Original Article

Profile of Perinatal Deaths at Masaka District Hospital in Kigali City, Rwanda: A Retrospective Cross Sectional Study

Alain Nshimirimana[1*], Japheths Ogendi[1,2]

[1]*Public Health, College of Health Sciences, Mount Kenya University, Kigali, Rwanda*
[2]*School of Public Health, College of Medicine and Health Sciences, University of Rwanda, Kigali, Rwanda*

***Corresponding author:** Alain Nshimirimana. Public Health, College of Health Sciences, Mount Kenya University, Kigali, Rwanda. Email: alshim2010@yahoo.fr. ORCID: https://orcid.org/0009-0007-4921-9408

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Abstract

Background
The global perinatal deaths and stillbirths in 2018 was alarming, with around 5 million perinatal deaths and 2 million stillbirths, predominantly concentrated in sub-Saharan Africa and South Asia (95%).

Objective
To assess the profile and factors associated with perinatal deaths among deliveries conducted in a public district hospital in Kigali City, Rwanda .

Methods
A retrospective cross-sectional study design was conducted using data from hospital files of neonates and mothers who delivered at Masaka District Hospital from January to December 2022. All 303 perinatal deaths were considered. Chi-square was performed for categorical variables to check the association between the outcome variable and predictor variable at significance level of 5%.

Results
The perinatal mortality rate was 35.8 deaths per 1000 live births. The leading cause of perinatal death were maternal sepsis 67(22%), followed by prematurity 62(20.5%), birth asphyxia 30(9.9%) and congenital anomalies 17(5.6%).However,88(29%) were with unknown causes. Perinatal deaths were statistically associated with maternal anemia (AOR:29.904,P-value:0.001),maternalSTIs(AOR:10.036,P-value:0.036),delivery complications(AOR:0.308,P-value:0.003),and neonatal factors such as birth weight (AOR:6.361,P-value :0.015) and prematurity (AOR:0.038,P-value:0.001).

Conclusion
The perinatal deaths at Masaka district hospital were relatively high. Management of following factors like prematurity, birth asphyxia, and maternal infection with high-quality care could significantly reduce perinatal deaths at district level.

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Keywords: Perinatal deaths, stillbirths, early neonatal deaths

Background

In 2018, global perinatal deaths accounted around 5 million globally with 2 million of stillbirths.[1] Around a half(47%) of under-five children recorded deaths are newborn and most of them (75%) are early neonatal deaths.[2] In 2021,European region registered a perinatal mortality rate ranging from 2.5-14.9 per 1000 live births.[3] An overwhelming majority (95%) of perinatal deaths has been registered in sub-Saharan Africa and South Asia. In Sub-Saharan African region, the rate of perinatal deaths was 34.7 per 1000 births. The East, west and south ,central African regions had respective perinatal mortality rate of 34.7,35.7 ,30.3 and 30.7 per 1000 births.[4]

Perinatal deaths account for most deaths comparing to children and adolescents deaths, but unfortunately it still has poor health investment specifically in low income countries.[5] Previous studies noted that delivery complications, preterm birth, and sepsis were the three leading causes of perinatal deaths.[6] Quality of healthcare service delivery for mother and children and improvement of social economic inequalities are of great importance to reduce perinatal deaths and generally maternal mortality.[7] A case review done in Nepal found perinatal deaths were increased among women who did not use methods of contraception, and factors such as education, living in area with poor sanitation and use of fuel in households were also noted.[8] A study done in three states of south Africa found that not only maternal quality healthcare determines the perinatal deaths.[9] Thus, gestational age, number of parity of the expectant mother and fetal weight also influence the perinatal deaths.[10] Moreover, study done in DRC noted that factors such as lack of prenatal care, low birth weight, fetal complications during delivery specifically prematurity, asphyxia and infections and parity greater than 4 were associated with perinatal deaths.[11]

