RISK FACTORS AND OUTCOMES OF REDUCED FETAL MOVEMENTS AMONG WOMEN ADMITTED IN MUHIMBILI NATIONAL HOSPITAL

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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 hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation titled: **''Risk factors and outcomes of reduced fetal movements among women admitted in Muhimbili National Hospital'',** in (partial) fulfillment of the requirements for the degree of master of medicine in Obstetrics and Gynaecology of the Muhimbili University of Health and Allied Sciences**.**

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Prof. Projestine Muganyizi MD, MMed, PhD

(Supervisor**)**

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Date

DECLARATION AND COPYRIGHT

I, **Dr. Saudiyya Mohamed,** declare that this **dissertation** is my own 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

This book is dedicated to my late mother Waheeda Hassan who I consider my first teacher in life. To my husband Mr. Geoffrey Gicharu Nganga, my son Ayden Nanga Gicharu and my brother Ismail Asnan.

ABSTRACT

Background

Reduced fetal movements in pregnant women is a common cause of anxiety, non-schedule visits to antenatal clinics and admission. It is considered a high risk pregnancy with the fetus at risk of hypoxia and sudden death. Maternal vigilance of fetal activity and timely reporting to healthcare providers when experiencing a reduced fetal movements may prevent perinatal morbidity and mortality. Therefore fetal surveillance is always indicated to assess the fetal wellbeing and to aid in opportune time of delivery. At least 40 % of pregnant women are concerned about RFM one or more times in pregnancy. Four to 15% of women will contact their doctor because of persistent reduced fetal movements in their third trimester. The management of reduced fetal movements varied significantly in different hospitals. The purpose of this study is to establish risk factors and outcomes of RFM among women admitted and delivered at Muhimbili National Hospital.

Objective: To determine risk factors for RFM and fetal outcomes of women admitted with RFM in Muhimbili National hospital.

Study Design*:* Hospital based unmatched case control. Study took place in Muhimbili National Hospital during November 2016 to April 2017. Ninety cases and 181 controls

Study site and setting: The study took place in the maternity wards at Muhimbili National Hospital.

Methodology: Unmatched case control study was conducted between November 2016 and April 2017. Using a Systematic sampling technique, cases of single tone mothers who were admitted in the antenatal wards due to various conditions and reported RFM were consecutively recruited for the study shortly after delivery. For each case two controls were also selected based on closest timing of their deliveries to that of the case, preferably from the same ward as the case. Cases and controls were eligible if they were at the gestational age of 32 weeks or more at the time of delivery. Those who met eligibility criteria were asked for consent and after acceptance, a structured questionnaire was administered and the newborn

outcomes were recorded from delivery notes. Data were analyzed by using IBM SPSS statistics version 20.0 software. Odds ratios and 95% CI were calculated to estimate risks for RFM and association of RFM with fetal outcome variables were established using Chi square. In all statistics, a p-value of <0.05 was considered significant. Ethical clearance was sought from MUHAS Senate Research and Publication Committee.

Results

A total of 271 pregnant women who delivered at MNH were recruited in the study including 90 cases and 181 controls. Mean age of the case and control were 29.23±6.16 years and 28.43±6.28 years respectively. Factors that were independently associated with RFM were, pregnant women with no formal education were more likely to have reduced fetal movements as compared to those with secondary and above (AOR=2.26, 95% CI,:1.224 - 4.160, p 0.009). Women with history of alcohol intake were shown to be more likely to have reduced fetal movements as compared to those with no history of alcohol intake (OR=4.20,95% CI,:2.29 – 7.58, p <0.001) and obstetric factors that were independently associated with RFM were PIH (OR= 2.44, 95% CI :1.41 – 4.17, p 0.001) and PPROM (OR=3.83, 95% CI: 1.15 – 10.0, p 0.007). The risks for RFM presenting with any of the medical conditions were (AOR= 3, 95% CI: 1.95 – 14.10, p 0.001). CS delivery was slightly higher in RFM (81.1%) compared to women with normal fetal movements. (71.3%), p=0.082.) and low birth weight (OR= 6.31, 95% CI:3.619-11.012, p <0.001), babies admitting to NBU (OR= 6, 95% CI: 3.542-10.424, p <0.001).

Conclusion

RFM is independently associated with a number of social, obstetric and medical factors. Women who report persistent RFM were more likely to end up with poor fetal outcomes as compared to controls hence should never be ignored.

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LIST OF ABBREVIATION

ACOG	American College of Obstetricians and Gynaecology
AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Care
AOR	Adjusted Odds Ratio
APH	Antipartum hemorrhage
BPP	Bio physical profile
BMI	Body mass index
C.S	Caesarean section
CTG	Cardiotocography
CI	Confidence Interval
COR	Crude Odds Ratio
FKC	Fetal kick count chart
HIV	Human Immunodeficiency Virus
IDM	Insulin dependent diabetes mellitus
IOL	Induction of labor
IUFD	Intrauterine fetal death
IUGR	Intra uterine growth restriction
MNH	Muhimbili National Hospital
MOH	Ministry of Health

MSL	Meconeuim stained liqour
MTCT	Mother to Child Transmission
MUHAS	Muhimbili University of Health and Allied Science
NRFS	Non reassuring fetal status
NICU	Neonatal intensive care unit
NRH	National Referral Hospital
OR	Odds Ratio
PIH	Pegnancy induced hypertension
PE	Pre-eclampsia
PI	Principal Investigator
PMTCT	Prevention of Mother to Child transmission
PPH	Post partum hemorrhage
PROM	Premature rupture of membranes
SGA	Small for gestational age
SVD	Spontaneous vaginal delivery
UK	United Kingdom
UTI	Urinary tract infection
VD	Vaginal delivery
VDRL	Veneareal disease research laboratory
WHO	World Health Organization

GLOSSARY OF TERMS

Amniotic fluid: The fluid that surrounds the baby within the amniotic sac. This environment cushions the baby from injury and plays an important role in the fetal development.

Antenatal: Period before birth, concerned with the care and treatment of the unborn baby and the pregnant woman.

Ant**e**partum: Time before the onset of labour

Apgar score: Scoring includes 5 variables; heart rate, respiratory effort, muscle tone, reflex irritability and color with a highest score of 10. The **A**pgar score is recorded at one minute and five minutes after birth

Cardiotocography: The electronic monitoring of the fetal heart rate and uterine contractions. The fetal heart rate is recorded by means of either an external ultrasonic abdominal transducer or a fetal scalp electrode, uterine contractions are recorded by means of a abdominal pressure transducer, It is graphically represented on a contin**u**ous paper print out

Congenital malformation: A physical defect in a baby at birth that can involve many different parts of the body.

Doppler : A diagnostic tool that uses low intensity ultrasound to detect the presence or absence of blood flow velocity in arteries or veins.

Fetal death : " still birth"

Fetal growth restriction: [FGR] strictly refers to babies that have failed to reach their growth during pregnancy. SGA –small for gestational age is defined as a baby with an antenatal ultrasound biometry assessment less than the 10^{th} percentile for gestational age according to national birth weight percentile.

Gestation: The time from conception to birth. The duration of gestation is measured from the first day of the last normal menstrual cycle.

Hypertension Repeatedly and persistently increased blood pressure exceeding 140/90 mmHg

Neonatal mortality rate : NMR the number of neonatal deaths occurring within
The first 28 days of live per 1000 births

Oligohydramnious: Deficiency of amniotic fluid volume

Perinatal mortality rate: The number of still births and neonatal and neonatal deaths per 1000 births.

Preterm birth: The birth of a baby at less than 37 weeks of gestational age

Postnatal period: Is the duration (42) weeks immediately after childbirth.

Quickening: This is the first perception of fetal movement by the mother. Usually felt at 18-20 weeks of gestation in the first pregnancy.

Singleton: A single baby

Still birth: Death prior to the complete expulsion or extraction form its mother of product of conception of 20 or more completed weeks of gestation or 500g or more birth weight. In Tanzania it is after 28 weeks of gestation.

Stillbirth rate: The number of stillbirths per 1000 births

1.0 INTRODUCTION

Reduced fetal movement is a common indication for assessment of fetal wellbeing. Fetal movement counts have been a recommended tool over the past three decades for the women in their second trimester as a way to monitor fetal wellbeing. Fetal movements counting is an easy and inexpensive and valuable screening tool for fetal well-being that increases maternal fetal bonding . Maternal perception of fetal movements is one of the first signs of fetal life and is regarded as a manifestation of fetal wellbeing (1). There is no evidence that any formal definition of reduced fetal movements is of greater value than subjective maternal perception in the detection of fetal compromise. No proposed definitions of decreased fetal movements have ever been proven to be superior to a subjective maternal perception in terms of identifying a population at risk. As giving correct, evidence based information about what to do in the event of an episode of reduced fetal movements may be a matter of life or death for the unborn baby, it is important that midwives use existing guidelines in order to deliver consistent information which is based on current evidence to women in their care (2) .

The Women presenting with decreased fetal movements do have a higher risk of stillbirth, fetal growth restriction, fetal distress, preterm birth, and other associated outcomes. Yet, little research has been conducted to identify optimal management, and no randomized controlled trials have been performed (3) . Therefore maternal perception of reduction or change of fetal movements should be considered clinically important. It has been suggested that reduced or absent fetal movements may be a warning sign of impending fetal death. Findings from an Auckland, New Zealand study indicate that women who frequently feel strong movements have a lower risk of stillbirth than those who do not perceive strong movements more than once or twice during a two week period. A majority of women (55%) experiencing a still birth perceive a reduction in fetal movement prior to diagnosis(4).

