■ **Original Research Article**

Maternal Mortality: A Two-Decade Review of Cases in a Tertiary Health Centre in North Central, Nigeria

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Abstract

Background and setting: Maternal mortality is a catastrophe associated with pregnancy resulting in the loss of life of a woman; and is a global indicator of the obstetrics performance of a centre. This study reports the maternal mortality in National Hospital Abuja, a 400-bed tertiary public hospital located in the cosmopolitan city of Abuja the capital of Nigeria, a low resource country. **Aims**: To determine the ratio, aetiology and cause of Death, presentation, and management of maternal deaths in National Hospital Abuja (NHA), North Central Nigeria. **Materials and method**: All patients with 'pregnancy associated mortality' (54 in number) in NHA for the period of twenty years were retrospectively reviewed against the total live birth of 29,389 in the same period. **Results**: During the twenty - year period the maternal mortality ratio was found to be 184 per 100,000 Live Births. The mean age of the patients was 31.46 years ± 5.7 with mean gestational age of 30.34 weeks ± 9.6. Most (57.4%) of the maternal deaths were in the age range of 30-39 years and 87% were unbooked patients. Majority of the deaths (77.8%) were in the third trimester and most of the patients were of low parity. The commonest underlying cause of death was pre-eclampsia/eclampsia. **Conclusion**: Maternal mortality ratio from our facility is low when compared with national data. These deaths were found mostly among unregistered patients and were commonly caused by pre-eclampsia/eclampsia with haemorrhage coming closely second. The post-mortem examination rate for maternal mortality is low. Strengthening the secondary health care facility in the zone as well as early referral of cases could help curtail maternal death.

Keywords: Maternal mortality, aetiology & causes of death, preeclampsia/eclampsia, post-mortem, north central Nigeria.

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Introduction

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" is termed as 'Maternal Mortality'. It is a global tragedy which claims the lives of approximately 810 women on daily basis.[1] In 2020, up to 287 000 women succumbed to pregnancy and delivery complications globally, with majority of these deaths (95%) occurring in low-resource settings.[2]

The most common measure of maternal mortality is the Maternal Mortality Ratio (MMR) which is defined as "the number of maternal deaths during a given time period per 100,000 live births" [2] As at 2017, Country-specific MMR estimates ranged from 3 (Finland) to 1360 (Sierra Leone) maternal deaths/100,000 live births.[3] Fifteen countries were considered to be "very high alert" or "high alert" being a fragile state (South Sudan, Somalia, Central African Republic, Yemen, Syria, Sudan, the Democratic Republic of the Congo, Chad, Afghanistan, Iraq, Haiti, Guinea, Zimbabwe, Nigeria and Ethiopia), these areas are regarded as the most dangerous places in the entire world for women to give birth. While Nigeria represents only 2.4 per cent of the world's population, it presently contributes 10 per cent of global deaths for pregnant mothers with recent figures showing a maternal mortality rate of 576 per 100,000 live births, the fourth highest on Earth.[4]

About 25% maternal deaths worldwide occur antepartum, another 25% occur intra partum and immediately postpartum, approximately 33% were sub-acute and delayed postpartum deaths, and the remainder were late deaths.[5] In Sub-Saharan Africa, however, significant variation in timing was observed, by country and region.[6] A population-based study in Lagos, Nigeria, using a sisterhood method revealed that 31.5% of reported maternal deaths occurred during pregnancy, 44.1% occurred during delivery and 24.3% within 6 weeks of delivery.[7]

A direct maternal death is one resulting from obstetric complications of pregnancy, labour, delivery, or the postpartum period, and from interventions, omissions, incorrect treatment, or a chain of events related to the obstetric complication while indirect deaths result from pre-existing disease (e.g. cardiac disease, malaria, tuberculosis, HIV) or a new disease that develops during pregnancy and is unrelated to pregnancy-related conditions but is aggravated by the physiologic effects of pregnancy (e.g. influenza). Direct obstetric deaths are more common than indirect obstetric deaths (86 and 12 per cent, respectively).[5]

In Nigeria, the poor maternal health indices are largely due to preventable causes related to poverty, illiteracy, lack of knowledge, delay in reaching health facilities either due to inaccessibility, poor roads and communication networks, poor transportation systems or long distances to be covered as well as delays in receiving appropriate care at health facilities.[5,8-10] Therefore, to change the narrative concerted efforts should be directed at improving the accessibility, availability, affordability and care quality of all the maternal health indices.