In Rwanda, Government has invested in maternal and child health interventions aimed at reducing their death from preventable causes through training of health care providers (midwives, nurses, gynecologists ,pediatricians, medical doctors, anesthetists), use of Rapid SMS, training and support of community health workers especially for those in charge of maternal and child conditions, provision of financial motivation based on the Community Health Workers' performance, free maternal services like Antenatal care, Postnatal care, immunization, and Family Planning.[12] Thereafter, the issues of neonatal deaths, stillbirth and equity gaps need to be revised to provide a high standard care to babies and their mothers. This is why WHO released in 2015 an action plan to eliminate preventable deaths which aims to reduce the stillbirth rate to 10 or fewer per 1,000 births and the neonatal mortality rate to 10 or fewer per 1,000 live births by 2030 in every country. [13] However, Rwanda has not attained the MDG 4 target in reducing child mortality including perinatal deaths. Additionally, it still far from meeting the SDG goal 3, which aims to reduce newborns and under-five children mortality to at least 12 deaths and 25 deaths per 1000 live births respectively. Moreover, neonatal mortality declined from 20 deaths per 1000 live births in 2015 to 19 deaths per 1000 live births in 2020.[14]

In Rwanda, perinatal death was 32 per 1000 live births in two tertiary hospitals, but however, there is no published data on perinatal deaths at national scale.[15] Existing studies have mostly focused on neonatal deaths and stillbirths separately. Study carried out in 25 hospitals of Rwanda found that neonatal deaths was caused by prematurity, birth asphyxia, sepsis ,respiratory distress and low birth weight and maternal factors such as multiple pregnancy and high parity were also determining factor.[16] Again, study done at Kibogora District Hospital on stillbirths found that among 2605 deliveries, stillbirths occupied in 133 which gives a rate of 51 per 1000 births (57%being macerated and 43% fresh stillbirth).

The same study reported common risk factors such as preterm delivery, inadequate monitoring of labor by midwives and delay in referral by Health center to be associated with stillbirth.[17]

According to the Health Management Information System (HMIS) data from June 2021 to June 2022, Masaka District Hospital in Rwanda reported a high incidence of birth asphyxia, making it the leading cause of neonatal mortality (39%), followed by prematurity (32%) and infection/ sepsis (10%). Despite these insights, there remains a gap in understanding perinatal deaths in Rwanda, prompting the focus of our research. Consequently, this study was conducted to assess the profile of perinatal deaths and factors associated with perinatal deaths among deliveries conducted in a public district hospital in Kigali City, Rwanda

Methods

Study design

A retrospective cross sectional study was conducted at Masaka District Hospital during the period of January to December among perinates. Masaka hospital is an urban general hospital locating in Kicukiro district of Kigali City.

Settings

The study was conducted at Masaka District Hospital in Kicukiro District. It is among public and urban district hospital built with the funding of the Government of china between 2008 and 2011. Masaka DH serves a population of 532092 inhabitants that covers 10 Health centers. It has different department including maternity with its theatre and neonatology services. [18] Maternity department has gyneco-obstetricians, pediatricians, experienced general practitioners, midwives and nurses. Masaka DH is following Maternal Newborn and Child Health strategic plan for 2018-2024 adopted by Rwanda Ministry of Health which targets to improve Maternal, Neonatal and Child Health through newborn(including stillbirths) mortality prevention and improving outcomes for newborns. [19] Strategies include neonatal death audits were established to determine the cause of death. Effective actions, including community awareness and the use of health information systems such as the Rapid SMS system when expectant mothers and/or newborns show danger signs, are essential. Upgraded and equipped neonatal health units in hospitals to provide essential newborn care are also crucial. Additionally, Ministry of Health has adopted participation in the registration of neonatal and child deaths in the Surveillance and Response System, which helps to measure the needs and prevent future neonatal deaths.[19]