A number of studies of fetal deaths in Norway and the UK identified that an inappropriate response by clinicians to maternal perception of RFM was a common contributory factor in stillbirth (5). A perception of increasing fetal activity during the last three months of pregnancy is a sign of fetal wellbeing (6)

Perception of reduced fetal movements serves as an indirect measure of central nervous system intergrity and its function. All the fetal movements are not alike. Fetal movements can be classified as weak, strong, rolling. Movements are first perceived by the mother between 18 and 20 weeks of gestation and rapidly acquire a regular pattern. Fetal movements have been defined as any discrete kick, flutter ,swish or roll (7). It can also be as early as 14 weeks in multi parity women due to the increased sensitivity of the more relaxed abdominal muscles. Between 20-36 weeks ,all types of fetal movements are felt (8). Rayburn categorized the fetal movements into three types as: rolling stretching, and balling up. The baby will move all the joints and the spine ensuring proper joint development. By 28 weeks all babies will show the startle reflex: where by baby bring both arms legs towards the chest by loud noise and sudden movement or sensation of falling. In the 3rd trimester baby bicycling movement using both feet called stepping, (8). This movement is important in helping to turn the baby upside down for a normal delivery. Fetus can move less during its sleep cycles which occur regularly throughout the day and night .Each cycle lasts 20-40 minutes overall. These sleep cycles rarely exceed 90 minutes in the normal, healthy fetus (9). Fetal rest activity cycles do not synchronize with the mother.

When fetus is exposed to chronic hypoxia, the fetus responds by conserving energy and subsequent reduction in the fetal movements to reduce oxygen consumption .This is an adoptive mechanism of the fetus. The perception of fetal movements by individual women and differences in the fetal activities in individual fetuses are probably the major component in variation of fetal movements. The greatest number of movements are experienced when the mother is lying down, fewer when sitting and fewest while standing (10). The greatest number of variable decelerations will be observed in the reclining position and it was increased with pregnancy progression. (11). Reduced fetal movements is considered as high

risk pregnancy with the fetus at high risk of hypoxia and sudden demise (12). Maternal perception of increasing fetal activity throughout the last 3 months of pregnancy is a sign of fetal well-being, whereas perception of reduced fetal movements is associated with increased risk of late stillbirth. Reduced fetal movements is even more significant when pregnancy is complicated by diseases like hypertension, diabetes mellitus (13), and anemia. Raising maternal awareness of fetal movements leads to a decrease in perinatal mortality. Women with reduced fetal movement should not wait until the next day to assess fetal well-being.The mother usually feels fetal movements best when she is lying down on her left side or sitting with her feet up. When she is busy she may not feel the fetal movement. Factors which can prevent the mother from perceiving fetal movements can be due to reduced amniotic fluid volume, obesity, anterior placenta, intrauterine growth retardation (IUGR), fetal growth restriction (FGR), or small for gestational (SGA) age babies, smoking, alcohol, drugs: benzodiazepines, opioids including methadone which sedate both mother and fetus. If she cannot feel 10 counts in 2 hours they should contact the clinician or maternity unit immediately for further evaluation (12). A single episode of decreased fetal activity is not significant in 70% of mothers. However in chronic fetal distress, it has been shown that there is significant reduction of fetal movements for at least 12 hours before the fetal heart stops. This is called MAS-movements alarm signal which indicates impending fetal death. Therefore changes in the fetal heart rate follow the MAS within 1-4 days if the fetal heart rate does not occur before that. There are number of expected outcomes associated with decreased fetal movements, eg: congenital anomalies, preterm birth, cerebral palsy, low birth weight, caessarian section.

Despite widespread use of many tests, limited evidence exists to demonstrate effectiveness at improving perinatal outcomes with application of these tests. At present there is no general agreed management of reduced fetal movements and a guideline, hence managing such pregnant women is challenging and controversial.

1.1 Literature Review

Fetal movements

Maternal perception of decreased fetal movements affects 5-15% of pregnancies and is associated with poor fetal outcome which include; asphyxia, preterm birth, growth restriction, or death in 10.6-15% of cases. This was a study done in eastern Norway. A woman who complains of reduced fetal movement have an increase risk of stillbirth that is 60 times more than women with normal fetal movement (8) . In 5% of patients who reported decreased fetal activity, the incidence of stillbirth is 60 times higher, the risk of fetal distress in labor 2 to 3 times higher, the incidence of low **A**pgar score at delivery is ten times greater, and the incidence of severe growth restriction 10 times higher. Cardiff count to ten charts showed that 60% of patients who reported to have decreased fetal activity did exhibit evidence of fetal compromise(14). It was first recommended in 1973 as a nonspecific early warning sign of fetal distress(15) and since then reduced fetal movements have been linked to both intrauterine and postpartum pathology . So far, there has been no evidence of any association between formal fetal movements counting and increased maternal anxiety or concern. Fetal movement counting does not cause deleterious psychological effects in low-risk pregnant women. In a randomized, controlled trial in Denmark, Neldam concluded that fetal movement counting was an acceptable method for pregnant women (14). Perception of fetal movements can be influenced by many factors like maternal activity, obesity, position, medications, placental location, gestational age, and fetal amniotic fluid level. Sedating drugs which cross the placenta such as alcohol, benzodiazepines, methadone and other opioids can have a transient effect on fetal movements (16). A study done in USA showed those on methadone had a relatively good outcome of buprenorphine-exposed infants, and recognition of the benefits of medication-assisted treatment for pregnant women with opioid use disorders in optimizing pregnancy outcomes. Fetal motor activity and fetal movement-fetal heart rate coupling were depressed from peak to trough at 36 weeks gestation. In Opioid abuse patients, the FHR and heart rate acceleration were significantly reduced (17).

From 30 weeks of gestation onwards, the level of carbon dioxide in maternal blood influences fetal respiratory movements, and some authors report that cigarette smoking is associated with a decrease in fetal activity (16). Women with uncomplicated pregnancies smoking two cigarettes significantly reduced the proportion of the time that fetal breathing movements were present. Chronic fetal hypoxia is a common pregnancy complication associated with IUGR that may influence respiratory outcome at birth. Maternal chronic hypoxia in late gestation increases fetal lung expression of genes regulating hypoxia signalling, lung liquid reabsorption and surfactant maturation, which may be an adaptive response in preparation for the successful transition to air-breathing at birth. In contrast to other models of chronic fetal hypoxaemia, late gestation onset fetal hypoxaemia promotes molecular regulation of fetal lung maturation.(18)

The administration of glucocorticosteroids to enhance fetal lung maturation has been reported by some authors to reduce fetal movements and FHR variability, detected by cardiotocography (CTG) over the 2 days following administration. The pathophysiology of corticosteroid changes in the fetal movement and fetal heart rate variability is still unclear and has not been definitely proven.(19). Fetuses with major malformations are generally more likely to demonstrate reduced fetal activity. However, normal or excessive fetal activity has been reported in anencephalic fetuses (20). A lack of vigorous motion may relate to abnormalities of the central nervous system, muscular dysfunction or skeletal abnormalities. Clubfoot or Talipes equinovarus is characterizsed by an adducted fore foot hind foot varus and ankle deformity. This is an underlying unifying factor for lack of fetal movement. Fetal movement is a key developmental signal in development of joints (21). An American study documented that working pregnant physicians and nurses had an increased catecholamine levels during the work and this is known to decrease blood floor to uterus. The fetus response to this decreased blood flow by decreasing motor activity (22).Hence working mothers are at risk. Fetal movements can vary over the course of the day, peaking between 9 pm and 1 am when maternal glucose levels are reduced (13) . The woman should seek evaluation immediately if she has not felt 10 kicks.

Many factors other than worsening fetal condition can influence the perception of movements, including maternal activity, position, obesity, medications(23),smoking (24) gestational age, placental location, and amniotic fluid volume. Some evidence show that women receive most fetal movements when lying down ,fewer when sitting and fewest while standing (10). Other studies found that. There is a concern among health professionals that fetal movement counting may induce time consuming and unwanted investigations. Antenatal perception of increasing fetal activity throughout the last 3 months of pregnancy is a sign of fetal well-being, whereas perception of reduced fetal movements is associated with increased risk of late stillbirth. Approximately 15 million infants born with prematurity each year, which is more than one tenth of all newborn infants globally Lancet et al. Prematurity is the leading cause of mortality in the first month of life in Tanzania, with one in every three newborn deaths is due to preterm complication. Tanzania ranks 12th in the world for the number of preterm deliveries (25) . Every year 210,300 babies are born before 37 weeks are completed. Of these babies 13,900 die every year. Preterm infants have a high risk of birth complications, including infectious diseases, intravascular hemorrhage, respiratory insufficiency and also other organ system involvement.

