The spatial patterns of maternal mortality in the core Niger Delta region of Nigeria

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ABSTRACT

Maternal mortality still constitutes serious challenge in many developing countries, especially Nigeria. Hence, this study analyzed the spatial patterns of maternal mortality in the core Niger Delta of Nigeria. Retrospective data were sourced from a government hospital in the respective states and from other secondary sources for an 8-year period (2010-2017). The findings revealed that the ratio of maternal mortality for Bayelsa, Delta and Rivers States were 651.16 per 100,000 live birth, 380.80 per 100,000 live birth and 709.16 per 100,000 live birth, respectively. Based on the result of the Krustal Wallis statistics, of 24.472 and a p-value of 0.000, (i.e. p<0.05), the null hypothesis, which states, "there is no significant variation in maternal mortality ratio in the study area" was rejected and the alternative hypothesis was therefore retained. This implies a significant variation in the maternal mortality ratio across the three states. The Maternal Mortality Ratio (MMR) of 625.9 per 100,000 live births for the core Niger Delta region is very high, The implication of this finding is that if the high maternal mortality rate is unchecked, it will act as a push factor of migration of women from the core Niger Delta region, This will invariably lead to a drop in the revenue of the government. The researchers recommend that government, health centres, women organizations, religious groups, Non-Governmental Organization (NGO) and other stakeholders should organize programmes aimed at creating public awareness on maternal health, Unqualified/unskilled health personnel should be trained and Government's support intensified in the region.

Keywords: *Core Niger delta, Live birth, Maternal mortality, Mortality ratio, Spatial variation, Sustainable development goal.*

Highlights of this paper

- The paper examines spatial patterns of maternal mortality ratio in the core Niger Delta Region of Nigeria.
- The study found out that maternal mortality is high in the region as a whole but there are variations among the states.
- The authors recommends training and retraining of medical personnel and awareness programe in order to reduce the maternal mortality ratio.

1. INTRODUCTION

Mortality is one of the important determinants of population structure and growth. Its impact on economic development cannot be over-emphasized. Mortality differs among males and females age groups, but among females, it is higher among women within the child bearing age cohort 15-49 years old (Olomo & Sajini, 2011). This age cohort is usually the economically active one. High mortality in this group signifies a great loss in the Gross Domestic Products (GDP) and the other index of development (World Health Organization, 2014). The death of women in child bearing age literary represents maternal mortality; however, it must be related to pregnancy. World Health Organization (2012) described maternal death professionally as "the death of a woman while pregnant or death within 6 weeks of giving birth, irrespective of the duration and site of pregnancy, from any cause arising from the pregnancy". Maternal mortality is very high in developing countries, despite several efforts made by the government to reduce the ratio; it is still far from the main target (Idowu, 2013).

There is disparity in maternal mortality ratio across the globe with developing regions accounting for 99% of such maternal mortality cases. African countries accounted for about 50% of maternal death cases in the world (CIA World Fact Book, 2014; Kalipeni, Iwelunmor, & Grigsby-Toussaint, 2017). South Sudan led with 2,054 deaths per 100,000 live births, while Nigeria recorded a maternal mortality ratio of 630 per 100,000 live births. The ratio has reduced in most countries but it is still high in Nigeria. This high occurrence of maternal mortality in Nigeria is of great concern as she is blessed with abundant natural resources and famously acclaimed the "giant of Africa" (World Health Organization, 2014). A global annual reduction of 5.5 per cent in maternal mortality ratios (MMR) between 1990 and 2015 was required to meet the target of Millelium Development Goals (MDGs) 5. However, figures published by WHO UNICEF UNFPA World Bank and UN Population Division (2015) revealed that Nigeria , which constitutes just 1.7% of the world's population, accounted for 10% of the world's maternal mortality ratio at an annual decline of less than l percent.

