FACTORS ASSOCIATED WITH EARLY PERINATAL MORTALITY IN JUBA TEACHING HOSPITAL, SOUTH SUDAN; 2018, A CROSS-SECTIONAL STUDY

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DECLARATION AND APPROVAL BY SUPERVISORS

I declare that this dissertation is my original work compiled with the guidance of my supervisors, and that to the best of my knowledge has not been submitted for a degree in any other university or published elsewhere. Where reference was made from other sources, published or otherwise, that source has been duly cited.

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ACKNOWLEDGMENTS

DEDICATION

This work is dedicated to my family, this accomplishment would not have been possible without them.

LIST OF ABBREVIATIONS

ANC   –   Antenatal Care

DHS   –   Demographic and Health Survey

EPMR   –   Early Prenatal Mortality Rate

JTH   –   Juba Teaching Hospital

KNH   –   Kenyatta National Hospital

MDG   –   Millennium Development Goal

MMR   –   Maternal Mortality Ratio

PNMR   –   Perinatal Mortality Ratio

UNFPA   –   United Nations Population Fund

UNICEF   –   United Nations Children's Education Fund

UON   –   University of Nairobi

WHO   –   World Health Organization

DEFINITION OF TERMS

Perinatal Mortality: Perinatal mortality (PM) refers to the death of the fetus after the age of viability, until the 7th days of life. It equals the sum of stillbirth and early neonatal death [1]

Perinatal mortality rate: The number of stillbirth plus neonatal deaths per 1000 total births [1]

Early Perinatal Mortality Rate: This is defined as number of stillbirth (>24 weeks of gestation) and early neonatal deaths occurring within the 1st 24 hours of life per 1000 births (this is the definition that has been adopted in our study). [2]

Early Neonatal Deaths: This is defined as death of alive newborn occurring <7 completed days (168 hours) from the time of birth. [1]

Neonatal Period: This is defined as the 1st twenty eight days of post-natal life. There is immediate (1st 24 hours), early (1st 7 days) and late (8 to 28 days) neonatal periods. [1]

Stillbirth: This is defined as death of fetus weighing at least 500g before complete expulsion or extraction from its mother. [1]

Still Birth Rate: It is the number of fetal loss prior to or during labor. [1]

Pre-Term: An infant born after 24 weeks gestation but before 37 completed weeks.

Post-Term: An infant born any time after completion of the 42nd week.

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ABSTRACT

Background/Objectives: Studies show that Africa region has the highest perinatal mortality rate with more than 5 times higher than developed countries. In spite of modest improvements of perinatal mortality rate in South Sudan, the country has recorded one of the worst health outcome indicators globally. The aim of this study was to determine factors associated with early perinatal mortality among deliveries at Juba Teaching Hospital, South Sudan.

Subjects/Methods: This was a cross sectional study conducted at Juba Teaching Hospital South Sudan, maternity word between 1st July 2018 and 31th August 2018. The study population comprised of mothers and their newborn babies delivered during the study period. Descriptive analysis was conducted to summarize characteristics of participants. Multivariable analysis was conducted using binary logistic regression to identify predictors of early perinatal mortality. Statistical significance was based on a p value of <0.05.

Results: There were 278 deliveries and 34 perinatal deaths during the study. Perinatal mortality rate among deliveries at JTH was 122.3 per 1000 live births. The stillbirth rate was 82.7 per 1000 births. Factors associated with early perinatal mortality: Non-formal education (p value <0.001), parity of ≥4 (p value 0.04), with prior history of stillbirth (p value 0.04), mothers <4 ANC visits (p value 0.005), gestational age between 28 to 36 weeks (p value <0.001), low birth weight (p value <0.001), twin birth (p value 0.008), delivery by caesarean section (p value <0.002), and with mal presentation (p value 0.027).

Conclusions: The early perinatal mortality rate at JTH was more than two fold higher than the estimated regional perinatal mortality; and level of education, parity, history of stillbirth, ANC visits, gestational age, weight, number of babies delivered, mode of delivery and mal-

presentation were independent predictors. Increased literacy and ANC visits by pregnant mothers can reduce these early perinatal deaths

1.0   INTRODUCTION

Perinatal mortality is define as death of the fetus after age of viability until the seventh day of life, and comprises stillbirth and early neonatal death [1]. Mother's health and care received during pregnancy and delivery are indicators of perinatal mortality as well as the baby's long-term life outcome [3, 4].

Studies shows perinatal mortality to be a rare event in developed countries. For instance, using a birth weight of 1000g in high income countries, international comparisons of fetal and neonatal mortality rates shows that range of fetal deaths is from 1.6-4.7 per 1000 total births and neonatal deaths is 1.1-4.3 per 1000 live births [5]. It has however been reported that 97% of stillbirths worldwide are witnessed in developing countries as well as 98% neonatal deaths [6].

Studies has shown that across the world, there are about three million babies who die during the early neonatal period. It has also been observed that 1 in 3 of these deaths occur during delivery, and ¾ of neonatal as well as maternal deaths occur during the 1st week of life. Half of these deaths also occur during the 1st 24 hours of delivery [7].

Literature reveals that there are significant differences in Early Perinatal Mortality Rate (PNMR) between developed and developing countries with about 98% of these deaths taking place in developing countries [1]. For instance, it has been noted that PNMR is >5 times higher in Africa than in developing countries [1]. Further, it has been found that PNMR in developed countries is around 10 deaths per 1000 births compared to 50 per 1000 births in developing countries [8].

In normal cases perinatal deaths are preventable, however in developing countries like South Sudan, most babies die even without being given a name or recording [9]. Further studies

indicate that South Sudan is likely to have one of the highest neonatal mortality rate globally with about 43 per 1000 live births. Most of these deaths that are over 53 percent occurs in 0 to 28 days of life [10]. Moreover, South Sudan has witnessed one of the slowest progress in reducing under 5-mortality rate [9]. In addition to this, the major indicators of maternal mortality ratio have stagnated in the region with perinatal mortality contributing to ¾ of the deaths in neonatal period [10, 11]. This study aims to determine factors associated with early perinatal mortality among mothers delivered in JTH, South Sudan.

2.0   LITERATURE REVIEW

Literature shows that there has been a significant reduction in under 5-mortality rate across the globe, in the year 1990 to 2012. For instance, it has been found that under 5 mortality rate reduced from 1-2% in the year 1990 to 1995 and 3.9% in the year 2005 to 2012 [12]. However, perinatal and neonatal mortality have increased across the globe over the years. For example, neonatal mortality rate accounted for 27% of infant mortality rate (IMR) in 1970s and further increased to 41% in 2010 [10]. More so, perinatal mortality have witnessed the least progress with over 25% of deaths recorded in the 1st week of life in 1980 and increasing further to 28% by the year 2000 (approximately 6.3 million perinatal deaths) [13, 14, 15].

According to the World Development Report, maternal and newborn health is adversely affected in countries witnessing conflict like South Sudan. There is no developing country that was affected by conflict that achieved a single millennium development gold (MDG), including reduction of maternal and newborn deaths [16]. For instance, in a retrospective study of perinatal mortality in Bundelkhand region India, maternal age of less than 20-30 years was found to be associated with perinatal death and increase risk of the death due to preterm [17].

