 3.07-8.83) while women with short IPI had 0.44 times lesser odds of being hypertensive compared to women with normal IPI (OR=0.44, 95% CI = 0.27-0.73 (Table 5).

Table 5: The odds ratios of fetal and maternal adverse outcome among women with short IPI and normal IPI

OUTCOMES	Odds ratio	95% CI	*p* - value
FETAL VARIABLES			
Stillbirth	2.38	1.29-4.39	0.0049
Low birth weight	4.19	2.62-6.71	<0.00001
Prematurity	5.04	2.84-8.91	<0.00001
Admission to NICU	2.27	1.33-3.86	0.0023
MATERNAL VARIABLES			
Anemia	1.66	1.09-2.54	0.0181
Preterm	5.21	3.07-8.83	0.00001
Hypertension	0.44	0.27-0.73	0.0011

5.0 DISCUSSION

This hospital-based analytical cross-sectional study among women admitted at Mnazi Mmoja Hospital showed a common practice of short inter-pregnancy interval in more than a third (35.6%) of them. Our findings in this study are comparable to studies conducted elsewhere in Tanzania and some countries with better economy. Previous studies in Mwanza and Dar es Salaam reported a prevalence of 33.3% and 22.14% respectively (43,44) which is also comparable with studies conducted in more developed countries including China (31.8%) and Canada (32%) [38, 39]. Our results, however, are much better than the results reported by some studies conducted elsewhere in Africa where a higher prevalence of short IPI ranging from 40% to more than 50% are reported (17,20). The reason for the wide variation in the prevalence of short IPI could be due to differences in education, adoption of modern lifestyle, and the use of modern contraception. Furthermore, reasons for the higher IPI as compared to our study could be attributed to cultural beliefs influencing the attitudes towards family planning and birth spacing (considered as privilege and power to have many children) as well as limited access to health care services like contraceptives.

The findings of our study showed the occurrence of short IPI was independently associated with young maternal age and lack of use of family planning. It has shown that the odds of having short IPI almost doubled among women with an age of 25-29 and 30-34 as compared to those aged at 35 years and above. This could be explained by the practice of early marriage in Zanzibar due to cultural norms and religious practices which prompts them to have a greater number of children within short interval. In comparison to other studies done, rural Uganda showed women aged 15-24 years were 4 times more likely to have short IPI, and those aged 25-34 years were 3 times more likely to have short IPI compared to women aged 35-44 years (20). Similarly, a study done in Tanzania showed women aged less than 25 years had more than twice the odds for having short IPI than those with 30-34 years (44). The differences of the observed findings maybe reflected on the cultural differences, religious perspective, health sector infrastructure and community awareness on factors associated with short IPI.

In this study, a greater percentage of women (80.4%) were found to have used contraceptives before the index pregnancy, however the majority (83.3%) were utilizing natural methods.

There is a need to focus more on initiatives that will improve the chance of modern contractive use because the prevalence of its use in this study, which was 17%, is lower than that of Ethiopia and Dar es Salaam which are 39.5% and 25% respectively (17,44). Nonetheless, given that the majority of the population are Muslims and their beliefs are opposed to modern methods, the disparity in the usage of modern contraception may be explained by religious perspectives. In addition, male act as the sole decision makers and mostly decide on the preference of having a large family. Cultural values could also potentially have an impact due to beliefs, such as the notion that the modern approach would render the pair infertile. This indicates that educating the community about contraception should be a higher priority rather than just merely providing contraceptives.

Moreover, our study findings on the factors associated with short IPI revealed that only 3.1% of participants had at least eight ANC contacts. Studies conducted locally as well as in other parts of Africa, such as those by Kikula et al (44), Belachew TB et al (41) and Alemi M et al at Yumbe Hospital in rural Uganda (20), also recorded similar observations. However, all studies examined four ANC visits in accordance with earlier WHO recommendations. The community should be better informed about the appropriate number of ANC contacts as per current recommendations as this would serve as a conduit for information regarding maternal health, the impact of short IPI and its associated fetal and maternal outcomes, as well as the related factors that are more likely to lead to short IPI such as lack of use of contraception.

The results of our study indicated that women with short IPI had a higher risk of anemia and premature deliveries as adverse maternal outcomes. According to this study, women with shorter IPIs were more likely than their counterparts to have anemia. This study's proportion of anemia among those with short IPI was about identical to that of a prospective Egyptian study (42) and somewhat higher than that of a Tanzanian study from Bugando (43). The physiological regression theory, which postulates an imbalance between the re-establishment of maternal reserve of nutrients during pregnancies as well as the presence of comorbidities, and the poor nutritional status of the poor developed countries, explains why there is a high proportion of anemia among those with short IPI. On the other hand, anemia prevalence is lower in developed nations, as evidenced by studies conducted in Turkey and Nepal (46, 47). These findings can be attributed to adherence to prenatal vitamin supplements, a low

prevalence of comorbidities, and nutritional factors other than pregnancy that contribute to anemia.