The incidence of maternal death is a disaster and a sorry situation, which has rendered many children motherless, depriving them of motherly and affectionate care, which could negatively influence their physiological, emotional and mental development. The high occurrence rate of maternal mortality in Africa despite countless interventions to reduce it has rendered the phenomenon a shocking demographic challenge in the region. Approximately, 800 women die worldwide during child birth daily, for each death, 20 or more women suffer injury or disability in pregnancy and childbirth (United Nations Population Fund for Africa, 2012).

The implications of these high risk and estimates of maternal mortality are the reductions of human resources, which will invariable lead to the overall threat to rapid development of the country. As one of the global efforts, the MDGs focused its attention and activities on improving the well-being of all populace.

Globally, maternal mortality ratio reduced from 380 per 100,000 live births in 1990 to 210 per 100,000 live births in 2013. This amounted to 45 percent reduction over the 23 years interval at an annual reduction rate of 2.3 percent. The reduction is quite remarkable, but it is not up to half of 5.5 percent annual reduction rate required to meet the 75% target of the Millennium Development Goals (MDGs) or the 6.4 per cent annual reduction rate required to meet

the 70% reduction in maternal death rate as targeted to meet the Sustainable Development Goals (between 2015-2030). Nigeria is among the top 13 nations globally with high maternal mortality ratio; unfortunately, it is not among the top 10 countries making fast progress to achieve the targets. It is worth knowing that maternal mortality is still rated high in Nigeria, particularly in the core Niger Delta Region.

The women marry or cohabit at early ages, which make them to have many children at the end of their reproductive years and invariably leads to the low level of human and capital development. Previous studies examined the causes of maternal mortality in a particular community; to the best of the authors' knowledge, no study has examined the spatial dimension of maternal mortality, or its temporal dimension in the region. The core Niger Delta region was chosen for this research because the region produces much of the oil resources in the country, the region also generates high revenue for the government but still have high rate of maternal mortality. Therefore, the aim of this study is to examine the spatial variations of maternal mortality in the Core Niger Delta region of Nigeria from the year 2010 to 2017. The objective is to examine the ratio of maternal mortality in each state of the core Niger Delta region. The null hypothesis formulated for this study was: there is no significant spatial variations in maternal mortality ratios in the study area.

1.1. Modernization Theory

The emphasis of modernization theory is on gross national (or domestic) products, economic development, urbanization, health care services and education. Modernization theory further explains the process of modernization within societies.

Economic development increases the standard of living, improved medical care and facilities, which in turn reduces the rate of mortality. Maternal mortality, as an index of health status is expected to reduce when there is an increase in the level of economic development (Inkeles & Smith, 1974; Van & Knodel, 1980).

The rate of maternal mortality in developed nations is from 10-15 per 100,000 live births while developing countries recorded rates of 100-200 more than this number (World Bank, 2015). Maternal death is the worst problem in sub-Saharan Africa and this area recorded the highest maternal mortality ratios globally (World Health Organization, 2010).

Nigeria still records maternal mortality ratios of 630 per 100,000 live births and thus Nigeria is being listed among nations that has recorded the highest ratio of maternal deaths. Inadequate basic social amenities in some places led to increase in maternal mortality. Pregnant women are exposed to dysentery, cholera, typhoid and other infections whenever they drink water that is polluted or lives in dirty environment, this can lead to complications during delivery, as the immune systems can also be weakened (Benova, Cumming, & Campbell, 2014; Save The Children, 2014).

When an area lacks access to basic facilities (good water, toilet etc), some diseases, such as hepatitis E, would be transmitted easily. There can be an outbreak of air and waterborne disease, and this is detrimental to the life of pregnant women (Jamieson, Theiler, & Rasmussen, 2006; Mamaye, 2015).

Emphasis by the Modernization theorist is further placed on the significance of capital for the development in Least Developed Countries (Rostow, 1971). Buor and Bream (2004) found out that a low level of maternal mortality is related to gross domestic product per capita and public health expenditures in sub-Saharan Africa. Modernization theory has been criticized for overemphasizing on economic development of the society and not considering inequality in societies as well as political reasons and class.

However, Shiffman and Okonofua (2007) opined that motherhood be made safer for all women in every class by a set of life-saving strategies that can work even in low resource areas.