In a prospective study in Khyber Teaching Hospital, Peshawar Pakistan. It was found that perinatal mortality rate was higher among women who lack antenatal care with about (88.7%) of the total patients (11,260) that participated in the study. Young age group >20 years also experienced more perinatal deaths. The study also established that the commonest risk factor for perinatal deaths were antepartum hemorrhage (29.9%), pregnancy induced hypertension (26.7%) and mechanical factor such as prolong and obstructed labor (14.5%) as well as congenital abnormality (10%) [18].

Studies have shown that PNMR in developing countries is between 50 per 1000 and over 60 per 1000 [19]. A meta-analysis study of twenty-four countries across the globe established that PNMR was significantly correlated to mother's age of <20 years and birth intervals. However, the study established that PNMR was associated with mother's age of 20 years and more in several countries (i.e. Uganda, Liberia, Kenya, Lesotho, Philippines, Gugana and Zimbabwe) [20]. It is important to note that there has been a lack of consensus among experts when it comes to indicators to measure newborn care [19].

According to un-matched case control study that was conducted in eleven hospitals in Marondera District in Zimbabwe, lack of education, polygamous marriage, multiparty and maternal unemployment were significantly correlated to PNMR. The study established that cause of death in early neonatal period were severe pre-maturity (27%), respiratory distressed syndrome (26%), birth asphyxia (16%) and neonatal sepsis (16%). There was high mortality in the few days after delivery which was a likely indicative of problem related to labor complication i.e. breech extraction delivery, aggressive resuscitation, cesarean section among other complications [21].

In a prospective population based observational study in Democratic Republic of Congo, the variables that were found to be significantly associated with PNMR was low birth weight (OR 13.57). The study further established that more than 50% the early neonatal deaths recorded during the 1st 2 postnatal days and majority (75%) of the deaths were due to low birth weight, prematurity or asphyxia and infection [22]. Yet another health facility based study in in rural Burkina Faso found that mothers with younger age were more likely to experience perinatal mortality [23].

Study on population based nested case control study in Ethiopia found that primi-parous mother (OR 3-15; 95% CI 1.03-9.6) had high perinatal death than multipara, mothers who

had previous history of perinatal death during the last pregnancy than their counter parts and also preterm newborn. The strongest determinants of perinatal death were antepartum hemorrhage and maternal apnea [24]. Another study carried out in two tertiary institution in southern Nigeria. High rate of perinatal death associated with high rate of un-booked pregnancy about 65.9% and 70% result in labor complication such as obstructed labor, rupture uterus and preterm/low birth weight and severe neonatal asphyxia [25].

In Uganda community based prospective cohort study, women who did not sleep under mosquito nets, living in urban slums, teenage and nulliparous women delivery at home had high perinatal death [26]. In contrary to study done in Ethiopia home delivery is protective than institutional delivery [24]. Study by Kenya demographic health survey (KDHS) [27] reported various variables to be main predictors of perinatal deaths i.e. age at 1st birth, parity, birth order, and birth interval.

A community based study conducted in Kassala, Eastern Sudan found there was high PNMR among mothers who delivered at home and had a parity of more than three children. The study also established that mothers who utilized antenatal care (ANC), slept under mosquito nets and took iron supplement for at least three months were more likely to experience lower PNMR [29]. Experts recommend utilization of quality emergency and neonatal care services in a health setting experiencing crisis in order to reduce PNMR [28].

Many studies have been conducted on perinatal mortality in different resource-limited countries with various objectives [30]. However, the main limitations in these studies are their small sample size, few are prospective cohort studies [31, 32] or community-based studies, and the use of non-standardized tools for assigning causes of deaths The most reliable data on cause of death come from hospital-based studies [33, 34] whereas in these

areas many pregnant women do not attend antenatal care services and a high proportion of deliveries are occurring outside health facilities, such as home.

3.0   CONCEPTUAL FRAMEWORK

3.1   Narrative

The conceptual framework upon which this study is based emanates from several interlinked observations. Socio-demographic factors and antenatal care factors adversely affect important maternal aspects that influence reproduction performance. These include education level, parity, and gestation at delivery, occupation, religion, age, marital status, ANC attendance, and 1st ANC visit, number of ANC visits, pregnancy complications, mode of delivery, and intrapartum complications.

Reduction of maternal and neonatal deaths have been comprised in governments, NGOs, and institutions on the basis of effective interventions on perinatal mortality (PNM). This underscores the great need of solid based data on the magnitude of early perinatal mortality on governments, communities and families. When the early perinatal mortality rate (EPNMR) is known, it seems possible to strategize on programs that target educating the population, interventions that are measurable, and having studies that are analytical, and can improve interventions and implementation. This in the long-term contributes on policies development and adoption, and decreasing the EPNM.