With regard to preterm birth, our study revealed that the odds were more than five times higher for women with short IPI. The results, however, differed from those of studies conducted in Tanzania (43), Nepal (47), and Bugando (43), with the odds being almost ten times greater. The findings observed discrepancy may be explained by the prevalence of short IPI in these studies correlating to the odds of preterm birth in short IPI. The reasons for these include the following: insufficient time for fetal development; stress and exhaustion in the mother; inadequate recovery of the mother's health from the physiological changes; hormonal fluctuations and nutritional depletion; and compromised uterine function as a result of stretching impeding the process of uterine involution. Because short IPI does not give a woman enough time to recover from the nutritional strain of her previous pregnancy, maternal nutrient depletion increases the risk of preterm birth and low birth weight. This compromises the mother's ability to support the growth and development of the fetus (56, 57).

Considering fetal outcome, the results of this study indicated a significant increase in the likelihood that women with short IPI will give birth to premature babies, stillbirths, low birth weight babies, and have NICU admissions. According to our study, mothers with short IPI had over double the likelihood of having stillbirth and being admitted to the NICU than their counterparts. A study conducted in six low- and middle-income countries by Bauserman et al. found that while the findings on stillbirth were similar, the findings on NICU admissions were higher (40). The study also found that women with a short IPI were more likely to have neonatal hospitalization and death. One possible explanation for the observed variation in NICU admissions is that the study was conducted in a national tertiary referral hospital that handles all complex cases. Additionally, a short IPI was linked to a higher risk of preterm birth and low birth weight newborns which also may account for the rise in NICU admissions.

According to this study, the likelihood of low birth weight was four times higher in women with short IPI in comparison to those with normal IPI. These results were nearly half as low as those of the Lilungulu et al study (43), but twice as high as those of the Mahande et al

study (45). However, the results of the study were not as high as those of Shrestha et al, who had about nine times the odds of having low birth weight kids (47), but they were somewhat lower than those of Koullali et al, who had almost 3 times the odds of having low birth weight babies (49). When looking at the prevalence of short IPI in these compared studies to that of our study at Mnazi Mmoja Hospital in Zanzibar, it is possible to explain the observed discrepancy.

Furthermore, compared to women with normal IPI, those with short IPI had five times higher odds of giving birth to premature babies (28.8% prevalence). With a prevalence of 29.3% of premature babies among individuals with short IPI, these results were comparable to those of Lilungulu et al (43). Maternal factors, including nutritional depletion throughout pregnancy and physiological recovery, as well as maternal anemia and an elevated risk for PROM, can explain this outcome (43).

6.0 STRENGTH OF THE STUDY, LIMITATIONS OF THE STUDY, CONCLUSION AND RECOMMENDATIONS

6.1 Strength of the study

This study has shown that short IPI is prevalent amongst women admitted for delivery at Mnazi Mmoja Hospital in Zanzibar. It has been able to highlight the associated factors for short IPI as well as determine the distribution of adverse pregnancy, both maternal and fetal, outcomes related to short IPI and thus projecting on critical information for possible measures to be taken in improving maternal and fetal well-being.

6.2 Limitations of the study

The study was carried out in a National Referral Hospital of Zanzibar, a tertiary hospital receiving referrals across Unguja and Pemba Island, which may alter generalizability of study findings as they receive complex cases. Lack of generalizability could also be attributed by the fact that the study was conducted in one setting. Because the study only followed the pregnancy outcomes for 24 hours after birth, some of the issues (like neonatal death which occurs in 28 days of the neonatal period) may have gone unnoticed. Although it accepts that its findings would have provided additional insights on the proportions of the pregnancy outcomes, the follow-up was not conducted in this study due to budgetary and time constraints for data collecting.

6.3 Conclusion

The findings from this study indicates that the short IPI is prevalent among women admitted for delivery at Mnazi Mmoja Hospital in Zanzibar, and are not adherent to the recommended IPI for several factors. The significant differences in the proportions of short IPI with participant's socio-demographic and obstetric characteristics were observed in women aged 25-29 and 30-34 as well as in those with lack of use of family planning, these would be attributed to socio cultural norms, religious perspective, health care infrastructure, and awareness on maternal, reproductive and child health wellbeing. On the pregnancy outcomes, the odds were significantly higher for women with short IPI to have stillbirth, low birth weight and premature babies, NICU admission, maternal anaemia and preterm labour and these are explained from the maternal depletion and physiological regression theories.