2. MATERIALS AND METHODS

2.1. Description of the Study Area

The area scope is the core Niger Delta region of Nigeria, This is the land enclosed by the natural delta of River Niger and River Benue, which are Bayelsa, Delta and Rivers States (Alagoa, 2005; Azaiki, 2003). The core Niger Delta region of Nigeria is located approximately within latitudes 4°15' N and 6°30' N and longitude 4°75' E and 7°36' E (see Figure 1). Content scope is spatial variations of maternal mortality in the core Niger Delta region of Nigeria. Time scope is 8 year (2010-2017). The reason for focusing on this area is that it is characterized by high poverty level, which can invariably leads to high incidence of maternal mortality.
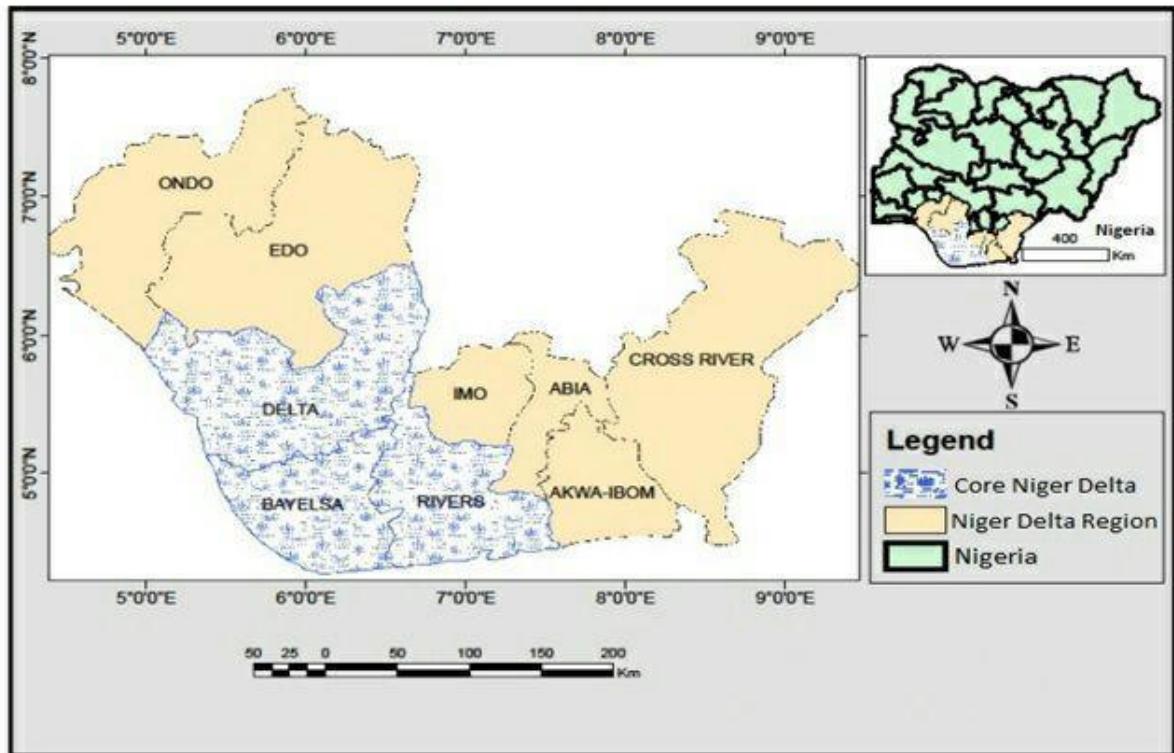

Figure 1. Core Niger Delta States (Study location) in Niger Delta region.

Source: Geography and environmental management cartographic and geographic information system (GIS) Lab (2018).