Population, sample size and sampling technique

The study population was births registered at Masaka district hospital and all 303 perinatal deaths registered were selected. A purposive sampling technique was used. That technique is a non-probability sampling technique that allows the researcher to identify members of population that are likely to have certain characteristics. In our research, the perinatal deaths' files (stillbirths and newborn died in neonatal unit within 7 days of life) were identified and retrieved from a larger set of files that also included records of live births. These files were purposively selected for detailed analysis based on their relevance to the study. Cases of perinatal deaths were identified using audited patient files. In our research, all the stillbirths and those for newborn died in neonatal unit within 7 days of life were selected and used. Abortion and late neonatal deaths occurred after first 7 days were excluded.

Data collection instrument and procedures

Data abstraction tool was used to extract data from the registries and medical files of perinates who have been registered at Masaka district hospital. Data abstraction tool is a tool used to systematically extract information from database, scientific reports, and other sources.[20]

This tool contained three sections, with first section including mother's information such as maternal age, occupation, education, parity, number of Antenatal Care (ANC), labor and delivery related conditions. Second section included causes for early neonatal deaths .Third section included of fetal and neonatal information such as death and birth time, weight, gender.

Data analysis

Data entry was entered and encoded using SPSS version 21. Descriptive statistics was done to show the frequency and percentage of independent variables compared to dependent one. Chi-square was performed for categorical variables to check the association between the outcome variable and predictor variable at significance level of 5%. Variables that were significantly associated with dependent variable in bivariate were then put into binary logistic regression to quantify the association between them.

Ethical consideration

Ethical clearance was provided by the Mount Kenya University Ethical Committee under Reference number MKU04/ PGS&R/0806/2023. Thus, permission to proceed with data collection was obtained from the Research Committee of Masaka District Hospital, with Reference number 221/MSK/DH/2023. The research information was collected using serial number of hospitalization and was kept for research purpose only.

Results

Socio-demographic characteristics of the participants

A slightly less than a half 139 (46.2) were in age between 25-35 years. A majority 208 (68.5%) were married. A total of 174 (57.4%) were reported that they were housewives and 35 (11.6 %) were businesswomen. Approximately, the same number, 150(49.5%) and 141(46.5%) attained primary and secondary level respectively. Majority of mothers 183 (60.4%) were in second social category according to Rwanda ministry of local government (Table 1).

Table 1. Socio-demographic characteristics

variables	Number	percentage
Age group		
15- 17	**8**	**2.6**
18-25	**84**	**27.7**
26-35	**140**	**46.2**
36-45	**71**	**23.4**
Residence		
Urban	**211**	**69.6**
Rural	**92**	**30.4**
Civil status		
Married	**208**	**68.6**
Single	**86**	**28.4**
Divorced	**1**	**0.3**
Cohabitating	**8**	**2.6**
Maternal occupation		
Housewife	**174**	**57.4**
Farmer	**78**	**25.7**
Employed	**10**	**3.3**
Businesswomen	**35**	**11.6**
student	**6**	**2.0**
Maternal social category		
Category 1	**49**	**16.2**
Category 2	**183**	**60.4**
Category 3	**71**	**23.4**
Education level		
Primary	**150**	**49.5**
Secondary	**141**	**46.5**
University	**11**	**3.6**
No Formal education	**1**	**0.3**

Description of perinatal mortality rate at Masaka district hospital, Rwanda

Perinatal mortality rate was calculated as a total of stillbirths added neonatal deaths within the first 7days of live , divided by total of live births added stillbirths multiplied by 1000 live births according to WHO. [21] During this period, there were 8441 deliveries registered which include 175

stillbirths and 8266 live births from which 128 died in first week of life (early neonatal deaths). The perinatal mortality rate at Masaka district hospital was 35.8 deaths per 1000 live births.