6.4 Recommendations

In addressing the consequences of short IPI, health care providers play an important role. It is common knowledge that the well-being of the pregnancy is crucial in ensuring the unborn child's and mother's positive outcome and improving their overall quality of life. For women of reproductive age, it is essential to have sufficient awareness about the negative effects of short-term IPI and the factors that are related with it, such as ANC contacts and the use of family planning for birth spacing. Therefore, provision of education on the significance of birth spacing can assist them in making informed decisions regarding their future reproductive lives. Additionally, ensuring that women receive comprehensive postpartum care, which includes a review of any problems from a prior pregnancy, a plan for future pregnancies, and appropriate counseling regarding contraception especially the modern contraceptives.

We recommend the health facilities to develop and enhance a conducive environment that will allow every postpartum woman to receive comprehensive education on family planning, while also emphasizing on the gravity of each ANC contact receiving education and counselling on potential future pregnancies. In order to improve family planning use, we also advise healthcare facilities to set up an integrated system that allows women who attend clinics to be followed up within the community using their phone numbers and home addresses. There should be community-based initiatives that highlight the advised birth spacing, especially in places of worship like mosques and churches where marriages are tied upon.

Furthermore, additional studies from other various health facilities are needed to explore and have a comprehensive understanding of the situation. Likewise, further studies are required to assess the factors that hinder the access, provision and the use of modern contraception.

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APPENDICES

Appendix I: Consent form, English version

Consent to participate in the study titled "Short inter-pregnancy interval; its associated factors and related pregnancy outcomes among women admitted at Mnazi Mmoja Hospital - Zanzibar".

Dear Madam,

My Name is Amney Suleiman, a resident doctor in the Department of Obstetrics and Gynecology at Muhimbili University of Health and Allied Sciences (MUHAS). I am conducting a research study on the stated title above and I hereby request your participation.

Purpose of the study: This study aims to determine the pregnancy outcomes associated with short inter-pregnancy intervals among admitted patients at Mnazi Mmoja Hospital in Zanzibar. The information obtained will be of importance in identifying the pregnancy outcomes that have been posed to be a risk from short inter-pregnancy intervals and how policymakers can make intervention strategies to overcome them.

How to participate: Participants who are willing to participate in this study will have to sign a consent form. A structured questionnaire in Swahili will be used to obtain the required information by the researcher.

Confidentiality: Information obtained from you will be kept confidential and there will be no link of data to you. Information obtained shall be used for research purposes only.

Costs: Your study participation is free and you are not required to pay any amount.

Voluntary participation and the right to withdraw from the study: Your participation is voluntary, and you have the right to withdraw from participating in this study at any time. Whatever your decision may be, it will have no effect in any way.

Risks: No risk is anticipated to arise by participating in this study.

Benefits: Your participation in this study will help to know the pregnancy outcomes associated with short inter-pregnancy intervals and advice will be given on possible measures to be taken to help reduce the occurrence of the adverse events.

Contact persons:

If you have any inquiries about this study, please do not hesitate to contact:

Dr. Amney Suleiman

Principal Investigator

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OR

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OR

In case of any inquiries on your rights as a participant in this study kindly contact:

The Chairperson of the Research and Publication Committee

Muhimbili University of Health and Allied Sciences (MUHAS)

P.O. Box 65001 Dar es Salaam

Tel. 022-2152489

I have understood the above information and I willingly agree to participate in this study with a full understanding of the study's purpose.

Initials and Signature of the participant: _____ Date: _____

Signature of Investigator: _____ Date: _____

Appendix II: Consent form, Swahili version

Fomu Ya Ridhaa, Kiswahili

Ridhia kushiriki katika utafiti uliopewa jina "Muda mfupi tenganishi wa mimba; sababu zake na matokeo yanayohusiana na ujauzito kati ya wanawake waliolazwa katika Hospitali ya Mnazi Mmoja - Zanzibar".

Kwa Bibi,

Jina langu ni Amney Suleiman, daktari mkaazi katika Idara ya Magonjwa ya Wanawake na Uzazi katika Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili (MUHAS). Ninafanya utafiti kuhusu kichwa cha habari kilichotajwa hapo juu na kwa hivyo naomba ushiriki wako.

Madhumuni ya utafiti: Utafiti huu unalenga kubaini matokeo ya ujauzito yanayohusiana na muda mfupi tenganishi wa mimba kwa wagonjwa waliolazwa katika Hospitali ya Mnazi Mmoja Zanzibar. Taarifa itakayopatikana itakuwa muhimu katika kutambua matokeo ya ujauzito ambayo yamekuwa hatarishi kutokana na muda mfupi kati ya mimba na jinsi watunga sera wanavyoweza kuweka mikakati ya kuingilia kati ili kuzipunguza.
Jinsi ya kushiriki: Washiriki ambao wako tayari kushiriki katika utafiti huu watatakiwa kusaini fomu ya ridhaa. Dodoso lililopangwa kwa Kiswahili litatumika kupata taarifa zinazohitajika na mtafiti.

