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CLINICAL ARTICLE

Determinants of perinatal mortality in Nigeria

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ABSTRACT

Objective: To determine risk factors for perinatal mortality among hospital-based deliveries in Nigeria. *Methods:* The WHO Global Maternal and Perinatal Health Survey was implemented in Nigeria as a first step in establishing a global system for monitoring maternal and perinatal health. Twenty-one health facilities with more than 1000 deliveries annually were selected by a stratified multistage cluster sampling strategy. Information was recorded on all women who delivered and their neonates within a 3-month period. *Results:* Overall, there were 9208 deliveries, comprising 8526 live births, 369 fresh stillbirths, 282 macerated stillbirths, 70 early neonatal deaths, and 721 perinatal deaths. The stillbirth and perinatal mortality rates were, respectively, 71 and 78 per 1000 deliveries; the early neonatal death rate was 8 per 1000 live births. Approximately 10% of all newborns weighed less than 2500 g, and 12.3% were born at less than 37 weeks of gestation. Predictors of perinatal mortality were mother's age, lack of prenatal care, unbooked status, prematurity, and birth asphyxia. *Conclusion:* The perinatal mortality rate remains unacceptably high in Nigeria. Fresh stillbirth accounted for most perinatal deaths. Interventions to improve the utilization and quality of prenatal care, in addition to the quality of intrapartum care, would considerably reduce perinatal death.
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1. Introduction

Perinatal death, as defined by the International Classification of Diseases [1], refers to the death of fetuses weighing at least 500 g or beyond 22 weeks of gestation, and early neonatal death (i.e. within the first 7 days of life). Estimates have revealed that more than 6 million perinatal deaths occur worldwide every year [2]. Early neonatal deaths account for three-quarters of deaths within the first 4 weeks of life [2].

African regions have the highest rates of stillbirth, and perinatal and neonatal mortality [2], an indication of the low levels of maternal health and nutrition, and the poor quality of obstetric and pediatric care available. The immediate causes of these deaths can be traced to various intermediate and distant determinants of neonatal mortality, including poverty, lack of skilled care at birth, weak health systems, suboptimal care-seeking, and poor-quality obstetric care [3–5]. Nigeria accounts for 6% of global neonatal mortalities and has one of the highest rates of neonatal death in the world [6]. In addition, its perinatal mortality rate of 76 per 1000 live births is one of the highest in Africa [2], and reports from Nigeria indicate that this rate is increasing [7–9].

By 2015, the fourth Millennium Development Goal aims to achieve a two-thirds reduction in the mortality of children younger than

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5 years from the level in 1990 [10]. Efficient civic registration and national health information systems are necessary for monitoring trends in newborn health, and in particular to measure progress with achieving the fourth Millennium Development Goal.

Reliable data on perinatal mortality are lacking in many developing countries as a result of the nonexistent, or at best inadequate, civic registration and national health information systems in these countries [11]. This poses serious challenges to effective monitoring of the impact of policies and interventions. In 2005, the WHO implemented the Global Maternal and Perinatal Health Survey, which aims to establish a global network of health facilities to collect focused information on maternal and perinatal health in order to facilitate identification of morbidity and mortality, monitoring of interventions, and evaluation of programs. Participating countries were selected from the 6 regions of the WHO based on the mortality rates of both adults and children younger than 5 years [12].

The aim of the present study was to test the WHO global data system by using the WHO Global Maternal and Perinatal Health Survey to assess maternal and fetal risk factors for perinatal mortality among hospital-based deliveries in Nigeria.

2. Materials and methods

The present prospective cross-sectional survey was designed as a pilot study to test the WHO global data system. Within Nigeria, the Federal Capital Territory (FCT), Katsina and Lagos states were selected for the study. Twenty-one health facilities (7 from each state) in the private and public sectors with annual deliveries of 1000 or more were randomly selected by using a stratified multi-stage sampling design. Ethical approval for the study was obtained from the WHO's Scientific and Ethical Review Group and Ethics Review Committee and from each participating health facility.

In each health facility, data collection took place between October 1, 2004, and February 28, 2005. During this period, all women who delivered in the selected health facilities and their neonates comprised the study population. Data were obtained at both the individual patient level and the health facility level.

The instrument for collecting individual patient data was a 54-item pre-tested data form [13]. The medical records of all study subjects were reviewed and abstracted by the midwife. Consent was not obtained from the mother because there was no direct contact with individual patients.