Fetal surveillance methods

The goal of fetal surveillance is to prevent fetal death. Fetal surveillance techniques based on assessment of fetal heart rate patterns have been in clinical use for years. Women at high risk for stillbirth should undergo antepartum fetal surveillance using the non -stress test, contraction stress test and bio physical profile. Biophysical profile consists of five indicators, includes fetal heart rate reactivity, breathing movements, muscular tone, gross body movements, amniotic fluid volume. Data suggest that fetal biophysical testing is a more accurate method of antepartum fetal monitoring(26).Two points are given to each parameter when present, and 0 will be awarded when absent after 30 minutes of ultrasound observation. Factors other than hypoxemia that may affect biophysical profile include gestational age , magnesium sulphate, steroids, labor, and excessive transducer pressure on the maternal abdominal wall. Doppler ultrasound may be effective in identifying at-risk fetuses specifically in high-risk pregnancies. Doppler ultrasound measure blood flow velocities in the fetal

vessels. Most commonly the umbilical artery. The indices used are pulsating index or resistant index. Normally growing fetuses have velocity diastolic flow while growth restricted fetuses often have diminished or absent or it may even be in reversed umbilical artery diastolic flow in severe growth restricted cases. Respiratory distress syndrome is caused by a deficiency of pulmonary surfactant. Tests of pulmonary maturity use different techniques to quantify the amount of surfactant present. Lecithin sphingomyelin (L/S)ratio was the first reliable assay. Lecitin sphingomyelin ratio of 2.0 or more has been associated with pulmonary maturity. A mature L/LS ratio predicts the absence of respiratory distress syndrome in 98% of neonate. A ratio of less than 1.5, the risk of developing RDS is about 73%. Also it is suggested Phosphatidylglycerol (PG) determination for fetal lung maturity is a reliable test in the presence of bloody amniotic fluid.(27).

Management protocol of reduced fetal movements

There is no universally agreed management protocol for clients who present with reduced fetal movements, and universal definition as not been agreed upon. In Eastern Norway and Bergen have registered all consultations for reduced fetal movements, as part of the international collaborative project "Fetal Movement Intervention Assessment"(Femina).There was an association between outcomes and the procedures used. Women who waited 24 hours with reduced or absent movements before contacting healthcare had increased risk. Among those with absent movements, 47% (42-52%) had such risk behavior between outcomes and procedures used. Out of 23,933 deliveries, 1200 pregnancies were examined. In 1043 pregnancies the mother had spontaneously presented her concern over reduced fetal movements. Asphyxia, death, growth restriction or preterm birth occurred in 19.6% (16.6-22.6%) of cases, ranging between units from 9.1% to 26.5%. Standard procedures varied extensively; ultrasonography was used in 39.0% to 98.6% and doppler in 4.5% to 74.6% of cases (28). Repeated episodes of RFMs at term are more likely to occur in women with high second-trimester uterine artery doppler resistance indices and are strongly associated with the birth of SGA infants. Women presenting with repeated episodes of RFM should be treated as being at high risk of placental dysfunction irrespective of the results of prenatal ultrasound and doppler assessment (29). A historical cohort study of all women (years 2011-2013, n = 399)

that visited the maternal emergency room (ER) (gestational age 24 + 0-42 + 0) due to RFM (group A), that was compared to a control group consisted from women with normal perception of fetal movements (group B). Groups were compared for maternal characteristics (age, gravity, parity, BMI), gestational age, placental location, gestational age at birth and fetal outcomes (birth-weight and Apgar scores). Reduced fetal movements were associated with anterior placenta (OR=1.44,P= 0.04) and nulliparity (OR= 2.28,P= <0.001) (30). Another study done in England showed women with RFM more likely to be nulliparous (p=0.002) and have induction of labour (p=0.0011). This study also showed the increased burden of care required by those with RFM, including increased NBU admission rates , increased induction rates and higher surveillance(31) . The study done in UK, Blackburn, the rate of still birth was increased in women with RFM (OR 2.11), some 26.6% had a poor perinatal outcome (still birth, small for GA or preterm delivery) (32). Fourteen delivery units in Norway registered all cases of RFM in a population-based quality assessment, they found that information to women and management of RFM varied significantly between hospitals. They intended to examine two cohorts of women with RFM before and during two consensus-based interventions aiming to improve care through: 1) written information to women about fetal activity and RFM, including an invitation to monitor fetal movements, 2) guidelines for management of RFM for health-care professionals. All singleton third trimester pregnancies presenting with a perception of RFM were registered, and outcomes collected independently at all 14 hospitals. The still birth rate among women with RFM fell during the intervention 4.2% vs. 2.4%. Improved management of RFM and uniform information to women is associated with fewer stillbirths (33). The study done in Norway, in 14 delivery units, maternal overweight, advanced age, smoking and the duration of RFMs are the characteristics that help in identifying pregnancies that should be targeted for intensified management. Time matters and knowledge-based information are needed to improve fetal health (34).

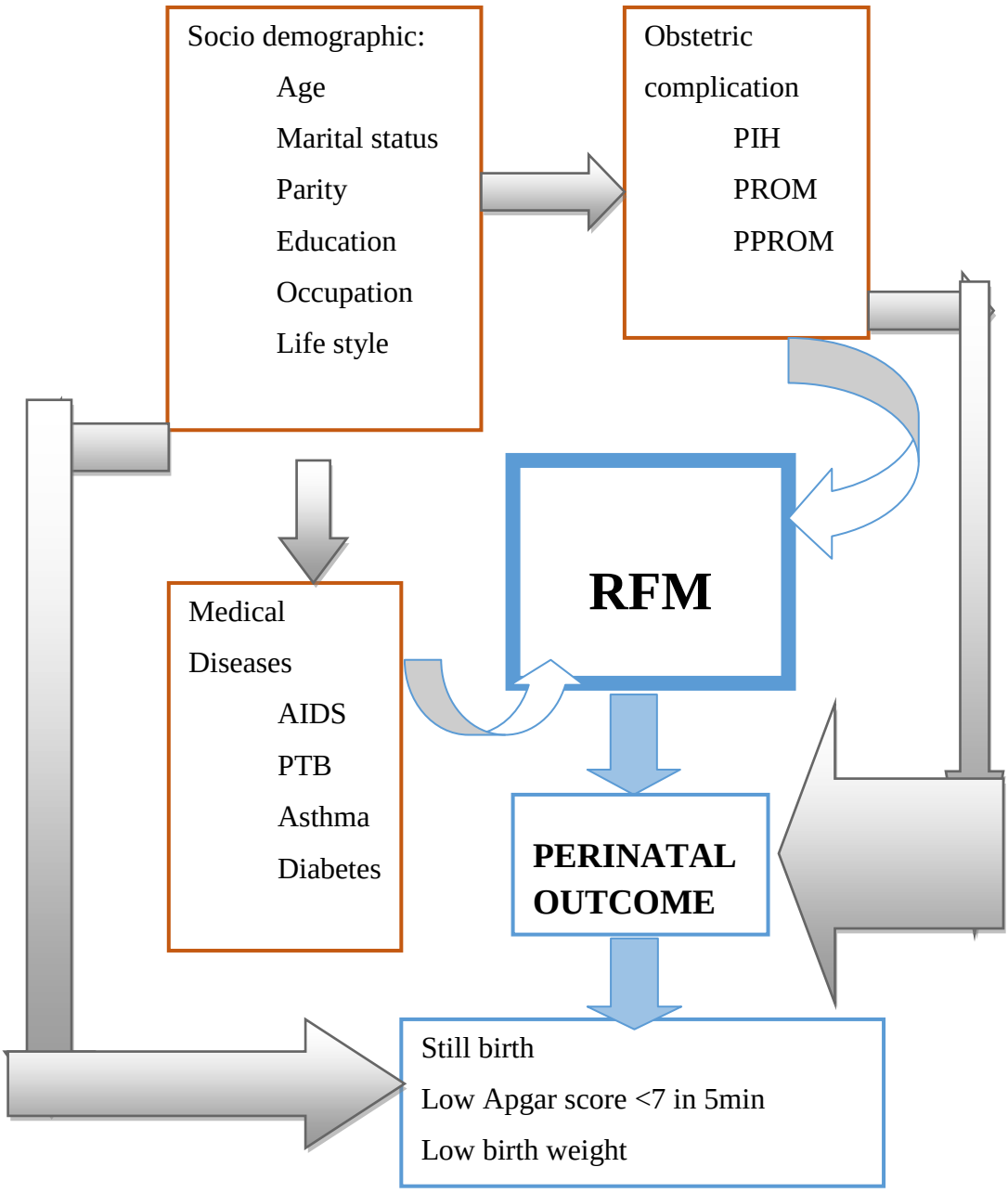
No study has been done on reduced fetal movements at Muhimbili National Hospital to identify optimal management and outcome of mothers who present with reduced fetal movements. I therefore intend to study and provide baseline information on the risk factors

and outcome of these pregnancies and management of reduced fetal movements. There is a need for evidenced based guideline.

1.2 Conceptual Framework

The figure below explains the risk factors for poor pregnancy outcome.

Fig. 01



1.3 Problem Statement

Maternal perception of fetal movements is widely used as a marker of fetal viability and wellbeing. Perception of reduced fetal movements causes concern and anxiety to the pregnant mothers and it is one of the causes of unplanned hospital visit and admissions. Tools like ultrasonography, cardiotocography are being used in antepartum fetal assessment in pregnant women with reduced fetal movements. However the evidence of its clinical benefit is limited**.** Reduced fetal movements is also used to check one of the danger signs in focused antenatal care to give optimal care and to ensure good fetal outcome. These women with reduced fetal movements should be carefully monitored and investigated to improve obstetric outcome. No study has been done in Muhimbili National Hospital on reduced fetal movements to identify optimal management and perinatal outcome of mothers who present with reduced fetal movements. This study focuses on the risk of poor pregnancy outcome in a setting where sonographic assessment of RFM is not readily available to backed-up maternal perception.