3.2   Schematic Conceptual Framework
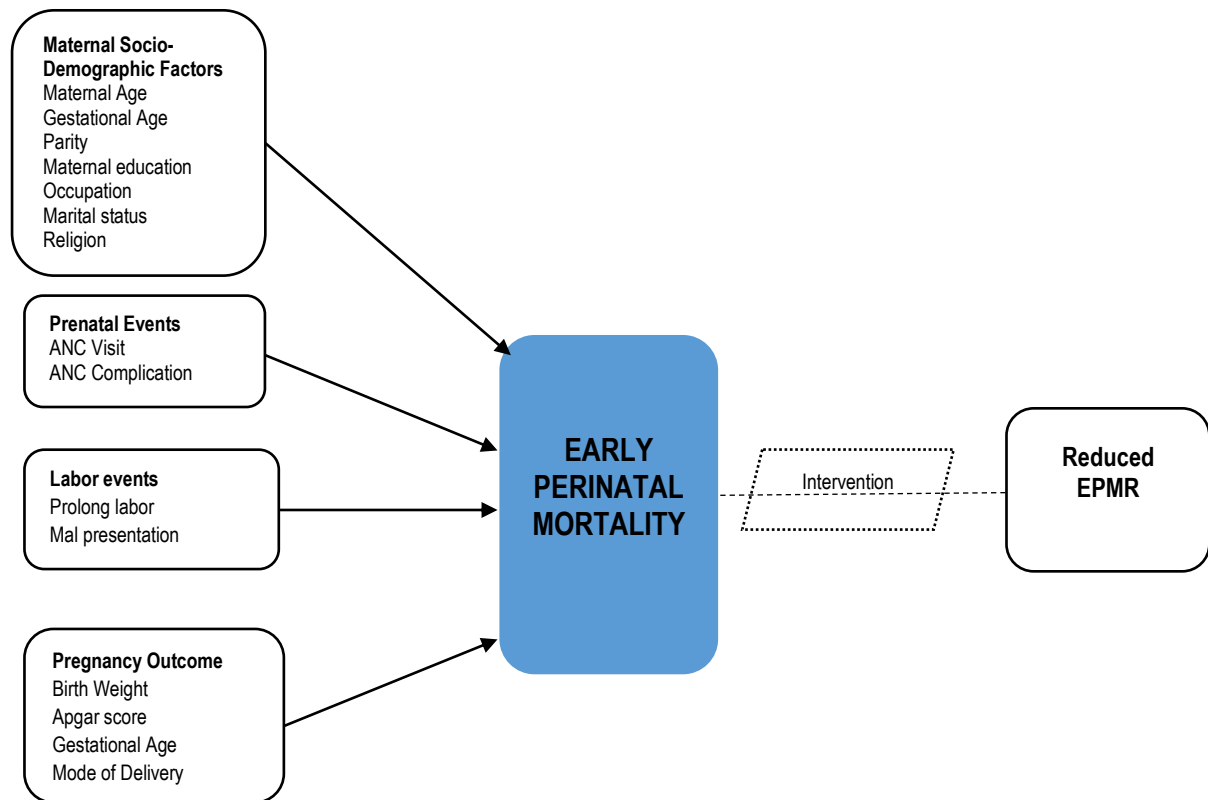
Figure 1: Schematic conceptual framework

4.0   RATIONALE

The immediate reason for this study is the researcher's interest in the health science, particularly that the mothers and newborn. The maternal and perinatal mortality continues to draw the attention of researchers and practitioner in the health sector. Every effort to words reducing this rick end to pregnancy will enhances the future prospects of South Sudan as young nation. Every life is valuable hence, the interest in factors associated with early perinatal mortality at JTH.

The lack of baseline data on various health indicators presents formidable challenge to the various stakeholders in South Sudan health sector. The findings of this study will be relevant to health professionals and government in initiating evidence based interventions to reduce early perinatal mortality. It will also be a reference point for determining factors associated with early perinatal mortality.

5.0   STATEMENT OF THE PROBLEM

Failure to achieve the millennium development goal 4 of reducing child mortality by 2/3 within the prescribed duration was indicative of health system deficiencies. An important weakness was inadequate supporting data on magnitude of the problem and ecological factors of, among others, early perinatal mortality. Hence, there exists inherent inability to institute objective measures and strategies that would enhance preventive measurable changes. In addition possible lack of awareness by the mothers specifically, and community in general, on the access, availability and utilization of Emergency Obstetric and Neonatal Care (EMONC) services worsens this grim situation. Hence, the need to establish the baseline data that will be a reference point on understanding the problem.

6.0   RESEARCH QUESTIONS

1. What are the magnitude/factors associated with early perinatal mortality at Juba Teaching Hospital (JTH), South Sudan?

7.0   OBJECTIVES

7.1   Broad Objective

To determine factors associated with early perinatal mortality among deliveries at Juba Teaching Hospital (JTH), South Sudan between 1st July 2018 and 31st August 2018.

7.2   Specific Objectives

1. To determine the overall early perinatal mortality rate among deliveries at Juba Teaching Hospital (JTH), South Sudan, between 1st July-31th August 2018

2. To describe maternal sociodemographic characteristics associated with early perinatal mortality among deliveries at JTH.

3. To determine association between antenatal care factors and delivery process with early perinatal mortality at Juba Teaching Hospital (JTH), South Sudan

8.0   METHODOLOGY

8.1   Study Design

This was a cross-sectional study design to determine the factors associated with early perinatal mortality among deliveries at JTH, South Sudan.

8.2   Study Setting

The study was carried out at Juba Teaching Hospital (JTH), maternity unit from 1st July 2018 to 31st August 2018 both dates inclusive. JTH is located in Juba which is Located in Central Equatorial States (CES). JTH is the largest teaching and referral hospital in the country, providing a 580 total bed capacity. The hospital has department of medicine, surgery, pediatric, obstetrics and gynecology and basic emergency service.

The Obstetrics and Gynecology Department of this hospital consists of the maternal and child health/family planning clinic, gynecology ward and maternal unit. The maternal unit comprises of labor word, operating theater, antenatal and postnatal words and newborn units. It has capacity of about 100 beds and managed by 4 consultant obstetrician/gynecologists, 6 medical officers, 8 house officers, 2 clinical officer, 13 nurses, 1 nursing officer in-charge, and 2 sisters.

The maternity unit conduct about 550-600 deliveries per month. Mother and child health department conducts antenatal clinic and the average monthly antenatal clinic attendance is about 617 patients. There is also neonatal unit managed by pediatric department two consultant pediatricians, intern doctors, 8 nurses and 2 sisters. The newborn unit has two sections, general ward and acute ward or critical ward with capacity of 10 beds, 9 incubators and newborn trolley. JTH provide service to the residence of Juba city, women relative of the

military personnel and women from camps managed by the UN and NGOs. The choice of this setting made it suitable site particularly because of the number patients and no similar study done in the setting.
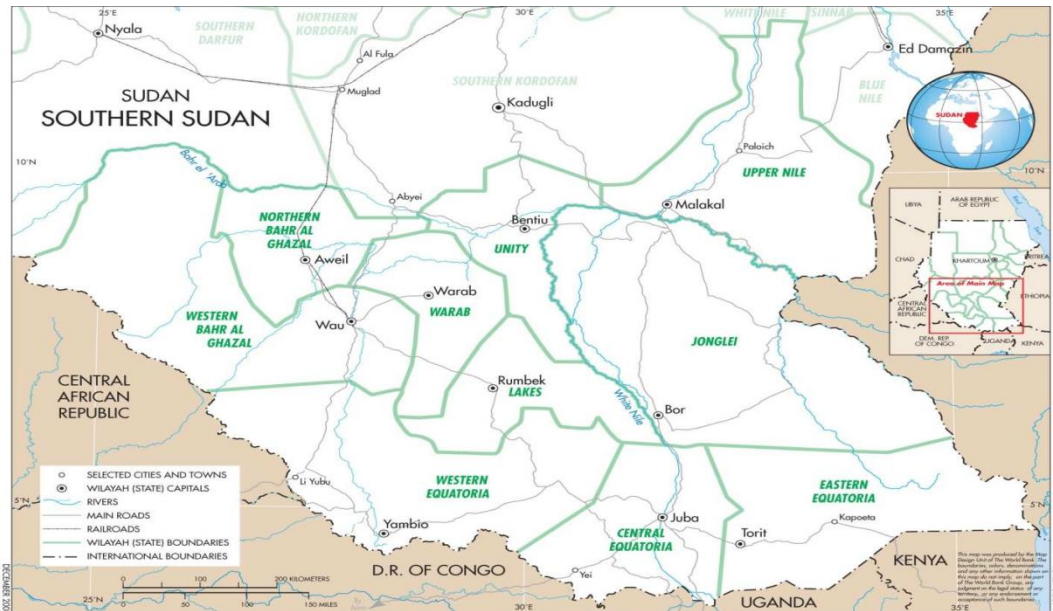
Figure 2: Map of South Sudan showing Juba County

8.3   Study Population

Mothers and their newborn babies delivered at JTH during the study period comprised of the study population.

8.3.1   Inclusion Criteria

All mothers who delivered their babies at JTH, South Sudan during the specified period.

All mothers who gave consent.

8.3.2   Exclusion Criteria

All mothers who delivered their babies before arrival to JTH maternity ward.