For individual patient data, maternal characteristics including age, parity, marital status, education, booking status, and number of prenatal visits were documented. The mode of onset of labor (spontaneous or induced) and indications for induction of labor were noted. Also recorded was the mode of delivery: spontaneous, vaginal birth after previous cesarean, cesarean (elective or emergency), instrumental delivery, symphysiotomy, or assisted breech delivery. Other maternal outcomes reported included blood transfusion, intensive care admission, referral, and death.

Gestational age and birth weight of the newborn were recorded. Other newborn outcomes included fetal presentation at delivery, status at birth (alive or dead), status of stillbirth (fresh or macerated), Apgar score at 5 minutes, sex, presence of congenital malformations, admission of newborn into intensive or special care unit, and status of neonate either at discharge or on postpartum day 7. Monitoring of neonates within the health facility was discontinued at discharge or on postpartum day 7, whichever was sooner. Neonates were not followed up after discharge from the health facility.

Facility level data included the type of facility (primary without surgical facilities, secondary, or tertiary with surgical facilities), location, hospital resources, and birth attendants. In each health facility, a log book of all deliveries was also maintained to enable the completeness of patient recruitment to be monitored.

Data were entered into an online global database at the country level by a data clerk who had received training. Data analysis was performed with SPSS version 15.0 (SPSS, Chicago, IL, USA). Associations were tested by the χ^2 or Fisher exact test as appropriate; the level of statistical significance was set at $P<0.05$. Multivariate logistic regression analysis with analysis of variance was used to assess independent risk factors associated with perinatal mortality.

3. Results

Twenty-one health facilities (5 tertiary and 16 secondary health facilities) participated in the survey. Deliveries in the health facilities and corresponding level of care are shown in Table 1. In total, there were 9208 deliveries, of which 9177 had complete records. There were 8526 (92.9%) live births, 369 (4.0%) fresh stillbirths, and 282 (3.1%) macerated stillbirths.

Seventy neonates (0.8%) died within the first 7 days before discharge from the hospital. Thus, there were 721 (7.9%) perinatal deaths. The stillbirth rate was 70.9 per 1000 births. The rate of intrapartum fetal death was 40.2 per 1000 births. There were 384 (4.2%) twin deliveries and 35 (0.4%) higher-order deliveries. Forty-three (10.3%) perinatal deaths were recorded among multiple births, and 678 (8.4%) among singletons. There were 4701 (51.5%) males and 4427 (48.5%) females. The male-to-female ratio was 1.06 to 1. Eighty-three (0.9%) neonates had congenital malformations. The overall mortality rate was 78.6 per 1000 deliveries. The perinatal mortality rate for multiple deliveries and singletons was, respectively, 102.6 and 77.2 per 1000 births.

The mothers' characteristics are shown in Table 2. Women were categorized as high risk if a pregnancy or intrapartum complication was identified. Information about the newborn, including need for admission to a special care baby unit, is shown in Table 3.

There was no significant difference in the incidence of perinatal death between secondary (7.7%) and tertiary (8.3%) health facilities ($P>0.05\%$); however, there were significant associations between mother's age and perinatal death, and between duration of schooling and perinatal death (Table 4). Mothers younger than 20 years and those older than 35 years tended to have a higher rate of perinatal death ($P<0.001$). The incidence of perinatal death also decreased with increasing maternal level of education ($P<0.0001$).

Table 1
Total number of deliveries in the study health facilities and level of care.

Federal Capital Territory		Katsina State		Lagos State	
Facility	No. of deliveries (level of care)	Facility	No. of deliveries (level of care)	Facility	No. of deliveries (level of care)
Gwarinpa GH	309 (secondary)	Katsina GH	833 (secondary)	Lagos State University TH	712 (tertiary)
Wuse GH	745 (secondary)	Daura GH	403 (secondary)	Lagos University TH	161 (tertiary)
Nyanya GH	393 (secondary)	Kankia GH	237 (secondary)	Island MH	367 (secondary)
Asokoro GH	776 (secondary)	Malunfashi GH	483 (secondary)	Gbagada GH	140 (secondary)
Maitama GH	625 (secondary)	Jibia GH	546 (secondary)	R-Jolad Hospital	461 (secondary)
National Hospital	492 (tertiary)	Dutsenma GH	493 (secondary)	Badagry GH	154 (secondary)
Gwagwalada SH	372 (tertiary)	FMC, Katsina	216 (tertiary)	Isolo GH	290 (secondary)

Abbreviations: FMC, Federal Medical Centre; GH, general hospital; MH, maternity hospital; SH, specialist hospital; TH, teaching hospital.

