PREVALENCE, ASSOCIATED FACTORS, MATERNAL AND PERINATAL OUTCOMES OF PREGNANCIES COMPLICATED BY PRETERM PREMATURE RUPTURE OF MEMBRANES BETWEEN 24 - 28 WEEKS GESTATIONAL AGE AT MILITARY HOSPITAL OF KAMENGE.

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DECLARATION

I declare that this dissertation is my work and has not been published or presented for a degree in any other institution.

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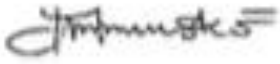
Signature:  Date : 30-11-2021

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The study was carried out at Military Hospital of Kamenge. This is an institution under the supervision of the Ministry of Health, Burundi.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACOG: American College of Obstetricians and Gynecologists

AFI: Amniotic fluid index

ANC: Antenatal Care

APGAR: Appearance, Pulse, Grimace, Activity, Respiration

BPP: Biophysical Profile

HDP: Hypertensive Disease in Pregnancy

HIV: Human Immunodeficiency Virus

IPI: Interpregnancy Interval

IUFD: Intrauterine fetal demise

KNH: Kenyatta National Hospital

LBW: Low Birth Weight

LMIC: Low- and Middle-Income Countries

LMP: Last Menstrual Period

NICU: Newborn Intensive Care Unit

PPH: Post-Partum Hemorrhage

PPHN: Persistent Pulmonary Hypertension of the newborn

PROM: Premature Rupture of Membranes

PPROM: Preterm Premature Rupture of Membranes

RDS: Respiratory Distress Syndrome

STI: Sexually Transmitted Infection

UTI: Urinary Tract Infection

WHO: World Health Organization

OPERATIONAL DEFINITIONS

Gestational age: Measure of the age of pregnancy from the beginning of woman`s last menstrual period or estimated by a first trimester ultrasound. It is measured in weeks.

Preterm birth: A birth which occurs before the 37^{th} week of pregnancy

Premature Rupture of membranes (PROM): Rupture of membranes (amniotic sac) before labor begins. We talk about PROM from 37 weeks of gestational age.

Preterm Premature Rupture of membranes (PPROM): When PROM occurs before 37weeks of gestational age.

ABSTRACT

Background: Premature preterm rupture of membrane (PPROM) is a major public health concern, complicating approximately 3% of all pregnancies globally ,with 50% of these pregnancies resulting into preterm births. The magnitude, associated factors and outcomes of PPROM in Burundi have not been extensively documented.

The purpose of the study: To determine the prevalence, associated factors, maternal and perinatal outcomes of pregnancies complicated by PPROM between 24- and 28-weeks gestational age at Military Hospital of Kamenge retrospectively from December 2020.

Methodology: This was an analytical cross-sectional study which adopted a simple random sampling technique. The files of 340 women admitted at the Obstetric wards between 2016-2020 at Military Hospital of Kamenge between 24 and 28 weeks of gestational age were retrieved from the central registry of the hospital. A structured data abstraction tool was used to extract patient information from the files. Frequencies and percentages were used to summarize categorial descriptive data while median and interquartile range were used to summarize continuous descriptive data. The prevalence of pregnancies complicated by PPROM between 24 and 28 weeks was calculated proportion of the total sample size included in the study. Binary logistic regression was used to investigate the factors associated with PPROM. Significance was investigated at $p<0.05$.

Results: The findings revealed that the prevalence of PPROM among women who were included in the study was 16.2%. PPROM occurred at 27weeks in 29.1% of cases while 21.8% of women had PPROM at 25 weeks , 20% at 24^{th} and 26^{th} week of gestation and 9.1% had PPROM at 28^{th} week of gestation. Multivariable model showed that, women aged 30 years and above, women who did not have any ANC visit, presence of anemia in current pregnancy and presence of HDP were significantly associated with PPROM. The findings revealed that 78.2% of women who had PPROM developed adverse complications. The common complications that were identified included placentae abruptio 27.3%, chorioamnionitis 20%, umbilical cord prolapses 14.5%, intrauterine fetal demise 16.4% and sepsis 10.9%.The neonatal findings also revealed that there were 74.5% livebirths, majority of the neonates had birthweight of less than 1.5kgs, 39% had RDS while NBU admission was 81.1% and the median length of stay was 5 days in NBU.

Conclusion: The prevalence of PPROM in our study was 16.2% which contrast from previous studies which found varied prevalence of PPROM. Significant association was found between PPROM , increased maternal age, anemia, HTN and nonattendance of ANC clinic. Early screening of HDP should be done in pregnancy and women should be sensitized to attend ANC clinic so those at risk can be identified and proper follow-up of the pregnancy can be done.

1. CHAPTER ONE: INTRODUCTION

1.1.Background

The Preterm Premature Rupture of Membrane (PPROM) is defined as the rupture of the fetal membranes prior to the start of labor and before 37 weeks(1)(2). This condition is one of the leading causes of preterm deaths accounting for about 3% globally (3) (1)(2). It has also been identified that PPROM contribute to around 30% of all preterm birth. Around 45 – 50% of the preterm births are mainly idiopathic and 25 – 20 percent were medically indicated (4). PPROM is therefore a serious health issue. It has been proven to be the cause of prenatal poor outcomes include fetal death, placental abruption, neonatal sepsis, and respiratory distress. PPROM is linked to 1 to 2% of fetal fatalities. As a result of PPROM, the mother is significantly more vulnerable to undesirable effects, such as an increased risk of infection, preterm delivery, and caesarean section deliveries (5).

Mohan et al. found that the incidence of PPROM in India was 2.2 percent while the associated complications included stillbirths (2.4%) and 3.3% deaths due to PPROM. The rate of maternal morbidity was low, with just 4.1% of patients experiencing postpartum hemorrhage, 2.3% dealing with abruptio placentae, and 15% dealing with sepsis. Meanwhile, 23% of patients gave birth via caesarean section (6). Similarly, Patil and Patil discovered that the incidence of PROM was 33.8% in their study of newborn outcomes in PPROM that was carried out in India. This study investigated neonatal outcomes in PPROM. neonatal outcomes included respiratory distress syndrome, which affected 26% of new-borns, and neonatal sepsis, which affected 14% of newborns. In addition, eleven percent of patients experienced puerperal fever, and three percent of patients had chorioamnionitis.

Additionally, a study in Uganda revealed that the prevalence of PPROM was 3.3% with seven percent deaths (7). This illustrate that PPROM is a leading cause of complications in pregnancy which requires proper management. However, in integrating the most appropriate management option, there are several elements that need to be fully evaluated such as gestational age, presence of infection, fetal presentation, status of the cervix as well as the availability of NICU (8).

The expectant management of preterm premature rupture of the membranes occurring prior to 34 weeks of gestation encompasses several interventions, namely the administration of antenatal corticosteroids, screening for infection, antibiotic therapy primarily for Group B

Streptococcus (GBS) prophylaxis, and clinical surveillance for infection and complications. In the absence of difficulties, the prevailing medical consensus aligns with this viewpoint. The American College of Obstetricians and Gynecologists (ACOG) recommends a treatment regimen consisting of intravenous administration of ampicillin at a dosage of 2 grams every 6 hours, along with erythromycin at a dosage of 250 mg every 6 hours, for a duration of 48 hours. Subsequently, the patient is administered oral amoxicillin at a dosage of 250 mg every 8 hours, along with erythromycin at a dosage of 333 mg every 8 hours, for a duration of five days (9). Advanced settings have integrated the use of conservative management in the outpatient care environment (10).

Globally, there has been an increased commitment to improve both maternal and neonatal outcomes in situations where there is extreme prematurity. However, despite the increased focus on development of better interventions to improve outcomes, there is little existing knowledge on the underlying risk factors which contribute to the increased PPROM. In Burundi, there has been less focus on PPROM as a major problem which warrants the focus on understanding the existing burden and contributing factors.

The periviable phase is defined by the American College of Obstetricians and Gynecologists (ACOG) as 20 to 25 weeks. GA and PPROM are the underlying causes of around 80% of those deliveries (11). Women with periviable PPROM not only run the danger of experiencing problems during pregnancy, but they also face the emotional and financial repercussions of either losing a child or caring for a kid who will have long-term comorbidities. In our circumstances, a preterm premature rupture of the amnion that occurs earlier than 28 weeks of gestation is regarded as previable. Women are given the option to terminate their pregnancies if they so want. The purpose of this study is to provide answers to these issues and shed light on this murky area for those who provide medical treatment.

2. CHAPTER TWO: LITERATURE REVIEW

2.1.Preterm Premature Rupture of Membranes pathophysiology

Preterm premature rupture of membranes (PPROM) is a complex obstetric condition characterized by the rupture of fetal membranes (amniotic sac) before the onset of labor and before 37 weeks of gestation. It is a significant contributor to preterm birth, which poses substantial risks to neonatal health and development. Understanding the pathophysiology of PPROM is crucial for effective management and prevention strategies. The age at which a pregnancy is considered viable varies from one region of the world to another due to the fact that the likelihood of a preterm infant surviving depends on the medical resources and newborn care facilities that are available. The age at which a fetus is considered viable ranges from 23 to 24 weeks of gestation in environments with a high level of resources, whereas in most environments with a low level of resources, excellent results are less likely until 28 weeks of gestation. As a consequence, the cut-off point for viability in the majority of African nations is 28 weeks GA (11).

