AJAS / SPAS

ISSN 2316-0861

African Journal of Applied Statistics
Vol. 4 (1), 2017, pages 183–191.
DOI: http://dx.doi.org/ajs/2017.183.209

Maternal Mortality and Associated Obstetric Risk Factors at Mother and Child Hospitals, Ondo State, Nigeria

Ewemooje, Olusegun Sunday[1,*], **and Omoniyi, Olasumbo Omotebi**[1]

[1]Department of Statistics, Federal University of Technology, Akure, Nigeria.

Received February 15, 2017; Accepted July 1, 2017; Published Online : August 28, 2017

Abstract: Maternal Mortality was discussed in this study with associated obstetric risk factors in order to examine its perceived determinants and contribution of mortality rate was calculated as 381 deaths/100 000 live births. Simple descriptive analysis, Chi-square Independent test and spatial analysis were applied on 6-year study from which 33 615 deliveries resulting in 128 perinatal deaths. The maternal fetal death, Antepartum Haemorrhage and Eclampsia were found to significantly causing 13.7%, 12.9% and 12.9% maternal deaths, respectively. For every unit increase in the mother's age, the risk of being involved in maternal deaths increases with caesarean section as the leading risk factor. The Mother and Child Hospitals have helped in reducing the Maternal Mortality by about 51% in the state from 745 per 100 000 live births in 2009 to 381per 100 000 live births in 2016.

Key words: Maternal Mortality; Obstetric Risks; Parity; Population; Spatial Analysis.
AMS 2010 Mathematics Subject Classification : 62-07; 62-09; 62H11.

Presented by Prof Gane Samb LO, Gaston Berger University and African University of Sciences and Technology (Sénégal & Nigeria)
Editor in Chief, Elected member of ISI.

*Corresponding author Ewemooje, Olusegun Sunday: osewemooje@futa.edu.ng
Omoniyi, Olasumbo Omotebi : omoniyisumbo@gmail.com

Résumé (French). Dans ce papier, nous discutons étudions la mortalité maternelle par rapports aux facteurs de risque obstétrique associés afin d'examiner et de déterminer ses déterminants. Celle-ci est estimée dans nos données à 381 décès sur 100 000 naissances vivantes. Une analyse descriptive simple, puis des tests de Chi-deux assiciés à une analyse spatiale ont été appliqués sur une étude de 6 ans, couvrant 33 615 accouchements avec 128 décès périnatals.

1. Introduction

The Global clarion call is to improve maternal health (*Millenium Development Goal (MDG) 5*) and reduce child mortality rates (*MDG 4*). Maternal mortality remains a universal challenge as approximately 289 000 maternal deaths occurred in 2013 worldwide, and the maternal mortality ratio in developing countries is 14 times greater than in developed regions [Finlay *et al.* (2015), The Guardian Newspaper (2016)]. From 1990 to 2013, the global maternal mortality ratio (MMR) reduced by 45% but the targets for (MDG 5) were not realised by many Sub-Saharan African countries [WHO (2014)]. Therefore, considering that 2015 has ended, it is imperative to not only strengthen efforts but also understand why past interventions have not yielded anticipated outcomes [Kyei-Nimakoh *et al.* (2016)]. Nigeria, a Sub-Saharan African country, with an estimated population of about 188.14 million [Countrymeters (2016)] has witnessed an increase in the maternal deaths in the last five years (2010 – 2015) with proportion of maternal deaths among deaths of female reproductive age increasing from 22.6% to 25.6% [WHO (2015)]. Hence, the country did not meet its target of a 75% reduction in MMR by the end of 2015 as stipulated in the MDG 5.

Maternal death which is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes needs to be looked into with great seriousness. In spite of all efforts made, maternal and child health remains a challenge to the healthcare delivery system in low-income and middle-income countries [Awasthi *et al.* (2016)]. As stated by World Health Organisation (WHO) in the 2005 world health report "Make Every Mother and Child Count" [WHO (2005)], the major direct causes of maternal deaths are severe bleeding/haemorrhage (25%), Pre-eclampsia (13%), unsafe abortions (13%), infections (12%), obstructed labour (8%) other direct causes (8%) and indirect causes 20%. Maternal deaths and disabilities are leading contributions in women's disease burden with an estimated 275,000 women killed each year in childbirth and pregnancy worldwide in 2011 [Koblinsky *et al.* (2012)], 45% of postpartum death occur within 24 hours while over 90% of maternal deaths occur in developing countries.