In 2015, the Federal Ministry of Health recommended that all health facilities providing maternal care should conduct a periodic review on maternal deaths, surveillance as well as response using a template designed by the World health Organization.[1,5,11] This was updated in 2016 to include Perinatal Death Reviews, while the initiative was re-titled Maternal and Perinatal Death Surveillance and Response (MPDSR). The data provides an effective means of monitoring and improving on health system performance required for sustained prevention of maternal mortality in Nigeria.[5] The current lack of substantive data on the circumstances under which women die in this country will be mitigated by periodic reviews like this with aim of reversing the unpleasant trend. [5,12,13]

This study is to determine the ratio, aetiology, and presentation of maternal deaths in National Hospital Abuja (NHA), North Central Nigeria.

Materials and Method

This is a retrospective cross-sectional study conducted in National Hospital Abuja - a 400-bed tertiary public hospital located in the cosmopolitan city of Abuja the capital of Nigeria, a low resource country. During the twenty-year period between 2000 and 2020, all patients with 'pregnancy associated mortality' (54 in number) had their case records retrieved and reviewed against the recorded total number of livebirths.

Those patients that register with the institution and has had at least one antenatal follow up clinic attendance are regarded as 'booked' patients while the unregistered patient who might have had antenatal attendance elsewhere but did not present a medical of history of such and presented to us in self-referral or intuitional referral are regarded as 'unbooked' patients of the institution.

The cause of deaths was generally determined via WHO Verbal autopsy (combination of clinical history, examination, and presentation) as only few had post-mortem autopsy done.

Statistical analysis was performed using the SPSS version 23. Continuous data was presented as means +- SD, while categorical data was presented

as percentages. Test of significance was with Fisher's exact test and the level of significance was at P< 0.05.

Results

Fifty-four (54) maternal deaths were recorded out of a total live birth of 29,389 over the period of 20 years giving a maternal mortality ratio of 184 per 100,000; 95% CI [136/100000,232/100000]. The mean age of the patients was 31.46 years $\pm$ 5.7 with mean gestational age of 30.34 weeks $\pm$ 9.6.

Most (57.4%) of the maternal deaths were in the age range of 30-39 years and 87% were unbooked patients. Majority of the deaths (77.8%) were in the third trimester and most of the patients were of lower parity (Table 1)

Table 1. Demographic and Obstetric Characteristics of the Patients

Variable	Frequency/Percentage (n=54)
Age	
● 20-29	19(35.2)
● 30-39	31(57.4)
● 40-49	4(7.4)
Ethnicity	
● Hausa	10(18.5%)
● Igbo	12(22.2%)
● Yoruba	6(11.1%)
● Others	12(22.2%)
● Not recorded	14(25.9%)
Booking status	
● Booked	6(11.1%)
● Unbooked	47(87%
● Not recorded	1(1.9%)
Parity	
● Nullipara	11(20.4%)
● Para 1/Para 2	22(40.7%)
● Para 3/Para 4	17(31.5%)
● Para 5/Para 6	4(7.4%)
Trimester	
● First trimester	5(9.34%)
● Second Trimester	7(13%)
● Third Trimester	42(77.8%)
Pregnancy Type	
● Singleton	50(92.6%)
● Twin	2(3.7%)
● Not applicable*	2(3.7%)

*First trimester abortion

There were more cases for each cause of death in the unbooked when compared to the booked patients though the difference did not reach statistical significance (Table 2)

Table 2. Distribution of the Cause of Maternal Death by Booking Status

Variable	Booked (N=6)	Unbooked (N=47)	Fishers Exact Test	P-Value
Haemorrhage	2(15.4%)	11(84.6%) 5(100%)	0.314ª	1.00
Sepsis	0(0%)	16(88.9%) 1(100%)		
Preeclampsia/Eclampsia	2(11.1%)	1(100%) 7(87.5%)		
Obstructed Labour	0(0%)	6(85.7%)		
Unsafe abortion	0(0%)			
Indirect	1(12.5%)			
Not determined	1(14.3%)			

P < 0.05 - statistically significant

Overall, the highest underlying cause of death (33.3%) is preeclampsia/eclampsia with the highest toll among the 30 – 39 age cohort (38.7%) and exacting the highest third trimester mortality (38.1%). Among the 20 – 29 age group however, haemorrhage is the highest cause of death (31.6%). This is depicted in Table 3.