8.4 Sample Size

Cochran's sample size determination formula was used to calculate sample size[35].

$$n' = \frac{NZ^2P(1-P)}{d^2(N-1) + Z^2P(1-P)}$$

Where:

n^1 = sample size with finite population correction

N = size of the target population = 660 (22 x 30 days – stipulated duration of collecting data) (estimated number of mothers of all babies who were delivered in labor ward within period of study, 20-25 babies are approximately delivered at Juba Teaching Hospital per day according to the registry book)

Z = the value that specifies the level of confidence you want in your confidence interval when you analyze your data. Typical levels of confidence for surveys are 95%, in which case z is set to 1.96

P = estimated proportion of perinatal mortality 4.1% risk (we will use the Uganda study [26], the perinatal mortality risk was 41 per 1,000 pregnancies)

d = margin of error = 2.1%

$$n' = \frac{660 \ X \ 1.96^2 \ X \ 0.041(1-0.041)}{0.021^2(660-1) + 1.96^2 \ X \ 0.041 \ (1-0.041)}$$

$$n' = 251 \text{ patients}$$

8.5 Sampling Procedure

Consecutive sampling techniques was most appropriate for the selection of mothers who delivered their babies. Study targeted 251 women (see sample size above) who met the

inclusion criteria were recruited after being informed about the study. Participants were assured of privacy and confidentiality.

8.6 Research Instruments

Questionnaire was used to collect information from participant consisting of both closed and open-ended questions. It also contained both numeric and category questions; responding to the objectives as set out to be obtained. The questionnaire was divided into three sections: ((i) to determine the overall early perinatal mortality rate; (ii) to describe maternal sociodemographic characteristics associated with early perinatal mortality; and (iii) to determine association between antenatal care factors and delivery process with early perinatal mortality.

8.7 Study Variables

Table 1: Study variables

Objective 1: Determine overall early perinatal mortality	
Independent Variable	**Dependent Variable**
1. **Total number of deliveries**	Perinatal deaths
2. **Total number of live births**	
3. **Number of still births**	
4. **Number of neonatal deaths within first 24hrs**	
5. **Neonatal complications at birth**	
Objective 2: Socio-demographic Factors	
1. **Education Level**	Perinatal Deaths
2. **Parity**	
3. **Gestation at delivery**	
4. **Occupation**	
5. **Religion**	
6. **Age**	
7. **Marital Status**	
Objective 3: Antenatal/ Intrapartum Factors	
1. **ANC attendance**	Perinatal Deaths
2. **Timing of first ANC visit**	

3. **Total number of ANC visits**
4. **Pregnancy complications**
5. **Mode of delivery**
6. **Post-partum Complications**

8.8   Data Collection and Management

All mothers who delivered their babies at JTH during the specified period and signed the consent form were selected to participate in the study. The delivery book of the labor ward was used to obtain the list of the mothers who had delivered in the last 24 hours. Research assistant working under the supervision of the principal investigator, interviewed the mothers using the questionnaire within the maternity unit on a daily basis. Mothers who were not willing to be interview immediately after the loss of their babies received counseling before commencement of interview.

All relevant information was entered into the questionnaire including maternal age, marital status, occupation, education, parity, antenatal visit, fetal presentation, mode of delivery, pregnancy complications, and intrapartum complications. Questionnaire were filled through verbal interview after delivery of the baby and obtained also the information on babies' weight, Apgar score and gestational age of the babies was estimated using the last menstrual data if available or from ultrasound report. Newborn death was those who born dead or certified death by the Doctor during the period the mother was still in the hospital. Trained personnel conducted data entering and overall coordination of the data collection in the absence of the principal investigator.

8.9   Recruitment and Consenting Process

The study approved, by the Ministry of Health, Government of South Sudan and permission from the administration of JTH. The research assistant trained by the principal investigator on

how to recruit the participant. An informed written consent obtained from the participant after delivery in the labor or postnatal words.

Research assistants recruitment was based on the following criteria, medical personnel, working in Juba teaching hospital, working in or previously worked in maternity unit and fluent in English and local languages. This was checked during piloting and testing of the research instrument.

Before the study started the research assistants was also trained on the ethical guidelines and procedure of the study. After completion, research assistants understood the following about the study: objectives of the study, process and importance of the questionnaire, and to piloting. The principal investigator was in charge of day-to-day implementation of the study.

8.10   Quality Control

Data was cleaned and checked for entry errors then corrected. Data was backed up in an external hard disk in case there was loss or damage to the original data. Only the PI and statistician had access to the data.

8.11   Data Analysis

Data was analyzed using SPSS, version 23. Descriptive analysis was conducted to summarize the characteristics of participants delivering at JTH and their newborns. Univariable analysis involving calculating means and standard deviation for continuous variables e.g. maternal age and percentages for categorical variables was done at this stage. The primary objective of the study was determined by calculating the proportion of participants recruited in the study experiencing early perinatal mortality. This proportion was expressed as a rate per 1000 deliveries occurring at the facility.

To correlate the maternal socio-demographic characteristics of mothers and obstetric care factors, cross tabulations were conducted. Categorical factors comparisons was done using Chi square tests. Conversely, for continuous independent variables comparison of means was conducted using Student's t test between the group experiencing early perinatal mortality and those not experiencing the outcome.

In addition, the risk factors were correlated with early perinatal mortality (EPNM) by correlating relative risk with 95% CI and Chi-squared values. Binary logistic regression analysis was conducted to identify the predictors of early perinatal mortality. Statistical significance was based on a p value of <0.05.

8.12   Ethical Considerations

This was a non-invasive study that involved interviewing mother of babies delivered and were managed in the labor ward. The names of the patients were not indicated on the questionnaires to maintain confidentiality. Proposal was submitted to Ethics and Research Committee of University of Nairobi and KNH for approval. Approval was sought from Ministry of Health Government of South Sudan. After approval by the ethics committee, permission was sought from Juba Teaching Hospital before commencement of the study.

8.12.1 Consent

This was a cross sectional descriptive study that involved interviewing mothers of babies who delivered and managed in the labor ward, with a close-ended questionnaire in a language they could understand. Mothers were informed that Dr. Flora Wesley, a postgraduate student from the University of Nairobi, Department of Obstetrics and Gynecology will carry out a study on factors associated with EPNM. The mothers were informed of the purpose of the study, and were not victimized or denied treatment if they did not wish to participate in the study. The

information given remained confidential, and no name was included on the questionnaire. A written consent was sought before the interview.

8.12.2 Confidentiality

The identity of mothers of the babies was kept anonymous. The information of the mothers and their babies was only available to the statistician and investigator for analysis only.

8.13   Limitations of the Study

Most patients were discharged 24 hours after delivery. The mothers had to be interviewed within 24 hours after delivery. Some of the mothers were not willing to be interviewed immediately after the loss of babies. In such cases, counselling was done before commencing interview.