Distribution of Perinatal Deaths by Documented Causes; January-December 2022 (n=303)

The leading cause of perinatal death, 67(22%) was maternal sepsis. This was followed by prematurity 62(20.5%). Birth asphyxia 30(9.9%), congenital anomalies 17(5.6%), neonatal sepsis 17(5.6%),cord prolapse 8(2.6%),uterine rupture3(1%),placenta abruption 3(1%) and materno-foetal immunization 2(0.7%). However the cause was not documented in 88(29%) of perinatal deaths (Figure 1).

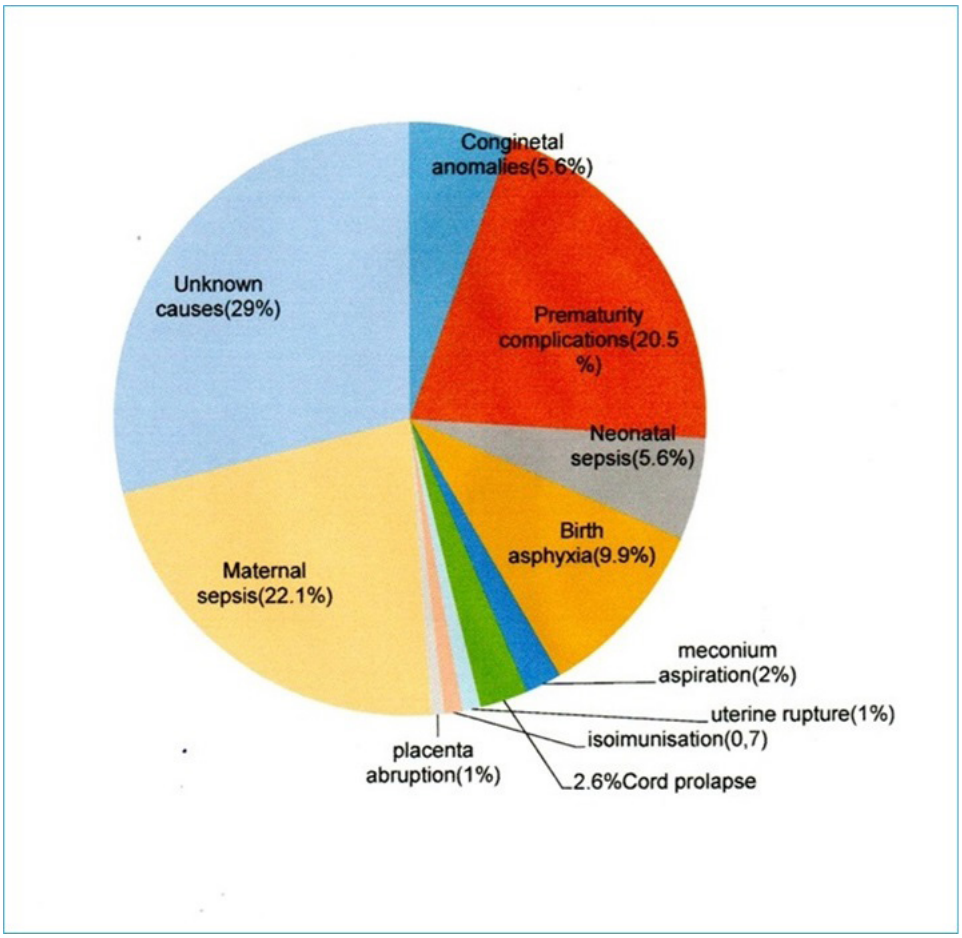

Figure 1. Distribution of Perinatal Deaths by Causes; January-December 2022 (number=303)

Bivariate analysis for factors associated with perinatal deaths

Bivariate analysis of maternal medical conditions associated with perinatal deaths at Masaka hospital

The bivariate analysis shows that the following factors were associated with perinatal deaths: maternal sepsis (p=0.001). Maternal anemia (p=0.009), maternal hypertension and its complications (p=0.036), maternal sexually transmitted infections (p=0.023) and delivery complications (which includes fetal distress, meconium aspiration, breech presentation) (p=0.001) were also significantly associated with perinatal deaths (Table 2).

