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Original Research Article

Maternal mortality statistics and risk factors at a tertiary hospital in Makurdi, Nigeria

Samuel K. Hemabh-Hilekaan*, Eka P. O., Maanongun M. T., Unazi U. E.

Department of Obstetrics and Gynecology, Benue State University Teaching Hospital, Makurdi, Benue State, Nigeria

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***Correspondence:**

Dr. Samuel K. Hemabh-Hilekaan,

E-mail: hemhilsk@yahoo.com

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ABSTRACT

Background: To determine the magnitude of maternal mortality and its major causes including the trend and social demographic factors associated with the problem in our environment.

Methods: A retrospective institutional review of all the case notes of maternal mortality at the Benue State University Teaching Hospital, Makurdi over a six-year study period, from July, 2012 to June, 2018 were computed and analyzed.

Results: A total of 2,442 deliveries took place within the period under review, out of which 2,325 were live births. Total maternal deaths were 26, giving a total maternal mortality ratio (MMR) of 1,118 deaths per 100,000. The major causes of maternal mortality during this period were unsafe abortion and its complications, hypertensive diseases in pregnancy, puerperal sepsis and obstetric hemorrhage.

Conclusions: Maternal mortality remains very high at our facility, although with a declining trend. This may be a reflection of the situation in the general population. Increased coverage of the National Health Insurance Scheme, blood availability and utilization of antenatal services will further reduce maternal mortality in Nigeria.

Keywords: Makurdi, Maternal mortality statistics, Nigeria, Trends, Risk factors, Tertiary hospital

INTRODUCTION

Maternal mortality also known as maternal death is said to be the death of a woman while pregnant or within 42 days of the termination of pregnancy, irrespective of the duration and the site of the pregnancy from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental cause.¹ It has been the major cause of death among women of reproductive age in many countries and a serious public health challenge especially in developing world.² Maternal mortality became a topical issue following the Nairobi 1987 "Safe motherhood" initiative. Despite the interest it generated globally, not much was achieved. This was followed by the millennium summit in 2000,

with the setting up of the millennium development Goals (MDGs). Although the fifth goal focused specifically on the reduction of maternal mortality by 75% by the end of 2015, this was not accomplished especially in most of Africa.³ According to world Health Organization estimates, about 536,000 women die of pregnancy-related causes annually, and close to 10 million women suffer complications related to pregnancy or childbirth.^{4,5} This is due to the estimated 30 to 50 morbidities both temporary and permanent seen for every maternal death, with approximately 30 to 40% of the about 180 million women who get pregnant annually in the world, or roughly 54 million women reporting some form of pregnancy-related morbidity yearly. Of these an estimate of another 15 million a year develop long-term disabilities from complications of obstetric fistula or

genital prolapse, pelvic inflammatory disease, or reproductive tract infections, uterine scarring, severe anemia as well as infertility.⁶ Globally, maternal mortality ratio has been declining progressively over the past 2 decades from 400/100,000 in 1990 to about 210/100,000 in 2010 which translates to 543000 to 287000, a decline of 47%. This although a positive development, fell short of the 5.5% target of the MDGs by 2015.⁷ The third goal of the newly launched sustainable development goals is therefore targeted to ensure healthy lives and to promote the well-being of all, including women and to reduce the global maternal mortality ratio to less than 70 per 100,000 live births by the year 2030.⁸ How well this will be achieved remains to be seen. The women of Nigeria certainly need help in this area. According to estimates, Nigeria currently has a population of over 180 million. With a birth rate of 5.5 births per woman, this is projected to reach 440 million people by 2050 with a growth rate of 3.2% annually.⁹ Nigeria health indices are one of the worst worldwide. Nigeria ranks second to India, in absolute number of maternal deaths and contribute about 10% of all global maternal deaths with the mortality ratio ranging between 800-1800 per 100,000 live births. It is estimated that about 60,000 maternal deaths occur annually in Nigeria with varying geographic and regional areas and between urban and rural areas. The northern part of the country generally has worse indicators.¹⁰

Maternal death may be due to a lot of factors ranging from primary medical causes such as abortions, preeclampsia/eclampsia, obstetric hemorrhage, sepsis, and ectopic pregnancy to secondary causes (anemia, heart disease, malaria and respiratory tract illness) and some underlying causes which contribute by causing delays in accessing health care. These include patient factors, factors from the community and those within the health facility. It is known that Nigeria has a weak health system from policy formulation and implementation to delivery of services. This is made worse by the socio-economic factors and cultural orientation of the population.