1.4 Rationale

Studying the risk factors and poor pregnancy outcome in women with reduced fetal movements will improve our knowledge and would contribute in improving future guideline in the management of pregnant women with reduced fetal movements in Muhimbili National Hospital and hence this study data may also be useful in doing further studies.

1.5 Research Questions

i. What are the factors independently affecting pregnancy outcome in women with reduced fetal movements admitted at MNH from November 2016 to April 2017?
ii. What are the risk factors of poor pregnancy and perinatal outcome in women with RFM admitted at MNH during November 2016 to April 2017?

1.6 Objectives

1.6.1 Broad Objective

To determine risk factors for reduced fetal movements and fetal outcomes of women admitted with RFM in Muhimbili National hospital from November 2016 to April 2017.

1.6.2 Specific objectives

1. To determine socio-demographic risk factors for RFM.
2. To determine obstetric risk factors for RFM.
3. To determine medical risk factors for RFM.
4. To determine association of RFM with mode of delivery and adverse fetal outcomes.

2.0 METHODOLOGY

2.1 Study Design

This was an unmatched hospital based case control study. It was conducted at Muhimbili National Hospital over a period of five months from November 2016 to April 2017. Ninety cases and 281 controls

2.2 Study site and setting

This study was conducted in Muhimbili National Hospital maternity wards. This is the largest tertiary and referral hospital in Tanzania and it also serves as a training facility for postgraduate and undergraduate students of Muhimbili University. Muhimbili National Hospital also attends referral patients.

The department of Obstetric and Gynecology is staffed by consultants, specialists, residents, medical officers and nurses as technical staff. The majority of Mothers delivering at MNH are referrals from the district hospitals of Amana, Temeke and Mwananyamala, Sinza from Dar Es Salam. Some mothers are admitted through the antenatal clinic or come directly from home. Few number of mothers are referred directly from smaller health centers, dispensaries and private hospitals without passing through the district level hospitals. All ANC women before delivery are admitted in antenatal wards numbered as (eg ward number 32,33,38,39,35,40) and are daily visited and monitored. After delivery all the women are admitted in postnatal wards together with antenatal patients due to unavailability of separate postnatal wards. Women in labour who are delivered by caesarean section will also return back to the same antenatal ward where they were admitted before surgery. The routine standard of care for a patient who presents with reduced fetal movements is: history and physical examination. Depending on the gestation, those who are at term are delivered immediately while those who have not attained a term gestation (less than 34 weeks) **are** evaluated and managed appropriately by use of fetal kick count (FKC), biophysical profile and dexamethasone. Decision are taken to deliver women with RFM when fetal kicks are less than 10 counts in 12 hours. This is the standard operating procedure that this study followed. The

specialists decide on time of delivery of preterm pregnancies based on ultrasound and BPP results. The care of patients in labour ward is done by residents in consultation with specialists and formulated care plan is implemented by trained midwives. The labour ward has a total of 9 beds and with a private wing. The private wing also has a total of 9 beds, all distributed over four cubicals. Per day an average of 30 - 40 deliveries are conducted. Labour is monitored by using partograph. Specialists ward round is done daily in the morning and while the residents are available round the clock. Maternity theatre is adjacent to labour ward with three operating tables for both elective and emergency cases which runs for twenty four hours. It conducts an average of 16-20 operations per day. Emergency and elective caesarian sections are performed by specialists and residents and medical officers.

The newborn unit (NBU) at Muhimbili National Hospital is equipped with incubators and ventilators that are used in the management of newborn with respiratory problem. It also has several phototherapy machines. Babies admitted there are kept warm, put on oxygen, intravenous drugs and fluids as per needs. Neonatal intensive care unit (NICU) is available within the NBU and any newborn requiring intensive life support can be attended there. It admits approximately 12 to 25 neonates per day, where one third of them are premature babies born in MNH or a referred from the municipal hospitals around Dar es Salam. There is special room for premature babies with a bed capacity of up to 40 neonates. The unit has two Neonatologists and four Pediatricians, residents and medical officers, intern doctors and qualified nurses. The specialists, neonatologist and residents perform daily ward rounds in NBU. There is a specialist daily on call to attend to difficulties that a resident cannot handle. Premature babies are admitted and covered with injectable antibiotics, vitamin K, if not breast feeding they are given intravenous fluids until they start breast feeding. Surfactant is also given to those babies with respiratory distress syndrome who can afford to buy if not they are given intravenous aminophylline..

2.3 Study population

Women delivered at MNH after being admitted to maternity wards at the gestation age of 32 weeks or more who met inclusion criteria. At 32 weeks gestation, the lungs will have produced sufficient surfactant to maintain respiratory activity and active intervention will increase chances of fetal survival.

2.4 Target population

Women who delivered at MNH after being admitted in maternity wards and who had perceived pre-labour reduced fetal movements (cases) on admission or during the course of admission and those who did not perceive RFM (control). The newborns of the women in two arms were implicitly studied.

2.5 Recruitment and enrolment

The study participants were recruited in maternity wards shortly after delivery. At Muhimbili National Hospital, postnatal mothers were combined together with antenatal patients and routine standard care management was followed. All the 271 who met eligibility criteria and consented women were recruited for study. All the women were eligible if they delivered at MNH after being admitted to maternity wards for medical or obstetric conditions at the gestation age of 32 weeks or more who had pre delivery perception of reduced fetal movements diagnosed by a specialist. The recruitment was conducted in antenatal/postnatal wards after they were back from the labor ward or theatre post-delivery. The women were admitted in any of the 6 wards [ward number 32, 33,38,39,35,40]. Women from these wards were visited every day. To select cases, every day one ward was selected randomly (using ballot technique). Once the ward was selected, all deliveries in that ward were identified by using delivery register and ward register. Cases were identified if the woman was diagnosed to have RFM by a specialist and also if she reported RFM. We also considered self-reported RFM which was not confirmed by a fetal kick count or who had no further investigations but was diagnosed by a specialist and documented in the file. Case notes were reviewed to confirm written diagnosis of RFM . After a case was identified, the files of the other two

women (controls), who delivered on the same day in the same ward were retrieved to establish their time of delivery as closest to that of the case and case notes were scrutinized to determine if they had no reduced fetal movements before delivery. Controls were selected based on their time of delivery closest to the cases. If no case or control was available in the same ward, then moved to the next higher number ward [Example, moving from ward 33 to 35 to 38 to 39 to 40 to 32] and the procedure started again. The process was repeated until all consequitive cases were established. Antenatal card was used to get ANC data. Fetal outcome data was obtained from patient files and delivery notes. Women in both arms were interviewed using a structured questionnaire. Data were collected from November 2016 to April 2017.

2.6 Inclusion criteria

1. Singleton pregnancy
2. ≥32 weeks gestation
3. Admitted at MNH for Medical or obstetric condition up to the time of delivery
4. Documented and self reported RFM for some duration while in the ward (Cases) or No documented or self reported RFM during the course of admission (Controls).
5. Mothers willing to give consent.

2.7 Exclusion criteria

1. Women with acute conditions that cause immediate fetal demise such as massive acute hemorrhage, Cord prolapsed, Uterine rupture
2. Eclampsia and unconscious patients
3. Major congenital anomaly
4. Women who were admitted in labour.
5. Too sick to give written consent

2.8 Sample size determination

At MNH, 15% of all deliveries have either APGAR score less than 7 or stillbirths. Assuming that women perceiving RFM will have increased risk for fetal poor outcome in a high risk population, it can be reasonably assumed that the incidence of RFM will be around 30%. Now assuming 95% CI in an unmatched case control study a calculated sample size of 263 delivering women will have a power of 80% to detect this difference if it exists according to Fleiss (http://www.openepi.com/SampleSize/SSCC.htm).This sample size was rounded up to 270 delivering women.

Sample size was obtained by the formula

$n = 2*\delta\ 2(z\alpha+z\beta)^2/(\Delta)^2$

Where;

n= is the total sample size (the sum of the sizes of both comparison groups),

σ= is the assumed SD of each group (assumed to be equal for both groups),

$z\alpha$ =value is the desired significance criterion (95% = 1.96),

zß =value is the desired statistical power (80% = 0.842),

Δ= is the minimum expected difference between the two means = 0.127

Calculating for a 10% drop-out rate one would needed to complete was 270 (90 cases and 180 controls) Hence n= 270.