Table 2
Characteristics of delivered mothers.

Characteristic	No. (%)	Percentage
Age group		
≤20 years	1298	14.1
21–25 years	1935	21.0
26–30 years	3161	34.4
31–35 years	1843	20.1
36–40 years	789	8.6
>40 years	168	1.8
Duration of schooling		
None	1890	20.7
1–6 years	1443	15.8
7–12 years	3270	35.9
13–18 years	2467	27.1
>18 years	46	0.5
Parity		
0	2543	28.9
1-2	3549	39.3
3–4	1631	18.5
>5	1169	13.3
Risk level		
Low risk	6771	23.5
High risk	2437	76.5
Number of prenatal visits		
None	1877	20.5
1–4	1859	20.3
>4	5421	59.2

When the mother received prenatal care, the incidence of perinatal death was significantly less than when she did not ($\chi^2=369.1$, $P<0.0001$; odds ratio [OR], 0.86; 95% confidence interval [CI], 0.84–0.88). Newborns of mothers who were not booked into the health facility were more likely to die than newborns of those booked into the health facility ($\chi^2=558.6$, $P<0.0001$; OR, 1.3 [95% CI, 1.22–1.32]). A parity of greater than 4 was also associated with a higher rate of perinatal mortality ($P<0.0001$).

Availability of obstetricians seemed to reduce the incidence of perinatal death ($P<0.0001$). There was also a marginally significant association between perinatal death and use of partograph: facilities reporting use of partograph experienced fewer (7.1%) perinatal deaths than facilities where it was not used (9.6%) ($\chi^2=17.4$, $P<0.0001$; OR, 0.97 [95% CI, 0.95–0.98]).

Elective cesarean delivery seemed to confer the most protection against perinatal death (Table 5). The lower incidence of perinatal death after cesarean was significant ($P<0.0001$). For the individual newborn, provision of a free delivery service did not reduce the risk of perinatal death. There was a 3% reduction in perinatal death when user fees were charged as compared with a free delivery service. This difference was also marginally significant ($\chi^2=40.1$, $P<0.0001$; OR = 0.96 [95% CI, 0.95–0.97]). The risk of perinatal death was higher in high-risk mothers (25.5%) as compared with low-risk mothers (5.4%) ($\chi^2=218.7$, $P<0.0001$; OR, 0.9 [95% CI, 0.89–0.92]).

There were 1261 (13.8%) premature deliveries. The risk of perinatal death was about 14% less among neonates born at 37 weeks of gestation or later, as compared with those born before 37 weeks; this difference was significant ($\chi^2=273.6$, $P<0.0001$; OR,

Table 3
Characteristics of newborns.

Characteristic	Number	Percentage
Gestational age at delivery		
<28 weeks	84	0.9
28–33 weeks	168	1.8
34–36 weeks	1009	11.1
37–41 weeks	7627	83.6
>41 weeks	234	2.6
Birth weight		
<1.50 kg	300	3.3
1.50–2.49 kg	631	6.8
2.50–3.99 kg	7617	82.7
≥4.00 kg	660	7.2
Mode of delivery		
Spontaneous vaginal	7374	80.5
Operative vaginal	156	1.7
Elective cesarean	279	3.1
Emergency cesarean	1066	11.6
Assisted breech	286	3.1
Apgar score at 5 minutes		
≤6	1484	16.1
≥7	7724	83.9
Admission into special care baby unit		
No	8738	95.1
Yes	449	4.9

Table 4
Association between maternal characteristics and perinatal death.

Characteristic	Frequency of perinatal death		*P* value
	Number	Percentage	
Mother's age			
≤20 years (n = 1298)	113	8.7	<0.0003
21–25 years (n = 1935)	134	6.9	
26–30 years (n = 3161)	233	7.4	
31–35 years (n = 1843)	132	7.2	
36–40 years (n = 789)	83	10.5	
>40 years (n = 168)	24	14.3	
Parity			
0 (n = 2543)	219	8.6	<0.0001
1–2 (n = 3459)	194	5.6	
3–4 (n = 1631)	122	7.5	
>4 (n = 1169)	152	13.0	
Duration of schooling			
0 years (n = 1890)	259	13.7	<0.0001
1–6 years (n = 1443)	115	8.0	
7–12 years (n = 3270)	209	6.4	
13–18 years (n = 2467)	126	5.1	
>18 years (n = 46)	2	4.4	
Prenatal care			
No (n = 1877)	246	18.4	<0.0001 [a]
Yes (n = 7280)	370	5.1	
Mother referred for delivery			
Yes (n = 1134)	289	25.5	<0.0001 [b]
No (n = 8061)	431	5.4	

[a] $\chi^2=369.1$, $P<0.0001$; OR, 0.86 (95% CI, 0.84–0.88).
[b] $\chi^2=558.6$, $P<0.0001$; OR, 1.3 (95% CI, 1.22–1.32).