Usiri: Taarifa itakayopatikana kutoka kwako itahifadhiwa kwa usiri na hakutakuwa na kiunganishi cha data na wewe. Taarifa itakayopatikana itatumika kwa madhumuni ya utafiti pekee.

Gharama: Ushiriki wako katika utafiti huu ni bure na hutahitajika kulipa kiasi chochote.

Ushiriki wa hiari na haki ya kujiondoa katika utafiti: Ushiriki wako ni wa hiari na una haki ya kujiondoa kushiriki katika utafiti huu wakati wowote. Uamuzi wako wowote hautakuwa na athari yoyote kwa njia yoyote.
Hatari: Hakuna hatari inayotarajiwa kutokana na kushiriki katika utafiti huu.
Manufaa: Ushiriki wako katika utafiti huu utasaidia kujua matokeo ya ujauzito

yanayohusiana na muda mfupi kati ya mimba na ushauri utatolewa kuhusu hatua zinazowezekana kuchukuliwa ili kusaidia kupunguza kutokea kwa matukio mabaya.

Watu wa kuwasiliana nao:

Ikiwa una maswali yoyote kuhusu utafiti huu tafadhali usisite kuwasiliana na:

Dkt. Amney Suleiman

Mpelelezi Mkuu

Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili (MUHAS)

Idara ya Magonjwa ya Wanawake na Uzazi

Simu. +255 718 215454

AU

Prof Projestine Muganyizi

Msimamizi wa utafiti huu

Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili (MUHAS)

Idara ya Magonjwa ya Wanawake na Uzazi

Sanduku la Posta 65001 Dar es Salaam.

Simu. +255 688 267218

AU

Dkt. Alli Saidi

Msimamizi Mwenza wa utafiti huu

Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili (MUHAS)

Idara ya Magonjwa ya Wanawake na Uzazi

Sanduku la Posta 65001 Dar es Salaam

Simu. +255 626 751387

AU

Ikiwa una maswali yoyote kuhusu haki zako kama mshiriki katika utafiti huu tafadhali wasiliana na:

Mwenyekiti wa Kamati ya Utafiti na Uchapishaji

Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili (MUHAS)

Sanduku la Posta 65001 Dar es Salaam

Simu. 022-2152489

Nimeelewa taarifa zilizo juu na nakubali kushiriki katika utafiti huu kwa kuelewa kabisa madhumuni ya utafiti.

Majina na Sahihi ya mshiriki: _____ Tarehe: _____

Sahihi ya Mtafiti: _____ Tarehe: _____

Appendix III: English Questionnaire

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

Questionnaire number……

Patient's file no……

PART 1: Socio-demographic characteristics

1. Age ….
2. Marital status
    a) Married
    b) Single
    c) Cohabiting
    d) Divorced
3. Level of education
    a) No formal education
    b) Primary
    c) Secondary
    d) Higher level
4. Residence
    a) Urban
    b) Rural
5. Religion
    a) Muslim
    b) Christian
    c) Other
6. Occupation
    a) Employed
    b) Unemployed

PART 2: Obstetrics characteristics

7. LNMP….
8. Parity....
9. Abortion….
10. Living….

11. Gestational age is calculated from the 1st date of the last normal menstrual period
    a) 28 to less than 34 weeks
    b) 34 to less than 37 weeks
    c) 37 weeks and above
12. Number of ANC contacts…..
13. Antenatal Blood Pressures:
    a) Elevated
    b) Normal
14. Last Hb measured ….
15. Planned pregnancy
    a) Yes
    b) No

PART 3: Past obstetrics history

16. Duration from last delivery ……. (Month of last pregnancy outcome……)
    a) Less than 7 months
    b) 7 to 17 months
    c) 18 to 23 months
    d) 24 to 59 months
17. Problem(s) during past pregnancy(ies)
    a) None
    b) Hypertensive disorders
    c) Gestational diabetes
    d) PROM/Preterm delivery
    e) C/S delivery
18. Outcome of last delivery
    a) Perinatal/neonatal death
    b) Infant death
    c) Normal baby
    d) Abortion
19. Was any family planning method used after previous pregnancy?
    a) Yes
    b) No

20. If yes, what method?
    a) Natural methods Eg. Calendar, coitus interruption, LAM, symptom-thermal
    b) Modern methods Eg. Hormonal contraceptives, injectables, loop, barriers

PART 4: Maternal outcomes

21. Anemia in pregnancy
    a) Absent if hemoglobin level 11g/dl and above
    b) Present if hemoglobin level Less than 11g/dl
22. PROM (If GA is ≥ 37 weeks) or PPROM (If GA is < 37 weeks)
    a) Absent
    b) Present
23. Preterm labor (If onset of labour occurs before 37 completed weeks of gestation)
    a) Absent
    b) Present
24. Hypertensive disorders of pregnancy
    a) Absent
    b) Present
25. Mode of delivery
    a) SVD
    b) Assisted vaginal delivery
    c) Caesarean section
26. If caesarean section delivery, give reason(s).....
27. 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