Table 2. Bivariate analysis of maternal medical conditions associated with perinatal deaths at Masaka hospital

Variable	Perinatal deaths		P.Value
	Stillbirth	Early neonatal	
Maternal sepsis			
Yes	71(23.4)	3(1)	**0.001**
No	104(34.3)	125(41.5)	
Maternal diabetes			
Yes	2(0.7)	1(0.3)	0.754
No	173(57.1)	127(41.9)	
Maternal anemia			
Yes	15(5)	2(0.7)	**0.009**
No	160(52.8)	126(41.6)	
Maternal HIV status			
Yes	10(3.3)	3(1)	0.153
No	165(54.5)	125(41.3)	
Maternal TORCH			
Yes	7(2.3)	2(0.7)	0.217
No	168(55.4)	126(41.6)	
Maternal STIs			
Yes	10(3.3)	1(0.3)	**0.023**
No	165(54.5)	127(41.9)	
Negative maternal rhesus			
Yes	4(1.3)	1(0.3)	0.310
No	171(56.4)	127(41.9)	
Maternal HTN &its complications			
Yes	9(3)	1(0.3)	**0.036**
No	166(54.8)	127(41.9)	
Antepartum Hemorrhage			
Placenta abruption	4(1.3)	1(0.3)	0.556
Placenta praevia	2(0.7)	1(0.3)	
No	169(55.8)	126(41.6)	
Uterine rupture			
Yes	6(2)	2(0.7)	0.317
No	169(55.8)	126(41.6)	
Oligoamnios			
Yes	5(1.7)	1(0.3)	0.200
No	170(56.1)	127(41.9)	
Delivery complications			
Yes	15(5)	33(10.9)	**0.001**
No	160(52.8)	95(31.4)	
Antenatal care			
ANC1	37(12.2)	30(9.9)	0.314
ANC2	71(23.4)	56(18.5)	
ANC3	47(15.5)	23(7.6)	
ANC4	20(6.6)	19(6.3)	

Bivariate analysis of neonatal factors associated with perinatal deaths at Masaka hospital

Perinatal deaths was significantly associated with gestational age (p=0.001), neonatal age at death (p=0.001) newborn birth weight (p=0.001), and prematurity (p=0.001) (Table 3)

Table 3. Bivariate analysis of neonatal factors associated with perinatal deaths at Masaka hospital

Variables	Perinatal deaths		P.Value
	Stillbirth	Early Neonatal	
Newborn/Foetal gender			
Male	79(26.1)	59(19.5)	0.870
Female	96(31.6)	69(22.8)	
Gestational age			
Extreme preterm	36(11.9)	43(14.2)	
Low preterm	40(13.2)	11(3.6)	
Moderate preterm	39(12.9)	8(2.6)	**0.001**
Normal GA	54(17.8)	65(21.5)	
Post term	6 (2)	1(0.3)	
Birth weight			
VLBW	54(17.8)	54(17.8)	
LBW	57(18.8)	14(4.6)	
Normal BW	60(19.8)	66(21.8)	**0.001**
Umbilical cord anomalies			
Yes	4(1.3)	1(0.3)	0.310
No	171(56.4)	127(41.9)	
Prematurity			
Yes	6(2)	62(20.5)	**0.001**
No	169(55.8)	66(21.8)	

Multivariable analysis for factors associated with perinatal deaths

Perinatal deaths were found to be statistically associated with maternal anemia, maternal STIs, delivery complications and neonatal factors such as birth weight and prematurity. Perinates whose mothers had anemia were 29 times more likely to die compared to those with mothers without anemia (AOR: 29.904, 95%CI: 8.955-99.861, P-value=0.001). Perinates whose mothers had sexual transmissible infections were 10 times more likely to die compared to those with mothers without STIs (AOR: 10.036, 95%CI: 1.167-86.293, P-value=0.036).