However, it is worth noting that the pathophysiology of PPROM is not well understood. The exact cause of PPROM is not fully understood, but several factors are believed to contribute to its pathophysiology. Infection and inflammation in the genital tract can lead to the production of various pro-inflammatory cytokines and enzymes. These substances can weaken the fetal membranes and cause collagen breakdown, leading to premature rupture. Inflammatory markers such as interleukin-1 and matrix metalloproteinases (MMPs) play a significant role in this process. Bleeding within the decidua, the maternal tissue that lines the uterus, can weaken the attachment between the fetal membranes and the decidua. This weakening can make the membranes more prone to rupture prematurely (8)(12).

Mechanical stress from overdistension of the uterus due to multiple pregnancies, excessive amniotic fluid, or fetal malpresentation can lead to a stretch-induced weakening of the fetal membranes, ultimately resulting in rupture. Alterations in the composition and structure of collagen and the extracellular matrix within the fetal membranes can compromise their integrity. Reduced collagen content and increased enzymatic activity can lead to membrane weakening and rupture. Hormones such as prostaglandins and oxytocin, which are involved in uterine contractions, can impact the fetal membranes. An imbalance in these hormonal signals might contribute to membrane weakening and rupture (13)(14) .

2.2.Maternal characteristics and clinical presentation

Preterm premature rupture of membranes (PPROM) is a significant obstetric complication characterized by the rupture of the amniotic sac before 37 weeks of gestation. This condition accounts for a significant proportion of preterm births and presents various maternal characteristics and clinical manifestations that are crucial for accurate diagnosis, management, and intervention. While PPROM can occur at any maternal age, certain age groups may have distinct risk profiles. Younger maternal age might be associated with behavioral risk factors, while older age might increase the likelihood of underlying medical conditions. A cross sectional study in Niger established that the average age was 29 years and almost half of the patients (41%) were nulliparous. When it comes to the mother's response to PPROM, 65.5% of consultations occurred within the first 24 hours, while 34.5% of visits occurred more than 24 hours following the rupture of the membranes. The majority of people who consulted within the first twenty-four hours of PPROM belonged to middle and upper social classes. On the other hand, the majority of patients who presented after 24 hours belonged to a social stratum that is considered poorer. In total, the study found that 8.2% of participants had a history of PPROM, 16.4% had a history of caesarean delivery, and 4.5% were positive for retroviral illness (15).

Another study by Seaward et al. established that women with PPROM were at increased risk of infection with the first 12 to 24 hours (16). An analytical cross-sectional study by Msomi et al. in South Africa in 2017 examined pregnancy outcomes in PPROM women. The data showed that 53% of respondents were HIV-negative, 52% were under 34 weeks pregnant, 31% had caesarean sections, and 59% had vaginal deliveries. The study also found that 44% of women had amniotic fluid drainage confirmed by speculum, 8% by ultrasound amniotic fluid index, and 15% by pad inspection. Positive amniotic fluid accumulating in the posterior fornix of the cervix validated the diagnosis in 17% of instances. A Bartholin's abscess was recorded in an HIV-negative patient, and another developed a UTI. The study participants had no additional pregnancy-related infections (17).

In a 2019 Jordanian retrospective study on protracted membrane rupture, Al-lawama et al. found that the average gestation age was 36 weeks, 57% of mothers had membrane ruptures under 48 hours, and all mothers had unknown GBS status. They were 74.4% asymptomatic at birth. In addition, 5% of new-borns had positive cultures and 13% had negative sepsis (18).

Further, a prospective study conducted in the United Kingdom established that in 33% of the patients, there was a Lactobacillus spp. depletion prior to the rupture of fetal membranes and persisted following membrane rupture (19).

2.3.Risk factors associated with Premature preterm rupture of membranes

Premature preterm rupture of membranes (PPROM) is influenced by a range of risk factors that interact in complex ways. Identifying women with these risk factors is crucial for timely intervention, monitoring, and the implementation of preventive measures to reduce the incidence of PPROM and its associated complications. A study in Ethiopia established that history of abortion, previous PPROM, c-section delivery and abnormal discharge in the present pregnancy were key risk factors of PPROM (20). In addition, a study in Ethiopia revealed that PPROM was present in 13.7 percent of all pregnancies. The risk factors identified included vaginal bleeding, infections during pregnancy and mid upper circumference of <23 cm (21).

In 2016, Reeti Rajan et al. found 0.8% prevalence of PPROM in India. PPROM caused 19% of premature births. The study found maternal risk factors like lower genito-urinary tract infection (61%), anemia (28%), and coitus (48%). The average gestation at membrane rupture was 32 weeks in the study (22). El-Achi et al. also revealed that maternal age, body mass index, nulliparity and diabetes mellitus (23). In Canada, Bouvier et al revealed that being underweight, history of PPROM, diabetes and lower level of education were independent risk factors (24).

In a retrospective study that Okeke and colleagues carried out in Nigeria in 2016, with the aim of determining the factors that might be used to predict PPROM, they found that the prevalence of PPROM was 3.3%, with a greater incidence in primigravidae. Additional predictors that were acquired include a young maternal age, a gestational age of less than 35 years, a latency period of fewer than ten years, and a birth weight greater than 4.5 kilograms (7). A case control study on maternal risk factors for PPROM was carried out in Ethiopia in 2018, and the results were published in 2018. In the course of the trial, participants included both women with and without PPROM beyond 28 weeks. The presence of abnormal vaginal discharges, a prior history of PPROM, an earlier history of cesarean section, and a history of abortion were identified to be risk factors for PPROM (25)

2.4.Management of Preterm premature rupture of the membranes

The initial step is to confirm the diagnosis of PPROM through a thorough clinical assessment. Clinical signs such as fluid leakage, vaginal pooling, and nitrazine paper testing can help

confirm the rupture. Once diagnosed, fetal well-being is assessed using continuous fetal heart rate monitoring and possibly ultrasound to check amniotic fluid volume. Antibiotic therapy is often initiated in cases of PPROM to reduce the risk of intrauterine infection, which can arise due to the loss of the amniotic fluid's protective barrier. Broad-spectrum antibiotics are typically administered, and the choice of antibiotic is guided by local antimicrobial resistance patterns. Administering corticosteroids to pregnant women with PPROM between 24 and 34 weeks of gestation is crucial to enhance fetal lung maturity. This practice reduces the risk of respiratory distress syndrome and other neonatal complications associated with preterm birth (26)

When administered to women who have PPROM, corticosteroids have been shown to minimize the chances of the complications respiratory distress and intraventricular hemorrhage. Antibiotics are prescribed to patients in order to lessen the likelihood of maternal and fetal infection, and doing so has been shown to lengthen the duration of latent infection (27). A study in Japan revealed that the latency period was shown to be increased and it was concluded that continuous amnio-infusion can be used to improve neonatal outcomes (28). In a study conducted in the United States among women with PPROM, it was found that 50% of the patients delivered prior to 24 weeks, 79% prior to 25 weeks and 43% of the neonates survived to discharge(29)

The systematic review conducted by Madar in 2018 examined research conducted globally from 1980 to 2018 that investigated the therapeutic management of preterm premature rupture of membranes (PPROM). The findings of this analysis indicated that it is crucial to conduct an initial ultrasound and perform vaginal and urinary bacteriological samples upon admission. The utilization of an antibiogram is crucial in instances where a positive vaginal culture is obtained, as it can provide valuable guidance for the appropriate selection of antibiotics in the event of an intrauterine infection during intrauterine insemination (IUI). The review additionally indicated that in the absence of newborn benefit, there is insufficient evidence to support the utilization of tocolysis in cases of preterm premature rupture of membranes (PPROM). It is advised to limit the duration of tocolysis administration to a maximum of 48 hours. It is recommended to administer prenatal corticosteroids before to 34 weeks of gestation, and for women at a heightened risk of preterm birth before 32 weeks, the administration of magnesium sulfate is advised. The management of clinically stable preterm premature rupture of membranes (PPROM) at home following 48 hours of hospital surveillance

may be deemed appropriate based on professional consensus. It is suggested that aspects of an IUI diagnosis be sought out during PPROM monitoring (30).

In the United States, a randomized trial was conducted by David et al in 2012 to evaluate the comparative effectiveness of expectant care versus induction of labor for cases of preterm premature rupture of membranes (PPROM) in the near term. The research findings indicated a minimal occurrence of newborn sepsis, and there was no observed advantage associated with the induction of labor. In the induction of labor group, a total of 3% of neonates were found to have acquired sepsis, whereas in the expectant management group, the reported incidence of sepsis among neonates was 4.1% (31)

A retrospective study conducted by Petit et al. (2016) in France established that out of a cohort of 187 women who were treated as outpatients for preterm premature rupture of membranes (PPROM), a total of 12 individuals (6.4%) experienced complications. The researchers have found three primary factors that contribute to an elevated likelihood of serious problems in a non-hospital setting: preterm premature rupture of membranes (PPROM) occurring prior to 26 weeks of gestation, non-cephalic presentation of the fetus, and oligohydramnios (32)

In 1999, a randomized trial was conducted in South Africa employed a double-blind, placebo-controlled design. The dexamethasone group had a lower incidence of perinatal mortality, with 4 neonatal fatalities in contrast to 10 deaths recorded in the placebo group. The results additionally indicated that no instances of severe sepsis were seen among the female participants in both groups, and there was no statistically significant disparity in the occurrence of sepsis between the two groups. The study's findings indicate that the administration of corticosteroids in underdeveloped countries yields a greater number of benefits compared to drawbacks (33).