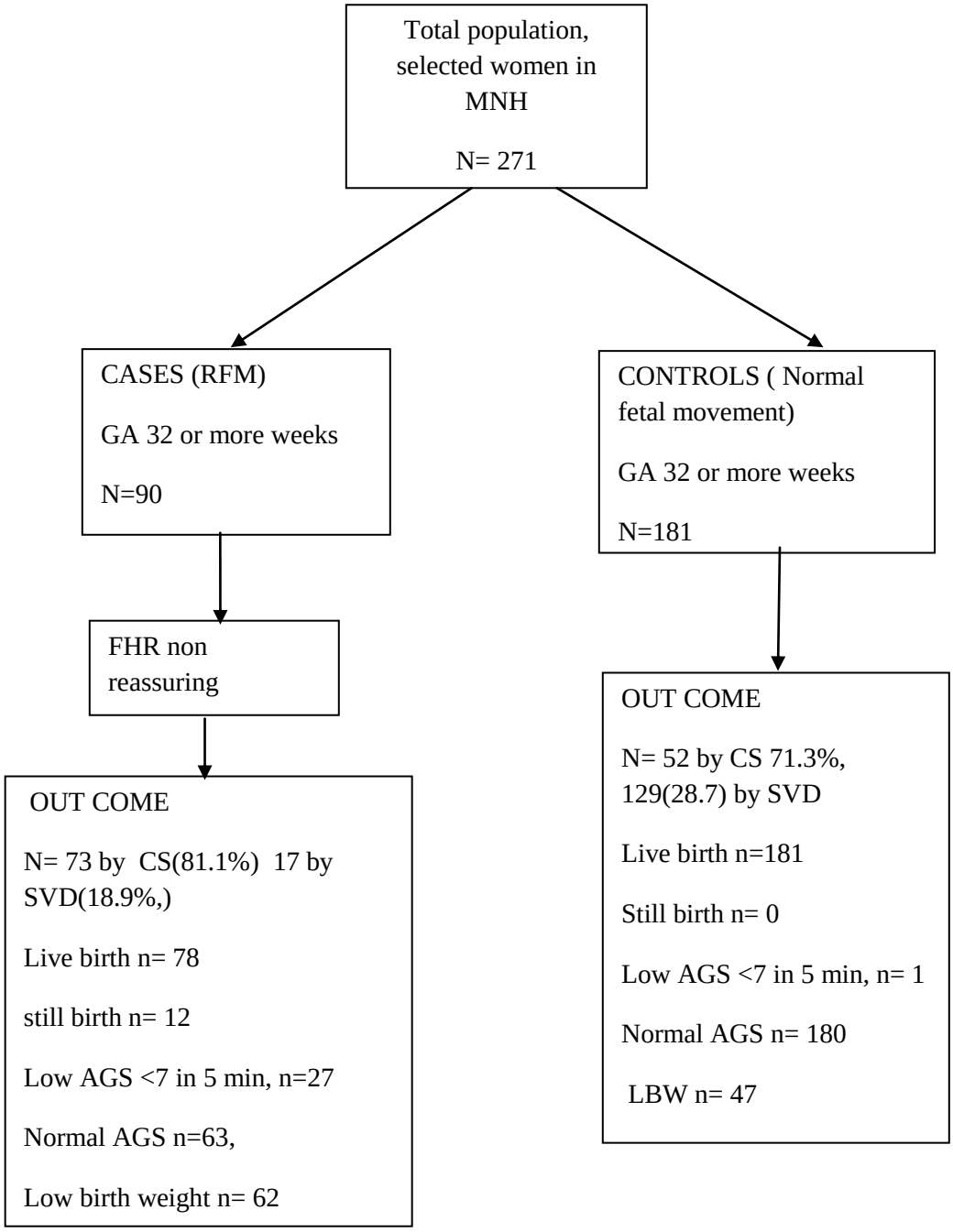
2.9 Data analysis

Statistical analysis was performed by using Statistical Package for Social Scientists (SPSS Version 20.0 software. Regression analysis was done to establish odds ratio for those who developed poor fetal outcome. Newborns whom were delivered either still birth or with Apgar score <7 (dependent variable) were pooled together in a composite outcome variable of poor pregnancy outcome. The risk for poor pregnancy outcome was estimated by odds ratio and 95% CI to determine the clinical importance. Multiple logistic regression was used to determine the independent factors (Age of the mother; marital status of the mother, level of education of the mother , parity, history of diabetes mellitus and hypertension, mode of delivery, sex of the baby, and birth weight) for the primary outcome. In all statistical calculations, a p-value of <0.05 was takes as statistically significant. Qualitative data was analyzed with Chi-square.

2.10 Ethical consideration

Clearance for this study was sought from the Muhimbili University of Health and Allied Sciences, Senate Research and Publication Committee. Permission to conduct the study was sought from the Director of Muhimbili National Hospital Ethical Committee. Thorough information about the study was given to every woman before they consent for the study. Any woman had a right to participate or decline from participating without required explanations. Privacy and confidentiality was assured at all times and participants had the right to withdraw from the study anytime even after consenting to participate. The diagnosis of RFM was made by a qualified doctor and the patient was investigated and managed accordingly as hospital protocol. Decision for prompt delivery was made when needed. Hence there were no any risks involved in conducting this survey. All the women were equally treated. Also they were assured that no risks associated with participating in the study and participant name did not appear on the questionnaire.

Figure 1: Flow diagram showing the participation of the approached women.



3.0 RESULTS

A total of 271 pregnant women who delivered at MNH between November 2016 and April 2017 were recruited in this study including 90 cases with reduced fetal movements and 181 without reduced fetal movements. Participants were 16 to 42 years of age with mean age of the case and control were 29.23±6.16 years and 28.43±6.28 years. Sixty nine percent of the study participants were married. Women who had primary education were more among the participants 54.6% .**Table 1.**

Table1: Distribution of maternal characteristics among participants

Maternal characteristics	n (%)
Age groups (years)	
16-20	31 (11.4)
21-25	58 (21.4)
26-30	80 (29.5)
31 and above	102 (37.6)
Educational level	
No formal education	6 (2.2)
Primary education	148 (54.6)
Secondary and above	117 (43.2)
Occupation	
Employed	168 (62.0)
Unemployed	103 (38.0)
Marital status	
Currently married	187 (69.0)
Currently unmarried	84 (31)
Gravidity	
Primigravida	73 (26.9)
Multi gravida	198 (73.1)
Parity	
Nulliporous	78 (28.8)
1-4 para	185 (68.2)
Para 5 and above	8 (3.0)
Living	
No living child	103(38.0)
One or more children	168(62.0)
Abortion	
Yes	40 (14.8)
No	231 (85.2)

RFM was associated with low level education than secondary education (OR=2.13, 95% CI 1.27-3.56, p=0.004), Cigarette smoking (OR=4.10, 95% CI: 1.45-11.3, p=0.008) and alcohol consumption (OR=4.20, 95% CI: 2.29-7.58, p<0.001). **Table 2.**

Table 2: Association between Socio-demographic characteristics distribution and maternal perception of reduced fetal movements

Obstetric complications	**Cases = 90**	**Control = 181**	**COR**	**95%CI**	**P - Value**
Age groups (years)					
16-20	9(10.0)	22(12.2)	0.75	0.31 – 1.80	0.52
21-25	16(17.8)	42(23.2)	0.70	0.35 – 1.41	0.32
26-30	29(32.2)	51(28.2)	1.04	0.57 – 1.92	0.89
31 and above	36(40.0)	66(36.5)	1		
Educational level					
No formal/primary	40(44.4)	114(63.0)	2.13	1.27-3.555	0.004
Secondary and above	50(55.6)	67(37.0)	1		
Occupation					
Employed	57(63.3)	111(61.3)	1.11	0.65 – 1.84	0.75
Unemployed	33(36.7)	70(38.7)	1		
Marital status					
Currently married	76(84.4)	111(61.3)	1		
Currently unmarried	14(15.6)	70(38.7)	1.57	0.75 – 3.30	0.23
Cigarette smoking					
Yes	11(12.2)	6(3.3)	4.10	1.45 – 11.3	0.008
No	79(87.8)	175(96.7)	1		
Alcohol consumption					
Yes	36(40.0)	25(13.8)	4.20	2.29 – 7.58	<0.001
No	54(60.0)	156(86.2)	1		

Respondents who had PIH were 2.4 times more likely to have RFM (OR=2.44, 95% CI:1.41-4.17 p=0.001), PPROM (OR=3.83, 95% CI: 1.15-10.0,p=0.007) and any of the above (OR=3.13, 95% CI: 1.79-5.26,p= <0.001) . **Table 3**

Table 3: Association of obstetric complications with maternal perception of reduced fetal movements

Obstetric complications	**Cases = 90 n (%)**	**Control = 181 n (%)**	**COR**	**95%CI**	**P – Value**
PIH					
Yes	40(44.4)	45(24.9)	2.44	1.41 – 4.17	0.001
No	50(55.6)	136(75.1)	1		
PROM					
Yes	10(11.1)	9(5.0)	2.38	0.93 – 6.25	0.07
No	80(88.9)	172(95.0)	1		
PPROM					
Yes	12(13.3)	7(3.9)	3.83	1.15 – 10.0	0.007
No	78(86.7)	174(96.1)	1		
Anemia					
Yes	24(26.7)	34(18.8)	1.56	0.86 – 2.86	0.14
No	66(73.3)	147(81.2)	1		
Any of above					
Yes	66(26.7)	85(47.0)	3.13	1.79 – 5.26	<0.001
No	24(73.3)	96(53.0)	1		

Respondents with AIDS and DM were 5 times more likely to have RFM. AIDS (OR=5.26, 95% CI: 1.0-27.8 p=0.05),Mothers with any of the medical conditions studied were three times more likely to have RFM. (OR= 3.05, 95% CI: 1.37-6.76, p=0.006). **Table 4.**