Mothers without delivery complications were less likely to have perinatal deaths compared to their counterparts with delivery complications (breech presentation, abnormal fetal heart rate, antepartum hemorrhage, shoulder dystocia and premature rupture of membrane)(AOR: 0.308, 95%CI: 0.142-0.668, P-value=0.003). Perinates having birth weight less than 1500gm were 6 times more likely to die compared to those with normal weight(AOR: 6.361, 95%CI: 1.432-28.251, P-value=0.015) .Term babies were less likely to die compared to those born before 37weeks of gestational age (AOR: 0.038, 95%CI: 0,016-0.092, P-value=0.001) (Table 4).

Table 4. Multivariable analysis for factors independently associated with perinatal deaths

Variables	AOR	95%CI		P.Value
		Upper	Lower	
Maternal Sepsis				
Yes	Ref.			
No	1.245	0.202	7.630	0.815
Maternal Anemia				
Yes	Ref.			
No	29.904	8.955	99.861	**0.001**
Maternal STIs				
Yes	Ref.			
No	10.036	1.167	86.293	**0.036**
Maternal HTN& its complications				
Yes	Ref.			
No	7.134	0.842	60.421	0.071
Delivery complications				
Yes	Ref.			
No	0.308	0.142	0.668	**0.003**
Gestational age				
Extreme preterm	Ref.			
Low preterm	1.159	0.088	15.213	0.910
Moderate preterm	0.548	0.045	6.660	0.637
Normal GA	0.793	0.074	8.528	0.848
Post term	7.293	0.850	62.552	0.070
Birth weight				
VLBW	Ref.			
LBW	6.361	1.432	28.251	**0.015**
Normal BW	1.208	0.431	3.385	0.719
Prematurity				
Yes	Ref			
No	0.038	0.016	0.092	**0.001**

Discussion

Findings from this current research revealed that the perinatal mortality rate at Masaka district Hospital, Rwanda, was 35.86 deaths per 1000live births. This percentage is slightly higher than a study done in two urban hospital of Kigali which showed a perinatal mortality rate of 32 per 1000 live births.[22] This high rate could be explained by the fact that the previous study was conducted in tertiary referral hospital where prematurity, which was the most cause, was well managed. This makes an accent to maternal and newborn health services that could be a challenge in some area (hospital) which needs to be addressed considerably to reduce the perinatal deaths. Similarly in northern Ethiopia, perinatal deaths rate was too low with 16.5 per 1000 live births.[23] This should be explained by the fact that the previous study was conducted in the community while the current was conducted in the hospital.

However, the current perinatal deaths showed a low rate compared to the study conducted in Uganda by Agnes which reported a perinatal mortality rate of 43 per 1000live births. This higher rate should be due to limited access to maternal and child healthcare service.[24] This might be also explained by the efforts and interventions implemented by the Government Rwanda to improve maternal and child health through a strong political will ,governmental commitment to reduce maternal and neonatal deaths by ensuring community health insurance scheme coupled with innovative strategic pillars of maternal health.[25]

In our study, 29% of causes of perinatal deaths were unknown specifically in stillbirths. This is consistent with the previous study conducted in Malawi on factors associated with stillbirth where the quarter of the causes were unexplained. [26] This constitutes a key problem in developing countries where perinatal deaths 'autopsy is not performed to determine the real causes such as genetic anomalies, intoxications(traditional medicines or other pharmaceutical and environmental chemicals). Thus, the common causes were documented to be maternal sepsis (22. 2%), prematurity's complications (20.5%), birth asphyxia (9.9%) and neonatal sepsis (5.6%) of causes of perinatal deaths. However, this is similar to the other studies which have reported the common cause as being prematurity, asphyxia and neonatal infections.[27]