2.5.Maternal and neonatal outcomes

There are varied outcomes that have been linked with PPROM for both maternal and neonates. A study by Masand et al found that there were 56.2% livebirths and within the first week of life around 33.3% of the neonates died majorly due to respiratory distress, sepsis and necrotizing enterecolitis. Upon being discharged, a total of 12 individuals were found to have survived. Among these survivors, it was observed that 64% exhibited symptoms of chronic lung illness, 25% experienced seizures, and 20% suffered from a notable intracerebral bleed (34). Storness et al. found that high amniotic fluid latency was associated with higher fetal survival with reduced maternal complications (35)

In a study conducted in Turkey and published in 2020, Gunay et al. discovered a positive correlation between a reduction in amniotic fluid index (AFI) during the gestational period of 23-33 weeks and an increased likelihood of shorter latency to delivery and longer postpartum hospital stays. This finding was obtained through a prospective observational design (3) In a retrospective study conducted within the same country in 2018, Kachramanoglu et al. examined the maternal and newborn outcomes associated with preterm premature rupture of membranes (PPROM), with a specific focus on the latency phase. The study found that the average delay period was 5.7±6.2 days. The study observed a higher likelihood of chorioamnionitis in pregnancies with a shorter gestational age, higher initial leucocyte count and C-reactive protein (CPR) values, and a lower initial amniotic fluid index (AFI) level. The most prevalent neonatal problems seen in this study were respiratory distress syndrome (n=88, 45.8%), hyperbilirubinemia (17.1%), and congenital pneumonia (9.3%). The study reported a neonatal death rate of 6.7% (36)

Onwughara et al. conducted a retrospective study in 2018, the incidence of PPROM was not seen to be elevated in women who are infected with the human immunodeficiency virus (HIV). Additionally, research has indicated that the likelihood of HIV transmission to newborns is reduced in HIV-infected women who have achieved viral suppression. Furthermore, the birth outcomes of these women are comparable to those of uninfected individuals (37). A study in Rwanda revealed that complications identified included chorioamnionitis, placenta abruptio and caesarean section delivery which occurred among 42%. Among the neonatal outcomes, neonatal mortality was the most common (67.9%) (38).

2.6.Conceptual framework

2.6.1. Narrative Conceptual Framework

This study sought to investigate the burden of PPROM, associated factors as well as the maternal and neonatal outcomes. Demographic and clinical characteristics were independent factors while presence of PPROM was our dependent variable. The management of PPROM was also investigated which has an influence on the treatment outcome identified.

2.6.2. Conceptual Framework diagrammatical presentation

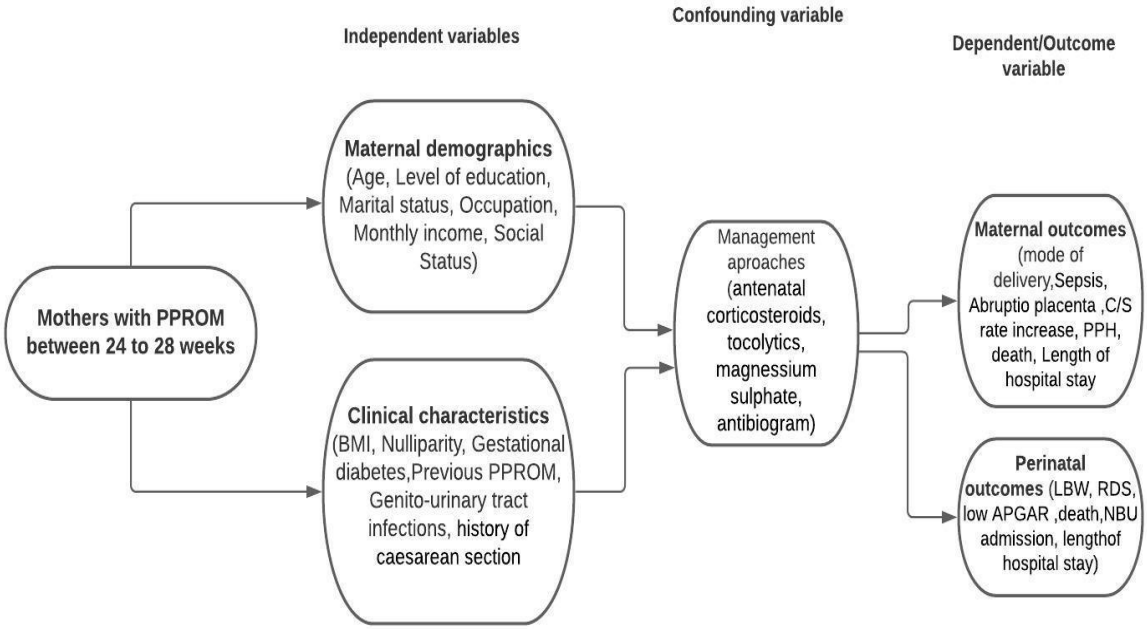

Figure 2.1:Conceptual Framework

2.7.Study Justification

PPROM is a leading cause of preterm birth, accounting for nearly one-third of all preterm births globally. PPROM is associated with a range of adverse maternal outcomes, including infection, postpartum hemorrhage, and maternal morbidity. Furthermore, preterm birth resulting from PPROM increases the risk of neonatal complications such as respiratory distress syndrome, intraventricular hemorrhage, and long-term developmental disabilities. Understanding the local impact of PPROM on maternal and neonatal health can guide targeted interventions to reduce morbidity and mortality rates. Within the African context, there is a scarcity of comprehensive data regarding PPROM, its prevalence, associated risk factors, and subsequent pregnancy outcomes. Conducting research in this area can provide accurate data to assess the extent of the problem and guide evidence-based interventions. Understanding the local context and factors contributing to PPROM enables the development of tailored interventions and public health strategies. This includes implementing educational programs, improving antenatal care services, promoting maternal nutrition, and strengthening infection control measures. Such interventions can have a direct impact on reducing the incidence of PPROM and its associated adverse outcomes. Investigating PPROM and its consequences aligns with global efforts to improve maternal and child health outcomes.

2.8.Research Question

What is the prevalence, the associated factors, maternal and perinatal outcomes in women with preterm premature rupture of membranes at 24weeks to 28 weeks gestational age at Military Hospital of Kamenge?

2.9. Study Objectives

2.9.1. Broad Objective

To determine the prevalence, associated factors, maternal and perinatal outcomes of pregnancies complicated by PPROM between 24- and 28-weeks of gestation at Military Hospital of Kamenge from 2016 to 2020.

2.9.2. Specific Objectives

Among pregnant women between 24 to 28 weeks of gestation admitted at Military Hospital of Kamenge from 2016 to 2020, to determine :

1. The prevalence of PPROM at 24-28 weeks of gestation
2. Associated factors (sociodemographic, medical and obstetric) with PPROM at 24-28 weeks of gestation.

3. Treatment modalities and selected maternal and neonatal outcomes (antenatal corticosteroids use, antibiotics use, chorioamnionitis, latency period, mode of delivery, PPH, maternal mortality, neonatal mortality, stillbirth admission, RDS, length of hospital stay,) in PPROM at 24-28 weeks of gestation

3 CHAPTER THREE: METHODOLOGY

3.1.Study Design

This study utilized an analytical cross-sectional study design. The prevalence of PPROM at 24 to 28 weeks of gestation was investigated with the purpose of comparing associated factors (the sociodemographic, medical and obstetric factors) between patients who were diagnosed with PPROM (considered as exposed)and those who did not have PPROM (considered as unexposed). Thus, this study design was appropriate in this study. The study was conducted retrospectively at Kamenge Military hospital from January 2016 to 31st December 2020.

3.2.Study Setting

This study was conducted at Kamenge Military Hospital in the obstetric unit. The hospital has a bed capacity of 40 in the obstetrics unit and attends to around 200 patients monthly (39). The hospital's maternity unit consists of a labor ward and two operating theaters that are operational around the clock. Within the labor ward, a collective of midwives operates in three distinct shifts, overseen by two medical officers. An operating theatre is designated for elective gynecological and obstetric cases, primarily performed by a specialist in obstetrics and gynecology. The second theater is designated for emergent situations that may come from the labor ward or be referred, and is staffed by a medical officer working 10 hours for the day shift and 14 hours for the night shift.

The attending obstetrician/gynecologist is responsible for intervening in the event of a complex case occurring in the labor unit or operating theater. A reception area exists where patients are initially received before to their admittance. The admitting area is equipped with an ultrasound equipment that is utilized by the medical officer responsible for the labor ward. There exists a total of four antenatal wards designated for the admission of obstetrics patients, while an equivalent number of postnatal wards are available to accommodate patients who have successfully delivered and are currently in stable conditions.

The hospital also includes a neonatology unit that provides care for preterm neonates and newborns experiencing distress. The hospital is partitioned into two distinct wards: one for the admission of neonates born on-site, and another for the admission of newborns referred from external sources. The hospital has as well an ICU with 11 bed capacity.

PPROM at the facility is diagnosed by confirmation of pooling of fluid in the vaginal cavity observed through a speculum vaginal examination. The findings from the speculum vaginal

examination are documented in the patient file which makes it possible to identify whether a patient developed PPROM or not. In cases when preterm birth takes place prior to 34 weeks, a conservative treatment approach is typically employed. This approach involves the administration of antibiotics, namely intravenous Ampicillin at a dosage of 1g every 8 hours for a duration of 48 hours, followed by a course of oral antibiotics. The recommended oral antibiotic for this purpose is erythromycin, to be taken at a dosage of 500mg three times a day for a period of 10 days.