Variable	Haemorrhage	Sepsis	PEC/Eclampsia	Obstructed Labour	Unsafe Abortion	Indirect	Not Determin
Age							
● 20-29	6(31.6%)	2(10.5%)	5(26.3%)	1(5.3%)	0(0%)	3(15.8%)	2(10.5%)
● 30-39	7(22.6%)	1(3.2%)	12(38.7%)	0(0%)	0(0%)	6(19.4%)	5(16.1%)
● 40-49	0(0%)	2(50.0%)	1(25.0%)	0(0%)	1(25.0%)	0(0%)	0(0%)
Trimester							
● First	1(20.0%)		0(0%)	0(0%)	1(20.0%)	2(40.0%)	1(20.0%)
● Second	1(14.3%)	0(0%)	2(28.6%)	0(0%)	0(0%)	2(28.6%)	1(14.3%)
● Third	11(26.2%)	1(14.3%) 4(9.5%)	16(38.1%)	1(2.4%)	0(0%)	5(11.9%)	5(11.9%)

Obstructed labour and Unsafe abortion contributed the least associated causes of death (1% each) (**Figure 1**)

Most of the patients (42.59%) died within 24 hours of admission (**Figure 2**) while only 3.7% died beyond seven (7) days of hospital stay.

Post-mortem examination was performed in only 2 (3.7%) of the mortalities, it was not done in 35.2% while records could not be traced in 61.1%.

This study was set out to determine the maternal mortality ratio, causes and presentation of maternal deaths in National Hospital Abuja (NHA), North Central Nigeria.

We identified fifty-four (54) maternal deaths out of a total live birth of 29,389 within the study period giving a maternal mortality ratio of 184 per 100,000.
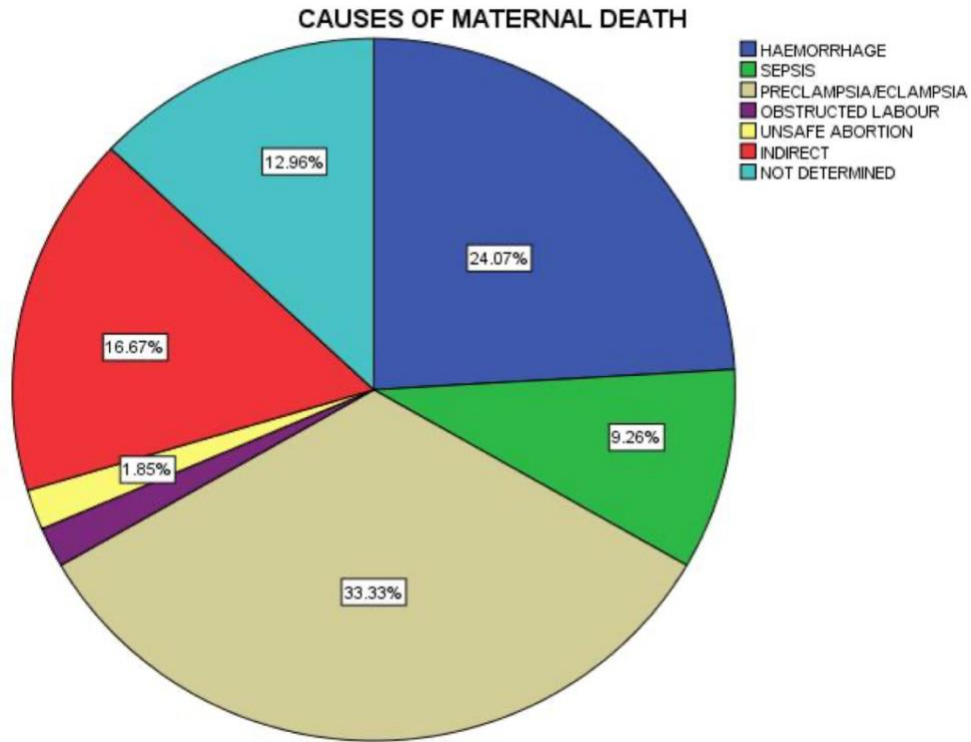
CAUSES OF MATERNAL DEATH