2.2. Data Collection

Retrospective study and survey research were adopted in this study. Data were obtained from secondary sources. The data were obtained from the hospitals using a proforma. Data collected throuh proforma include: number of maternal death, year of death, month of death, age at death, causes of death etc. Secondary data were collected from journals, internet and books. All the cases of maternal deaths were retrieved from the hospitals chosen for this research with the use of proforma. A government own tertiary hospital was selected in each state, based on accessibilities to pregnant woman and functions. Ethical approval was obtained from the hospital so as to gain access to the patients' file. All the hospitals chosen were therefore accessible and all perform tertiary functions such as teaching, research, treatment and serve as referral hospital to many other hospitals in the area. Data for the assessment of the levels and ratios of maternal mortality was sourced from the record office and labour wards in each hospital. Information was also retrieved from the post natal record and intensive care unit of the hospitals.

245

2.3. Data Analysis

The data generated were presented and discussed using frequency counts, percentages, map and cross-tabulations. The hypothesis, which states that there is no significant variations in maternal mortality ratio in the study area" was analysed using Krustal Wallis statistics at 0.05 significant level with the aid of Statistical Package for Social Scientists (SPSS), version 12.

3. RESULTS AND DISCUSSION

The levels and ratio of maternal mortality were examined. The three states that made up the core Niger Delta region (NDR) were examined separately and the results were used to present the true picture of maternal mortality levels and the ratio in the core Niger Delta. The spatial patterns of mean maternal mortality ratio in the study area are presented in Figure 2.
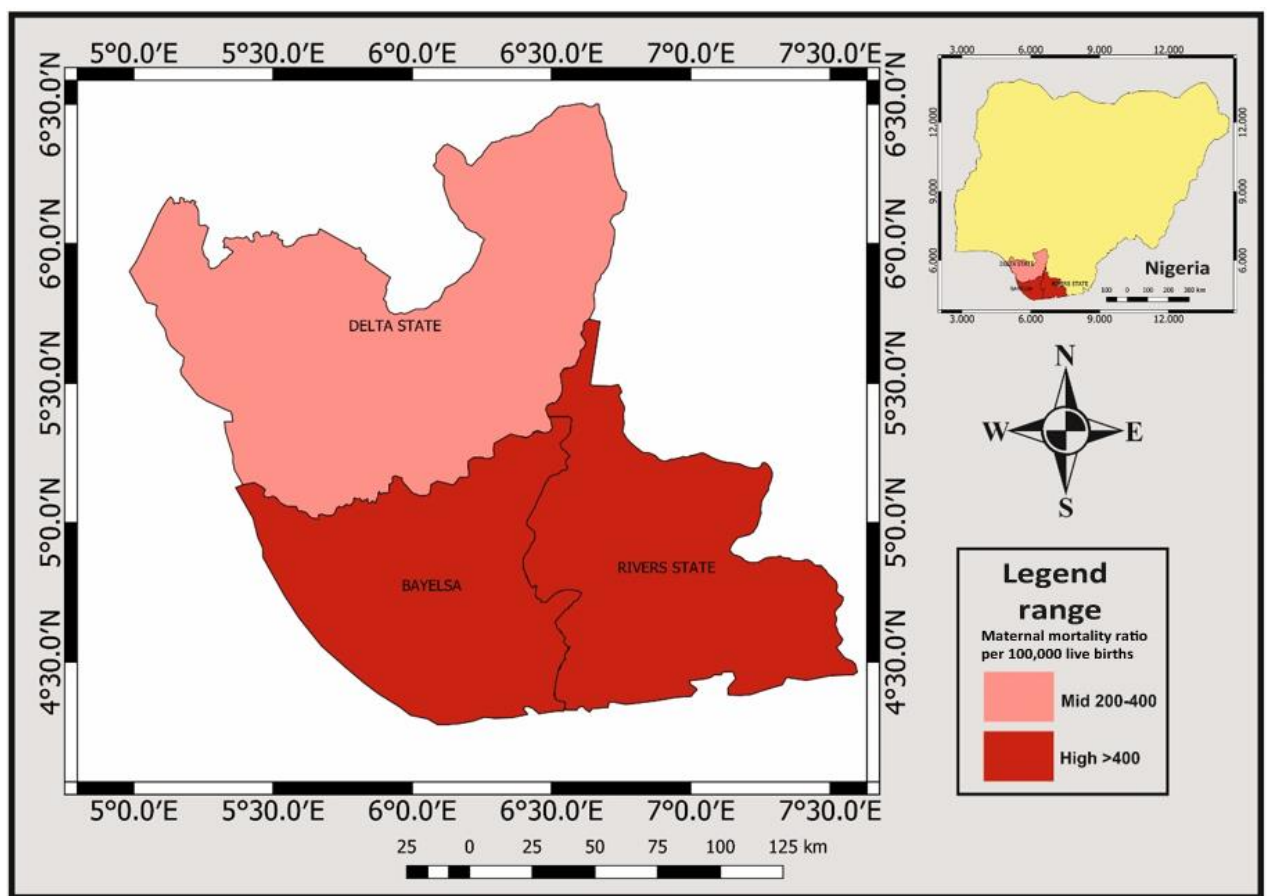
Figure 2. Spatial patterns of mean maternal mortality ratio in the Niger Delta region.