The administration of dexamethasone at a dosage of 6mg twice daily for a duration of 48 hours, or alternatively, the use of betamethasone at a dosage of 12mg twice daily for a duration of 24 hours, is recommended.

The recommended course of action includes prescribing bed rest and doing serial ultrasounds to evaluate the overall health and condition of the fetus.

Prematurely born newborns are admitted to a common facility known as the Newborn Unit, where daily rounds are conducted by a team consisting of pediatricians and medical officers providing medical assistance.

In the event of premature labor, the prescribed treatment for tocolysis at the medical facility consists of administering Nifedipine at a dose of 10mg every 15 minutes for a duration of 1 hour, followed by a maintenance dosage of 20mg administered twice daily.

3.3.Study Population

The study population included pregnant women admitted to obstetric wards at Military Hospital of Kamenge between 24 and 28 weeks of gestation from January 2016 up to December 2020.

3.4.Inclusion and Exclusion Criteria

3.4.1. Inclusion criteria

-Pregnant women admitted to obstetric wards between 24 and 28 weeks of gestation.

Patients referred with a PPROM outcome

-Complete patient files which include maternal and perinatal outcomes

-Singleton and multiple gestations.

-IUFD at admission

3.4.2. Exclusion criteria

-Incomplete records for key variables (Maternal and perinatal outcomes)

3.5.Sample size determination

3.5.1.Sample Size determination from objective 1 on establishing prevalence of PPROM at 24-28 weeks of gestation

According to a study conducted by González-Mesa et al. in 2021, the prevalence of PPROM between 24 to 28 weeks was 12.9% (40).

The sample size was calculated using Fischer's formula.

no = z^2 pq/e2

Where No is the sample population

Z^2 is the abscissa of the normal curve (1.96)

P is the estimated prevalence in the population (0.129)

q is (1-p) the proportion of an attribute that is absent in the population (0.871)

e is the margin of error included in the study (5%)

Therefore, the sample size was

n = z^2 pq/e2

n = (1.96^2) (0.129*0.871)/0.0025)

= 0.4542/0.0025

= 172

3.5.2. Sample Size determination from objective 2 on establishing maternal risk factors

According to a study conducted by Mohamed Taman et al. in 2021, the most common associated risk factor in PPROM between 24 to 28 weeks was recurrent urinary tract infection (28%).(41)

The sample size was calculated using Fischer's formula with 1.96 standard normal deviation, 28% prevalence of PPROM and 5% margin of error giving a sample of 309. Adding a 10% attrition. The sample size was 340.

3.5.3.Sample Size determination from objective 2 on establishing perinatal outcomes

According to a retrospective study conducted by V.Dusingizimana. et al (2019) over a period of 4 years at Kigali University Teaching Hospital, Rwanda; looking at maternal and neonatal outcomes at 24 to 34 weeks of gestation with PPROM,the neonatal mortality in the gestational group 24 to 28 weeks was **73.5%** .). (42)

The sample size was calculated using Fischer's formula with 73.5% neonatal mortality, five percent margin of error giving 299

= 299

Thus, including a 10% attrition, the targeted sample population was **340.**

Therefore, a sample size of 340 women admitted to obstetric wards between 24 and 28 weeks of gestation was considered.

3.6.Sampling technique

The research employed a simple random sampling methodology. All patient records that satisfied the predetermined criteria for inclusion were found, and their inpatient numbers were randomized using Microsoft Excel. A total of 340 records were collected as the initial sample. The utilization of this approach was crucial as it effectively mitigated prejudice and ensured equitable opportunity for selection among all patients.

3.7.Data Variables

Table 3.1: Data Variables

Objective	**Exposure Variables**	**Outcome variable**	**Sources of data**
Maternal characteristics	Age, marital status, monthly income, social class, parity, level of education, previous PPROM,), chronic diseases, antenatal visits,	PPROM	Patient files
Management	Antenatal corticosteroids, tocolytics, magnesium sulphate, antibiotics		Patient files
-To determine maternal outcomes	Women with PPROM at 24 to 28 weeks of gestation	--maternal sepsis -Latency period -C/S rate -PPH - maternal Death	Patient files

		-Length of hospital stay	
To determine the neonatal outcomes	Women with PPROM at 24-28 weeks of gestation	-APGAR -Birth weight -RDS -NBU admission -Death -Length of hospital stay	Patient files

3.8.Recruitment of research assistants

The study principal investigator recruited two research assistants who were clinical officers by profession. They were trained to ensure that the data collected is quality.

3.9.Data collection tools

A data abstraction tool in relation to the study objective was used to extract patient information from the files.

3.10. Quality assurance

The research assistants were trained to ensure they collect quality data. The data collection tool was also reviewed by expert consultant and specialized in fetal maternal healthcare. A qualified statistician was also recruited to review the tool and ensure that data collected answers the study objectives.

3.11. Data collection procedure

The data collection process began after approval from the KNH-UoN Ethics Committee and Military Hospital of Kamenge Administration. The researcher with the help of two trained research assistants accessed the files of pregnant women who were admitted in obstetric wards from January 2016 up to December 2020 from the hospital health information department which stores all patient files from different departments. Antenatal files were retrieved starting from 31st December 2020 going backwards up to the achievement of our sample size which was January 2016 . The files that met the inclusion criteria were selected from the retrieved files.

3.12. Data management

The collection of data was conducted utilizing a data abstraction tool that aligned with the study's aims. The data abstraction tools that had been completed were securely stored in a

locked cupboard, awaiting the process of data entry and subsequent analysis. The process of data entry was conducted with Epi data version 3.1. Following the completion of data entry, the encoded data was subsequently exported into SPSS version 26 for the purpose of analysis. The data that was accessible in digital format were securely maintained on a laptop protected by a password. Access to this laptop was restricted to the researcher or individuals authorized by the researcher.

3.13.Data analysis

Data analysis was done objectively. The demographic and clinical chaarcteristics were analyzed descriptively. Grouped data was summarized using frequencies and percentages while continuous data was summarized using median and Interquartile range as well as mean and standard deviation. The prevalence of PPROM was calculated as a proportion of the total sample and expressed as a percentage. Both bivariable and multivariable analysis were conducted using binary logistic regression. In developing the multivariable model, variables that were significant at bivariable analysis. Maternal and fetal outcomes were analysed descriptively using frequencies and percentages. Data analysis was done using SPSS version 26 software. All comparisons were performed at 0.05 significance level. The analysis included both descriptive and inferential analysis.

3.14.Ethical considerations

The study proposal underwent the necessary approval process, first receiving departmental permission and then being presented to the research committee of the Kenyatta National Hospital University of Nairobi. The management of the Military Hospital of Kamenge was also requested to provide approval. Confidentiality was maintained by utilizing only the patient's file number and refraining from recording their name. To maintain the confidentiality and security of data, physical security measures were implemented for both hard copy documents and mass storage devices, including USB drives and external hard drives. All collected information was maintained in strict confidentiality and exclusively utilized for the purposes of the study.

3.15.Dissemination of the results

Concerning the distribution of information, the findings of the study were presented in the form of a dissertation at the Obstetrics and Gynaecology Department of the University of Nairobi. Additionally, the results were shared with Kenyatta National Hospital and the Military Hospital

of Kamenge. The primary objective of this dissemination is to contribute to the establishment of recommendations in the field.

4. CHAPTER 4: RESULTS

4.1.Introduction

The study investigated the prevalence, associated factors, maternal and perinatal outcomes of pregnancies complicated by PPROM between 24- and 28-weeks of gestation at Military Hospital of Kamenge from 2016 to 2020. The specific objectives that were assessed included prevalence of PPROM at 24 to 28 weeks of gestation, sociodemographic, medical and obstetric factors associated with PPROM, treatment modalities, selected maternal and neonatal outcomes. A total of 390 files were screened, 350 met the inclusion criteria.