Table 4: Association of medical condition variables with maternal perception of reduced fetal movements, data presented as n (%)

Medical conditions	**Cases = 90**	**Control = 181**	**COR**	**95%CI**	**P – Value**
HIV infection					
Yes	6(6.7)	6(3.3)	2.10	0.65 – 6.67	0.22
No	84(93.3)	175(96.7)	1		
AIDS					
Yes	5(5.6)	2(1.1)	5.26	1.0 – 27.8	0.05
No	85(94.4)	179(98.9)	1		
PTB					
Yes	2(2.2)	0(0)			
No	88(97.8	181(100)	NA		NA
Asthma					
Yes	1(1.1)	4(2.2)	1		
No	89(98.9)	177(97.8)	2.01	0.22 – 18.2	0.54
Cardiac disease					
Yes	1(1.1)	0(0)			
No	89(98.9)	181(100)			NA
DM					
Yes	5(5.6)	2(1.1)	5.26	1.0 – 27.8	0.05
No	85(94.4)	179(98.9)	1		
Any medical condition					
Yes	16(17.8)	12(6.6)	3.05	1.37 – 6.76	0.006
No	74(82.2)	169(93.4)	1		

Respondents with RFM were 10 times more likely to have babies with low apgar score (COR=77.14 95% CI :10.27-15.79 p <0.001). Mothers with RFM were 6 times more likely to have babies with low birth weight (COR= 6.3 95% CI: 3.619–11.012 p <0.001. Table 5

Table 5: Association of pregnancy outcome variables with reduced fetal movements

Pregnancy outcome	Case =90	Control=181	COR	95% CI	P value
APGAR score at 5th minute					
Low	27(30.0)	1(0.5)	77.14	10.270 -15.79	< 0.001
Normal	63(70.0)	180(99.5)	1		
Prematurity					
Yes	65(72.2)	122(67.4)	1		
No	25(27.8)	59(32.6)	0.795	0.456 – 1.387	0.420
Birth status					
Alive	78(86.7)	181(100)	NA	NA	
Still birth	12(13.3)	0(0)			
Birth weight					
Low birth weight	62(68.9)	47(26.0)	6.31	3.619 – 11.012	< 0.001
Normal birth weight	28(31.1)	134(74.0)	1		
Mode of delivery					
Vaginal delivery	17(18.9)	52(28.7)	0.58	0.311-1.072	0.082
Caesarian section	73(81.1)	129(71.3)	1		
Urgency of caesarian					
Elective	5(6.8)	21(16.3)	1		
Emergency	68(93.2)	108(83.7)	0.39	0.136-1.050	0.062
Admission to NBU					
Yes	58(64.4)	42(23.2)	6	3.452-10.424	<0.001
No	32(35.6)	139(76.8)	1		

Multi variate logistic regression analysis revealed the following factors to be significantly associated with reduced fetal movements among pregnant women with maternal perception of RFM interviewed. Education level, alcohol intake, obstetric complication and medical diseases. Pregnant women with low level of education were 2 times more likely to have

reduced fetal movements as compared to those found to be with secondary and above education (AOR=2.26, 95%, CI: 1.224-4.160 , p 0.009).Women with history of alcohol intake were shown to be 3 times more likely to have reduced fetal movements as compared to those with no history of alcohol intake (AOR=3.41,95% CI: 1.60 – 7.066, p 0.001).Women with PIH were 2 times more likely to have reduced fetal movements (AOR=2.41, 95% CI: 1.22 – 4.731, p 0.044). Respondents with PPPOM are 3 times more likekly to have RFM (AOR = 3.7, 95 % CI: 1.07-12.05, p 0.04. Low birth weight babies are 6 times more likely to have RFM (AOR= 6.23, 95%CI: 3.21-11.91,p <0.001.Women presenting with any medical diseases were 3 times more likely to have reduced fetal movements as compared to women without medical diseases (AOR= 3.0, 95% CI: 1.95 – 14.10, p 0.001.

Table 6: Multivariate logistic regression for association with maternal perception of reduced fetal movements, data presented as n (%)

Variable	Case n (%) 90	Control n (%) 181	AOR	95% CI	P value
Educational level					
No formal/primary	40(26.0)	114(74.0)	2.26	1.224-4.160	0.009
Secondary and above	50(42.7)	67(57.3)	1		
Cigarette smoking					
Yes	11(64.7)	6(35.3)	2.6	0.762 – 8.846	0.127
No	79(31.1)	175(68.9)	1		
Alcohol consumption					
Yes	36(59.0)	25(41.0)	3.41	1.60 – 7.066	0.001
No	54(25.7)	156(74.3)	1		
PIH					
Yes	40(47.0)	45(53.0)	2.41	1.22 – 4.731	0.044
No	50(27.0)	136(73.0)	1		
PPROM					
Yes	12(63.1)	7(36.9)	3.7	1.07 – 12.05	0.04
No	78(30.9)	174(69.1)	1		
Birth weight					
Low birth weight	62(56.8)	47(43.2)	6.23	3.21 – 11.91	< 0.001
Normal birth weight	28(17.2)	134(82.8)	1		
Prematurity					
Yes	65(34.7)	122(65.3)	1.75	0.70 – 3.51	0.11
No	25(29.7)	59(70.3)	1		
Any medical condition	16(57.1)	12(42.9)	3	1.95 – 14.10	0.001
Yes	74(30.4)	169(69.6)	1		
No					

4.0 DISCUSSION

We found that the study participants were between 16 to 42 years old. Mean age of the case and control were 29.23±6.16 years and 28.43±6.28 years respectively. This group is the representative of the peak age group and not different from general population. This study provides important information about risk factors and perinatal outcome of women with maternal perception of reduced fetal movements.. The women were recruited soon after delivery from maternity wards. Our final sample size was 281 with the control group comprising 181 women with normal fetal movements. Women with reduced fetal movements were 90 women. Women with a known fetal anomaly and multiple pregnancy were excluded. Women who were diagnosed with IUFD prior to delivery were also excluded. The majority of women in both groups were 31 years of age and above (40.0%) and (36.5%).This is a similar findings found in the study done in UK where they found no association with age, gravidity and parity (32, 35), The drug use by the participants was negligible. This study shows that drug use in our setup by pregnant mothers is not a major cause of reduced fetal movements. Most of mothers developed reduced fetal movements while admitted in the ward compared to the mothers admitted with reduced fetal movements.

Pregnant women with no formal education were found to be 2.0 times more likely to have reduced fetal movements as compared to those with secondary and above (AOR=2.26, 95% CI: 1.224 - 4.160, p 0.009). Women with history of alcohol intake were shown to be more likely to have reduced fetal movements as compared to those with no history of alcohol consumption (AOR=3.41, 95% CI: 1.60 – 7.25, p 0.001). This finding is similar to the study done by Mc Cathy CM (31).

Our study demonstrate that patients with PIH (47.0%) were predisposed to reduced fetal movements (AOR 2.41, 95% CI :1.22 – 4.731, p value 0.044). Some evidence from previous study done in Royal Blackburn Hospital shown an association with PIH and reduced fetal movements (32), (AOR= 2.09, 95% CI: 0.51–8.61 , p 0.307). It is known hypertension affect the placental perfusion and marked reduced movements in hypertensive are highly suggestive of fetal distress.(36), They also found preeclampsia is associated with RFM (OR =2.14; 95%

CI: 1.25 to 3.66), though this was an observational study. Blood pressure should be measured in all antenatal mothers and appropriate and prompt management be initiated. Multivariate logistic regressions shows women with PPROM are 3 times more likely to develop RFM (AOR=3.0, 95% CI: 1.07 – 12.05, p 0.04). PPROM was managed with antibiotics and dexamethasone for all the participants. Women with maternal perception of RFM and presenting with any of the medical conditions were , 3 times more likely to have reduced fetal movements as compared to women without medical diseases (AOR= 3, 95% CI :1.95 – 14.10, p 0.001).It is different from the retrospective study done in Nottingham City Hospital (4), where they found no association between maternal diseases and RFM or still birth.

We found that mean gestational age at delivery in MNH was 36.1 ± weeks. Comparing the mode of delivery it is found to be not significant**.** A higher number of women with RFM 81.1% were delivered by CS and 71.3% of controls were also delivered by CS, p=0.163. In the study group 93.2% and 83.8% controls were delivered by emergency cesarean section, p 0.82. Only 6.8% of cases and 16.3% controls were delivered by elective cessarian section (OR =0.39.95% CI: 0.136-1.050, p=0.062). The prospective cohort study done in Cork university maternity hospital found that mode of delivery was not significant in women with RFM (31). In comparison to the study done by Nor Azlin et al demonstrated (37) 5.6% were delivered by elective CS and 31.4% was delivered by emergency CS. The elective CS rate is almost low as in our study. Higher number of rate of cesarean section in the control group was due to previous scars and complicated pregnancies. The study done in Royal Blackburn Hospital also showed no statistically significant difference in mode of delivery (32), where emergency CS 15.7%, p=0.10 versus elective 7.3% , p= 0.23. However our Emergency cesarean rates were higher. This could be explained by the surveillance methods they used eg use of Doppler artery US where as in MNH, doppler US are not routinely used. Not using of CTG machine to monitor fetal well-being could also have influenced the higher cesarean rate. These women should be carefully investigated and monitored to improve the obstetric outcome by improving surveillance methods in developing countries.