The region has an average MMR of 625.9 per 100,000 live births. The figure depicts that the MMR for Bayelsa and Rivers States falls within the high maternal mortality range, while that of Delta State falls within the medium mortality rate range. The number of live birth and number of maternal mortality level for each year were gotten from the hospitals see (Table 1). This enabled the researchers' to calculate the maternal mortality ratio.

Table 1. Level and ratios of maternal mortality in the study area.

Year	Maternal mortality level	No of live birth	MMR per 100,000
2010	33	4779	690.52
2011	28	4900	571.43
2012	27	4572	590.55
2013	21	5358	391.94
2014	23	4382	524.87
2015	36	3619	994.75
2016	24	3511	683.57
2017	26	3709	701
Total	218	34830	625.9

In Bayelsa State, data on the maternal mortality level were collected from 2010 to 2017. Maternal mortality level was high in 2015 due to the fact that government now focused more on other matters relating to the state because those issues also exert serious health burden on the population. The MMR reduced to 202.43 in 2016, but increased again to 645.16 per 100,000 live births in 2017. The total maternal mortality rate over the period was 651.16 per 100.000 live births.

In Delta State, MMR was generally lower than that of Bayelsa State, throughout the 8 years period. MMR in Delta State was also lower than that of Rivers State over the same period. It is interesting to know that the Delta State Government took special interest in maternal health, providing free medical services for women right from pregnancy to delivery time. Hence, more women embrace this development by registering for ante natal care on time and do not play with the regular ante natal appointments. This tremendous effort has reduced MMR greatly in Delta State. However, the highest MMR occurred in 2017, with MMR of 488 per 100,000 live births and the mean MMR was 251 per 100,000 live births

In Rivers State, the study found out that MMR was high throughout the years under study. The sampled hospital has a good sense of record keeping compare to Bayelsa and Delta States. However, this has not reflected in the reduction of maternal death in the state. In 2012 and 2013, the Government offered some assistance towards maternal mortality reduction, but as the number of pregnant women that turned up in the hospital increases, the support from government had little impact, and as the years passed by, government attention was shifted to other economic, and health related issues in the state.

Generally speaking, the number of cases of maternal death per year is still very high in the core Niger Delta region. This is not in line with the target of the MDGs of 2015 and SDGs. Instead of a reduction in MMR, the core Niger Delta has been witnessing increasing MMR on a yearly basis.

Table 2. Maternal mortality ratio by states.