28. Newborn condition at birth
    a) Alive
    b) Stillbirth
29. APGAR score at 1st minute
    a) 7 and above
    b) Less than 7

30. APGAR score at 5 minutes
    a) 7 and above
    b) Less than 7
31. Birth weight
    a) 2500gm and above
    b) 1500gm to < 2500gm
    c) Less than 1500gm
32. Prematurity (determined based on Ballard's score)
    a) Absent
    b) Present
33. Baby admitted to NICU within 24hours
    a) No
    b) Yes
34. Early neonatal death within 24 hours
    a) Absent
    b) Present

Appendix IV: Dodoso kwa Kiswahili

Tafadhali soma kwa makini na jaza nafasi zilizoachwa wazi au weka alama ya (√) kwenye herufi inayofaa:

Nambari ya dodoso ……

Nambari ya faili la mgonjwa ……

<u>SEHEMU YA 1: Sifa za kijamii na kidemografia</u>

1. Umri ….
2. Hali ya ndoa
    a. Kwenye ndoa
    b. Sina mwenza
    c. Kuishi pamoja
    d. Mtalaka
3. Kiwango cha elimu
    a. Hakuna elimu rasmi
    b. Msingi
    c. Sekondari
    d. Kiwango cha juu
4. Makazi
    a. Mjini
    b. Kijijini
5. Dini
    a. Mwislamu
    b. Mkiristo
    c. Nyingine
6. Kazi
    a. Mwajiriwa
    b. Hana ajira

SEHEMU YA 2: Sifa za uzazi

7. Siku ya mwisho ya hedhi ya kawaida….
8. Mimba ulizozaa....
9. Mimba zilizotoka….
10. Watoto wanaoishi….
11. Umri wa ujauzito (unahesabiwa kutoka tarehe ya kwanza ya hedhi ya mwisho ya kawaida)
    a. Wiki 28 hadi chini ya wiki 34
    b. Wiki 34 hadi chini ya wiki 37
    c. Wiki 37 na Zaidi
12. Idadi ya ziara za ANC …..
13. Shinikizo la damu la ujauzito:
    a. Imeongezeka
    b. Ya kawaida
14. Hb iliyopimwa mwisho ….
15. Ujauzito ulipangwa
    a. Ndio
    b. Hapana

SEHEMU YA 3: Historia ya awali ya uzazi

16. Muda kutoka tokeo la ujauzito wa mwisho ……. (Mwezi wa matokeo ya ujauzito wa mwisho……)
    a. Chini ya miezi 7
    b. Miezi 7 hadi 17
    c. Miezi 18 hadi 23
    d. Miezi 24 hadi 59
17. Tatizo wakati wa ujauzito wa awali
    a. Hakuna
    b. Magonjwa ya shinikizo la damu
    c. Kisukari cha ujauzito
    d. PROM/Kujifungua kabla ya muda
    e. Upasuaji

18. Matokeo ya kujifungua kwa mwisho
    a. Kuzaa mtoto amekufa/kufa baada ya kuzaliwa
    b. Kifo cha mtoto baada ya siku 28
    c. Mtoto wa kawaida
    d. Mimba kutoka
19. Je, njia ya uzazi wa mpango ulitumika baada ya ujauzito wa awali?
    a. Ndio
    b. Hapana
20. Ikiwa ndiyo njia gani?
    a. Njia za asili Mf. Kalenda, kuvunja kujamiiana, Ukosaji wa hedhi kutokana na kunyonyesha, joto-mwili
    b. Njia za kisasa Mf. Vidonge vya homoni, sindano, vizuizi vya kuzuia mimba