For the purposes of this study, a poor perinatal outcome was defined as either low apgar score < 7 in 5 minutes, low birth weight, prematurity or still birth. Women with reduced fetal movements (30%), had low apgar score (OR=77.17, 95% CI: 10.270-15.79, p=<0.001. Most of the women (99.5%) without reduced fetal movements had babies with normal apgar score. The Findings of this study demonstrate a higher proportion (72.2%) of the cases had preterm deliveries as compared to control with 67.4%. None of the control had still birth as compared to 13.3% of the cases who had still birth. Significant higher proportion (68.9%) of the cases delivered babies with low birth weight as compared to only 26.0% of the control who had babies with low birth weight, (AOR=5.481, 95% CI :2.771-10.854, p <0.001). In comparison to our study some studies also have demonstrated low birth weight (38) (OR= 2.41 ,95% CI: 2.09-2.79; P < 0.001). The newborns who had low apgar score <7 in five minutes were 96.4% as compared to controls the apgar score were 0.6%, OR= 77.14, 95% CI: 10.270 – 579.464, p <0.001. This is different from the study done (39, 40). Another study done by (41) also found poor perinatal outcome in patients with RFM. Study done by Dutton PJ, (42), also found poor perinatal outcome after maternal perception of RFM. New borns admitted to new – born unit, were 6 times higher compared to controls (OR=6, 95% CI: 3.452-10.424, p <0.001). Most of the babies were admitted to NBU because of low birth weight. Mean birth weight was 2.6 ± kg. Congenital anormalies 4.4% in cases and 1.1 % of congenital anomalies were found in controls. We failed to demonstrate that there was an association with reduced fetal movement and congenital anormalies.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Majority of pregnant women with reduced fetal movements had poor fetal outcome. Fetal surveillance improves fetal outcomes in women who present with reduced fetal movements. Further research is needed to clarify optimum management strategies to optimize maternal and fetal outcome.

5.2 Recommendations

1. All antenatal mothers should be counselled on fetal kick counts in their ANC visits to reduce anxiety. We strongly recommend not to ignore mothers complaining about RFM.

2. Women perceiving a reduction in fetal movements should undergo CTG/non stress test and ultrasound assessment of fetal growth and liquor volume.

3. Health care providers at all levels of service delivery should be trained on the use of CTG machine as a fetal surveillance method . These fetal surveillance tools should be available at all times.

4. Health institutions should have guidelines on evaluation and management of women who present with reduced fetal movements.

5.3 Study limitation

1. Very few of this study participants had been using opioids, antidepressants, alcohol and cigarette smoking. This could be due to subject sensitivity. They may have not declared the real truth on this sensitive matter.

2. Not all women who presented with reduced fetal movements were subjected to fetal surveillance methods due to unavailability of ultrasound round the clock.

3. The main outcome of interest ‘still birth, low apgar score’ was relatively uncommon, probably due to urgent cesarean sections without waiting for further surveillance methods like BPP or CTG.

4. Limited obstetric ultrasound availability around the clock, unavailability of umblical artery doppler velocimetry could have hampered in managing patients with RFM. This could have made the clinicians to do emergency caesarean section instead of taking further risks in waiting due to non-reassuring fetal status. Hence increasing the cesarean rate.

5. It was observed that many women who had confirmed IUFD but were excluded in the study population and the majority of them had RFM prior to diagnosis.

5.4 Mitigation strategy

This was a case control study which was suitable for rare diseases like reduced fetal movements. More over this study was suitable for investigating multiple risk factors associated with reduced fetal movements. The principle investigator with two well trained assistants were involved in face to face interview thus making the data obtained more reliable.

5.5 Strength

All women approached to participate in the study agreed to be enrolled in this study. There was no drop out of any study participant. A pretest questionnaire was administered and modifications were done before data collection. The principle investigator was the main person collecting data and the research assistants were supervised and guided throughout the data collection period.

REFFERENCES

1. Marsal K. Ultrasonic assessment of fetal activity. Clinics in obstetrics and gynaecology. 1983;10(3):541-63.

2. Warland J, Glover P. Fetal movements: What are we telling women? Women and birth : journal of the Australian College of Midwives. 2017;30(1):23-8.

3. Froen JF, Tveit JV, Saastad E, Bordahl PE, Stray-Pedersen B, Heazell AE, et al. Management of decreased fetal movements. Seminars in perinatology. 2008;32(4):307-11.

4. Efkarpidis S, Alexopoulos E, Kean L, Liu D, Fay T. Case-control study of factors associated with intrauterine fetal deaths. MedGenMed : Medscape general medicine. 2004;6(2):53.

5. Saastad E, Vangen S, Froen JF. Suboptimal care in stillbirths - a retrospective audit study. Acta obstetricia et gynecologica Scandinavica. 2007;86(4):444-50.

6. Stacey T, Thompson JM, Mitchell EA, Ekeroma A, Zuccollo J, McCowan LM. Maternal perception of fetal activity and late stillbirth risk: findings from the Auckland Stillbirth Study. Birth. 2011;38(4):311-6.

7. Neldam S. Fetal movements as an indicator of fetal well-being. Danish medical bulletin. 1983;30(4):274-8.

8. Rayburn WF, McKean HE. Maternal perception of fetal movement and perinatal outcome. Obstetrics and gynecology. 1980;56(2):161-4.

9. Patrick J, Campbell K, Carmichael L, Natale R, Richardson B. Patterns of gross fetal body movements over 24-hour observation intervals during the last 10 weeks of pregnancy. American journal of obstetrics and gynecology. 1982;142(4):363-71.

10. Minors DS, Waterhouse JM. The effect of maternal posture, meals and time of day on fetal movements. British journal of obstetrics and gynaecology. 1979;86(9):717-23.

11. Cito G, Luisi S, Mezzesimi A, Cavicchioli C, Calonaci G, Petraglia F. Maternal position during non-stress test and fetal heart rate patterns. Acta obstetricia et gynecologica Scandinavica. 2005;84(4):335-8.

12. Saastad E, Tveit JV, Flenady V, Stray-Pedersen B, Fretts RC, Bordahl PE, et al. Implementation of uniform information on fetal movement in a Norwegian population reduced delayed reporting of decreased fetal movement and stillbirths in primiparous women - a clinical quality improvement. BMC research notes. 2010;3(1):2.

13. Eller DP, Stramm SL, Newman RB. The effect of maternal intravenous glucose administration on fetal activity. American journal of obstetrics and gynecology. 1992;167(4 Pt 1):1071-4.

14. Liston RM, Bloom K, Zimmer P. The psychological effects of counting fetal movements. Birth. 1994;21(3):135-40.

15. Sadovsky E, Yaffe H. Daily fetal movement recording and fetal prognosis. Obstetrics and gynecology. 1973;41(6):845-50.

16. Castillo RA, Devoe LD, Ruedrich DA, Gardner P. The effects of acute alcohol intoxication on biophysical activities: a case report. American journal of obstetrics and gynecology. 1989;160(3):692-3.

17. Jansson LM, Velez M, McConnell K, Spencer N, Tuten M, Jones HE, et al. Maternal buprenorphine treatment and fetal neurobehavioral development. American journal of obstetrics and gynecology. 2017;216(5):529 e1- e8.

18. McGillick EV, Orgeig S, Allison BJ, Brain KL, Niu Y, Itani N, et al. Maternal chronic hypoxia increases expression of genes regulating lung liquid movement and surfactant maturation in male fetuses in late gestation. The Journal of physiology. 2017.

19. Jackson JR, Kleeman S, Doerzbacher M, Lambers DS. The effect of glucocorticosteroid administration on fetal movements and biophysical profile scores in normal pregnancies. The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstet. 2003;13(1):50-3.

20. Visser GH, Laurini RN, de Vries JI, Bekedam DJ, Prechtl HF. Abnormal motor behaviour in anencephalic fetuses. Early human development. 1985;12(2):173-82.

21. Hester TW, Parkinson LC, Robson J, Misra S, Sangha H, Martin JE. A hypothesis and model of reduced fetal movement as a common pathogenetic mechanism in clubfoot. Medical hypotheses. 2009;73(6):986-8.

22. Katz VL, Jenkins T, Haley L, Bowes WA, Jr. Catecholamine levels in pregnant physicians and nurses: a pilot study of stress and pregnancy. Obstetrics and gynecology. 1991;77(3):338-42.

23. Kean LH, Gargari SS, Suwanrath C, Sahota DS, James DK. A comparison of fetal behaviour in term fetuses exposed to anticonvulsant medication with unexposed controls. BJOG : an international journal of obstetrics and gynaecology. 2001;108(11):1159-63.

24. Coppens M, Vindla S, James DK, Sahota DS. Computerized analysis of acute and chronic changes in fetal heart rate variation and fetal activity in association with maternal smoking. American journal of obstetrics and gynecology. 2001;185(2):421-6.

25. Blencowe H, Cousens S, Oestergaard MZ, Chou D, Moller AB, Narwal R, et al. National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications. Lancet. 2012;379(9832):2162-72.

26. Manning FA, Platt LD, Sipos L. Antepartum fetal evaluation: development of a fetal biophysical profile. American journal of obstetrics and gynecology. 1980;136(6):787-95.