Legend:
- HAEMORRHAGE
- SEPSIS
- PRECLAMPSIA/ECLAMPSIA
- OBSTRUCTED LABOUR
- UNSAFE ABORTION
- INDIRECT
- NOT DETERMINED

Pie chart values:
- 24.07%
- 9.26%
- 33.33%
- 1.85%
- 16.67%
- 12.96%

Figure 1. Pie Chart showing Causes of Maternal Death

LENGTH OF HOSPITAL STAY

Bar chart (Percent vs Length of Hospital Stay):
- < 24HOURS: 42.59%
- 24 HOURS to < 48 HOURS: 27.78%
- 48 HOURS to 7 DAYS: 22.22%
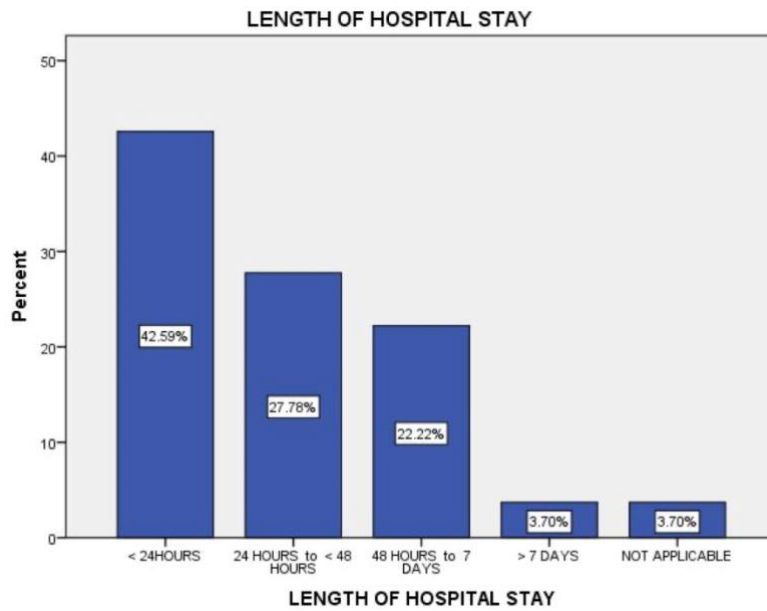- > 7 DAYS: 3.70%
- NOT APPLICABLE: 3.70%

Figure 2. Bar Chart showing Length (duration) of Hospital stay before Maternal Death

Discussion

This is far below the national average of 814 per 100,000 live births reported by the World Health Organization (WHO).[5,8] as well as figures from other regions of the country.[9,11,12] Up-to-date figures show a maternal mortality rate of 576 per 100,000 live births.[4] Our low figure may be attributable to the fact that National Hospital as a tertiary health institution is relatively better equipped with more skilled personnel and infrastructural resources compared to most other health facilities in the country. Patients self-referred or referred from secondary health facilities can easily reach our centre as it's situated in the city centre, however, the sub optimal referral system and lack of documented data on the MMR in this secondary facility serve to limit the comparative analysis.

Furthermore, causes related to poverty, illiteracy, lack of knowledge, delay in reaching health facilities either due to inaccessibility, poor roads, poor communication networks, poor transportation systems or long distances to be covered as well as delays in receiving appropriate care at health facilities may be minimal.

Previous studies including those from other developing countries have confirmed an inverse relationship between community wealth and maternal death.[14-24] In Nigeria, although it has been found by a Multiple Cluster Indicator Survey in 1999 that significant differences in the levels of maternal mortality between zones in the North and South exist (in South-West, MMR was reported as 166 maternal death per 100,000 live births compared to 1549 maternal deaths per 100,000 live births in the North-East)[5,8] a more recent national multi-centre study[25] conducted in eight referral hospitals in eight states, in four out of the six geopolitical zones of the country showed a rather high MMR of 2,085 per 100,000 live births (range: 877 – 4,210 per 100,000 births). Significant contributing factors identified by the authors included delivery in secondary facilities, non-booking status, referral from lower-level health facilities, multiparity, grand-multiparity and past experiences of early pregnancy loss.