9.0   RESULTS

There were 319 mothers delivered at JTH during the study period, 13 of mothers did not give consent, 306 consented to participate, 28 of mothers had incomplete questionnaire/missing data resultant in 278 participants for the study (figure 3). Inclusion criteria was all mothers who delivered their babies at JTH during the study period and mothers who agreed to participate. The minimum estimated number of the mothers' required for this study to have power was 251.
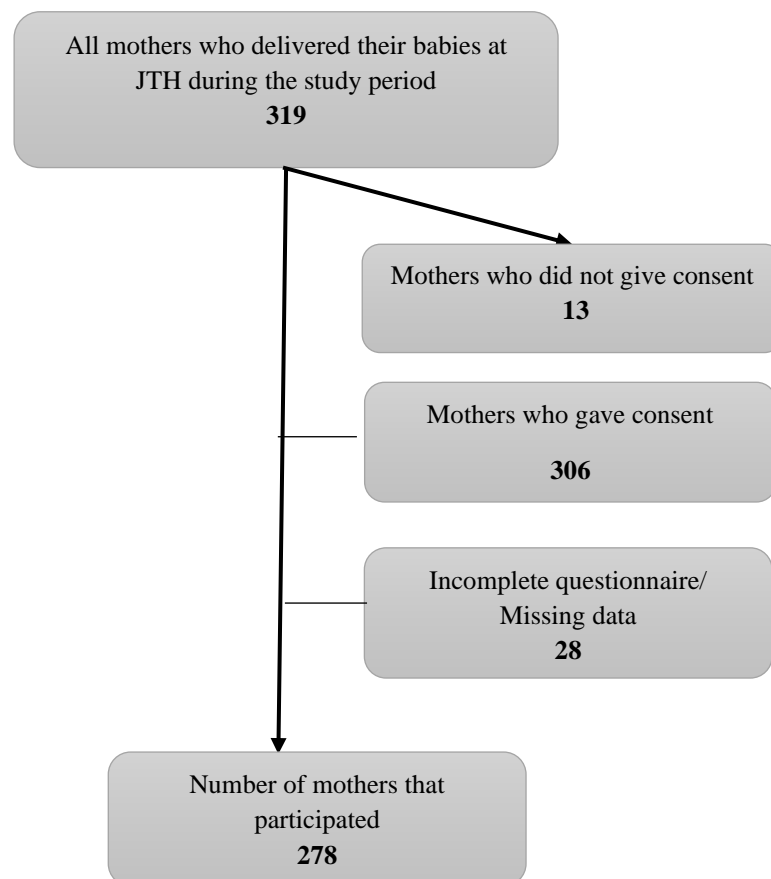
Figure 3: Flow chart showing recruitment process of participants

Figure 4 show that out of the 278 mothers that gave birth, 244 (87.8%) mothers had alive birth with the remaining 34 (12.2%) mothers having perinatal death. The perinatal mortality rate among deliveries at JTH during the study period was 122.3 deaths per 1000 total births.
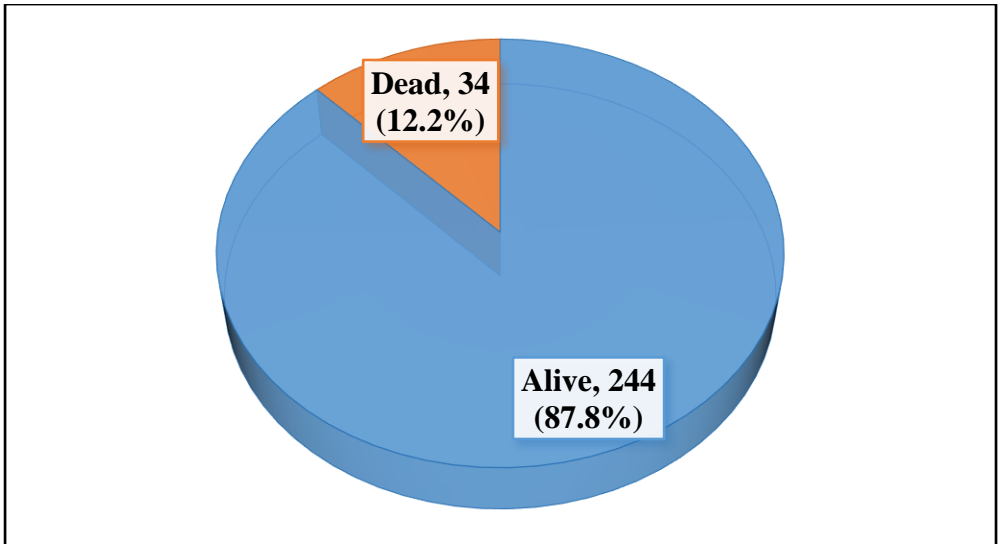
Figure 4: Pregnancy outcome for mothers who delivered at JTH between 1st July and 31st August 2018

Figure 5 shows that stillbirths were experienced by 23 mothers, and out of the 23, 14 (41.2%) were Fresh Stillbirth (FSB) and 9 (26.5%) Macerated Stillbirths (MSB). The remaining deaths were attributed to Early Neonatal Deaths (END), 11 (32.3%). The stillbirth rate was 82.7 per 1000 total births.
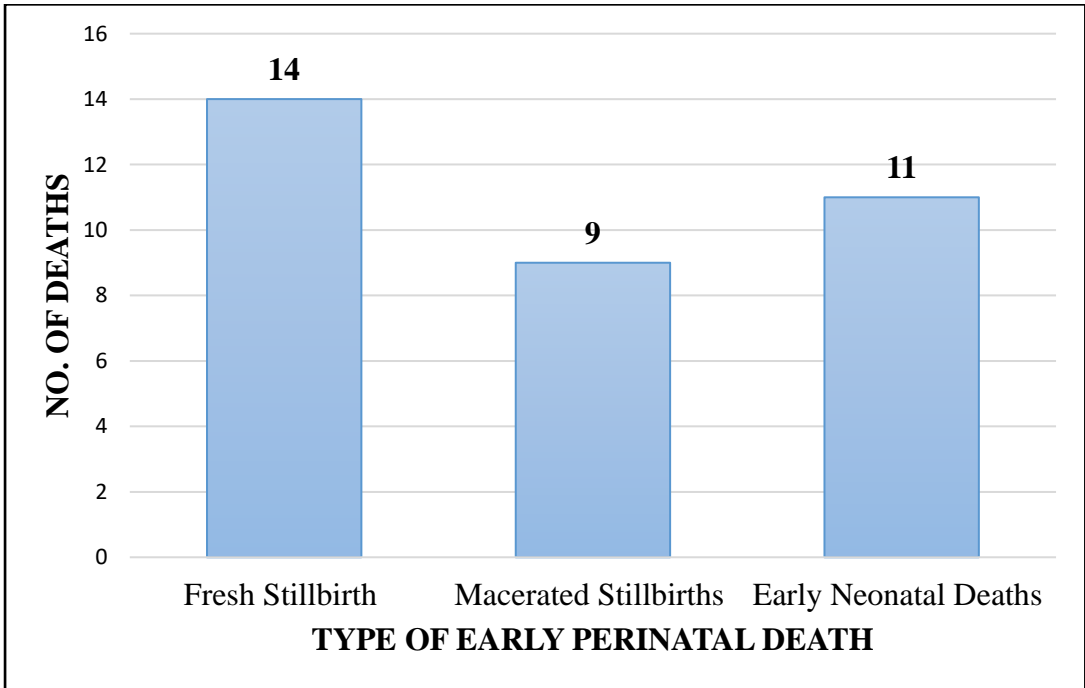
Figure 5: Contributors of early perinatal death among deliveries at JTH between 1st July and 31st August 2018

Table 2: Socio-demographic characteristics of mothers who delivered at JTH between 1st

July and 31st August 2018

Characteristic	Frequency	%
Maternal age (in years)		
<20	60	21.6
20-34	205	73.7
≥35	13	4.7
Marital status		
Single	27	9.7
Married	251	90.3
Educational attainment		
No formal education	46	16.5
Primary	117	42.1
Secondary	83	29.9
College/University	32	11.5
Employment status		
Unemployed	239	86.0
Employed	39	14.0
Spouse employment status		
Unemployed	133	53.0
Employed	118	47.0
Religion		
Christian	270	97.1
Muslim	8	2.9

Socio-demographic characteristic are shown in Table 2. The mean maternal age was 25 years with the majority being between 20 and 34 years (73.7%). Ninety percent of the women were married, while women with primary level of education comprised 42%, with 86% and 42% of their spouses unemployed. An overwhelming majority of the participants were Christians (97%).

