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Original Research Article

A qualitative perinatal audit at a rural health facility in Eldoret, Kenya

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ABSTRACT

Background: Objectives of the study were to ascertain the pattern of occurrence of perinatal mortality by applying the World Health Organization (WHO), International Classification of Diseases, tenth revision (ICD-10) to deaths during the perinatal period, ICD perinatal mortality (ICD-PM), following the introduction of a qualitative perinatal audit process at a rural health facility in Kenya.
Methods: A single centre retrospective analysis demonstrating the application of the WHO, ICD-PM. Data pertaining to perinatal deaths for the period from 1st May 2017 to 31st August 2018 was obtained from Plateau Mission Hospital perinatal audit records.
Results: There were 22 perinatal deaths during the study period, 17 were included in the study. The overall perinatal death rate was 11 per 1000 births. Antepartum deaths were as a consequence of fetal growth related problems (33.3%), infection (33.3%) or unexplained (33.3%) with pregnancy-related hypertensive disorders (gestational hypertension, pre-eclampsia and eclampsia) being the most frequent medical condition associated with the mortalities. Neonatal deaths (47.1%) were the most frequent in the study and were a consequence of low birth weight and prematurity (25.0%), Convulsions and disorders of cerebral status (25.0%). The maternal condition in most of these cases being complications of placenta, cord and membranes. Acute intrapartum events and were least in this setting accounting for 17.4% of deaths.
Conclusions: The ICD-PM is generalizable and its use in perinatal death classification emphasises focus on both mother and baby. Our study showed the majority of perinatal deaths occurred in the early neonatal period & affected mostly preterm infants.

Keywords: Kenya, Perinatal audit, Perinatal mortality, Rural facility

INTRODUCTION

Over 5 million perinatal deaths occur each year, 98 percent of these arising from low- and middle-income countries.[1] Perinatal deaths consist of stillbirths or foetal deaths from 22 weeks of gestation and early neonatal deaths or deaths within the first week after birth.[2] Perinatal mortality rate (PNMR) is regarded as an indicator of maternal health, socioeconomic environment as well as quality of obstetric and neonatal care and can therefore be used as a tool in assessing the standard of health care regionally as well as globally.[3,4] Progress towards achieving the millennium development goals (MDGs) 4 (reducing the under-five year mortality rate by two-thirds) and 5 (reducing the maternal mortality ratio by three-quarters by 2015 with 1990 as baseline) has been slow with many countries, including Kenya, failing to reach the set targets. The major contributor now to under-five year child mortality is neonatal death.

Perinatal audit is defined as the systematic and critical analysis of the quality of medical care, including procedures used for diagnosis and treatment, the use of resources, and the resulting outcome and quality of life

for mother and child.[5,6] Death reviews are a simple cost effective way of defining health care problems and highlighting probable solutions. In a recent review of perinatal audits, a meta-analysis of seven before-and-after studies in low- and middle-income countries indicated a reduction in perinatal mortality of 30% after introduction of perinatal audit.[7] The mortality audit process in many developing countries in Sub Saharan Africa is limited to tertiary or referral facilities, focusing on maternal deaths, notably influenced by the World Health Organization's (WHO) "Beyond the Numbers" guide for reviewing maternal deaths in low-resource settings. Perinatal mortality audit has been used less frequently and its implementation in developing economies is yet to be comprehensively researched.[7] To facilitate straightforward and consistent capture of perinatal deaths; The WHO application of the coding rules of the 10th revision of the International Classification of Diseases and related health problems (ICD-10) to deaths during the perinatal period: ICD-PM,8 is regularly applied. The ICD-PM's three distinct features include identification of the timing of perinatal death (antepartum, intrapartum, neonatal); the causes of death linked to existing ICD codes; and ICD-PM links the maternal condition with the perinatal death.[8]

The aim of this study was to describe perinatal mortalities at a rural health care facility in Kenya, by analysis of extent and determinants of these deaths from May 2017 to August 2018 at Plateau Mission Hospital (PMH).

METHODS

The Study design of this study was to adopted from a previously published study.[9] Data from the facility perinatal audit records, correlated with parturition registers in labor room, death registers, case files of early neonatal deaths and mothers' files of stillbirths were analysed retrospectively.

The study setting of this study was to carried out at Plateau Mission Hospital (PMH), a rural primary care facility situated in Uasin Gishu County, Kenya and serving a catchment area of 80,000 residents. Annual number of deliveries was about 1,500 out of which 80% are low-risk deliveries. Twenty-four hours following every perinatal death, a mortality meeting involving members of the department of obstetrics and neonatal unit was held. The mortality case is discussed in the form of a formalised audit report with recommendations.

