



Maternal Mortality: In-Depth Review of Maternal Death in a Referral Hospital in Jigawa State, Nigeria

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Abstract

Background: Maternal mortality remains a major public health challenge in Nigeria. In 2023, Nigeria accounted for approximately 28.5% of global maternal deaths despite representing only 2.6% of the world's population. This study aims to determine the maternal mortality ratio (MMR) and identify factors contributing to maternal deaths at Rasheed Shekoni Federal University Teaching Hospital (RSFUTH), Dutse.

Methods: A retrospective review of maternal deaths that occurred in the Department of Obstetrics and Gynaecology, RSFUTH, between 1 December 2023 and 30 November 2024 was conducted. Relevant information was extracted from patients' case files using a structured proforma. Data were analyzed using IBM SPSS version 26. Descriptive statistics were presented as frequencies and percentages, while associations were tested using Fisher's exact test at a significance level of $p < 0.05$.

Results: During the study period, 768 deliveries and 30 maternal deaths were recorded, resulting in an MMR of 3,906 per 100,000 live births. Two cases were excluded from analyses of causes and contributory factors because of incomplete records. The mean age of the women was 26.5 ± 8.6 years, with over half (53.6%) aged 15–25 years. Most women resided in rural areas (67.9%), were homemakers (92.8%), and had no formal or Qur'anic education (60.8%). Hypertensive disorders of pregnancy (32.1%) and puerperal sepsis (28.5%) were the leading causes of death. Most women (87.5%) delivered in hospitals, while 75% of deaths occurred during the postpartum period. More than half (57.1%) died within 1–7 days of admission.

Conclusion: Maternal mortality at RSFUTH was extremely high. Hypertensive disorders of pregnancy and puerperal sepsis were the leading causes, while inadequate treatment, limited equipment and infrastructure, and delays in referral contributed significantly to maternal deaths.

Keywords: Dutse; maternal mortality; obstetric care; puerperal sepsis; referral hospital

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Introduction

Maternal mortality remains a significant public health challenge in Nigeria. Developing countries, including Nigeria, account for nearly 99% of all maternal deaths globally (Olonade et al., 2019). Maternal mortality is defined as the death of a woman while pregnant or

within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes (World Health Organization, 2013). The most common cause of maternal death globally is obstetric haemor-

rhage, followed by hypertensive disorders of pregnancy, as well as sepsis, unsafe abortion, and embolism (Geller et al., 2018; Sageer et al., 2018; Say et al., 2014).

In 2023, the World Health Organization (WHO) reported that the maternal mortality ratio (MMR) in Nigeria was 1,047 per 100,000 live births (World Health Organization et al., 2023). This places Nigeria among countries with the highest maternal mortality, accounting for nearly 28.5% of global maternal deaths despite constituting only about 2.6% of the world's population. The report further states that a woman in Nigeria has a 1 in 19 lifetime risk of dying during pregnancy, childbirth, or postpartum, whereas in the most developed countries the lifetime risk is 1 in 4900 (World Health Organization et al., 2023). However, the Nigeria Demographic and Health Survey (NDHS 2018) reported a much lower MMR of 512 deaths per 100,000 live births (National Population Commission (Nigeria) and ICF, 2019). The significant difference between the two reports could be due to various factors including changes in data collection methods, reporting practices, or actual changes in maternal mortality rates over time.

The leading direct causes of maternal mortality in Nigeria align with global trends and include obstetric haemorrhage, hypertensive disorders of pregnancy, sepsis, obstructed labour, and unsafe abortion. Indirect causes include malaria, anaemia, and HIV/AIDS (Oye-Adeniran et al., 2014). Key determinants include: (a) socio-economic and cultural factors such as poverty, illiteracy, gender inequality, and early marriage (Ogu et al., 2016; Piane, 2019); and (b) healthcare system factors including poor antenatal coverage, inadequate skilled birth attendants, long distances to health facilities, underfunding, and dilapidated infrastructure (Doctor et al., 2012; Maduka and Ogu, 2020).

Nigeria adopted several national policy interventions aimed at reducing maternal mortality, including the National Health Policy (2016) and the maternal and child health component of the National Strategic Health Development Plan (2010–2015; revised 2018–2020). Jigawa State implemented programs such as Free Maternal, Newborn and Child Health (Free MNHC), “Haihwa Lafiya,” and Save One Million initiatives. Evidence suggests that the impact has been modest due to weak implementation, insufficient funding, and limited community engagement.