According to World Bank (2015), Sierra Leone has the highest Maternal mortality rate of 1 360 deaths/100 000 live births in Africa, this is followed by Central African Republic with 882 deaths per 100 000 live birth and then Chad has 856 deaths per 100 000 live births while Nigeria recorded the 58 000 maternal deaths resulting in maternal mortality ratio of 814 per 100 000 live birth in 2015 [WHO (2016)]. This shows that in year 2015, maternal

deaths account for 25.6% of the deaths among the female reproductive age in Nigeria. Nigeria and India account for over one third of all estimated global maternal deaths in 2015, with an approximate maternal deaths of 58 000 19% and 45 000 15% respectively [WHO (2015)].

These developments are strong motivation to proceed on analysis of determinants of maternal mortality. The results of such an analysis would serve as a basis for explaining the partial failures of current policies and perhaps will lead to new strategies towards attaining better results. In this context, we will proceed with our research on data provided by Mother and Child Hospitals in Ondo state, Nigeria. For a reminder, Nigeria is a conglomeration of 36 states and the federal capital territory of the country. Ondo state, which is one of the states in Nigeria, contributes significantly (745 deaths/100 000 live birth in 2009) to this horrible situation as it has the highest infant and maternal mortality rate in the South West Nigeria until year 2009 which brought about the establishment of Mother and Child Hospitals in the state. These hospitals were run with the aim of achieving the MDG's 4 and 5 to reduce child mortality by 67% and maternal mortality by 75% by 2015 as well as run for integrated, qualitative, critical and referral services for pregnant women, nursing mothers and children under five years old. As year 2015 has come and gone, there is need to measure the impact of the Mother and Child Hospitals program in the state. The results of our study are expected to be extrapolated on a nationwide area.

2. Materials and Methods

2.1. Description of Study Area

Ondo state lies between latitudes $5^o45'$ and $7^o52'$ North and longitudes $4^o20'$ and $6^o05'$ East in the South West region of Nigeria. Its land area is about 15,500km2 and it is bordered with Ogun and Osun States to the West, Edo and Delta States to the East, Ekiti and Kogi States to the North while the Gulf of Benin and the Atlantic Ocean completes its southern borders. It has a population of 3 441 024 according to 2006 Nigerian population and housing census. This study is a retrospective review of maternal death cases that occurred in Mother and Child Hospitals, Ondo state between January 2010 and December 2015.

2.2. Data Collection and Analysis

The case files of all women were retrieved from the Medical Records Department of the hospital and data extracted into a study pre-format focusing on socio-demographic and obstetric characteristics including age, parity, occupational status, booking status and season of delivery before death as well as cause of death where applicable. Descriptive statistics of the potential risk factors of the study period were analyzed. Spatial analysis was also conducted to identify the core location of the affected people in order to detect their medical challenges in relation to diagnosed causes of maternal deaths. Data entry and analysis were carried out using Tableau and SPSS. Chi-square was used to test for association between variables at 0.05 level of significance. Results were also expressed as percentages and presented in tables and charts.

3. Results and Discussions

3.1. Socio-demographic and Obstetric Characteristics

The distributions of socio-economic, demographic and variables inducing maternal mortality as observed from the result of the analysis show that education background has a strong relationship with maternal deaths. One hundred and ten, 110 (85.9%) patients were married women vis-à-vis the level of education, 90 (70.3%) of the women had at least a secondary level while just one (1) had no formal education. As their level of education increases to tertiary, the maternal deaths reduce to 19(14.8%). Unskilled workers (52.3%) were shown to be more prone to maternal deaths than the professionals and skilled workers (23.4%) as seen in Table 1.

The age group 35 years and above recorded the highest maternal deaths of 42 (33.1%), followed by 30 – 34 years of 33 (26%) while the least was recorded by 15 – 19 years. This suggests that as the age increases, the risk of women being involved in maternal deaths increase. The booking status (Antenatal care status) also reveals that 99 (77.3%) of the patients were unbooked for antenatal care while only 29 (22.7%) were booked. Caesarean section which include the electronic and emergency caesarean sections recorded the highest 50 (39.1%) among other mode of delivery while still birth recorded the least 1 (0.8%).

The majority of the patients 89 (59.6%) were at least on their second pregnancy. 77(60.2%) of the death occurs during wet season while 51(39.8%) occurs in dry season. Antepartum/Obstetric Haemorrhage (*APH*), Eclampsia, Pregnancy Induced Hypertension (*PIH*) and Postpartum Haemorrhage (*PPH*) occur more significantly in wet season than dry season while Intrauterine Fetal Death (IUFD) occurs more significantly during dry season than wet season (see Figure 1).