Study population of this study was to perinatal deaths consisting of stillbirths and early neonatal deaths, occurring at the health care facility were included in the study. World Health Organization (WHO) descriptions were applied; 10 a stillbirth was defined as a fetal death after at least 22 completed weeks of gestation or weighing 500 g or more at birth. An early neonatal death was defined as a live birth dying within the first seven days of life, the early neonatal period, and born after at least 22 completed weeks of gestation or weighing 500 g or more at birth. Macerated stillbirth or fetal death occur within the uterus before the onset of labour. Fresh stillbirth i.e., fetal death occurs within the uterus during labour and delivery. All live and stillborn babies delivered at PMH were included in this study. Babies delivered outside PMH and audit records or case files with incomplete data were excluded from the study.

Data collection

Audit records of mortality cases at the study site were analysed retrospectively. The study period was 15 months from May 2017 to August 2018. Mortality cases were reviewed in audit meeting sessions by members of the mortality committee that included the resident medical officers, nursing officer in charge, senior most midwife, clinical officer and an external obstetricians' input.

Presentations were based on the individual narratives and were followed by open discussions identifying the causes of the death, the underlying factors, any potentially avoidable deaths as well as recommendations for improved care. First, the perinatal deaths were classified according to the time of occurrence, as antepartum (before labour onset), intrapartum (during labour / caesarean section), or in the neonatal period (early- up to day seven of postnatal life). As per the coding rules of the 10th revision of the International Classification of Diseases and related health problems, each perinatal death case was assigned an ICD-10 code and the main maternal disease or condition in the perinatal death to two perinatal data sets. This method demonstrated the ICD-PM, which adopts features of many classification systems allowing applicability in all settings and international comparisons.[8] The first part of the audit record covered demographic characteristics of the mothers and their babies, such as maternal and gestational age, nationality, gravidity, parity, birth weight, and sex. The second part included data on the number of routine antenatal clinics attended, obstetric complications and their management, intrapartum care and complications including characteristics of labour and delivery. Condition of the baby at birth (alive or stillbirth), sex and birth weight of baby, congenital anomalies and afterwards, Apgar score, management of the newborn's illness that led to a fatal outcome, and time and causes of death were also included.

Data analysis

The baseline characteristics of the study participants were summarised in descriptive tables. From the audit meeting detailed forms, perinatal deaths were firstly grouped according to timing; antepartum, intrapartum, or in the neonatal period. Neonates delivered before the period of gestation of 37 weeks were considered preterm. The main cause of perinatal death was coded according to the ICD-

PM assigning only one cause of death for each fetus/neonate. The existing ICD-10 groups of maternal conditions were used.[11] The results of the perinatal causes of death and maternal conditions separated by timing, were tabulated.

All statistical analyses were conducted using STATA software version15.0 (Texas, USA). Continuous variables were expressed as mean values with standard deviation (SD), and nominal variables as numbers and percentages. The study was approved by the institutional ethics committee.

RESULTS

During the fifteen-month study period 2027 births were recorded. There was a total of 22 perinatal deaths corresponding to a perinatal death rate of 11 per 1000 births. Singleton and twin births constituted 91% and 9% of cases respectively. Five cases were excluded from the study due to weight <500 g (n=2) and missing case files (n=3). On admission fetal heart beats were audible in 50% of the fresh still births. Table 1 shows the characteristics of mothers, pregnancies, deliveries, and children among the cases of perinatal death that occurred during the study period. The study group maternal age ranged from 17 to 38 with the median age being 25.53 years. Minority of women (n=8, 47.1%) were primi-para. Majority of the women in the study had attended at least one antenatal care visit and 35.5% of mothers had attended the recommended four antenatal care visits. Vaginal delivery was the most frequent mode of delivery (94.1).

Table 2 shows the distribution of perinatal deaths across the antepartum, intrapartum and neonatal periods. The reviewed database consisted of 17 late fetal (birthweight >500 g or >22 weeks of gestation) and early neonatal (up to 7 days) deaths. Of the cases studied, 35.3% (n=6) of deaths occurred in the antepartum period, with 17.4% (n=3) occurring intrapartum and majority (n=8, 47.1%) in the early neonatal period. Figure 1 shows distribution n (%) of perinatal deaths across the antepartum, intrapartum and neonatal time periods during duration of study.

Antepartum deaths

The causes of antepartum were distributed evenly either as a result of deformations and chromosomal abnormalities (n=2), unspecified antepartum infections (33.3%) or comprised disorders related to fetal growth (33.3%). Maternal conditions associated with deformities and chromosomal abnormalities were mostly maternal medical and surgical conditions; of which 66.7% were maternal hypertensive disorders and 33.3% complications of placenta, cord and membranes.