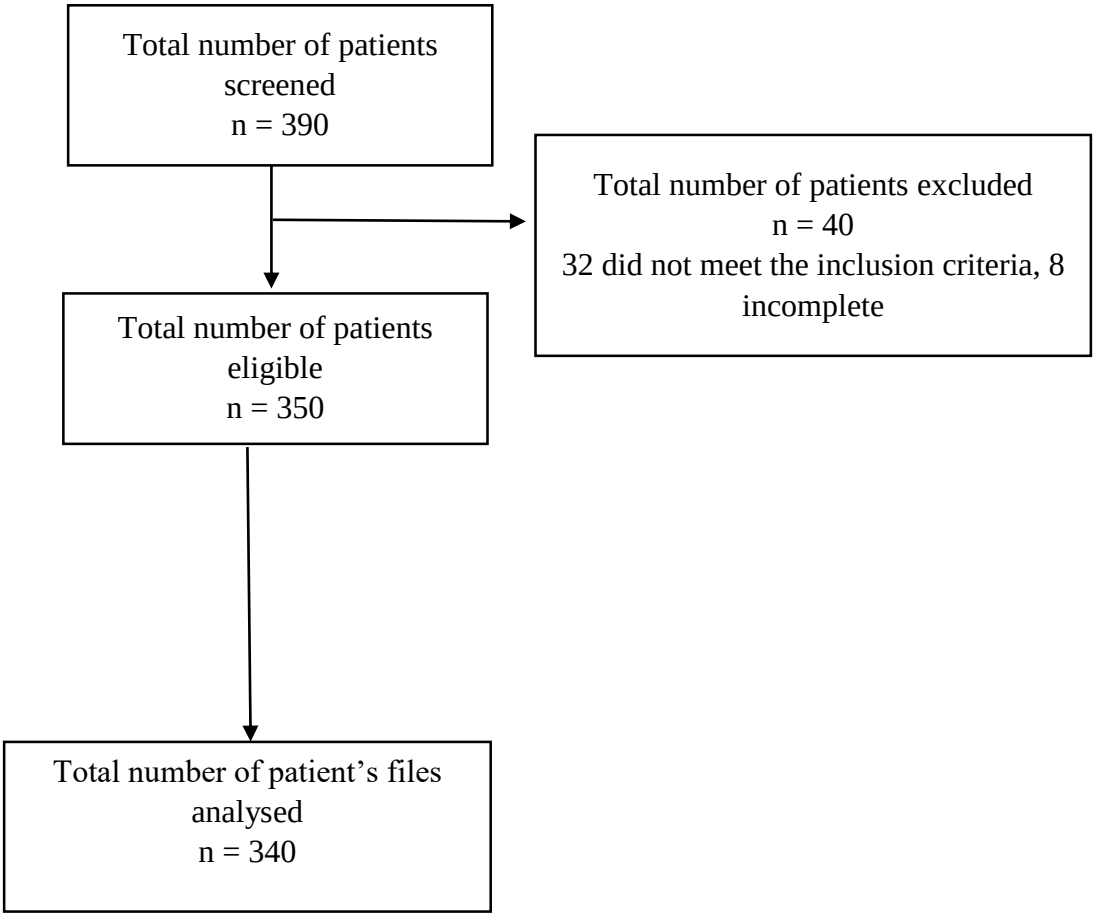

Figure 4.1:Study flow chart

4.2.Descriptive analysis

4.2.1. Demographic characteristics and obstetric history of pregnant women admitted to obstetric wards between 24 and 28 weeks of gestation at Military Hospital of Kamenge

The findings showed that the median age was 32 ranging between 28 and 36 years, 95.9% (n =326) of the respondents were married while 43.8% (n =149) had secondary level as their highest level of education. The median gravidity was 4(IQR:3 -5), median parity was 2 (IQR: 1 -4). Among multiparous women who were involved in the study, the median interpregnancy interval was 2 (IQR: 1 -3). In investigating the history of CS delivery, 18.8% (n =64) had history of CS delivery, 0.6% (n =2) had history of PPROM, 5.9% (n =20) had history of preterm birth, 2.9% (n =10) had history of HDP. The findings also showed that19.4% (n =66) had history of miscarriages as shown in Table 4.1.

Table 4.1:Demographic characteristics and obstetric history of pregnant women admitted to obstetric wards between 24 and 28 weeks of gestation at Military Hospital of Kamenge

	Frequency	Percent
Age Median (IQR)	32(28 -36)	
Marital status		
Single	14	4.1
Married	326	95.9
Education level		
None	15	4.4
Primary	107	31.5
Secondary	149	43.8
Tertiary	69	20.3
Gravida Median(IQR)	4(3 -5)	
Parity Median (IQR)	2(1 -4)	
Interpregnancy interval Median (IQR)	2(1 -3)	
History of CS		
Yes	64	18.8
No	276	81.2
History of PPROM		
Yes	2	0.6
No	338	99.4
History of Preterm birth		
Yes	20	5.9
No	320	94.1
History of HDP		
Yes	10	2.9
No	330	97.1
History of anaemia		
Yes	6	1.8
No	334	98.2
History of miscarriages		
Yes	66	19.4

No	274	80.6

4.2.2. Current obstetric factors of pregnant women admitted to obstetric wards between 24 and 28 weeks of gestation at Military Hospital of Kamenge

The findings revealed that, 75.6% (n =257) of the patients had attended ANC, 84.8% (n =218) of them attended public health facilities, 5.9% (n =20) of mothers had chronic medical condition, 32.9% (n =112) were using medication in current pregnancy. The common medication used included folic acid, antiretroviral disease, albendazole and antibiotics. The findings also showed that, 10.3% (n =35) of the women had anemia while 8.5% (n =29) of the respondents had HDP as shown in Table 4.2.

Table 4.2:Current obstetric factors of pregnant women admitted to obstetric wards between 24 and 28 weeks of gestation at Military Hospital of Kamenge

	Frequency	**Percent**
ANC		
Yes	257	75.6
No	83	24.4
ANC facility		
Type of facility		
Health Centre	218	84.8
Private	19	7.4
Referral Hospital	20	7.8
Presence of chronic condition		
Yes	20	5.9
No	320	94.1
Medication use in current pregnancy		
Yes	112	32.9
No	228	67.1
Alcohol use		
Yes	11	3.2
No	329	96.8
UTI in this pregnancy		
Yes	20	5.9
No	320	94.1
Vulvovaginal discharges		
Yes	21	6.2
No	319	93.8
Anaemia in this pregnancy		
Yes	35	10.3
No	305	89.7
Gestational diabetes		
Yes	2	0.6
No	338	99.4
HDP		
Yes	29	8.5

No	311	91.5

4.3.The prevalence of PPROM at 24-28 weeks of gestation at Military Hospital of Kamenge

The findings revealed that the prevalence of PPROM among the mothers who were included in the study was 16.2%, 95%CI(12.4% – 20.5%) as shown in Table 4.3.

Table 4.3:Prevalence of PPROM

	Frequency	Prevalence (95%CI)
Yes	55	16.2(12.4 - 20.5)
No	285	83.8(79.5 - 87.6)

4.3.1. Gestational age at PPROM

The gestation at PPROM diagnosis was also assessed, the findings revealed that, 29.1% (n =16) of the women had PPROM at 27 weeks, 21.8% (n =12) had PPROM at 25 weeks while 20% (n =11) had PPROM at 24th and 26th week of gestation. Further, 9.1% (n =5) had PPROM at 28th week of gestation as shown in Figure 4.2.

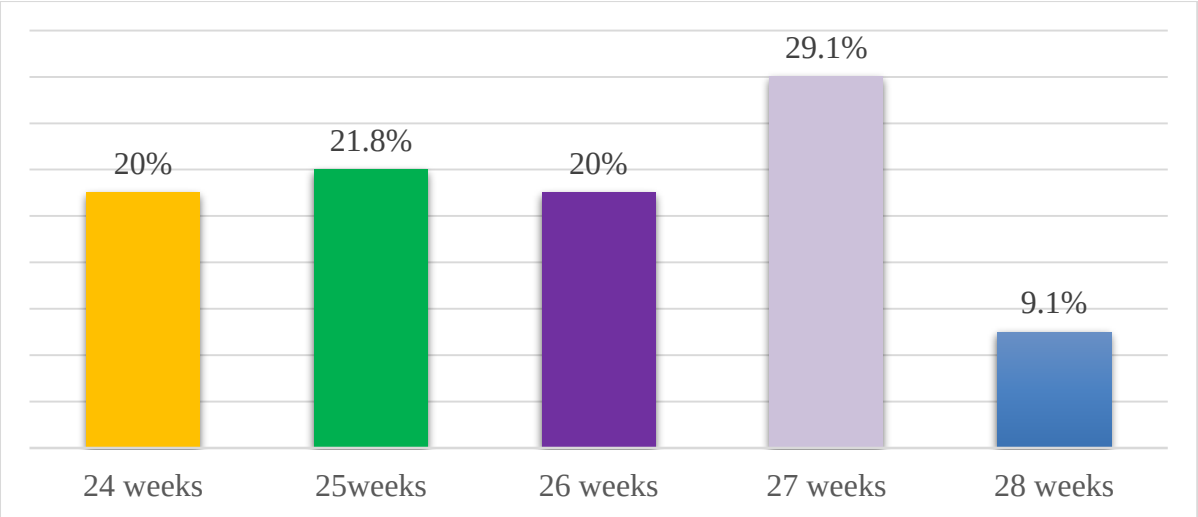

Figure 4.2:Gestational age at PPROM

4.3.2. Other conditions diagnosed at admission

Among the 285 patients, the findings revealed that at admission 40.4.% (n = 115) of the mothers presented with preterm labor,17.8% (n =51) presented with IUFD while 5.3% (n =15) presented with other condition which include sepsis, anemia, urinary tract infection and uterine rupture as displayed in Figure 4.3.