Table 2: Association between socio-demographic characteristics with early perinatal mortality at JTH between 1st July and 31st August 2018

	PERINATAL OUTCOME		Odds Ratio (95% CI)	P Value
	Dead (%)	Alive (%)		
Maternal age (in years)				
Less than 25 years	11 (08)	135 (92)	0.51 (0.23-1.08)	0.10
More than 25 years	23 (14)	143 (86)		
Marital status				
Married	31 (12)	220 (88)	0.89 (0.25-3.12)	1
Not Married	3 (03)	24 (89)		
Educational attainment				
Non formal education	14 (30)	32 (70)	4.64 (2.13-10.09)	<0.001
Formal Education	20 (09)	212 (91)		
Employment status				
Unemployed	34 (14)	205 (86)	N/A	-
Employed	0 (00)	39 (100)		
Spouse employment status				
Unemployed	18 (13)	115 (87)	1.26 (0.59-2.71)	0.57
Employed	13 (11)	105 (89)		
Religion				
Christian	31 (11)	239 (89)	4.63 (1.05-20.31)	0.06
Muslim	3 (37)	5 (63)		

In Table 3, women who had no formal education were about 5 (95% CI 2.1-10.1 p value < 0.001) times more likely to experience early perinatal death comparing to those who had attained formal education. The other socio-demographic characteristics were not significantly associated with perinatal mortality.

Table 3: Association of obstetric care factors with early perinatal mortality at JTH

Obstetric Factors	PERINATAL OUTCOME		Odds Ratio (95% CI)	P Value
	Dead	Alive		
Parity				
Less than 1	9 (9)	91 (91)	0.61 (0.27-1.35)	0.26
More than 1	25 (14)	153 (86)		
More than 4	24 (10)	209 (90)	0.40 (0.18-0.91)	0.04
More than 5	10 (22)	35 (78)		
Birth interval (in years)				
<2	1 (7)	14 (93)	0.38 (0.05-2.10)	0.47
≥2	26 (16)	137 (84)		
Previous history of stillbirth				
Yes	8 (19)	26 (81)	2.58 (1.06-6.29)	0.04
No	26 (11)	218 (89)		
ANC visits				
<4	21 (19)	88 (81)	3.15 (1.45-6.84)	0.005
≥4	11 (07)	145 (93)		
Gestational age (in weeks)				
28-36	19 (31)	43 (69)	5.13 (2.41-10.9)	<0.001
More than 36	15 (8)	174 (92)		

As shown in Table 4, the obstetric care factors associated with increased EPNM were pervious history of stillbirth (OR = 2.6; 95% CI 1.1-6.3; p val. 0.04), <4 ANC visits (OR=3.2; 95% CI 1.5-7.0; p val. <0.005), gestational age of ≤ 36 weeks (OR= 5.1; 95% CI 2.4-11; p val. <0.001), while parity of ≥4, appeared significantly reduce EPNM (OR=0.4; 95% CI 0.2-0.09; p val. 0.04). Early perinatal mortality were highest among the gestational age of 28-36 weeks with the rate declining significantly between 37-41 and 42 weeks of gestation; this trend was statistically significant (OR = 5.13; CI 2.41-10.9; p val. 0.001)

Table 4: Association of pregnancy outcome with early perinatal mortality at JTH

Outcome	PERINATAL OUTCOME		Odds Ratio (95% CI)	P Value
	Dead	Alive		
Weight (in grams)				
1000-2499	13 (32)	28 (68)	06.22 (2.68-14.40)	<0.001
≥2500	15 (07)	201 (93)		
Admitted to NBU				
Yes	11 (16)	56 (84)	1.6 (0.74-3.50)	0.280
No	23 (11)	188 (89)		
Mode of delivery				
Vaginal	19 (08)	208 (92)	0.22 (0.10-0.47)	<0.002
Caesarean section	15 (29)	36 (71)		
No. of babies delivered				
Singleton	27 (10)	236 (90)	0.25 (0.09-0.65)	0.008
Twin	7 (47)	8 (53)		
Complications				
Yes	26 (11)	201 (89)	0.70 (0,30-1.64)	0.480
No	8 (16)	43 (84)		
Prolonged labor				
Yes	04 (09)	42 (91)	0.64 (0.21-1.92)	0.480
No	30 (13)	202 (87)		
Obstructed labor				
Yes	2 (22)	7 (78)	2.11 (0.42-10.6)	0.610
No	32 (12)	237 (88)		
Mal presentation				
Yes	9 (24.3%)	28 (75.7%)	2.78 (1.18-6.55)	0.027
No	25 (10.4%)	216 (89.6%)		

As shown in Table 5, there is an increased risk of early perinatal mortality in babies delivered with birth weight (1000-1499 grams) as compared to weight > 2500grams, the perinatal mortality decline as the baby birth weight increased, and it is statistically significant

(OR 6.22; CI 2.68-14.40; p val.< 0.001). In women with complication of labor, early perinatal death was statistically significant higher for mal-presentation (OR 2.78; CI 1.18-6.55; p val. 0.027). While spontaneous vertex delivery appeared to significantly reduce EPNM (OR= 0.22; CI 0.10-0.47; p val. 0.002).

10.0   DISCUSSION, CONCLUSION AND RECOMMENDATIONS

10.1   Discussion

The findings of this study showed an unacceptably high early perinatal mortality rate among women in JTH. The early perinatal mortality rate that this study describes (**122.3 deaths per 1000 total births**) is greater than the wide range of rates reported in many studies from different developing countries. For instance, like in Zimbabwe study conducted by Tachiweyika et al. [21] early perinatal mortality rate is lower (36–75 per 1000 births). The stillbirth rate was 82.7 per 1000 births which was also significantly high compared with studies in Kenya and Pakistan [38, 39] which were 30-40 per 1000 births. In relation to the global study of perinatal mortality, early perinatal mortality in South Sudan is unacceptably high, detecting the need for urgent intervention. The high EPNM may be as result of poor intra-partum care contributing to the high fresh stillbirth.