It is because of this that, we set out to study the maternal mortality ratio at Benue State University Teaching Hospital, Makurdi, North central Nigeria which we believe will be a reflection of the environment in which it is located. This is because measuring maternal mortality is difficult and complex, especially, in low resourced sub-Saharan African countries like Nigeria, with numerous socio-economic, cultural and infrastructural barriers.¹¹ A relatively basic set of interventions can dramatically reduce the rates of PPH, including skilled care before, during and after childbirth, active management of the third stage of labor and in many cases, administration of uterotonics.¹²

Our objectives in this study was to determine the institutional maternal mortality ratio, the major contributory factors and the demographic variables accounting for the high and rising trend, despite the

Federal government effort to reduce it through many programs such as free antenatal care services for all pregnant women and the midwives service scheme for rural areas, all aimed at improving the maternal mortality ratio and the living standard of the average Nigerian woman.

METHODS

Benue State University Teaching Hospital is located in Makurdi, North Central Nigeria. It was officially commissioned by President Goodluck Jonathan in 2012 as a tertiary health care institution located just next to the Benue State University, about 3 kilometers along Makurdi Gboko road. It is a 350 bed hospital engaged in tertiary health care and involved in the training of both undergraduate and postgraduate medical doctors. The department of Obstetrics and Gynecology has a bed capacity of about 40 beds, with a well equipped theater adjacent to the labor ward, an emergency gynecology unit, postnatal, gynecology and obstetrics wards. The hospital also has a well equipped neonatal and intensive care unit (ICU).

This was a hospital based six year retrospective study from July, 2012 to June, 2018. The case records of all pregnant women who died in our center within the study period were retrieved and information on age, parity, booking status, causes of death were entered onto a data form designed for the study and analyzed. The cases were identified through the labor ward, postnatal ward, intensive care unit (ICU), gynecological emergency unit and the theater records. Those whose records could not be traced were excluded from the study. Causes of mortality were classified according to the tenth revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10)¹³. Where there was more than one cause of death, priority was given to the major primary cause as recorded in the case note. Deaths occurring between 42 days and one year after pregnancy and delivery, incidents that were due to direct or indirect maternal causes although a recognized entity were not included in this study.¹³ Maternal mortality was calculated by dividing the total maternal death by the total number of live births recorded within the study period multiplied by 100,000. The pattern of maternal mortality for each year was also calculated. The results were computed using frequency and descriptive methods of SPSS software version 25 and presented by simple statistical tables. The study was approved by the hospital Ethical committee.

RESULTS

Table 1 shows the yearly variation of maternal mortality ratio in the period under review. A total of 26 maternal deaths occurred among 2,325 live births within the six year study period. This gave a maternal mortality ratio (MMR) of 1,118 deaths per 100,000 live births. The highest ratio of 2,072 deaths per 100,000 was found in

the first year of the study (July 2012- June 2013) which also corresponded with the first year of operation of the Benue State University Teaching Hospital, Makurdi. There was a gradual and consistent fall in the trend of maternal mortality over the next five years. The least observed yearly maternal mortality ratio of 787 deaths per 100, 000 births was seen in the fifth year of the study

period (July 2016-June 2017), which was followed with a slight rise in the sixth year. The observed rise in maternal mortality in that year may be due to strike actions by hospital workers, lack of adequate information to women on the importance of antenatal care and reduced governmental budgetary support for health education and other health services.

Table 1: Year of death, live births and maternal mortality ratio.

Year of death	Frequency	Percentage (%)	Live births	MMR
July 2012-June 2013	4	15.4	192	2,072
July 2013-June 2014	5	19.2	406	1,231
Jul 2014-June 2015	5	19.2	302	1656
July 2015-June 2016	4	15.4	450	889
July 2016-June 2017	4	15.4	508	787
July 2017-June 2018	4	15.4	466	858
Total	26	100.0	2,325	1,118

Total maternal mortality ratio= $26/2,325 \times 100,000 = 1,118$ per 100,000 live births.

Table 2: Socio-demographic characteristics and maternal mortality.

Variables	Frequency (N=26)	Percentage (%)
Age		
14-19	2	7.7
20-24	6	23.1
25-29	6	23.1
30-34	4	15.4
35-39	7	26.9
40-44	1	3.8
Ethnicity		
Tiv	19	73.1
Idoma	5	19.2
Igbo	1	3.8
Hausa	1	3.8
Educational status		
Uneducated	1	3.8
Primary	7	26.9
Secondary	9	34.6
Tertiary	9	34.6
Occupation		
House wife	10	38.5
Farmer	6	23.1
Trader	3	11.5
Student	3	11.5
Teacher	2	7.7
Others	2	7.7

Table 2 shows that majority (26.9%) fell within the age bracket of 35-39. The mean age is 28.62, with a standard deviation of 6.853.