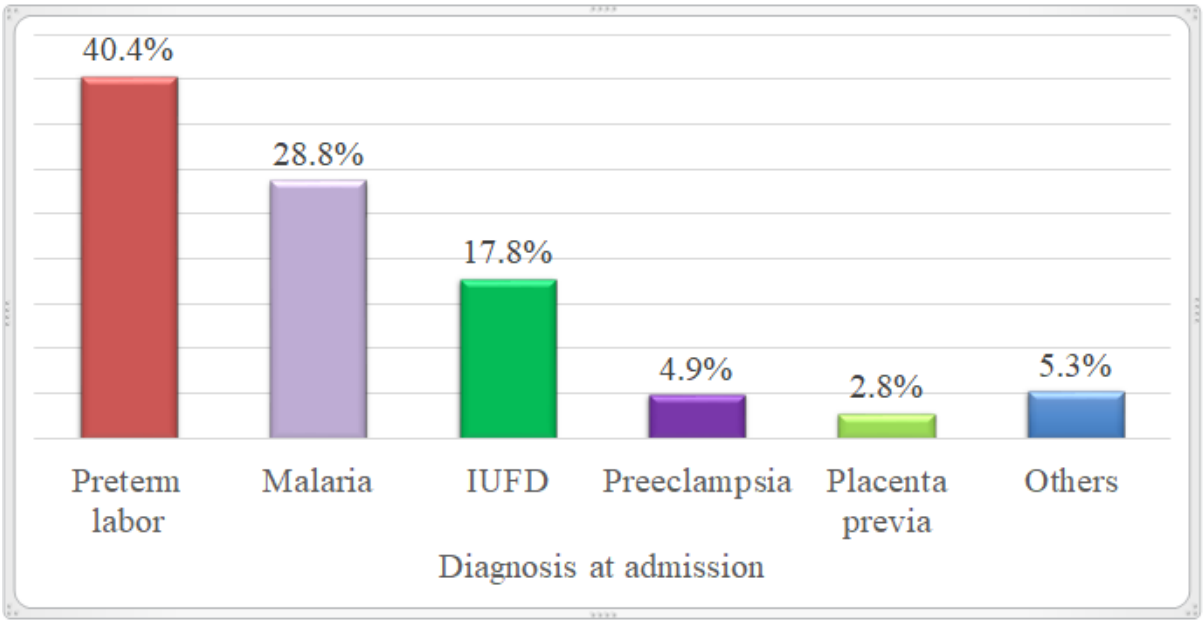

Figure 4.3:Conditions diagnosed at admission

4.4.The sociodemographic, medical and obstetric factors associated with PPROM at 24-28 weeks of gestation at Military Hospital of Kamenge

The findings revealed that age, previous CS delivery, Lack of ANC visit, presence of anaemia and HDP in pregnancy were significantly associated with PPROM between 24 and 28 weeks. The findings showed that the odds of developing PPROM at 24-28weeks of gestation for women aged 30 years were 2.2 times increased compared to those aged below 30 years, (OR = 2.158, 95%CI: 1.372 – 3.345, p<0.001). The odds of women with previous CS having PPROM were 2.5 times the odds of those with vaginal delivery between 24 and 28 weeks (OR = 2.53, 95%CI: 1.33 – 4.82, p = 0.005). Further the findings revealed that, women who did not have any ANC visit were more at risk to develop PPROM between 24 and 28 weeks, (OR =3.768, 95%CI: 1.45 – 9.79, p = 0.002). The odds of women who were diagnosed with anemia in current pregnancy having PPROM were 2.7 times the odds of those without anemia in current pregnancy between 24 and 28 weeks, (OR = 2.719, 95%CI:1.244 – 5.942, p = 0.014). The odds of developing PPROM at 24-28weeks of women HDP in current pregnancy were 2.2 times greater than those without it as shown in Table 4.4.

Table 4.4:The sociodemographic, medical and obstetric factors associated with PPROM at 24-28 weeks of gestation at Military Hospital of Kamenge

	PPROM			
	Yes	No	OR(95%CI)	
Age				
<30 years	8(14.5)	148(51.9)	Ref	
=>30 years	47(85.5)	137(48.1)	2.2.(1.372 -3.345)	**p<0.001**
Level of education				
None	3(5.5)	12(4.2)	Ref	
Primary	18(32.7)	89(31.2)	0.76(0.18 - 3.14)	0.759
Secondary	23(41.8)	126(44.2)	0.94(0.41 -2.13)	0.938
Tertiary	11(20)	58(20.4)	1.04(0.48 - 2.27)	1.039
Marital status				
Single	2(3.6)	12(4.2)	0.86(0.19 - 3.95)	0.599
Married	53(96.4)	273(95.8)	Ref	
Residence				
City	40(72.7)	207(72.6)	1.01(0.0.51 -2.15)	0.651
Rural	15(27.3)	78(27.4)	Ref	
Occupation				
Employed	18(32.7)	92(32.3)		
Unemployed	22(40)	124(43.5)	1.19(0.54 - 2.61)	0.670
Student	2(3.6)	13(4.6)	1.31(0.62 - 2.78)	0.485
Farmer	13(23.6)	56(19.6)	1.50(0.30 - 7.52)	0.616
Gravidity				
<4	35(63.6)	174(61.1)	1.16(0.61 - 2.03)	0.42
=>4	20(36.4)	111(38.9)	Ref	
Parity				
=<2	0	1(0.4)	1.19 (0.65 - 1.24)	0.847
>2	55(100)	284(99.6)	Ref	
Previous CS				
Yes	18(32.7)	46(16.1)	2.53(1.33 -4.82)	**0.005**
No	37(67.3)	239(83.9)		
History of miscarriage				
Yes	11(20)	55(19.3)	1.04(0.51-2.15)	0.516
No	44(80)	230(80.7)	Ref	
ANC				
Yes	50(90.9)	207(72.6)	Ref	
No	5(9.1)	78(27.4)	3.77(1.45 -9.79)	**0.002**
Chronic medical condition				
Yes	1(1.8)	19(6.7)	0.26(0.03 -1.98)	0.135
No	54(98.2)	266(93.3)	Ref	
Alcohol use				
Yes	2(3.6)	9(3.2)	1.16(0.25-5.5)	0.135
No	53(96.4)	276(96.8)	Ref	
UTI				
Yes	3(5.5)	17(6.0)	0.91(0.26 -3.22)	0.59
No	52(94.5)	268(94)	Ref	
Vulvovaginal discharges				
Yes	7(12.7)	14(5.7)	2.41(0.92 - 6.279)	0.067
No	48(87.3)	231(94.3)	Ref	
Anaemia				
Yes	11(20)	24(8.4)	2.72(1.25 -5.942)	**0.014**
No	44(80)	261(91.6)		

HDP				
Yes	10(18.2)	13(4.6)	2.16(1.27- 4.35)	**p<0.001**
No	45(81.8)	272(95.4)		

4.4.1. Independent sociodemographic, medical and obstetric factors associated with PPROM at 24-28 weeks of gestation at Military Hospital of Kamenge

A Multivariable analysis was conducted to identify independent factors associated with PPROM between 24 and 28 weeks of gestation. In developing the model, factors that were significant under bivariate analysis were included in the model to control for confounders as shown in Table 4.5. The findings revealed that women aged 30 years and above were 5.5 times more likely to have PPROM between 24 and 28 weeks of gestation, (aOR = 5.507, 95%CI: 2.456 – 12.35, p<0.001), the probability of women who had ANC visit developing PPROM was 20% compared to those who did not attend ANC, (aOR = 1.811, 95%CI: 1.451 – 2.411, p = 0.038), Those with anaemia in current pregnancy were 2.3 times more likely to have PPROM between 24 and 28 weeks of gestation, (aOR = 2.311, 95%CI: 1.511 – 2.671, p =0.013), women who had HDP in current pregnancy were 3 times more likely to have PPROM between 24 and 28 weeks of gestation, (aOR = 3.112, 95%CI: 2.11 – 5.322, p<0.001),

Table 4.5:Independent sociodemographic, medical and obstetric factors associated with PPROM at 24-28 weeks of gestation at Military Hospital of Kamenge

	aOR(95%CI)	**P-value**
Maternal age		
>30 years	Ref	
>=30 years	5.507(2.456 -12.352)	p<0.001
Previous caesarean section		
Yes	0.510(0.251 -1.037)	0.063
No	Ref	
ANC visit	0.338(0.126 -0.910)	
Yes	Ref	
No	1.811(1.451 - 2.411)	0.038
Anaemia in this pregnancy		
Yes	2.311 (1.511 - 2.671)	0.013
No	Ref	
HDP		
Yes	3.112 (2.11-5.322)	p<0.001
No	Ref	

4.5.Treatment modalities and selected maternal and neonatal outcomes (in PPROM at 24-28 weeks of gestation

4.5.1. Treatment modalities among women with PPROM at 24 and 28 weeks of gestation

The findings revealed that among the women with PPROM between 24 and 28 weeks, 32.7% (n =18) of the women were referred. Obstetric ultrasound was conducted in 87.3% (n =3) of the patients, 10.9% (n =6) of the women had their pregnancies terminated, 96.4% (n =53) had antibiotics administered, steroids were administered in 72.7% (n =40) of women while tocolytics were given to 18.2% (n =10) of the mothers as shown in Table 4.6.

Table 4.6:Treatment modalities among women with PPROM at 24 and 28 weeks of gestation

Management approach	Frequency	Percent
Obstetric Ultrasound		
Yes	48	87.3
No	7	12.7
Termination of pregnancy		
Yes	6	10.9
No	49	89.1
Antibiotics administered		
Yes	53	96.4
No	2	3.6
Steroids administration		
Yes	40	72.7
No	15	27.3
Tocolytics given		
Yes	10	18.2
No	45	81.8
Induction of labor		
Yes	7	12.7
No	48	87.3

4.5.2. Maternal outcomes and Pregnancy complications among women with PPROM at 24 – 28 weeks of gestation at Military Hospital of Kamenge

The results established that, labor was induced in 12.7% (n =7) of the women, 27.3% (n =15) delivered via CS. The median latency period was 4 days (IQR:1 – 8 days).The findings showed that, 27.3% (n =15) of the patients had placentae abruptio, 20% (n =11) had chorioamnionitis, 14.5% (8) had umbilical cord prolapses, 16.4%(n =9) had intrauterine fetal demise. The median length of stay in the hospital was 5 (IQR: 3 – 11) days as shown in Table 4.7.