Women's education was inversely associated with early perinatal deaths as observed in this study. Mother's with no formal education (30.0%) experienced more perinatal deaths than women with formal education. Similar findings were noted in other studies done in Zimbabwe, Kenya and India [21, 27, 42] they found that the higher the level of education, the more knowledgeable about the risks associated with pregnancy. This implies that education increases awareness and eventually improves the overall pregnancy outcome.

In this study parity showed a significant association with early perinatal death, parity of ≥4 appeared to reduce early perinatal deaths. Our results suggests that multiparity is associated with a lower level of risk than primiparity. This result is contrary to what other studies found in Eastern Sudan [29] and Nigeria [32] where they showed parity of ≥4 increases the risk of perinatal deaths. It is possible that multiparous mothers, who have greater experience, feel

more confident during pregnancy and consider antenatal care and institutional delivery less important. However, a study done Addis Ababa, Ethiopia [43] did not show any significant association. The difference in the association might be because of difference in the study design, study populations or sample size.

Mothers with previous history of stillbirth were more likely to experience early perinatal death in current pregnancy. This result is similar to a study done in Addis Ababa, Ethiopia [43], in which the risk of perinatal death was 10.6 times higher when there was previous history of perinatal loss. This might be explained by previous history of ENND increases the risk of obstetric complications that can affect the perinatal outcome.

Number of antenatal care visits was another factor associated with early perinatal mortality in this study, mothers who had <4 ANC visits were more likely to experience perinatal death. This results are supported with previous study by Aziem et al. [29] in Eastern Sudan which showed that antenatal care was a significant protective factors for perinatal death. Antenatal care is one of the key strategies recommended to reduce the risk of neonatal mortality in any community irrespective of socio-demographic background. ANC visits to a health facility provide the basis for other ANC services.

The gestational age was related with early perinatal mortality, mother with a gestational age of ≤ 36 weeks were more likely to experience perinatal death. This finding is comparable with different studies done in East Province of Zimbabwe [21] and Rural Congo [22]. This can be explained by the fact that early gestational age can increase maternal morbidities and poor pregnancy outcome including perinatal mortality.

Birth weight (1000-1499g) was a significant factor associated with early perinatal mortality in this study. Study conducted in Rural Congo [22] shared similar finding where they found

that LBW independently conferred a greater than 10-fold increase in the risk of perinatal death. The association of birth weight with early perinatal mortality is mainly because of prematurity. One of the commonest causes of perinatal death is preterm birth and its complications.

This study found that mothers who gave birth through caesarean section were more likely to experience early perinatal death. This result is similar to a study done in East Province of Zimbabwe [21] that found SVD to be a protective factor for perinatal death compared with cesarean section. Since caesarian section is commonly conducted when there is an obstetric complication and when adjusting obstetric complications for mode of delivery, most mothers who underwent this mode of delivery experienced early perinatal death.

Number of babies delivered was another factor associated with early perinatal mortality in this study, mothers who had twin pregnancy were more likely to experience perinatal death. This finding is comparable with study done in Rural Congo [22]. Majority of the newborn twins have lower birth weight than singletons and low birth weight is a strong risk factor for perinatal twin death. Maternal unawareness of twin pregnancy is common, and only a fraction of the twin mothers are registered as high risk pregnancies antenatally.

Mal presentation was inversely associated with early perinatal deaths as observed in this study. Mother's with mal presentation (24.3%) experienced more perinatal deaths than women without mal presentation. Similar findings were noted in other studies done in Ethiopia [24, 43] they found that mechanical factors like malpresentation increased the risk of perinatal deaths. It has been proved that perinatal mortality due to mechanical causes like malpresentation is preventable. Therefore, if mothers who experienced early perinatal deaths would have received optimal intrapartal care, most of the babies could have been saved, and no mother should have developed rupture in unscarred uterus.

10.2   Conclusion

The high early perinatal mortality is accounted by the fact that the most mothers had one or more high risk factors. Factors identified as associated with early perinatal mortality were: mother's with no formal education, parity of ≥4, mothers with previous history of stillbirth, mothers who had <4 visits, gestational age between 28 to 36 weeks, low birth weight, twin birth, delivery by caesarean section, twin birth, and mothers with mal presentation. Risk factors can be prevented with preconception care, effective antenatal care, early investigations and increased visits in later part of pregnancy along with proper intranatal and neonatal care can reduce early perinatal mortality. These findings are timely given the high early perinatal mortality rate at JTH.

10.3   Recommendations

- Effective antenatal care with early registration, adequate surveillance of high-risk status and timely decision may reduce the early perinatal deaths at JTH.

- Improving literacy and number of ANC visits is important to identify high risk factor before pregnancy and during gestation for appropriate care.

- Increase awareness about risk factor of early perinatal deaths that can be avoided by proper diet, adequate rest, and regular antenatal check-up.

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12.0   APPENDICES

Appendix I: Questionnaire – Factors associated Early Perinatal Mortality in JTH (South Sudan)

1. **IP No.:** …………………
2. **Study NO**……………

3. **Date of admission…………………………..time(am\pm)…………………….**

A. **GENERAL CHARCTERISTICS:**

Socio-demographic characteristics

1. **Age**……………..

2. **Marital Status**   (a) single [ ]   (c) divorced/ separated [ ]

    (b) Married [ ]   (d) widowed [ ]

3. **Educationlevel attained**   (a) no formal education [ ]   (b) primary [ ]

    (c) Secondary [ ]   (d) college/ university [ ]

4. **Occupation:**   (a) student [ ]   (b) Unemployed [ ]

(c) Farmer [ ]   (d) Business [ ]

    Other (specify) _____

5. **If married, spouse occupation:**   (a) student [ ]   (b) Unemployed [ ]

    (c) Farmer [ ]   (d) Business [ ]

    Other (specify) _____

6. **Religion:**   (a) Christian [ ]   (b) Muslim [ ]

    Other (specify)……………………………

Obstetric characteristic

1. **Parity**……………….

2. **LMP**………………….............

3. **Gestational age in completed weeks**……………………**Gestational by u/s**

4. **When was the last delivery**…………………………..

5. **Previous history of stillbirth or early neonatal death** (a) Yes [ ]   (b) No [ ]

    If yes state cause……………………….

6. **Where did you do the delivery?**   (a) Delivered at JTH [ ]   (b) delivered elsewhere [ ]

    B. **PRENATAL EVENTS**

1. **Antenatal care attend**   (a) Yes [ ]   (b) No

    (C) If yes no of times…………………..

2. **Gestational age at first attending ANC**………………..

3. If attended antenatal clinic, where (a) Booked at JTH [ ] (b) Booked elsewhere [ ]

4. Antenatal care complication

(a) Anemia [ ] (b) pregnant induced hypertension

(c) Malaria [ ] (d) PROM

(e) Other specify…………………..

5. Reason for admission (a) Labor [ ] +- (b) APH

(c) PIH [ ] (d) Malaria

(e) Other specify…………………..

6. On set of labor (a) spontaneous [ ] (b) Induced [ ]

(c) Other specify……………………

C PREGNANT OUTCOME

1.Pregnant outcome (a) Alive [ ] (b) Death [ ]

2. Birth weight (grams)…………………

3. Gestational age in weeks…………………

4. Apgar score in 1 minute……………5 minutes……………..10 minutes……………

5. Meconium passed (a) yes [ ] what grade (1, 2, 3,)……………..

(b) No [ ]

6. Admitted to NBU (a) Yes [ ] (b) No [ ]

7. Reason for NBU admission (a) Birth asphyxia [ ]

(b) Meconium aspiration syndrome [ ]

(c) Prematurity [ ]

(d) Other specify…………………….