Intrapartum deaths

Intrapartum perinatal deaths were due to either acute intrapartum events (66.7%) or unspecified circumstances 33.3% (n=1). Majority of these occurred in the context of mothers without an identified condition.

Table 1: Maternal, pregnancy, and childbirth characteristics for the study cases.

Characteristics	Perinatal deaths	
	N	%
Maternal age at childbirth (years)		
<20	5	29.4
20 - 34	9	52.9
>34	3	17.7
Parity		
0	8	47.0
1 - 4	6	35.3
>4	3	17.7
Gestational age (weeks)		
22 -27	2	11.8
28 -33	5	29.4
34 - 36	2	11.8
> 36	8	47.0
Antenatal visits		
0	8	47.0
1 - 3	3	17.7
>3	6	35.3
Mode of delivery		
Spontaneous vaginal delivery	16	94.1
Caesarean section	1	5.9
Stage of labour at presentation		
1st stage	10	58.8
2nd stage	7	41.2
Maternal education		
No formal education	0	0
Primary	9	52.9
Secondary or higher	8	47.1
Marital status		
Living with partner	9	52.9
Living without partner	8	47.1

Neonatal deaths

Neonatal deaths in the data set were composed of complications of low birth weight and prematurity (25%), convulsions and disorders of cerebral status and congenital deformations with chromosomal abnormalities (n=2). The maternal condition in most of these cases (n=3, 37.5%) was complications of placenta, cord and membranes.

Table 3 Maps the perinatal causes of death against the maternal conditions for all perinatal deaths in the PMH data set using the ICD-PM.

Table 2: The distribution of perinatal deaths across the antepartum, intrapartum and neonatal periods.

Characteristics	Perinatal deaths
Maternal age at childbirth (years)	
<20	2
20 -34	5
> 4	1
Parity	
0	2
1 - 4	5
>4	1
Gestational age (weeks)	
22 - 27	1
28 - 33	2
34 - 36	1
> 6	4
Antenatal visits	
0	5
1 - 3	2
>3	1

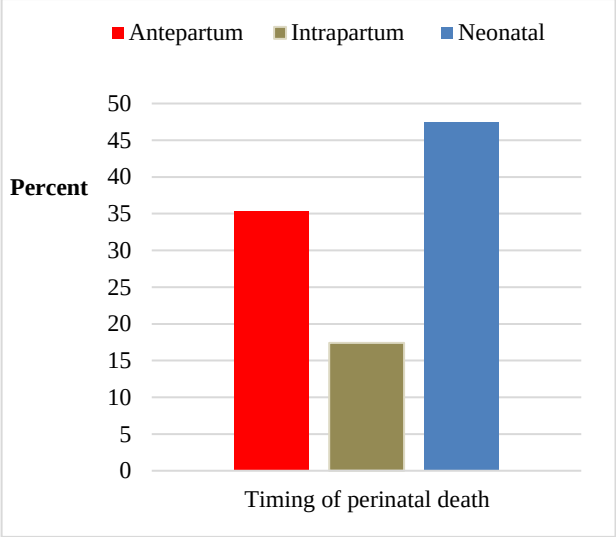

Figure 1: Distribution of perinatal deaths across the antepartum, intrapartum and neonatal time periods at Plateau Mission Hospital, Eldoret (n=17).

Table 3: Perinatal causes of death against the maternal conditions for all perinatal deaths in the PMH data set using the ICD-PM.

Maternal condition	M1: Complications of placenta, cord and membranes	M2: Maternal complications of pregnancy	M3: Other complications of labour and delivery	M4: Maternal medical and surgical conditions	M5: No maternal condition	Other	Total (%)
Antepartum death							
A1 Congenital malformations,	1	-	-	1	-		2 (33.3)
Deformations and chromosomal	-	-	-	-	-	-	0
Abnormalities	-	-	-	-	-	-	0
A2 Infection	-	-	-	-	2	-	2 (33.3)
A3 Antepartum hypoxia	-	-	-	-	-	-	0
A4 Other specified antepartum disorder	-	-	-	-	-	-	0
A5 Disorders related fetal growth	2	-	-	-	-	-	2 (33.3)
A6 Antepartum death of unspecified Cause	-	-	-	-	-	-	0
Total (%)	3 (50.0)	-	-	1 (16.7)	2 (33.3)		6 (100)
Intrapartum death							
I1 Congenital malformations,	-	-	-	-	-	-	0
Deformations and chromosomal abnormalities	-	-	-	-	-	-	0
I2 Birth trauma	-	-	-	-	-	-	0
I3 Acute intrapartum event	-	-	1	-	1	-	2 (66.7)
I4 Infection	-	-	-	-	-	-	0
I5 Other specified intrapartum disorder	-	-	-	-	-	-	0
I6 Disorders related to fetal growth	-	-	-	-	1	-	1 (33.3)
I7 Intrapartum death of unspecified cause	-	-	-	-	-	-	0
Total (%)			1 (33.3)		2 (66.7)		3 (100)

Continued.