SEHEMU YA 4: Matokeo ya mama

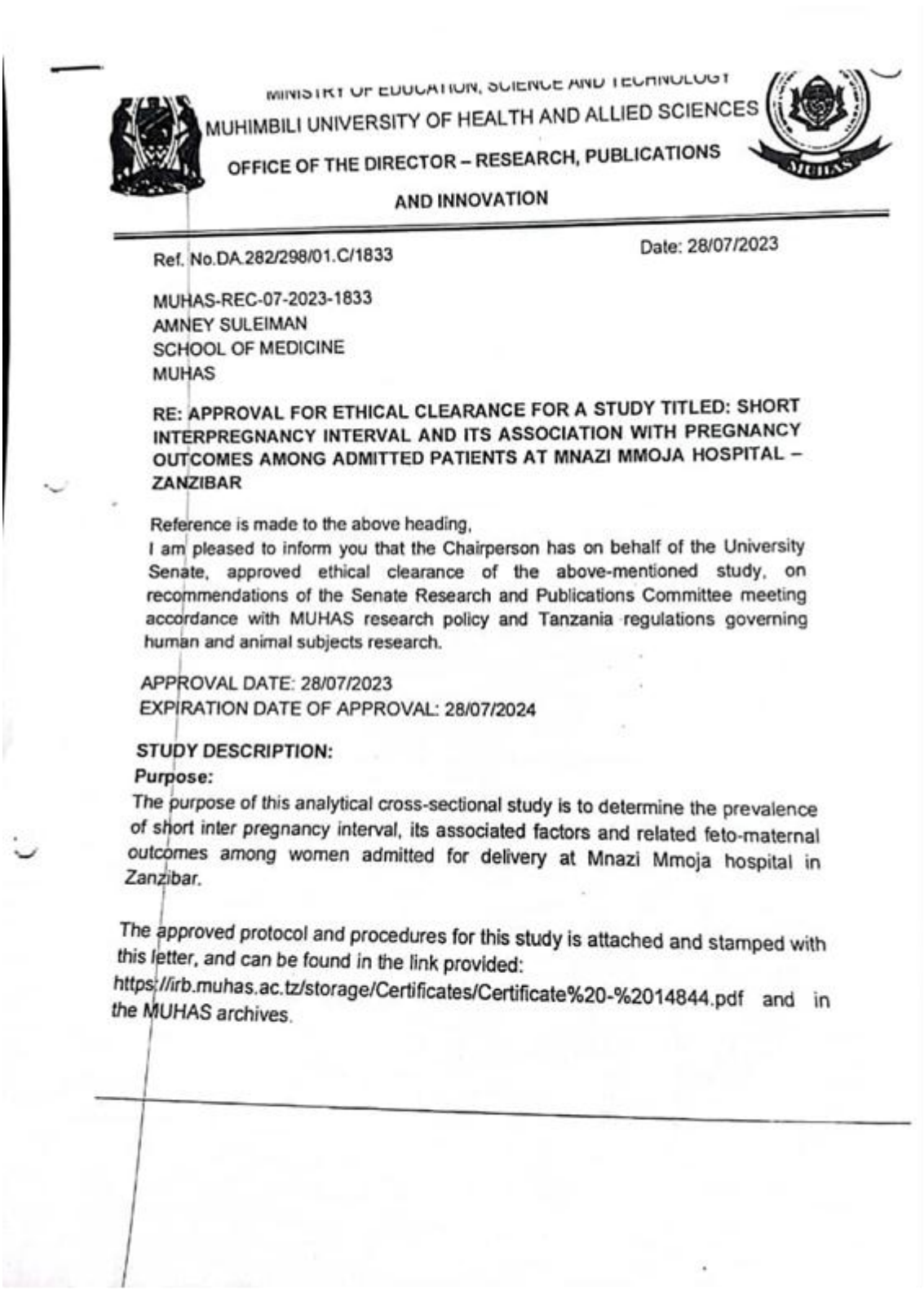
21. Upungufu wa damu katika ujauzito
    a. Hakuna ikiwa kiwango cha hemoglobini ni 11g/dl na zaidi
    b. Ipo ikiwa kiwango cha hemoglobini ni chini ya 11g/dl
22. PROM (Ikiwa umri wa mimba ni ≥ wiki 37) au PPROM (Ikiwa umri wa mimba ni < wiki 37)
    a. Hakuna
    b. Ipo
23. Uchungu wa kabla ya muda (Ikiwa kuanza kwa leba kunatokea kabla ya wiki 37 kukamilika)
    a. Hakuna
    b. Ipo
24. Magonjwa ya shinikizo la damu la ujauzito
    a. Hakuna
    b. Ipo
25. Njia ya kujifungua
    a. Kawaida
    b. Kujifungua kwa kusaidiwa
    c. Upasuaji
26. Ikiwa ni upasuaji, toa sababu .....

27. Kutokwa na damu baada ya kujifungua kupimwa kwa makadirio ya kupoteza damu baada ya kujifungua (yaani; >500mls baada ya kujifungua kwa kawaida au > 1000mls baada ya upasuaji)
    a. Hakuna
    b. Ipo

SEHEMU YA 5: Matokeo ya mtoto

28. Hali ya mtoto mchanga wakati wa kuzaliwa
    a. Hai
    b. Kuzaliwa na kufa
29. Alama ya APGAR katika dakika ya 1
    a. 7 na zaidi
    b. Chini ya 7
30. Alama ya APGAR katika dakika 5
    a. 7 na zaidi
    b. Chini ya 7
31. Uzito wa kuzaliwa
    a. 2500gm na zaidi
    b. 1500gm hadi < 2500gm
    c. Chini ya 1500gm
32. Kudumaa (kulingana na kipimo cha Ballard)
    a. Hakuna
    b. Ipo
33. Mtoto kulazwa chumba cha mahututi ndani ya masaa 24
    a. Hapana
    b. Ndio
34. Kifo cha mtoto mchanga ndani ya masaa 24
    a. Hakuna
    b. Kipo