Table 2 shows the association between maternal socio-demographic characteristics and maternal deaths. The

mean age of women who died during pregnancy and childbirth in the study period was 28.62 (SD=6.85) with a range of 18-40 years. There were two peaks of maternal mortality recorded with a majority (30.8%) of the deaths among those ≤ 24 years and among those (26.9%) mothers who were ≥ 35 years old. The low maternal mortality of 7.7% seen within the teenage age group may not have been representative of the population and could be due to the initial low delivery rate in the hospital. Tiv and Idoma ethnicity was one of the strong predictors of maternal death. This may also have been because they were the two dominant local tribes within the study area. Although literature have shown that the higher the level of western education, the less likely is a woman to have a maternal death, lack of education and low educational status (primary school) only accounted for 30.7% of maternal deaths in this study. Majority of maternal deaths were literate with 34.6% having secondary education and another 34.6% with tertiary level education. The high level of education among these women may have been as a result of the fact that many women considered the BSUTH as an elite hospital with major patronage by the educated middle and high class individuals. The study convincingly demonstrated that, occupation of women was a major factor influencing maternal mortality, with women in the lower socio-economic group (farmers, traders and house wives) contributing 73.1% to maternal mortality in the period under review. Although most (76.9%) of the women were booked for antenatal care, yet a significant number (23.1%) remained unbooked and contributed to maternal mortality in this study. Low parity and vagina delivery were also observed to be predictors of mortality (Table 3).

The annual case fatality observed within the study period is highlighted in Tables 4 and 5. The leading direct cause

of obstetric death in the facility was unsafe abortion which accounted for 42.3% of all deaths, while hypertensive diseases in pregnancy, puerperal sepsis and hemorrhage made up 23.1%, 11.5% and 3.8% respectively.

Table 3: Parity, booking status and mode of delivery.

Variables	Frequency (N=26)	Percentage (%)
Parity		
Para 0	5	19.2
Para 1	4	15.4
Para 2	8	30.8
Para 3	6	23.1
Para 4	3	11.5
Booking status		
Unbooked	6	23.1
Booked	20	76.9
Mode of delivery		
Vaginal	25	96.2
Abdominal	1	3.8

The indirect causes of death were liver disease 7.68% while heart disease, wound sepsis and molar gestation contributed 3.84% respectively. There was a significant relationship ($p < 0.037$) in Table 6 between booking status and educational status in relation to maternal death (p

Table 6: Association between booking status and educational status.

Variables	Educational status				Chi-Square	P Value	
	Uneducated	Primary	Secondary	Tertiary			
Booking status	Booked	0	0	1	5	8.474	0.037
	Unbooked	1	7	8	4		

Table 6 showed that there is a significant relationship between booking status and educational status in relation to maternal death (p value < 0.05).

Table 7: Association between parity and direct causes of maternal mortality.

Variables	Direct causes of maternal mortality				Chi-Square	P Value
	Abortion and complications	Hypertensive diseases in pregnancy	Puerperal sepsis	Hemorrhage		
Parity	Para 0	4	0	0	24.417	0.081
	Para 1	1	1	0		
	Para 2	4	1	3		
	Para 3	2	3	0		
	Para 4	0	1	0		

Table 7 showed that there is no significant relationship between parity and direct causes of maternal mortality (p value > 0.05).

value $= 0.05$). However, there was no significant relationship ($p > 0.081$) between parity and direct causes of maternal mortality (p value > 0.05) as indicated in Table 7.

Table 4: Direct causes of maternal mortality.

Variables	Frequency	Percentage (%)
Unsafe abortion and complications	11	42.3
Hypertensive diseases in pregnancy	6	23.1
Puerperal sepsis	3	11.5
Hemorrhage	1	3.8
Total	21	80.8

Table 5: Indirect causes of maternal mortality.

Variables	Frequency	Percentage (%)
Liver disease in pregnancy	2	7.68
Heart disease in pregnancy	1	3.84
Wound sepsis/septicemia	1	3.84
Molar gestation	1	3.84
Total	5	19.2

DISCUSSION

This study showed a maternal mortality ratio of 1118 deaths per 100,000 live births at Benue State University Teaching Hospital, Makurdi, which is very high. This is however lower than 1381/100,000 live births found by

Alobo et al, and is much less than 2337/100,000 in another study by Ochejele et al, both studies in a similar facility in Makurdi.^{7,14} The maternal mortality ratio is also similar to that found in Jos (1010/100,000 deliveries) in 1994 in the same region of North Central, Nigeria.¹⁵ The results of maternal mortality ratio in Nigeria vary