Table 5
Association between newborn characteristics and perinatal death.

Characteristic	Frequency of perinatal death		*P* value
	Number	Percentage	
Gestational age			
<37 weeks (n = 1261)	244	19.4	<0.0001 [a]
≥37 weeks (n = 7861)	465	5.9	
Mode of delivery			
Spontaneous vaginal (n = 7374)	425	5.8	<0.0001
Operative vaginal (n = 156)	33	21.2	
Elective cesarean (n = 279)	5	1.8	
Emergency cesarean (n = 1066)	172	32.4	
Assisted breech (n = 286)	67	23.4	
Birth weight			
<1.5 kg (n = 300)	141	47.0	<0.0001
1.5–2.49 kg (n = 631)	91	14.4	
2.5–3.99 kg (n = 7617)	435	5.7	
≥4.0 kg (n = 660)	54	8.2	
Apgar score			
≤6 (n = 1484)	708	47.7	<0.0001 [b]
≥7 (n = 7724)	13	0.2	
Sex			
Male (n = 4701)	402	8.6	<0.01 [c]
Female (n = 4427)	301	6.8	

[a] $\chi^2=273.6$, $P<0.0001$; OR, 0.86 (95% CI, 0.83–0.88).
[b] $\chi^2=3898.4$, $P<0.0001$; OR, 0.52 (95% CI, 0.50–0.55).
[c] $\chi^2=9.8$, $P<0.01$; OR, 1.01 (95% CI, 1.01–1.03).

Table 6
Perinatal deaths by Wigglesworth classification.[a]

Birth weight	Number of perinatal deaths					Total (percentage)
	Macerated stillbirths	Congenital malformations	Immaturity	Asphyxia	Other	
<1000 g (n = 34)	18	2	14	0	0	34 (5.2)
1001–1500 g (n = 42)	16	7	16	3	0	42 (6.4)
1501–2000 g (n = 65)	35	4	18	8	0	65 (9.9)
2001–2500 g (n = 55)	20	7	11	16	1	55 (8.3)
>2500 g (n = 464)	151	5	49	250	9	464 (70.3)
Total (percentage)	240 (36.4)	25 (3.8)	108 (16.4)	277 (41.9)	10 (1.5)	660 (100.0)

[a] Birth weight data missing for 61 neonates.

0.86 [95% CI, 0.83–0.88]). Low-birth-weight neonates constituted 10.1% of all deliveries (Table 5). Low-birth weight was associated with perinatal death: almost a quarter (24.9%) of all neonates weighing less than 2.5 kg died, as compared with 5.9% of those weighing more than 2.5 kg ($\chi^2 = 419.1$, $P<0.0001$; OR, 0.78 (95% CI, 0.77–0.83]).

Table 7
Multivariate regression analysis of risk factors for perinatal death.

Variable	*P* value	Odds ratio	95% CI	
			Lower	Upper
Maternal age	0.020			
≤20 years	0.402	0.83	0.53	1.29
21–25 years		1		
26–30 years	0.034	1.46	1.03	2.07
31–35 years	0.534	1.14	0.75	1.43
36–40 years	0.049	1.67	1.00	2.78
>40 years	0.009	3.03	1.31	6.98
Duration of schooling	0.002			
None	0.058	7.80	0.93	65.34
1–6 years	0.051	8.31	0.99	69.97
7–12 years	0.088	6.28	0.76	51.84
13–18 years	0.205	3.92	0.47	32.40
>18 years		1		
Prenatal visits	0.002			
None	0.001	1.74	1.27	2.39
1–4	0.042	1.40	1.01	1.95
>4		1		
Parity	0.967			
0	0.679	1.07	0.78	1.46
1–2		1		
3–4	0.992	0.99	0.70	1.43
≥5	0.841	0.96	0.61	1.50
Mode of delivery	0.000			
Spontaneous vaginal delivery		1		
Operative vaginal delivery	0.503	1.23	0.67	2.25
Elective caesarean section	<0.001	0.12	0.05	0.36
Emergency caesarean section	0.027	0.73	0.55	0.96
Assisted breech delivery	0.188	0.74	0.47	1.16
Gestational age	0.000			
<28 weeks	0.000	8.27	3.59	19.06
28–33 weeks	0.017	1.89	1.12	3.19
34–36 weeks	0.123	1.30	0.93	1.81
37–41 weeks		1		
≥42 weeks	0.181	1.54	0.82	2.91
Apgar score at 5 minutes				
≤6	<0.001	446.87	253.10	788.97
≥7		1		
Birth weight	0.281			
<1.5 kg	0.059	1.49	0.99	2.25
≥1.5–2.49 kg	0.799	1.05	0.70	1.58
2.5–3.99 kg		1		
≥4 g	0.533	1.16	0.73	1.82
Payment for delivery services				
No		1		
Yes	0.027	0.53	0.31	0.93
Partograph for labor management				
No	0.990	1.00	0.63	1.59
Yes		1		
Mother referred for delivery				
Yes	<0.001	1.99	1.49	2.68
No		1		