In Nigeria a significant number of childbirths occur at home, with the prevalence of home delivery among young mothers around 69.5% (Adewuyi et al., 2019).

Women from primary health centers are often referred to secondary and tertiary hospitals for emergency obstetric care when complications arise (Chinkhumba et al., 2014), resulting in higher maternal deaths being registered in referral hospitals (Hussein et al., 2016; Okonofua et al., 2017). This study aims to determine the MMR and identify factors contributing to maternal death at RSFUTH, Dutse.

Methodology

Study Setting

The study was carried out in the Department of Obstetrics and Gynaecology of RSFUTH, Dutse, between 1 December 2023 and 30 November 2024. RSFUTH is one of two tertiary health facilities in Jigawa State and serves as a referral center for patients within Jigawa and neighboring states. Jigawa State is located between latitude 11°N and 13°N, and longitude 8°E and 10°E, with an area of 22,410 km² and a population of 4.3 million (2006 census) (Okonofua et al., 1992). Eighty percent of the population resides in rural areas. The MMR of Jigawa State was estimated at 1,012 deaths per 100,000 live births using the sisterhood method (Sharma et al., 2017).

Study Design

Hospital-based retrospective descriptive study of all maternal deaths at RSFUTH over a 12-month period, 1 December 2023 to 30 November 2024.

Study Population and Data Collection

All cases of maternal deaths at RSFUTH during the review period. Patients dead before arrival were excluded. A structured proforma (adapted from the Nigerian MDSR proforma) was used to extract socio-demographic data; cause, time, and date of death; gestational age; admission details; place and mode of delivery; and referral source from case files, labour ward, postnatal ward, and theatre records.

Statistical Analysis

IBM SPSS version 21.0. Normally distributed variables expressed as mean $\pm$ SD; skewed variables as median and interquartile range. Qualitative variables as percentages. Associations tested using Fisher's exact test ($p < 0.05$, 95% confidence).

Ethical Consideration

Approval from Health Research and Ethics Committee, RSFUTH (RSFUTH/GEN/226/V. II), 18 November 2023. No patient contact was involved.

Results

A total of 768 deliveries and 30 maternal deaths were recorded, giving an MMR of 3,906 per 100,000 live births. Two cases were excluded from cause-of-death analysis due to insufficient data (analytical $n = 28$).

The mean age was 26.5 ± 8.6 years (range 16–44). Maternal death was highest (53.6%) among women aged 15–25 years. The majority resided in rural areas (67.9%), were homemakers (92.8%), and had no formal or Qur'anic education (67.9%). Mean parity was 3.5 ± 3.6 (range 0–12). Primiparous and multiparous women each accounted for 32.1% of deaths. Most (57.1%) had booked for antenatal care, over half at primary health centers. Socio-demographic characteristics are in Table 1.

Table 1: Socio-demographic characteristics of maternal death cases at RSFUTH ($n = 28$) — Part 1

Variable	n	%
Age (years) (<i>Mean $\pm$ SD = 26.50 ± 8.58; Range = 16–44</i>)		
15–25	15	53.6
26–35	8	28.6
36–45	5	17.8
Residence		
Rural	19	67.9
Urban	9	32.1
Occupation		
Homemaker	26	92.8
Civil servant	1	3.6
Student	1	3.6
Education		
No formal or Qur'anic education	19	67.9
Primary	0	0.0
Secondary	5	17.9
Tertiary	2	7.1
Unknown	2	7.1

Table 1 continued — Part 2

Variable	n	%
Parity (<i>Mean $\pm$ SD = 3.50 ± 3.62; Median (IQR) = 3 (1–5); Range = 0–12</i>)		
Nulliparous	3	10.7
Primiparous	9	32.1
Multiparous	9	32.1
Grandmultiparous	7	25.0
Antenatal booking status		
Booked	16	57.1
Primary HF [†]	9	56.2
Secondary HF [†]	5	31.2
Tertiary HF [†]	2	12.5
Unbooked	8	28.6
Unknown	4	14.3

HF = Health Facility; IQR = Interquartile Range.