Appendix V: Ethical Clearances



MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATION

Ref. No.DA.282/298/01.C/1833 Date: 28/07/2023

MUHAS-REC-07-2023-1833
AMNEY SULEIMAN
SCHOOL OF MEDICINE
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: SHORT INTERPREGNANCY INTERVAL AND ITS ASSOCIATION WITH PREGNANCY OUTCOMES AMONG ADMITTED PATIENTS AT MNAZI MMOJA HOSPITAL – ZANZIBAR

Reference is made to the above heading,
I am pleased to inform you that the Chairperson has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 28/07/2023
EXPIRATION DATE OF APPROVAL: 28/07/2024

STUDY DESCRIPTION:
Purpose:
The purpose of this analytical cross-sectional study is to determine the prevalence of short inter pregnancy interval, its associated factors and related feto-maternal outcomes among women admitted for delivery at Mnazi Mmoja hospital in Zanzibar.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided:
https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2014844.pdf and in the MUHAS archives.

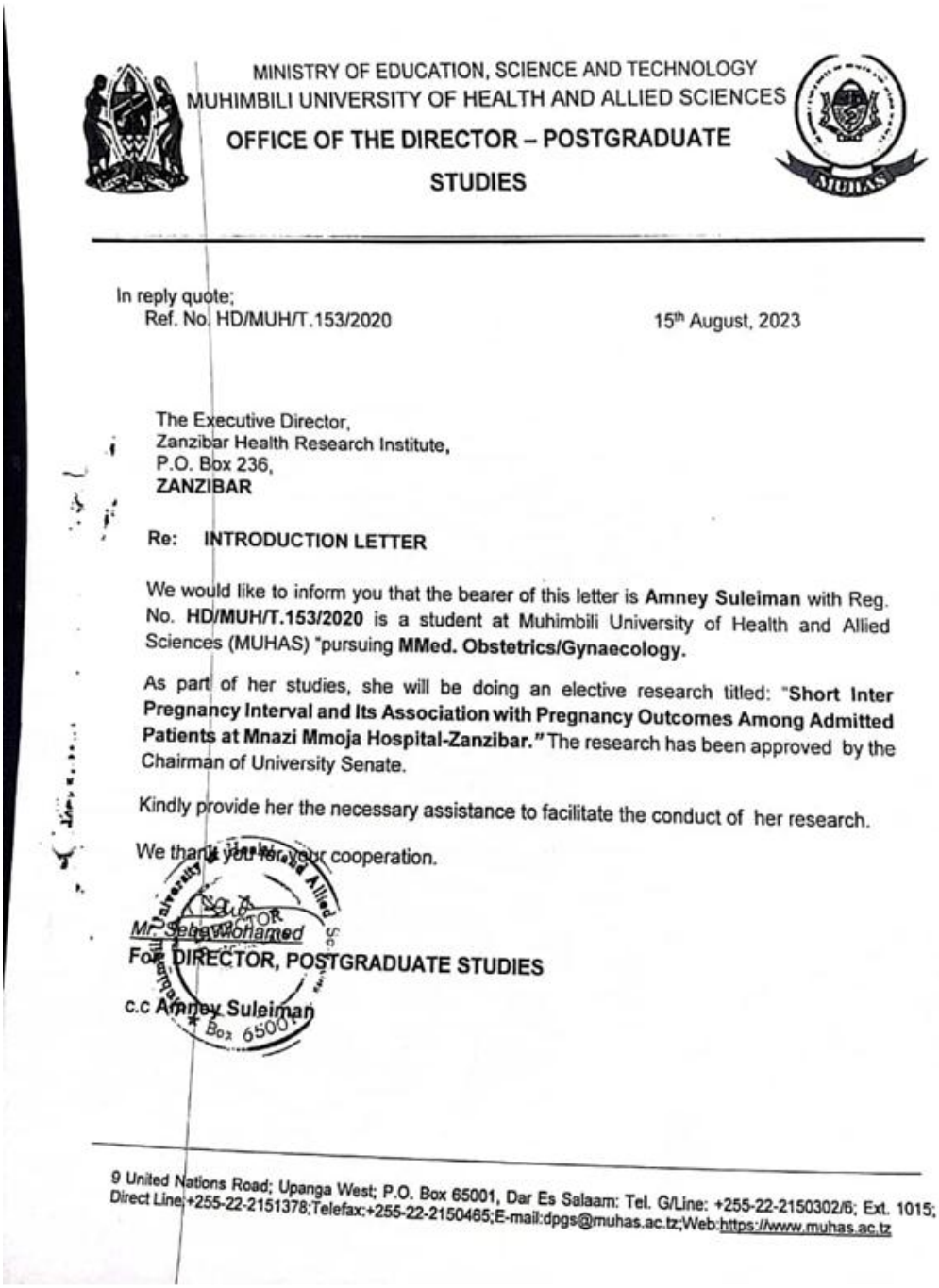
The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain data transfer agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain material transfer agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country,
8. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
9. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
10. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drc.muhas.ac.tz/.