There was significant association between fetal presentation and perinatal death: as compared with cephalic presentation (6.7%), perinatal deaths were higher when the presentation was breech (21.6%) or other than breech or cephalic (32.4%). These differences were statistically significant ($P<0.0001$). Asphyxia was also a major risk factor for perinatal death. When the 5-minute Apgar score was 6 or less, almost half (47.7%) of the neonates died, as compared with only 0.2% of neonates with a score of 7 of more ($\chi^2 = 3898.4$, $P<0.0001$; OR, 0.52 [95% CI, 0.50–0.55]).

Although the incidence of newborn males (51.5%) was only slightly higher than that of newborn females (48.5%), males had a slightly higher but significant risk of perinatal death as compared with females ($\chi^2 = 9.8$, $P<0.01$; OR, 1.01 [95% CI, 1.01–1.03]).

The Wigglesworth classification [14] was used to describe probable causes of perinatal death according to birth-weight groups (Table 6). Approximately 70% of perinatal deaths occurred among newborns weighing more than 2.5 kg: asphyxia and macerated stillbirths accounted for more than 80% of perinatal deaths in this category. Overall, asphyxia and macerated stillbirths in normal-weight newborns accounted for 60.8% of all perinatal deaths.

A multivariate logistic regression model was used to determine independent predictors of perinatal mortality. All significant maternal and newborn risk factors were entered into the regression model. At the level of the mother and the neonate, the following factors independently predicted perinatal mortality: maternal age between 26 and 30 years, and maternal age more than 40 years; lack of prenatal care; prematurity; asphyxia; free maternity service; mode of delivery; mother's level of education; and unbooked status (Table 7). Parity, birth weight, and use of partograph did not independently predict perinatal death. Payment for maternity services seemed to be protective of perinatal mortality with a 47% reduction in risk of perinatal death.

These significant predictors of perinatal death were entered into a forward stepwise logistic regression model. The variables strongly predicted risk of perinatal death in the following order: asphyxia, lack of prenatal care, prematurity, unbooked status, maternal age greater than 35 years, and duration of schooling.

4. Discussion

The present survey served as a test of the WHO's global system to collect vital information about maternal and newborn health. The WHO Global Maternal and Perinatal Health Survey was envisaged as a mechanism to facilitate monitoring of the use of evidence-based interventions by health systems across the world and the impact of such interventions. Given the present focus on achieving optimal health for populations across the world, the survey was timely. Its chief strengths were the prospective nature of data collection and the follow up of mothers and newborns in hospital until discharge. The participating health facilities were principal maternity units. The sampling strategy ensured that the selected health facilities were a true reflection of health facilities across the country. Thus, the findings provide an overview of current practice and

offer possibilities of identifying potential interventions to improve newborn health.

Perinatal mortality is regarded as a sensitive index of the quality of obstetric care for any given population. In the present study, macerated and fresh stillbirths accounted for, respectively, 39.1% and 51.2% of all perinatal deaths. Where intrapartum fetal death accounts for most perinatal deaths, it indicates poor-quality intrapartum care. This finding is in keeping with observations of others [7,15–17]. Access to various measures of obstetric care has been shown to influence stillbirth rates strongly [15].

Whereas the incidence of perinatal mortality in developed countries is low, a rising trend has been reported in Nigeria [7]. For example, recent studies in Nigeria have reported higher rates of perinatal mortality than found in the present study, including 77.03 per 1000 deliveries [7], 84.8 per 1000 [8], 133.94 per 1000 [9], and 86.3 per 1000 [18]. Unlike the present study, these other studies were retrospective reviews of hospital records. Nevertheless, the high rates of perinatal mortality are consistent.