3.2. Maternal Mortality

Thirty Three Thousand, Six Hundred and Fifteen (33,615) deliveries resulting in 128 maternal deaths were recorded during the study period in Mother and Child Hospital, Ondo state giving a maternal mortality ratio of 381 per 100 000 live births. The result authenticates the claim of the Ondo state commissioner of health who reported that the Mother and Child Hospitals have helped in reducing the Maternal Mortality from 745 per 100 000 live births in 2009 to about 317 in 2016 [The Guardian Newspaper (2016)]. There was much variability in the annual maternal death toll while maximum number 28 (21.9%) of maternal deaths was recorded in year 2010.

Figure 2 show that Akure area of the state had the highest number 90 (70%) of deaths recorded, Idanre area 13 (10%), Igbara-oke area 6 (5%), akoko area 5 (4%) while the least were recorded for Iwaro Oka, Ore and Owena-Akure areas with 1 (1%) death each. Most of the recorded death cases are patients who reside in Akure, the state capital. This is not far fetch from the fact that the population of the Akure is far more than other parts of the state.

Table 1. Socio-Demographic Pattern of Deaths

	Characteristics	Cases N (%)
Age (years)	15-19	12 (9.4)
	20-24	11 (11.00)
	25-29	26 (20.5)
	30-34	33 (26.0)
	≥ 35	42 (33.1)
	0	39 (30.5)
	1	19 (14.8)
	2	24 (18.8)
	3	20 (15.6)
	4	15 (11.7)
	≥ 5	11 (8.6)
Educational background	None	8 (6.3)
	Primary	30 (23.4)
	Secondary	71 (55.5)
	Tertiary	13 (14.8)
Occupation Status	Professional and skilled	30 (23.4)
	Unskilled	67 (52.3)
	Unemployed	31 (24.3)
Booking status (Antenatal status)	Booked	29 (22.7)
	Unbooked	99 (77.3)
Season of Delivery	Dry (November-March)	51 (39.8)
	Wet (April-October)	77 (60.2)
Mode of delivery	Breech Delivery	5 (3.9)
	Ceasarean Section	50 (39.1)
	Forceps delivery	9 (7.0)
	Spontaneous Virginal delivery	35 (27.3)
	Still birth delivery	1 (0.8)
	Not recorded	28 (21.9)

3.3. Causes of Maternal Deaths

The major cause of the maternal deaths in the state is PPH as it account for 20.2% of the total causes as shown in Figure 3. This is followed by IUFD with 13.7%, APH and Eclampsia have 12.9% each while the least was recorded for placenta praevia, prolonged pregnancy and preterm labour with 0.8% each. Other causes of maternal as recorded are sepsis, obstructed labour, prolonged labour, PIH, chemical poisoning, breech presentation, Anaemia, Malaria in pregnancy and postpartum eclampsia.

PPH is the most prevalence cause of maternal death in Akure as it account for 23.6% of all causes of deaths in the city. Therefore, Akure accounts for 84% of the PPH diagnosed. IUFD accounts for 40% of total causes of maternal deaths in Akoko area of the state as the highest while Eclampsia and obstructed labour account for 20% each in Idanre area to rank highest.