[†]Percentage of booked cases ($n = 16$), not of total sample.

Three-quarters (75%) of maternal deaths were attributed to direct causes. Hypertensive disorder of pregnancy (32.1%) was the commonest cause, closely followed by puerperal sepsis (28.5%). All deaths due to hypertensive disorders and PPCM occurred in women aged 15–25 years. Half of sepsis deaths (50%) occurred in women aged 26–35 years, and most (66.7%) haemorrhage deaths in women aged 36–45 years. Statistically significant associations were found between cause of death and both age ($p = 0.011$) and parity ($p = 0.008$). See Tables 2 and 3.

Table 2: Causes of maternal mortality at RSFUTH ($n = 28$)

Cause of maternal death	n	% total
Direct causes ($n = 21$, 75.0%)		
Hypertensive disorders (HDP)	9	32.1
Eclampsia [†]	6	22.1
Severe pre-eclampsia [†]	3	10.7
Puerperal sepsis	8	28.5
Obstetric haemorrhage	3	10.7
Antepartum (APH) [†]	2	7.1
Postpartum (PPH) [†]	1	3.6
Peripartum cardiomyopathy (PPCM)	3	10.7
Indirect causes ($n = 7$, 25.0%)		
Anaemia	1	3.6
Amniotic fluid embolism	1	3.6
Pulmonary embolism	1	3.6
Sickle cell disease	1	3.6
Pharyngo-tonsillitis	1	3.6

APH = antepartum haemorrhage; PPCM = peripartum cardiomyopathy; PPH = postpartum haemorrhage.

[†]Percentage within cause group, not of total sample.

Table 3: Association between cause of maternal death, age group, and parity ($n = 28$)

Variable	HDP (n=9)	Sepsis (n=8)	Haem. (n=3)	PPCM (n=3)
Age group (years)				
15–25	9	2	0	3
26–35	0	4	1	0
36–45	0	2	2	0
Parity				
Nulliparous	0	0	0	2
Primiparous	5	2	0	1
Multiparous	4	3	0	0
Grandmultiparous	0	3	3	0

HDP = hypertensive disorders of pregnancy; Haem. = obstetric haemorrhage; PPCM = peripartum cardiomyopathy.

Fisher's exact: age vs. cause $p = 0.011$; parity vs. cause $p = 0.008$.

Causes with $n = 1$ each (anaemia, amniotic fluid embolism, pulmonary embolism, sickle cell disease, pharyngo-tonsillitis) excluded from cross-tabulation due to insufficient cell counts.

Most women had sought care elsewhere before presenting at RSFUTH (85.8%), and were critically ill at admission (82.1%). Most (87.5%) delivered in a hospital, and 75% of deaths occurred postpartum. Mean admission–death interval was 62.85 ± 88.2 hours (range 1.5–408 h); 57.1% died within 1–7 days. Mean dis-

tance travelled was 72.01 ± 57.3 km (range 3–192 km); 35.7% travelled >100 km. Table 4 shows details.

Table 4: Place of care, clinical condition, pregnancy period at death, admission–death interval, and distance travelled ($n = 28$)

Variable	n	%
Place of initial care		
None (self-referral)	2	7.1
Study hospital (RSFUTH)	2	7.1
Other hospitals	24	85.8
Primary HF [†]	7	29.2
Secondary HF [†]	15	62.5
Tertiary HF [†]	1	4.2
Private HF [†]	1	4.2
Health condition at admission		
Stable / mildly ill	5	17.9
Critically ill	23	82.1
Pregnancy period at time of death		
Antepartum	4	14.3
Intrapartum	3	10.7
Postpartum	21	75.0
Place of delivery[‡] ($n = 24$)		
Home	3	12.5
Hospital	21	87.5
RSFUTH [§]	7	33.3
Referring hospital [§]	13	61.9
Other [§]	1	4.8
Admission–death interval ($Mean \pm SD = 62.85 \pm 88.2$ h; Range 1.5–408 h)		
<24 hours	8	28.6
1–7 days	16	57.1
8–14 days	3	10.7
≥15 days	1	3.6
Distance: home to hospital ($Mean \pm SD = 72.01 \pm 57.3$ km; Range 3–192 km)		
<5 km	3	10.7
5–50 km	8	28.6
51–100 km	7	25.0
>100 km	10	35.7

HF = Health Facility; RSFUTH = Rasheed Shekoni Federal University Teaching Hospital.