Maternal condition	M1: Complications of placenta, cord and membranes	M2: Maternal complications of pregnancy	M3: Other complications of labour and delivery	M4: Maternal medical and surgical conditions	M5: No maternal condition	Other	Total (%)
Neonatal death							
N1 Congenital malformations, Deformations and chromosomal abnormalities	1	-	-	1	-	-	2 (25.0)
N2 Disorders related fetal growth	-	-	-	-	-	-	0
N3 Birth trauma	-	-	-	-	-	-	0
N4 Complications of intrapartum events	-	-	-	-	-	-	0
N5 Convulsions and disorders of cerebral status	-	-	1	-	1	-	2 (25.0)
N6 Infection	-	-	-	-	-	-	0
N7 Respiratory and cardiovascular disorders	-	-	-	-	1	-	1 (12.5)
N8 Other neonatal conditions	-	-	-	-	-	-	0
N9 Low birthweight and prematurity	-	-	-	-	2	-	2 (25.0)
N1- Miscellaneous	-	-	-	-	-	-	0
N11 Neonatal death of unspecified cause	-	-	-	-	1	-	1 (12.5)
Total (%)	1 (11.1)		2 (22.2)	1 (11.1)	5 (55.6)		8 (100)

DISCUSSION

Improved data collection and analysis from nations with high infant mortality is necessary to develop cost-effective and successful programmes aimed at improved neonatal health. According to data published in 2015, Kenya's neonatal mortality (NMR) rate as per public health institutions stands at 22/1000 live births.[12] NMR in rural areas is 21 deaths per 1,000 live births and 26 deaths per 1,000 live births in urban areas. The urban-to-rural NMR ratio is 1.2.2.

Reduction of PMR and improved maternal and child health requires identification of service-related factors leading to perinatal death.[12,13]

Main findings

The study demonstrated the WHO application of ICD-10 to deaths during the perinatal period. ICD-PM following the introduction of a qualitative perinatal audit process at the rural health facility. The timing of a perinatal death, the cause of perinatal death, and the maternal condition were analysed.

Perinatal mortality in primigravida participants (25%) was relatively lower than in the multigravidas.

In the overall distribution of perinatal death based on gestational age, the majority of deaths occurred in preterm infants (GA<37 weeks), accounting for 53.0% of all the deaths in our study. Our result is similar to the global epidemiology of 15 million preterm births, in which preterm birth estimated to be a risk factor in over 50% of all neonatal deaths.[14,15]

Antepartum deaths were as a consequence of problems related to fetal growth (33.3%), infection 33.3% (n=2) or unexplained with pregnancy-related hypertensive disorders (gestational hypertension, pre-eclampsia and eclampsia) being the most frequent medical condition associated with the mortalities.

The significantly lower proportion of birth asphyxia in all causes may be due to the progress of neonatal resuscitation training and improved perinatal care.

Early neonatal deaths (47.1%) were the most frequent in the study and were mostly a consequence of low birth weight and prematurity (n=2, 25.0%), Convulsions and disorders of cerebral status (25.0%). The maternal condition in most of these cases being complications of placenta, cord and membranes. Acute intrapartum events accounted for 17.4% of deaths and were least in this setting.

Strengths and limitations of this study was to this is the first application of ICD-PM in a rural facility dataset in kenya. The main strength of this paper is it represents a total obstetric population at the facility, with the majority of cases (both births and deaths) in the study period. Maternal conditions were well documented in every case. The risk of recall bias was judged to be low, given that the mortality meetings and reports were conducted 24-48

hours after delivery or neonatal death, and before discharge from hospital.

The outcome of this study may not be generalizable to the country as a whole as participants included in the analysis predominantly lived in the rural areas. No autopsy was performed to further investigate the cause of death.

Misclassification of fresh stillbirths as early neonatal deaths was another potential bias. However, this bias was minimal because each birth was attended by a skilled healthcare provider, who also assessed the signs of life after delivery.

CONCLUSION

The use of perinatal death audits to evaluate perinatal care in low and middle-income countries, is beneficial and the ICD-PM can be a globally applicable perinatal death classification system. Our study showed the majority of perinatal deaths occurred in the early neonatal period. Cause of death varied with gestational age.

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Ethical approval: The study was approved by the Institutional Review Board Plateau Mission Hospital

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