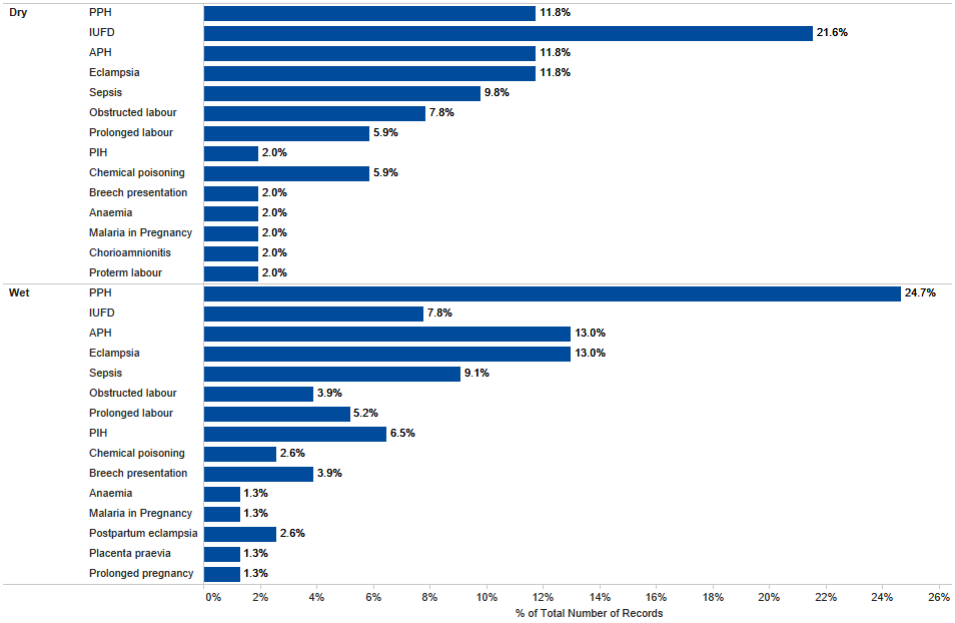

Fig. 1. Diagnosed Causes of Maternal Deaths by Season

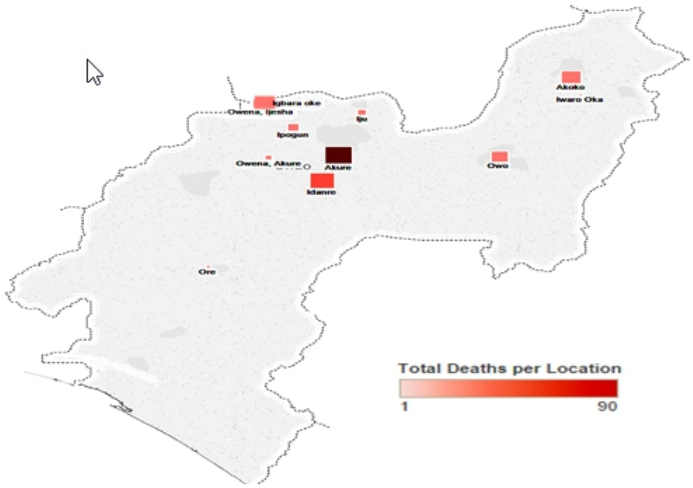

Fig. 2. Map of Ondo State Showing Maternal Deaths as Recorded by Mother and Child Hospitals

3.3.1. Relationship between age and causes of death

The hypothesis is stated as follows;

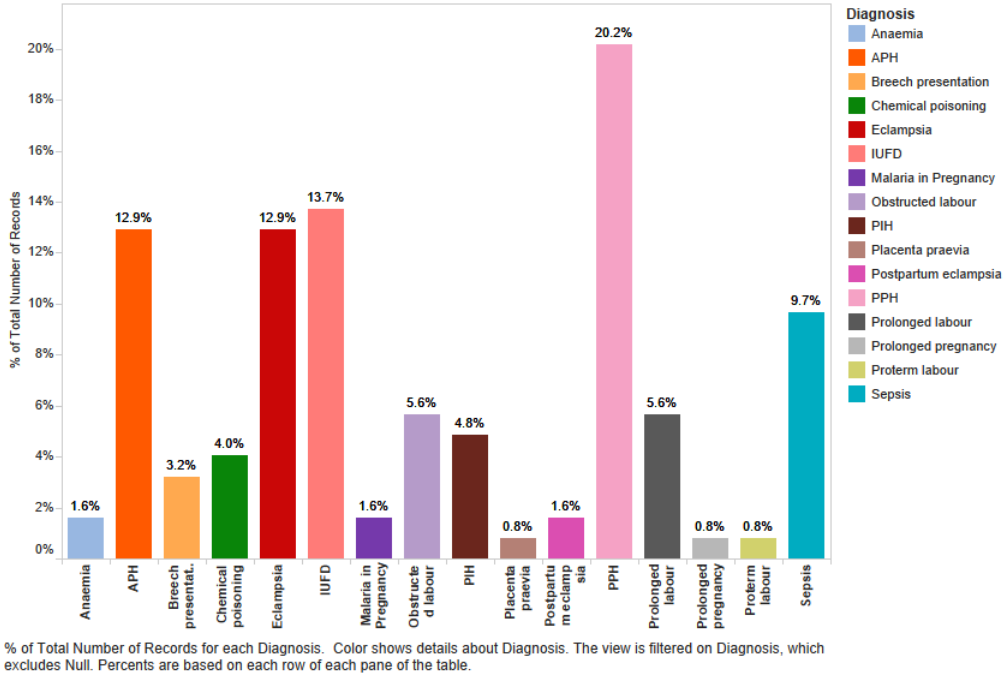

Fig. 3. Prevalence of Causes of Maternal Deaths

H_0 : The cause of maternal death is independent on age
H_1 : The cause of maternal death is not independent on age