Dr. Nahya Salim Masoud,
Chairperson, MUHAS Research and Ethics Committee

Muhimbili University of Health and Allied Sciences
DIRECTOR
Research, Publications & Innovations
Box 65001

Appendix VII: Introduction Letter



MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.153/2020 15th August, 2023

The Executive Director,
Zanzibar Health Research Institute,
P.O. Box 236,
ZANZIBAR

Re: INTRODUCTION LETTER

We would like to inform you that the bearer of this letter is **Amney Suleiman** with Reg. No. **HD/MUH/T.153/2020** is a student at Muhimbili University of Health and Allied Sciences (MUHAS) "pursuing **MMed. Obstetrics/Gynaecology.**

As part of her studies, she will be doing an elective research titled: "**Short Inter Pregnancy Interval and Its Association with Pregnancy Outcomes Among Admitted Patients at Mnazi Mmoja Hospital-Zanzibar."** The research has been approved by the Chairman of University Senate.

Kindly provide her the necessary assistance to facilitate the conduct of her research.

We thank you for your cooperation.

Muhimbili University of Health and Allied Sciences
DIRECTOR
P. Box 65001

Mr. Selemani Mohamed
For: DIRECTOR, POSTGRADUATE STUDIES

c.c **Amney Suleiman**

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015; Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz

Appendix VII: Permission Letter

REVOLUTIONARY GOVERNMENT OF ZANZIBAR

SECRETARY
ZANZIBAR RESEARCH COMMITEE
P. O. Box 2321 - Maizini, Zanzibar
Tel: 024 2231869
Fax: 024 2231742



RESEARCH/FILMING PERMIT

(This Permit is only Applicable in Zanzibar for duration specified)

Ref: 200171427523375720132 1

SECTION	
Name	AMNEY SULEIMAN
Gender	F
Date and Place of Birth	27-01-1990 KARIAKOO, ZANZIBAR
Nationality	TANZANIAN
Data Collection Duration	03 Month(s)
Research Tittle	SHORT INTERPREGNANCY INTERVAL AND ITS ASSOCIATION WITH PREGNANCY OUTCOMES AMONG ADMITTED PATIENTS AT MNAZI MMOJA HOSPITAL
Date of Issue	02-10-2023
Valid until	02 01-2024

FULL ADDRESS OF SPONSOR

Name of the Authorizing Officer	BAKARI K. MAKAME
Signature and Seal	
Institution	Office of the Chief Government Statistician
Address	P. O. Box 2321, Zanzibar
Printed Date	02-10-2023

Page 1/2

HOSPITALI YA MNAZI MMOJA ZANZIBAR

IDARA YA MAFUNZO NA UTAFITI MMH

Tarehe: 16/10/2023

Nd. AMNEY RUFFIMAN
Mwanafunzi/Mfanyakazi..... MIAFILI
Chuo/Ofisi/Hospitali..... MUHAS

KUH: RUHUSA YA KUFANYA UTAFITI.

Mada ya hapo juu inahusika na barua hii.

Ombi lako/lenu la kuja kudadisi baadhi ya wagonjwa/wafanyakazi kwa lengo la kulamilisha utafiti huo limepokewa na kuzingatiwa. Ruhusa imetolewa kuja kwa ajili ya udadisi huo unaohusiana na

SHORT INTERPREGNANCY INTERVAL AND ITS ASSOCIATION WITH PREGNANCY OUTCOMES AMONG ADMITTED PATIENTS AT MNAZI MMOJA HOSPITAL ZANZIBAR

kuanzia tarehe ya barua hii kwa muda wa mwezi mmoja.

Unatakiwa/Mnatakiwa kuwasilisha matokeo ya utafiti wako/wenu ofisini kwa Mkurugenzi Mtendaji mara baada ya kazi ya uandishi wa ripoti hiyo kumalizika na kuwasilisha kwenye Taasisi husika.

Unatakiwa/Mnatakiwa kuvaa vitambulisho muda wote wa kazi hii kwenye maeneo ya hospital. Pia uwe/muwe na kopi ya barua hii. Kutokana na upungufu wa wafanyakazi hospitalini hapa huruhusiwi/hamruhusiwi kutumia wafanyakazi wa hospital kwa kazi yako hii.

Natanguliza shukurani za dhati kwa mashirikiano
Ahsante

Ahlam Ali Amour
MD,MMED (INTERNAL MEDICINE) and DTMH
Mkurugenzi Mafunzo na Utafiti
Hospitali ya Mnazi Mnoja,
Zanzibar.