according to the region, with results of 454/100,000 live births in Benin, South West, 1400/100,000 in Enugu South East, 1625/100,000 in Kano, North West, 2849/100,000 in Nguru and 1732/100,000 in Bauchi both in north East Nigeria.¹⁶⁻²⁰ The maternal mortality seen in this study is higher than the estimate for Africa of 1000 per 100,000 deliveries.¹⁰ The trend however, showed an overall consistent drop in the yearly maternal mortality over the years from 2072 maternal deaths (2012-2013) to 787 deaths (2016-2017) with a slight rise in the third and sixth years. The slight rise could be explained by the drop in the total number of deliveries at the center in the period, which may have been due to strikes by workers at the center. The observed falling trend in mortality is consistent with the global trend and the views expressed by Mairiga et al even if the decrease is quite modest.^{7,21,22} This finding differs from the earlier observed rising trend by Ujah from 1990-1994 within the same region and the fluctuating but consistent rise seen in Maiduguri Teaching Hospital from 2002 to 2004 by Audu et al.^{23,24} This may have been as a result of the combined improvement in health facilities, education and the socioeconomic status of the people over time. However, the observed non-static or undulating pattern of maternal mortality at the center is similar to the observation by Adamu et al, in a population based study.¹¹ This also shows that maternal mortality is a dynamic process common in all human activities and that it may exhibit outbreaks even in facility based institutions and not only necessarily with in populations as highlighted by Adamu et al.

The direct causes of maternal death accounted for 80.8% of the cases while indirect causes were 19.2% as shown in Tables 4 and 5 respectively. The leading cause of maternal death in this study was unsafe abortion and its complications which accounted for 42.3% of total maternal deaths. This is similar to the finding by Alobo et al in the same city and region and to those in the southern part of Nigeria where illegal abortion and hemorrhage are leading causes of maternal mortality.^{7,11,25} This is also contrary to another report in northern Nigeria where abortion related maternal deaths were the least 19 and to the documented evidence that hemorrhage was the leading cause of maternal mortality in the developing countries such as Nigeria.

The second observed cause was hypertensive disorders (23.1%) unlike other parts of northern Nigeria where eclampsia and hemorrhage are the leading causes of death in the region among pregnant women.^{19,24,26}

Puerperal sepsis (11.5%) and hemorrhage (3.8%) formed the least of the direct causes of maternal mortality. This may be as a result of early hospital access, use of antibiotics and adequate availability of blood supply from the National Blood Transfusion Service, which has a large pool of blood available for distribution to hospitals all over the country. Among the indirect causes of maternal death, liver disease constituted the highest

7.68% and justifies the continuous screening for hepatitis and other related infections during the prenatal period.

The study findings indicated that maternal mortality is most common (61.5%) at the two extremes of reproductive life of ≤ 24 and ≥ 35 years as already shown in other similar studies, although teenage deaths made up only 7.7% in our study.^{11,15,20} The low contribution of mortality from teenagers may be due to the urban and so called elite nature of the facility, making it difficult for those in the lower socioeconomic group mostly represented by the rural and agrarian population to access services. The fee paying nature of the hospital with a higher relative cost per service may have compounded the problem. The high mortality noted within the two extremes of the population may also be due to immaturity and increasing age and prevalence of medical disorders and increasing parity generally observed in the population.

Ethnicity was a high predictor of maternal mortality in our study with the highest deaths among women of Tiv (73.1%) and Idoma (19.2%) tribes. This was a similar finding in a study in Maiduguri where women of Kanuri/Shuwa ethnic group constituted the highest mortality followed by Babur-Bura.²⁴ Thus ethnicity was a high predictor of mortality in our study. It will be interesting to look at the influencing demographic variables that made ethnicity an important determinant of mortality, but it is most likely that the ethnic groups also constitute the highest proportion of patients as indigenes of the locality.

Although illiteracy is closely related to maternal mortality, most of the deaths in this study were literate with illiterate group making up only 3.8%. It has been shown that many women dying in Nigeria are illiterate and those of low socioeconomic status.^{27,28} Our finding may be due to the urban nature of the facility, socio-cultural and economic status of the people and the environment prevalent in the society at the time. Health facility factors can also not be ruled out as likely contributors to maternal mortality ratio in this study. Lower parity (≤ 2) and unbooked status contributed significantly to mortality as commonly found in other studies while vagina delivery was a major determinant of mortality in our study. Although issues of delays involving the patient, transportation and other institutional bottlenecks were not explored here, it is our belief that all these may have contributed in no small measure to the overall maternal mortality seen in this study.

CONCLUSION

The overall maternal mortality ratio in our hospital is very high, although the yearly trend appears to be falling. Direct causes of death such as abortion and its complications, hypertensive disorders, sepsis and hemorrhage still account for most of the maternal deaths.

Use of modern contraceptive services, antenatal clinic (ANC) services, and a deliberate effort at increasing access to healthcare by extending coverage of the National Health Insurance Scheme (NHIS) to the middle and low income earners in Nigeria, and the increased availability of blood through the National Blood transfusion Service will likely lead to a steady decline in maternal mortality all over Nigeria.

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