Table 2. Pearson's Chi-square Test for Independence

	Cause of Death	Asymptotic Value	Significant (2-sided)	Decision
AGE	Eclampsia	3.513	0.48	Not significant
	Sepsis	20.221	0.00	Significant
	Haemorrhage	11.224	0.02	Significant
	Ruptured Uterus	2.137	0.71	Not significant
	Obstructed labor	2.355	0.67	Not significant
	Others	2.535	0.64	Not significant

The result of the analysis is given in the Table 2, this shows that the Sepsis and Haemorrhage are dependent on age of the women while eclapsia, raptured uterus, obstructed labour and others are not dependent on age. Hence, as the women advance in age, they are more prone to Sepsis and Haemorrhage as causes of maternal death. It was also observed that as parity or gravidity increases, the tendency of the women having sepsis increases.

4. Conclusion

Maternal age, parity, gravidity, occupational status and season of delivery are the major risk factors associated with the occurrence of maternal mortality. Since an increase in maternal age increase the likelihood of the maternal deaths, hospital management are hereby advised to pay more attention to mothers above the mean age (30yrs) during delivery. Caesarean section being a leading risk factor should be properly done by specialists to reduce the chances of maternal mortality. In general, women who had a lower occupational status were more prone to maternal mortality than those with a higher status. Mothers who were unbooked for antenatal care also had a higher risk of death. This may be because they only present at the hospital when they have severe, sometimes life threatening, complications. In conclusion, the Mother and Child Hospitals have helped in reducing the Maternal Mortality by about 51% in the state from 745 per 100 000 live births in 2009 to 381 per 100 000 live births in 2016.

Hence, it is recommended that other states in the federation (Nigeria) should key into establishing specialized hospitals to take care of mothers and their children in order to reduce overall mortality rate in Nigeria. Then, this study can be extended to cover more states in the country.

References

Awasthi A., Pandey C.M., Chauhan R.K. and Singh U.(2016). Disparity in maternal, newborn and child health services in high focus states in India: a district-level cross-sectional analysis. *BMJ Open 6:e009885*, DOI: 10.1136/bmjopen-2015-009885.

Countrymeters(2016). Nigeria population. Website: (*http://countrymeters.info/en/Nigeria*). Visited 2016/09/23.

Finlay J.E., Moucheraud C., Goshev S., Levira F., Mrema S., Canning D., Masanja H. and Yamin A.E.(2015). The Effects of Maternal Mortality on Infant and Child Survival in Rural Tanzania: A Cohort Study. *Maternal and Child Health Journal*, ISSN 1092-7875. DOI 10.1007/s10995-015-1758-2

Koblinsky M., Chowdhury M.E., Moran A., Ronsmans C.(2012). Maternal morbidity and disability and their consequences Neglected Agenda in Maternal Health. *Journal of Health Popul Nutr.* 30(2), 124 – 130.

Kyei-Nimakoh M., Carolan-Olah M. and McCann T.V.(2016). Millennium development Goal 5: progress and challenges in reducing maternal deaths in Ghana. *BMC Pregnancy and Childbirth.* DOI 10.1186/s12884-016-0840-0.

The Guardian Newspaper. (2016), Ondo records 75% reduction in maternal deaths. Website: (*http://guardian.ng/news/ondo-records-75-reduction-in-maternal-deaths/*)

World Bank (2015). Maternal mortality ratio (modeled estimate, per 100,000 live births). Website: (*http://data.worldbank.org/indicator/SH.STA.MMRT*)

World Health Organization (2005). The World health report, 2005: make every mother and child count. ISBN 92 4 156290 0

World Health Organization (2014). Trends in maternal mortality: 1990 to 2013. Estimates by WHO, UNICEF, UNFPA, The World Bank and the United Nations Population Division. Geneva.

World Health Organization (2015). Trends in maternal mortality: 1990 to 2015: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. ISBN 978 92 4 156514 1.

World Health Organization (2016). Maternal mortality in 1990-2015, Estimates developed by WHO, UNICEF, UNFPA and The world bank. *www.who.int/gho/maternal_health/countries/nga.pdf*