The mean age of the patients was 31.46 years (SD 5.7); up to 20.4% were nulliparous, majority (72.3%) were multiparous (parity 2-4) and 87% were unbooked patients (in the facility). This is in contrast with the recent findings from a multi-centre study across the country where the mean age of the deceased patients was 28.5 years (SD 5.5); 31% were nulliparous and 37.3% were multiparous (parity 2–4) and close to 40% never booked for antenatal care.[5] Our finding are the first of such study in this centre and environment

and this will serve as point for future similar studies. The long duration spanning 2 decades remains a strength and as the finding reflects what is obtainable in most socioeconomically developing and developed societies whereby women often participate in labour force making early childbearing and grand multiparity less common.

Our findings regarding the immediate antecedent and underlying causes of death concurs with national data in which 70 percent of maternal deaths are due to one of five complications: haemorrhage, infection, unsafe abortion, hypertensive diseases of pregnancy, and obstructed labour.[21,25,28] Pre-eclampsia/eclampsia was the commonest overall cause of death (33.33%) followed by haemorrhage (24.07%), then indirect deaths (16.67%) and sepsis (9.26%). Up to 12.96% of the recorded deaths were from undetermined causes, this could be partly due to the low post-mortem examination rate; consequently, missing a significant number of certain covert causes of deaths like pulmonary and amniotic fluid embolisms. Obstructed labour and unsafe abortion contributed the least (1% each) of maternal deaths during the period of review. Overall, the result obtained from our study is replicated in other climes. A multicentre systemic review of maternal deaths in 115 countries (60,799 deaths) determined that haemorrhage accounted for 27.1%, hypertensive disorders 14.0%, and sepsis 10.7% of maternal deaths.[5] The rest of deaths were due to abortion (7.9%), embolism (3.2%), and all other direct causes of death (9.6%). Regional estimates varied substantially, for instance, while in the UK thrombosis and thromboembolism continue to be the leading cause of direct deaths, conversely more than one-third of maternal mortalities in the US were attributable to cardiovascular conditions (15.5% of total MM).[5]

Furthermore, a recent study in Ethiopia showed similar trend in which the leading causes of the direct maternal deaths were hypertensive disorders of pregnancy (32.5%), postpartum haemorrhage (25%), sepsis (10%), pulmonary thromboembolism (7.5%) and amniotic fluid embolism (7.5%). In Latin American and the Caribbean, hypertensive disorders constitute a significant cause of maternal mortalities accounting for 22.1% (95% CI 19.9% CI- 24.6%) of all maternal mortalities in the region.[19] Another direct cause, embolism, accounted for more deaths than the global average in South-eastern Asia and Eastern Asia, 12.1% (95 percent CI 3.2%- 33.4%) and 11.5% (95% CI 1.6% CI- 40.6%), respectively.

Our study also revealed that up to 87% of the women were not booked for antenatal care in our facility, 42.59% and up to 96% died within 24 hours and 7 days of admission respectively. The access to records of the unbooked hitherto their arrival in our facility constitutes a huge challenge coupled with less acceptance for post mortem autopsy in this environment. Most of the death in this category of patients were from haemorrhages, sepsis, and hypertension related complications. Indeed; a study in Canada determined that prolong length of hospital stay (and re-admission) emanate mainly from post-partum haemorrhage, major puerperal infections and hypertensive disorders further highlighting the increased morbidity and mortality risk associated with these conditions even in advanced centres.[26] This short duration of hospital stay denotes that these women were either self-referred or were transferred from other health facilities in a poor clinical state when the probability of their survival despite timely intervention is low. Delay in seeking appropriate health care help, delay in appropriate referral, and lack of prompt transport from home to health facilities as well as institutional factors have generally been found to be avoidable factors contributing to maternal death.[27-30]

Conclusion

In conclusion, maternal mortality ratio from our facility is low when compared with national data. These deaths which were found mostly among unregistered patients were commonly caused by preeclampsia/eclampsia with haemorrhage coming closely second. The post-mortem examination rate for maternal mortality is low. Strengthening the secondary health care in the zone as well as early referral of cases could help curtail maternal death.

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