The above studies suffer from the limitation of being hospital-based data; however, a major prospective community-based evaluation of stillbirths in developing countries has shown that stillbirth rates in developing countries are about 7-fold higher than those in developed countries [19]. Most of these stillbirths are thought to be preventable with high-quality intrapartum care [20]. The finding that intrapartum stillbirths accounted for most perinatal deaths in the present study supports this contention.

Hospital-based data, including those of the present study, may potentially underestimate the true rates of perinatal mortality because neonates are not followed up after the first week after discharge and, significantly, 62% of births in Nigeria are home-based [21].

All of the independent predictors of perinatal mortality identified in the present study have been previously documented. Older maternal age is a risk factor for perinatal mortality. Women aged 25 years and younger in the present study had reduced odds of experiencing perinatal death as compared with women aged 40 years and older, whereas McClure et al. [19] showed that women older than 35 years had a 1.5-fold increased risk of experiencing stillbirth as compared with younger women. A low level of maternal education apparently has an inverse relationship with care-seeking behavior. For mothers with no formal education, McClure et al. [19] demonstrated a 1.6-fold increase in the stillbirth rate.

Unbooked status [7] and lack of prenatal care [17,19] have also been reported to increase the risk of perinatal death. The benefits of women attending at least 4 prenatal visits have been reported. Goldenberg et al. [15] showed that a significant reduction in perinatal mortality would be possible if at least 52% of all pregnant women were to make 4 prenatal visits: every percentage increase in women making at least 4 visits thereafter would be associated with a reduction in prenatal stillbirth of 0.30 per 1000 deliveries, and a reduction in intrapartum stillbirth of 0.16 per 1000 deliveries.

Whereas high rates of stillbirth indicate poor obstetric care, both the 6-fold increase in perinatal mortality associated with neonates born at less than 28 weeks of gestation and the close to 500-fold odds of perinatal death associated with birth asphyxia illustrate the poor state of neonatal care services in the present study. Prematurity is the most important cause of perinatal death in developing countries, even for newborns that are close to term [22].

Although birth weight was significantly associated with perinatal death in the present study, when subjected to multivariate regression low birth weight was not shown to independently predict perinatal mortality. Low birth weight is, however, consistently reported to be a significant cause of perinatal mortality [7,17,19]. We presume that there are additive effects of the interactions among low prenatal care use, poor intrapartum supervision, and poor neonatal services on the role of prematurity and low birth weight. Poverty at the individual and communal level contributes significantly to these interactions.

The association of free maternity services with perinatal mortality was an unexpected finding, which was probably due to a combination of poor utilization and poor quality of obstetric care. Even when services are free, prevailing attitudes and beliefs may limit the acceptance of life-saving interventions. Thus, effective strategies of health education are imperative to improve access to reproductive health interventions.

The distribution of perinatal deaths according to the Wigglesworth classification [14] clearly revealed areas where interventions are required. This distribution implied that effective interventions to improve the quality, in addition to the utilization, of prenatal care and the quality of intrapartum supervision would reduce perinatal mortality by almost two-thirds through the elimination of macerated stillbirths and asphyxia-related deaths in normal weight newborns.

Elective cesarean delivery significantly reduced the odds of perinatal mortality. This finding supports an increased use of cesarean to reduce perinatal death. Increased access to cesarean delivery in developing countries to reduce perinatal mortality has also been advocated [15,19]. Whereas the rate of cesarean delivery in most countries worldwide is above 10% [23], the cesarean rate in most Sub-Saharan African countries, as supported by the findings in the present study, is below 5%, reflecting poor access to health services [24]. Goldenberg et al. [15] showed that the maximum impact of cesarean delivery would be achieved if the cesarean rate in a given population were to rise from 0% to 8%: each percentage rise in cesarean delivery would be associated with reduction in intrapartum stillbirth of 1.61 per 1000 deliveries.

A combination of factors—namely, social disparities, weak infrastructure, and poor-quality obstetric care—is responsible for the high rate of perinatal death prevalent in the present study setting. Consequently, pragmatic solutions will require multisectoral approaches to address the problem. There is a strong need for advocacy for universal access to sexual and reproductive health premised on reliable research data. Ultimately, improvements in newborn health will occur only when social inequities and infrastructural decay are reversed.

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Conflict of interest

The authors have no conflicts of interest.

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