27. Strassner HT, Jr., Golde SH, Mosley GH, Platt LD. Effect of blood in amniotic fluid on the detection of phosphatidylglycerol. American journal of obstetrics and gynecology. 1980;138(6):697-702.

28. Froen JF, Saastad E, Tveit JV, Bordahl PE, Stray-Pedersen B. [Clinical practice variation in reduced fetal movements]. Tidsskrift for den Norske laegeforening : tidsskrift for praktisk medicin, ny raekke. 2005;125(19):2631-4.

29. Scala C, Bhide A, Familiari A, Pagani G, Khalil A, Papageorghiou A, et al. Number of episodes of reduced fetal movement at term: association with adverse perinatal outcome. American journal of obstetrics and gynecology. 2015;213(5):678 e1-6.

30. Mohr Sasson A, Tsur A, Kalter A, Weissmann Brenner A, Gindes L, Weisz B. Reduced fetal movement: factors affecting maternal perception. The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstet. 2016;29(8):1318-21.

31. McCarthy CM, Meaney S, O'Donoghue K. Perinatal outcomes of reduced fetal movements: a cohort study. BMC pregnancy and childbirth. 2016;16(1):169.

32. O'Sullivan O, Stephen G, Martindale E, Heazell AE. Predicting poor perinatal outcome in women who present with decreased fetal movements. Journal of obstetrics and gynaecology : the journal of the Institute of Obstetrics and Gynaecology. 2009;29(8):705-10.

33. Tveit JV, Saastad E, Stray-Pedersen B, Bordahl PE, Flenady V, Fretts R, et al. Reduction of late stillbirth with the introduction of fetal movement information and guidelines - a clinical quality improvement. BMC pregnancy and childbirth. 2009;9:32.

34. Tveit JV, Saastad E, Stray-Pedersen B, Bordahl PE, Froen JF. Concerns for decreased foetal movements in uncomplicated pregnancies--increased risk of foetal growth restriction and stillbirth among women being overweight, advanced age or smoking. The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstet. 2010;23(10):1129-35.

35. Simon A, Sadovsky E, Aboulafia Y, Ohel G, Zajicek G. Fetal activity in pregnancies complicated by rheumatic heart disease. Journal of perinatal medicine. 1986;14(5):331-4.

36. Lili LN, Matyunina LV, Walker LD, Daneker GW, McDonald JF. Evidence for the importance of personalized molecular profiling in pancreatic cancer. Pancreas. 2014;43(2):198-211.

37. Nor Azlin MI, Maisarah AS, Rahana AR, Shafiee MN, Aqmar Suraya S, Abdul Karim AK, et al. Pregnancy outcomes with a primary complaint of perception of reduced fetal movements. Journal of obstetrics and gynaecology : the journal of the Institute of Obstetrics and Gynaecology. 2015;35(1):13-5.

38. Pagani G, D'Antonio F, Khalil A, Akolekar R, Papageorghiou A, Bhide A, et al. Association between reduced fetal movements at term and abnormal uterine artery Doppler indices. Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology. 2014;43(5):548-52.

39. Hu D, Tong S, Wei R, Hui Z, Haidan L, Zhi D, et al. The polymorphisms on Igkappa gene are related to susceptibility of breast cancer and gastric cancer. Genetic testing. 2008;12(4):575-80.

40. Lili LN, Britton NF, Feil EJ. The persistence of parasitic plasmids. Genetics. 2007;177(1):399-405.

41. Heazell AE, Bernatavicius G, Roberts SA, Garrod A, Whitworth MK, Johnstone ED, et al. A randomised controlled trial comparing standard or intensive management of reduced fetal movements after 36 weeks gestation--a feasibility study. BMC pregnancy and childbirth. 2013;13:95.

42. Dutton PJ, Warrander LK, Roberts SA, Bernatavicius G, Byrd LM, Gaze D, et al. Predictors of poor perinatal outcome following maternal perception of reduced fetal movements--a prospective cohort study. PloS one. 2012;7(7):e39784.

APPENDICES

Appendix I: Consent Form

Consent to participate in this study

Greetings,

My name is Dr. Saudiyya Mohamed. I am the main investigator of this research project with the objective of determining the pregnancy outcome in women with reduced fetal movements in Muhimbili National Hospital .

Purpose of the study

This study will collect information on pregnancy outcome in women with reduced fetal movement and will be compared with women with normal fetal movement.

What Participation Involves

If you agree to participate in this study the following will occur:

1. You will be given a questionnaire which you will be required to answer questions that have been prepared for the study in order to obtain the intended information to improve student welfare in the university.
2. You will take part in this study until you complete your delivery.

Confidentiality

I assure you that all the information collected from you will be kept confidential. Only people working in this research study will have access to the information. We will be compiling a report. We will not put your name or other identifying information on the records of the information you provide.

Risks

You will be asked questions about factors that are associated with your personal information. Some questions could potentially make you feel uncomfortable. You may refuse to answer any particular question and may stop participation at any time.

Rights to Withdraw and Alternatives

Participating in this study is completely voluntary. If you choose not to participate in the study or if you decide to stop participating in the study, you can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve any penalty or loss of any benefits to which you are otherwise entitled in the community.

Benefits

The information you provide will help to increase our understanding on pregnancy outcome in women with reduced fetal movement in Muhimbili National Hospital .

In Case of Injury

We do not anticipate that any harm will occur to you or your family as a result of participation in this study.

Who to contact

If you ever have questions about this study, you should contact the principal investigator, Dr, Saudiyya Mohamed (+255 757 998 281), is the key contact person with regard to any queries about this study. If you have any questions/concerns about your rights as a participant you may contact Professor Said Aboud, the chairman of the university senate research and publications, MUHAS P.O.BOX 65001, Dar Es Salaam. Telephone; 2150302-6

Appendix II: Questionnaire

SOCIO DEMOGRAPHIC DATA

Serial Number ……

Hospital number……..

1. Case ☐ 2.Control ☐
2. Age in years ……
3. Marital status
    a. Single
    b. Married
    c. Divorced
    d. Separate
    e. Widow
4. Level of Education
    a. No formal education
    b. Primary school
    c. Secondary school
    d. College/University
5. Occupation
    a. Peasant
    b. Self employed
    c. Employed
    d. House wife
6. Life style

    i) Did you drink alcohol before pregnancy?
    a. Yes
    b. No

    ii) Did you consume alcohol during current pregnancy?
    a. Yes
    b. No

iii) Did you smoke cigarettes/tobacco during current pregnancy ?

a. Yes
b. No
c. If Yes how many cigarettes per day……
d. Years of smoking ……

iv) Did you smoke cigarette before pregnancy?..... How many per day?.....

7. Are you on any of the following drugs? OR Are you taking any medication?
    a. Antidepressant
    b. Antipsychotic
8. Sedative
    a. Narcotic
    b. Opioid
9. Past Obstetrics and ANC History

1) Gravidity …….
2) Parity…….
3) Abortion……
4) Living……
5) GA at first visit……
6) Total ANC visits……
7) Hb level at last ANC visit recorded ……
8) Hb level checked on admission ……..
9) Last BP recorded at ANC
10. Blood group …….
11) Rhesus factor :
    i) Positive
    ii) Negative

iii) Not tested

12) VDRL

a. Positive
b. Negative
c. Not tested

13) Injection TT received

a. Yes
b. No

14) Dewormed?

a. Yes
b. No

15) Anti malarial prophylaxis received?

a. Yes
b. No

16) Urine analysis

a. Protein
b. Sugar
c. Ketones
d. Not tested

10. Reduced fetal movements felt before admission? OR After admission in the ward?

a. Before
b. After

11. OBSTETRIC COMPLICATIONS

Does the patient suffered from any of the following?

1. D.M
2. P.I.H
3. PROM
4. HIV

5. Anemia
6. PPROM
7. Any other ……..

12. MEDICAL ILLNESSES: Does the patient suffer from the following illness?
    a. PTB
    b. AIDS
    c. ASTHMA
    d. CARDIAC DISEASE
    e. OTHERS ……..

13. Ultra sound done after diagnosis of RFM?
    a. Yes
    b. 2.No
14. Gestaional age by US ……..
15. Oiligohydroamnious by US : 1. Yes 2. No
16. Bio physical profile done or not 1. Yes 2. No
    a. Value …….
17. Mode of Delivery
    a. SVD
    b. Cesarean section
18. .If CS
    a. 1.Emergency
    b. 2.Elective
19. Reason for CS
    1. Fetal condition
    2. Specify…….
    3. Maternal condition
    4. Specify……

FETAL OUTCOME

Date of Delivery: ……..

20. GA at delivery in weeks ……

21. Sex :

    a. Male

    b. Female

22. Apgar score at

    i. One minutes. ……

    ii. Five minutes ……..

23. Resuscitation done

    a. Yes

    b. No

24. Admission to NBU?

    a. YES.

    b. NO

25. Reason for admission :

    a. 1.Preterm

    b. 2.Low birth weight

26. Cogenital anormalies present or not ?

    a. 1,Yes

    b. 2.No

    c. Specify……..

27. Still birth

    a. 1.Yes

    b. 2.No

28. Macerated still birth

    a. 1.Yes

    b. 2.No

29. Birth weight…… kg