Table 4.7:Maternal outcomes and pregnancy complications

	Frequency	Percent
Induction of labor		
Yes	7	12.7
No	48	87.3
Mode of delivery		
C/S	15	27.3
Vaginal	40	72.7
Blood transfusion		
Yes	3	5.5
No	52	94.5
Latency period Median (IQR) days	4 (1 - 8	
Adverse outcomes		
Yes	43	78.2
No	12	21.8
Chorioamnionitis		
Yes	11	20
No	44	80
Umbilical cord prolapses		
Yes	8	14.5
No	47	98.2
Abruptio placenta		
Yes	15	27.3
No	40	72.7
PPH		
Yes	1	1.8
No	54	98.2
Uterine rupture		
Yes	4	7.3
No	51	92.7
Sepsis		
Yes	6	10.9
No	49	89.1
Intrauterine fetal Demise		
Yes	9	16.4
No	46	83.6
Hospital length of stay Median(IQR)	5(3 - 11)	

4.5.3. Gestational age at delivery

The findings showed that 29.1%(n =16) delivered at 28 weeks, 23.6% (n =13)delivered at 27 weeks while 7.3% (n =4) delivered at 30 weeks and above as showed in Figure 3

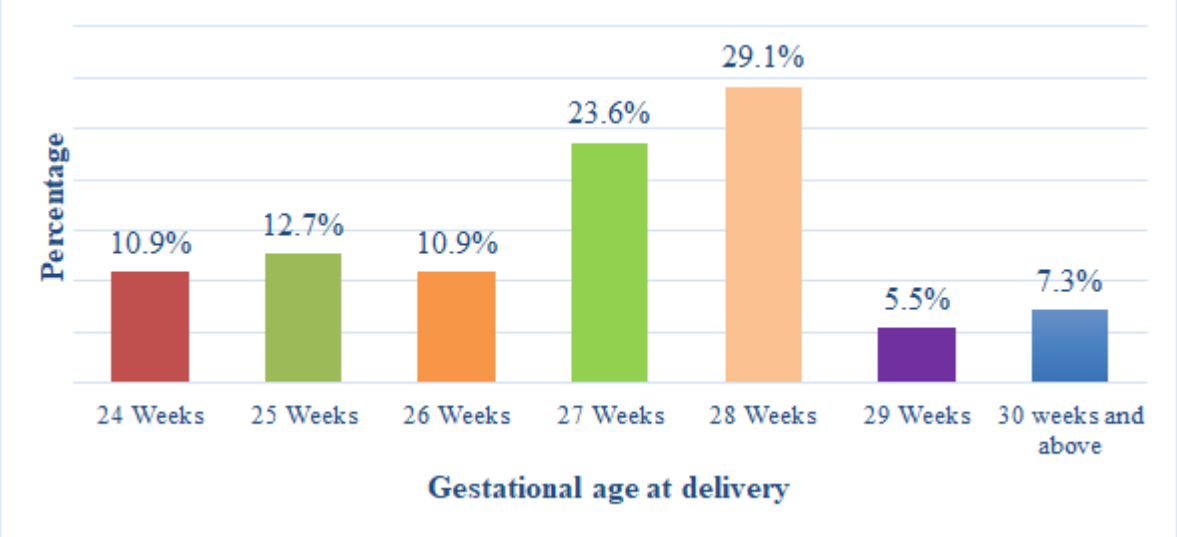

Figure 4.4:Gestational age at delivery

4.5.4. Neonatal outcomes

The findings revealed that, there were 74.5% (n =41) livebirths, 63.4% (n =26) of the neonates had Apgar score of less than 7 at first minute, 43.9% (n =16) had respiratory distress syndrome. The finding also revealed that 45.5% (n =25) of women with PPROM were discharged with live babies while 54.5% (n =30) died (IUFD, stillbirths and died in NBU) as shown in Table 4.8.

Table 4.8:Neonatal Outcomes

	Frequency	Percent
Viability		
Livebirth	41	74.5
Stillbirth	14	25.5
Gestational age at delivery Mean (SD)	27 (±3.4)	
Apgar Score at 1st Minute (n =41)		
<7	26	63.4
>7	15	36.6
Apgar Score at 5th Minute (n =41)		
<7	18	43.9
>7	23	56.1
Birth weight (n =41)		
< 1kg	18	43.9
1kg- 1.5kg	20	48.8
1.5kg - 2.5kg	3	7.3
Respiratory Distress Syndrome (n =41)		
Yes	16	39
No	25	61
Neonatal death before NBU admission (n =41)		
Yes	4	7.3
No	36	92.7
Overall Outcome		
Stillbirth	14	25.5
Neonatal mortality	16	29.0
Discharged alive	25	45.5

CHAPTER FIVE: DISCUSSION

The study investigated the prevalence, associated factors , maternal and perinatal outcomes of pregnancies complicated by PPROM between 24 to 28 weeks of gestation between 2016 to 2020. The findings have showed that the median age was 32 years with majority of the patients ranging between 28 and 36 years. These findings are comparable to a study conducted in Niger by Osaikhuwuomwan (15) which found that the average age was 29 years. Most of the patients were not first-time mothers with the median gravida of 4. This explains the age which is representative of the type of participants that were included in the study. Similarly, another study conducted in Northwest Ethiopia by Addisu et al.(21)investigating PPROM found that the average age was 29 years. The findings from their study also further asserted that majority of patients were multiparous. The risk of complications and admission into obstetric wards is higher in older multiparous women which explain the gravidity and parity of the patients recruited in present study (43). The findings from our study also established that almost half of the women had secondary level education. Secondary level of education is the highest level of education among many individuals in developing countries including Burundi. However, the level of education in Burundi is lower considering a 35% literacy level. This explains why only 20.3% of the patients in our study had tertiary level of education. The hospital is also a public referral hospital which admits mothers across different social classes with majority from low income families considering its affordability of care. The findings from our current study also found that almost all of the patients were married. In Burundi majority of girls get married in their adolescents and young adulthood. Majority of the patients were aged between 28 and 36 years which is relatively higher than the average age of marriage in Burundi. Approximately 20% of women in Burundi get married before they reach the age of 18 years(44).

The findings from our current study revealed that the prevalence of PPROM between 24 and 28 weeks among women admitted with obstetric conditions was 16.2%. these findings are in line with a study conducted in China which revealed that the prevalence of PPROM was 19.2% (2). However, it is worth noting that the prevalence of PPROM in their study included patients in their third trimester while in our study we investigated between 24 and 28 weeks which might explain the prevalence with a study conducted in China which is a developed country with greater focus on quality care delivery. The study was also conducted in rural China. The findings from our present study contrast those from many previous studies which have found varied prevalence of PPROM (21)(45)(40). According to a study conducted in Ethiopia by Adissu et al, the prevalence was 13.7%. This study was conducted cross sectionally where

patients were recruited systematically between March 14 to June 20, 2019 and it is located 667km from the capital city of Addis Ababa. Another study conducted by Bouvier et al. in Canada revealed that the prevalence of PPROM was 2.8%. This study was a cohort study investigating approximately 7866 pregnant women at their first prenatal visit to the perinatal clinic of the institution. Additionally, González-Mesa et al. in a study conducted in Spain, 0.49% of all patients admitted at or before 28 weeks of gestation (40). Burundi is a country that has faced longer periods of civil unrests which have significant destabilized the healthcare system hence creating major discrepancies in care with other developing countries. Some of these studies have been conducted in developed countries which have strong and high quality of care services which has direct positive influence on maternal care and reduce the prevalence of PPROM. However, it is worth noting that the prevalence of PPROM varies significantly across different settings. In a study conducted in Brazil, the prevalence of PPROM was 3.1% (46). In another study conducted in Uganda, the prevalence was 7.5% (47), in India, the prevalence was 2.2% (6) while in Egypt, the prevalence of PPROM was 5.3% (48). In developed settings, the prevalence is significantly lower although in developing settings the prevalence is higher although not comparable to our findings which are extremely high.

The finding from the current study have showed that women who were aged 30 years and above were 2.2 times more likely to have PPROM between 24 and 28 weeks of gestation compared to those aged below 30 years. These findings are comparable to a study conducted in United States which found that maternal age (>29years) was associated with increased risk of PPROM (46). A study conducted in Nigeria by Okeke et al. found that maternal age was associated with PROM although there was an inverse relationship considering that in their study, it was found that younger mothers are more prone to PROM. This discrepancy could be as a result of the gestational age targeted in the study. In their study, they focused on gestation of ≥37 weeks while in our study, we were limited to gestational period of between 24 and 28 weeks. Another study in Omani by Al Riyami et al, it was found that there was significant association between maternal age and extreme PPROM.

The findings from our study also revealed that, previous CS delivery was significantly associated with PPROM. These findings are comparable to a study in Egypt which revealed that there was increased risk of PPROM among women with previous CS delivery. Similarly, in a study conducted by Bouvier et al, previous CS delivery was also associated with PPROM. Similarly, in a study conducted in Ethiopia investigating risk factors for PPROM by Assefa et al. (20) who found that women who had previous history of caesarean section were 3 times more likely to have PPROM.