8. Outcome: (1) Stillbirth (a) FSB [ ] (b) MSB [ ]

(2) Neonatal death first 24 hours

9. Mode of delivery (a) spontaneous vaginal [ ] (b) assisted vaginal [ ]

(c) Caesarean section [ ]

10. Indication for caesarean sections (a) non-reassuring fetal status [ ]

(b) CPD [ ]

(c) Uterine rupture [ ]

11. Number of babies delivered   (a) singleton [ ]   (b) Twin [ ]

                                (c) Triplets [ ]   (d) Other……….

D LABOR EVEN

1. Prolong labor   (a) Yes [ ]   (b) No [ ]

2. Obstructed labor   (a) Yes [ ]   (b) No [ ]

3. Mal presentation   (a) yes [ ]   (b) No [ ]

                        If yes specify   (a) OPP [ ]

                                      (b) Face [ ]

                                      (c) Brow [ ]

                                      (d) Shoulder [ ]

                                        (e) Breech [ ]

4. Cord prolapsed   (a) Yes [ ]   (b) No [ ]

5. Uterine rupture   (a) Yes [ ]   (b) No [ ]

                        (a) Other specify…………………………..

Appendix II: Consent Information and Consent Form

Introduction

My name is Dr. Flora. I am a post graduate student in the department of Obstetrics and Gynecology at the University of Nairobi.

I am conducting a study on: Factors associated with Early Perinatal Mortality in Juba Teaching Hospital, South Sudan

Purpose of the Study

1. To determine the overall early perinatal mortality rate among newborn babies of mothers delivered in JTH during the study period.

2. To associate maternal socio-demographic characteristics with early perinatal mortality among mothers who delivered within the study period.

3. To associated obstetric care factors with early perinatal mortality among mothers who delivered within the study period.

Basis of Participation

Your participation will be purely voluntary. You are free to withdraw at any time during the course of the study period. Your refusal to participate or withdrawal at any time during the study period will not in any way affect the quality of your treatment.

Confidentiality

All information obtained in the study will be treated with utmost confidentiality.

I shall NOT use your name in any of my reports.

Benefits

Participation or non-participation does not come with any financial costs. Equally, no compensation will be provided for participation in the study.

Risk and Discomfort

Any examination process that will be conducted by the researcher will cause no damage to the participant.

Request for Information

You may ask more questions about the study at any time or at this moment. You will be informed of any significant findings.

Study Procedures

Approval from the Ministry of Health government of South Sudan and permission from the administration of JTH (South Sudan) will be sought. An informed written consent will be obtained from the participant after delivery in the labor or postnatal words. Mothers who are not willing to be interviewed immediately after the loss of their babies will receive counseling before commencement of interview. All relevant information will be entered into the questionnaire. Questionnaire will be filled through verbal interview after delivery of the baby and obtain also the information on babies weight, Apgar score and gestational age of the babies will be estimated using the last menstrual data if available or from ultrasound report and these babies admitted to the neonatal unit the information will be obtain from the new born units record.

You may contact Dr. Flora on 0707617761 or Dr. ……………… (UON Department of Obstetrics and Gynecology) or Dr. ……………………. (UON Department of Obstetrics and Gynecology) or KNH/UON Ethical Review Committee Secretariat P.O. Box 20723 – 00202, Nairobi, Telephone Number: +254 2726300 Ext. 44102 and email address uonknh_erc@uonbi.ac.ke

Consent

Having read this consent form, all my questions have been answered, my signature below indicates my willingness to participate in this study and my authorization to use and share with others.

I ………………………………………………………………………… the (Patient/Guardian) of ………………………………………………………………… after reading and having the study purpose explained to me by Dr. Flora, do hereby give informed consent to participate in the study: **Factors associated with Early Perinatal Mortality in Juba Teaching Hospital, South Sudan**

Signed ……………………………………………………. Date ……………………

Thumb Print ………………………………………………… Date ……………………

I confirm that I have explained to the patient the above statement.

Signature of questionnaire Investigator (Dr. Flora) …………………………

Dr. Flora

Phone No.: +254 707617761

Appendix III: Study Time Frame

Activities	DEC 2017 - AUG 2018	SEP 2017	OCT 2017	NOV 2017	JAN 2018	JULY - AUG 2018	OCT 2018	NOV 2018	MAY 2019
Proposal Development	■								
Proposal Presentation		■							
ERC Approval			■	■	■				
Data Collection						■			
Data Analysis							■		
Report Writing								■	
Dissemination of Findings									■

Appendix IV: Budget

ITEM	QUANTITY	UNIT COST (Ksh)	TOTAL (Ksh)
Printing & Packaging			
Proposal printing	28	10	280
Photocopy of proposal	28*3	3	252
Binding of proposal	3copies	100	300
Proposal printing 2nd draft	3copies	10	840
Photocopy of proposal 2nd draft	3copies	3	252
Binding proposal 2nd draft Ethic: UON/KNH	3copies	100	300
Total			1384
Printing of questionnaire	2	10	20
Photocopy of questionnaire	2*300	3	1800
Printing of result black & white	3copies	10	300
Printing of result color	3copies	20	600
Binding of Final paper	3copies	100	300
Total			3020
Contracted Services			
Statistician	1	30,000	30,000
Research Assistant	4	60,000	60,000

Sub Total			90000
Communication			
Emails & Phone calls	1	5000	5000
Sub Total			5000
Publication	1	50,000	50,000
Contingency 15%	1	22410	22410
Grand Total			171814

Appendix VI: Ethical Approval Ministry of Health Juba

The Republic of South Sudan

Ministry of Health

MOH/ERB26/2018   **Date: 20th June 2018**

To: Dr. Flora
University of Nairobi

Research Approval Letter

Dear Dr. Flora,

SUBJECT: FACTORS ASSOCIATED WITH EARLY PERINATAL MORTEALITY IN JUBA TEACHING HOSPITAL, SOUTH SUDAN

I am writing in response to the request for authorization for the study on " **Factors Associated with Early Perinatal Mortality in Juba Teaching Hospital, South Sudan**

After close review of the proposal, I am glad to inform you that the ethical committee at the Ministry of Health for the Republic of South Sudan has approved the study. The Ministry acknowledges the importance of getting baseline information aimed at providing evidence-based information on improving maternal Health cross South Sudan.

Please, keep the Ministry informed in case of any changes regarding the study and on its progress. I look forward to the report, especially the recommendations that will be generated from the study.

Note that any information generated from the study should not be published without the consent of the Ministry of Health, Republic of South Sudan.

Good luck and don't hesitate to get in touch should there be any queries.

Dr. Richard Laku Lino
Director General of Policy Planning, Budgeting and Research
Ministry of Health, Republic of South Sudan.

CC: Undersecretary MOH-RSS
CC: Director General, Reproductive Health

2 1 JUN 2018

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