The results showed that perinatal deaths were found to be statistically associated with maternal anemia, maternal STIs, delivery complications and neonatal factors such as birth weight and prematurity. This similarity is found also in the study done on factors associated with perinatal deaths in Addis Ababa where perinatal deaths were 2times high among anemic mothers. This might be due to that maternal anemia is responsible for intrauterine restricted growth and consequently causing stillbirths or low birth weight and prematurity.[28]

Perinates whose mothers had sexual transmissible infections were 10 times more likely to die compared to those with mothers without STIs. This was consistent with the study in Kenya on sexually transmissible infections on pregnant women found that maternal STIs were associated with perinatal deaths.[29] This highlights the importance of managing maternal sexual transmissible infections on pregnancy that reach the fetus through the placenta and could cause abortion,stillbirths,prematurity,low birth weight, etc.[30] Mothers without delivery complications (breech presentation, abnormal fetal heart rate, antepartum hemorrhage, shoulder dystocia and premature rupture of membrane) were less likely to have perinatal deaths compared to their counterparts with delivery complications. This is similar to the multicounty survey on maternal and new born care that highlighted an association between maternal delivery complications and perinatal death.[31]

Perinates having birth weight less than 1500gm were 6times more likely to die compared to those with normal weight. That is consistent to the previous studies done in Ethiopia and DRC that found an high relationship between perinatal mortality and low birth weight with successive findings. [28-11] Low birth weight resulting from prematurity and intrauterine restricted growth or both predisposes to a range of poor health outcome such as fetal and neonatal mortality.[32] This explains the importance of good nutrition of pregnant mothers and screening and treatment of pregnancy complications during Antenatal care visit. Term babies were less like to die than the counterparts of less than 37 weeks of gestational age .This current study was similar to the previous study done on perinatal mortality in southern Ethiopia that showed preterm babies had high risk of perinatal mortality compared to term babies. [33] The common causes of death for the premature newborn are respiratory failure, infection and congenital malformation. Prevention and management of premature birth stay a challenge in maternal and new

born care health services and a high quality management at all health sector levels would reduce considerably perinatal deaths.[34]

Strength and limitations

This study used accurate and measurable data allowing our findings to be generalized or/ and replicated for similar studies. This should give clear insight to formulate evidence based policy decision and implementation. However, there were limitations to our study because the informations were abstracted from files of the patients. Although, causes of perinatal deaths were provided if it is possible that some specific causes may be missed by doctors when certify death. That was due to lack of medical legal practices such as autopsy to identify the real cause of perinatal deaths. That's why a slight majority of perinatal deaths 'causes were not documented.

Conclusions

There was relatively a high perinatal mortality rate at Masaka district Hospital, Rwanda was 35.86 deaths per 1000live births. The documented diagnosis of perinatal deaths at Masaka district hospital, Rwanda, most common causes were maternal sepsis, prematurity complications, birth asphyxia ,neonatal infection and more than one quarter were with unknown cause. Following factors maternal anemia, maternal STIs, post term pregnancy, delivery complications and neonatal factors such as birth weight and prematurity were associated with perinatal deaths. Relying on those factors mostly prematurity prevention and its high quality management and birth asphyxia as well maternal infection, would reduce considerably the number of perinatal deaths at all levels of healthcare system.

Recommendations

A relative high perinatal mortality rate and factors associated were highlighted and following recommendations are formulated to the ministry of health and Masaka district hospital to strengthen maternal and new born care by making available sufficient equipment, high-quality and affordable medicines , skilled and motivated workforce at all levels of health care system to manage maternal infections, prematurity and delivery complications. Mothers are also recommended to attend ANC visits as early as possible to be screened for maternal infections and other pregnancy's complications and plan for delivery. Other researchers are encouraged to conduct the study at national scale to attain representativeness.

Authors' contribution

AN designed the study, collected, analyzed, interpreted the data, and wrote the manuscript. OJ supervised the study. All authors have read and approved the manuscript for publication.

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Declaration of conflict of interest

The authors declare no conflict of interest with regards to this research and authorship of this article.

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