[†]Percentage of patients referred from other hospitals ($n = 24$).

[‡]Denominator $n = 24$; 4 patients had no recorded place of delivery.

[§]Percentage of hospital deliveries ($n = 21$).

Contributory factors to maternal death included: absence or inadequate treatment of pregnancy complications (60.7%), lack of essential equipment and facilities (46.2%), delay in deciding to refer (42.8%), no antenatal care (21.4%), home delivery (14.3%), delay

in decision-making or getting permission (10.7%), and lack of midwifery skills (7.1%).

Discussion

The MMR observed was extremely high at 3,906 deaths per 100,000 live births, exceeding state and national figures (Okonofua et al., 2017; Sharma et al., 2017). This is not unexpected, as RSFUTH serves as a referral center for complicated obstetric emergencies. More than three-quarters of patients were referred after receiving care elsewhere and were critically ill upon arrival. Previous research has similarly documented higher MMRs in referral centers (Hussein et al., 2016; Okonofua et al., 2017, 1992; Oladapo et al., 2016). The MMR here surpasses those of Ahmadu Bello University Teaching Hospital (2,564 per 100,000) and Aminu Kano Teaching Hospital (969 per 100,000) (Ntoimo et al., 2018), likely due to their longer establishment, better infrastructure, and intensive care availability.

Maternal mortality was highest in the 15–25-year age group. Evidence shows mixed findings on age and mortality risk, with some studies reporting higher risks at the extremes of reproductive age (Adamu et al., 2003) and others identifying increased risk in older women (Kassebaum et al., 2014).

Hypertensive disorders emerged as the leading cause of death, all in women aged 15–25 years. Obstetric haemorrhage was predominantly in women aged 36–45 years. Significant associations were found between cause of death and both age and parity. Pharyngotonsillitis may have contributed to indirect maternal mortality by precipitating sepsis in a physiologically vulnerable pregnant woman; van den Akker et al. (2017) notes that indirect maternal deaths from medical conditions aggravated by pregnancy remain important contributors.

More than two-thirds of deaths were among rural women. Mean distance to care was 72.01 ± 57.3 km, with one-quarter travelling >100 km. Long distances delay emergency obstetric care, reduce antenatal utilization, and increase home deliveries (Kibret et al., 2023). Improving rural infrastructure, emergency transportation, and community awareness would significantly reduce mortality.

Ntoimo et al. (2018) identified lack of antenatal booking, referrals from lower-level facilities, and grand multiparity as risk factors — all observed here. Antenatal care quality at rural primary health centers was likely

suboptimal (Fagbamigbe and Idemudia, 2015; Azodoh et al., 2021). Referral delays from secondary facilities were also a major contributing factor.

The main limitation is the single-center design and small sample size, limiting generalizability. Nonetheless, this provides important baseline data for a newly established teaching hospital.

Conclusion

The MMR at RSFUTH is extremely high. Leading causes were hypertensive disorders of pregnancy and puerperal sepsis. Key contributory factors included inadequate clinical management, equipment shortages, poor infrastructure, and referral delays. Priority interventions should target rural infrastructure improvement, emergency transport systems, and strengthening emergency obstetric care at secondary facilities.

What is Known About Maternal Mortality

- This study provides the first hospital-based MMR estimate at RSFUTH since its establishment as a teaching hospital, offering baseline data to inform obstetric emergency services policy.
- Hypertensive disorders were the leading cause of death predominantly among younger women, while obstetric haemorrhage occurred exclusively among older, higher-parity women, with significant age and parity associations confirmed.
- Over two-thirds of deaths occurred among rural women; mean distance to the referral hospital was 72.0 ± 57.3 km, with approximately one-quarter travelling >100 km.

Authors' Contribution

AAH initiated and designed the study. AAH and ASM were involved in literature search and synthesis. AAH and UAA were involved in data collection and statistical analysis. AAH, MR, and ZB were involved in critical revision of the manuscript. All authors approved the final draft.

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Conflict of Interest

The authors declare no conflict of interest.

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