The findings from the present study also revealed that, lack of ANC visit was associated with increased likelihood of PPROM. Antenatal care is essential in maternal care where early screening is conducted and present proper ways to manage potential obstetric complications such as PPROM. These findings are comparable to Assefa et al. (20) who found that lack of ANC visit or attendance of less than 2 was associated with increased risk of PPROM. The ANC incorporates diverse services which are aimed at improving pregnancy outcomes. These findings are comparable to a study conducted by Zhang et al. (49) which revealed that early ANC attendance was associated with reduced burden of PPROM and preterm labor. Further, another study in Indonesia by Pratiwi et al. (50) who found that the prevalence of PPROM equalled to 28,3% in maternal anemia group. The findings further determined that pregnant women with anemia would be at risk of PROM 3.59 times greater than non-anemic mother. Low haemoglobin levels (<11.1g/ dL) are associated with premature rupture of membranes, presumably low levels of haemoglobin are the initial symptoms which do not appear so that can cause infection. The results from our present study also revealed that presence of HDP in current pregnancy was associated with increased risk of PPROM. the findings showed that, those with HDP in current pregnancy were 2.2 times more likely to have PPROM between 24 and 28 weeks of gestation. These findings are comparable to a study conducted in China which revealed that the risk of PPROM was 3.10 in women diagnosed with hypertensive disorders of pregnancy (51).

The management approaches of PPROM were also investigated in our current study. Majority of the patients had obstetric ultrasound done, 10.6% of women had their pregnancies terminated as a management approach. Majority were given antibiotics and steroids for management of PPROM while 18.2% were managed using tocolytics. These findings are comparable to a systematic review conducted by Madar (30) who identified that, use of ultrasound is essential in management of patients with PPROM. Further, antenatal corticosteroids are recommended for high risk mothers to control adverse outcomes. The use of antibiotics in management of PPROM has also been stressed by Lorthe who asserted that when corticosteroids are given to women with PPROM, the risk of respiratory distress and intraventricular haemorrhage is lowered. Antibiotics are provided to lower the risk of infection in the mother and fetus, however they have been shown to lengthen the latency period.

The findings from our present study have showed that labor induction was done in 12% of the patients. A study carried out in the United States by David et al. (31) revealed that induction of labor was not found to have any significant positive outcome in terms of controlling adverse outcomes among women with PPROM. The use of steroids has also been found to be beneficial in management of PPROM in developing countries (33).

The findings from the current study revealed that 78.2% of women who had PPROM developed adverse complications. However, these findings can be alluded to unavailability of resources in the hospital to manage these cases. Burundi has weak health system and lacking common necessities that can aid in management of patient conditions. The common complications that were identified included placentae abruptio 27.3%, chorioamnionitis 20%, umbilical cord prolapses 14.5%, intrauterine fetal demise 16.4% and sepsis 10.9%. In a study conducted by Ekin et al., it was found that the occurrence of chorioamnionitis and placental abruption were common maternal complications associated with PPROM (52). Further, findings from our current study found that the median latency period was 4 days. The findings from our study can be compared to Nayot et al (53) who found that majority of women with PPROM between 25 to 28 weeks had a latency period of more than 72 hours. Women with preterm premature rupture of membranes (PPROM) who had a latency period of less than 72 hours were shown to have a higher likelihood of experiencing pregnancy-induced hypertension and giving birth to infants with a birth weight below the 3rd percentile. On the other hand, PPROM women with a latency period exceeding 72 hours were more likely to have received steroid treatment and develop clinical chorioamnionitis.

The neonatal findings from the current study revealed that there were 74.5% livebirth, majority of the neonates had birthweight of less than 1.5kgs, 39% had RDS while NBU admission was 81.1% and the median length of stay was 5 days in NBU. These findings are comparable to a study conducted by Bouvier et al. (45) which found that neonatal complications associated with PPROM were APGAR 5' <4, birth weight <2500 g, stillbirth, neonatal jaundice, and hospitalization of mother and neonate. Another study conducted in Turkey by Taner et al (3) found that there is increased risk of shorter latency to delivery and longer postpartum length of stay at the hospital with decrease in AFI between 23-33weeks of gestation. Kachramanoglu et al. (36) also found that 45% of the newborns had respiratory distress syndrome at birth in their study which is higher than in our study.

5.2.Study strengths and limitations

- Strengths

The hospital is one of the largest in the country hence most depicts the exact situation and the burden of PPROM in Burundi

- Limitations

The study was a retrospective study hence the findings were limited to the informations contained in the patient`s files.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1.Conclusion

The prevalence of PPROM between 24 and 28 weeks of gestation was 16.2%.

Multivariable model showed that, mothers aged 30 years and above, women who did not have any ANC visit, presence of anemia in current pregnancy and presence of HDP were significantly associated with PPROM.

The findings revealed that 78.2% of women who had PPROM developed adverse complications. The common complications that were identified included placentae abruptio 27.3%, chorioamnionitis 20%, umbilical cord prolapses 14.5%, intrauterine fetal demise 16.4% and sepsis 10.9%.

The neonatal findings also revealed that there were 74.5% livebirths, majority of the neonates had birthweight of less than 1.5kgs, 39% had RDS while NBU admission was 81.1% and the median length of stay was 5 days in NBU.

6.2.Recommendations

- The prevalence of PPROM was found to be quite high in pregnant women from 24-28weeks of gestation .Those at risk should be identified and a proper follow-up should be ensured.
- Hypertensive disorders, no ANC attendance anemia, previous c/s were found to be significantly associated with PPROM. Adherence to ANC should be encouraged and early screening for hypertensive disorders in pregnancy and anaemia could help to reduce the risk of PPROM
- In our study, early PPROM was found to be at the origin of maternal complications, intrauterine fetal demise and high neonatal mortality. Parents should be informed about the adverse outcomes so they can make informed decisions.

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APPENDICES

Study title: Prevalence, Associated Factors, Maternal and Perinatal Outcomes of Pregnancies Complicated by Preterm Premature Rupture of Membranes Between 24 to 28 weeks Gestational Age at Military Hospital of Kamenge: A Descriptive Cross-Sectional Study

Appendix I: Data Abstraction tool

SECTION A : Demographic characteristics

1. Age :……
2. Level of Education:

   None [ ] Primary [ ] Secondary [ ] Tertiary [ ]
3. Marital Status: Married [ ] Single [ ] Widow [ ] Separated/Divorced [ ]
4. Residence

   City [ ] Rural Area [ ]
5. Occupation

   Employed [ ] Unemployed [ ] Student [ ]

SECTION B. Obstetric history

6. Parity: …….
7. Last delivery (year)…….
8. Interpregnancy interval (months):……
9. Previous Cesarean Section

   Yes [ ] No [ ]
10. If yes how many:……
11. History of previous PPROM

    Yes [ ] No [ ] If yes how many: …….
12. History of Preterm Birth

    Yes [ ] No [ ] If yes how many :
13. Past Pregnancy complications

    PPH: Yes [ ] No [ ]
14. Hypertensive Disorders on previous pregnancies: Yes [ ] No [ ]

    If yes state which one:…….
15. Gestational Diabetes : Yes [ ] No [ ]
16. Anemia : Yes [ ] No [ ]
17. Others (state which one) :……
18. History of miscarriages: Yes [ ] No [ ]

    If yes state: Number: …….

SECTION C: Current Pregnancy

19. Antenatal Care: Yes [ ] No [ ]

    If yes: - how many times: …….

20. Level of the facility:

21. Height (in meters):……..

22. Weight (in Kg): ……

23. BMI: …….

24. Results of the following:

    HIV [ ] VDRL [ ] Hep B [ ] Syphilis [ ]

25. Chronic medical condition: Yes [ ] No [ ]

    If yes, which one……

26. Medications on this pregnancy: Yes [ ] No [ ]

    If yes state which medications:……

27. Drugs on pregnancy: Yes [ ] No [ ]

28. Alcohol consumption: Yes [ ] No [ ]

29. History of UTI on this pregnancy? : Yes [ ] No [ ]

30. History of vulvovaginal discharges: Yes [ ] No [ ]

    If yes which color:….

31. New onset of disease on this pregnancy:

    Anemia : Yes [ ] No [ ]

    Gestational Diabetes: Yes [ ] No [ ]

    Hypertensive Disorders: Yes…… No…… If yes precise which one:

    Others (State which one):……..

32. Number of fetus: single……. Multiple…….

    If multiple how many? :…….

33. PPROM in this pregnancy : Yes [ ] No [ ]

    If yes : gestational age at PPROM : ……weeks

SECTION D. Management and Delivery

33. Referral status: Yes [ ] No [ ]

34. Termination of pregnancy Yes [ ] No [ ]

35. Expectant management:

    Antibiotics given: Yes [ ] No [ ]

    Steroids administration: Yes [ ] No [ ]

Obstetric Ultrasound: Yes [ ] No [ ]

Tocolytics given: Yes No

If yes: name of drug…… dosage …… duration……

36. Induction of labor: Yes No

37. Mode of delivery:

Vaginal ☐ C/S ☐

38. Latency period (days) : ……

39. Pregnancy Complications: Chorioamnionitis: Yes [ ] No [ ]

Umbilical cord prolapse: Yes [ ] No [ ]

Abruption placenta: Yes [ ] No [ ]

Intrauterine fetal demise: Yes [ ] No [ ]

40. Gestational age at delivery (in weeks): …….

SECTION E. Maternal Outcome

41. PPH: Yes No

42. Hysterectomy: Yes No

43. Sepsis: Yes No

44. Death: Yes No

45. Length of hospital stay (in days):…….

SECTION F. Neonatal Outcome

1. Viability: Alive…….. Stillbirth……..

2 APGAR: 0 min: …… 5min:…… 10min:…….

3. Birth weight:

< 1kg ☐ 1kg-1.5kg ☐ 1.5kg-2.5kg ☐ >2.5kg ☐

4. Congenital abnormalities: Yes No

If yes state which one:

5. RDS (Respiratory Distress Syndrome) : Yes……No……

6. NBU admission: Yes No

7. Length of stay at NICU (in days): …….

Dead ☐ Alive ☐