Year	MMR BAYELSA	MMR DELTA	MMR RIVERS	MMR NDR
2010	756.3	0	891.53	690.52
2011	717.08	297	661.38	571.43
2012	589.01	128	587.42	590.55
2013	697.35	291	345.09	391.94
2014	328.59	465	849.15	524.87
2015	1445.09	216	1692.71	994.75
2016	202.43	203	923.36	683.57
2017	645.16	488	816.74	701
Mean MMR	672.6	251	845.9	643.6
Total MMR	651.16	380.8	709.16	625.9

It could be inferred from the results of the study Table 2, that in Rivers State, the mean MMR was 845.9, which was the highest among the three states, therefore ranking first, while the mean MMR in Bayelsa State was 672.6 per 100,000 live births, therefore ranking second. Ranking third is Delta State with mean MMR of 251.

$$\text{MMR formula} = \frac{\textit{no of maternal death (levels)}}{\textit{no of livebirth}} \text{ x } 100,000 \qquad\qquad 1$$

However, on a comparative basis with the regional MMR, Table 2, the MMR in Delta State (380.8) was way below the regional average, while that of both Bayelsa (651.16) and Rivers (709.16) States were well above the regional MMR.

The hypothesis was tested using maternal mortality ratio:

Hₒ: There is no significant variation in maternal mortality ratio in the study area.

Table 3 shows the result of Kruskal- Wallis Statistic of 24.472 with p-value of 0.000. The probability value was less than 0.05 (p<0.05) for the region.

Table 3. Kruskal- Wallis Statistic (Non- Parametric test) result summary for Niger Delta region.

States	Mean rank (MR)	Kruskal-wallis χ^2 statistic	Df	p-value	Remarks
Delta	7.04	24.472	2	0.0000	S
Rivers	27.96				
Bayelsa	20.51				

Note: S= significant at 5% (p<0.05), df- degrees of freedom.

On the basis of this, the null hypothesis which states "there is no significant variation in maternal mortality ratio in the study area" was rejected and the alternative hypothesis was therefore retained. This means that the maternal ratio varies across the states in the study area. It was noted earlier that the findings from this work agree with what has been established in the literature. It has been noted that the maternal mortality ratio also varies within the country, Africa, and between the developing and developed countries (AMOO, Emmanuel, & Azuh, 2010; Audu, Takai, & Bukar, 2010; Izugbara, Wekesah, & Adedini, 2016; Olamijulo, Olorunfemi, Olaleye, Ogedengbe, & Giwa-Osagie, 2012; Omo-Aghoja, Aisien, Akuse, Bergstrom, & Okonofua, 2010).

The MMR for the NDR (625.90 per thousand live births) was found to be higher than the nation's MMR (560 per 100,000 live births). The findings from this study agreed with the work of Audu et al. (2010), that maternal mortality ratio (430 per 100,000live births) in Maiduguri was high. Olamijulo et al. (2012) also reported a similar scenario of a very high maternal mortality ratio of 2096 per 100,000 live births in Lagos State Teaching Hospital. The findings also correlate with the submission of Ladan (2006), which revealed a high MMR of 1625 per 100,000 live births in Kano state. Conclusively, the finding supports the report of Izugbara et al. (2016) that MMR is generally high in Nigeria, stressing that the women in the country were at high risk. The maternal mortality ratio for the core NDR (625.90 per 100,000 live births) was higher than the National MMR (560 per 100,000 live births) and the sub Sahara African average of 510 per 100,000 live births. The implication of this finding is that if this high trend of maternal mortality should continue, it means the region is lacking better medical care and facilities, then, the health of women in the region would be at risk. There will be tendency for women to migrate from the core Niger Delta to regions within and outside that can provide better medical services, thus depopulating the core Niger Delta the more. The depopulation is not healthy to the region especially if the migrant women are of high status, women, who can contribute to the revenue of the government through paying of tax and other means.

4. CONCLUSION

The ratio and spatial patterns of maternal mortality was determined in each state. MMR for Bayelsa was 651.16 per 100,000 live births. MMR in Delta State was 380.8 per 100,000 live births, while the MMR for Rivers State was 709.16 per 100,000 live births. The MMR for the core Niger Delta was 625.9 per 100,000 live births. The study concluded that there are significant variations in maternal mortality ratio in the study area.

Based on the findings of the study that, maternal mortality is high in the Niger Delta region and varies among the three states, in a bid to reduce the ratios, well below the global average and to meet the target of the SDGs 3, the researchers recommend that: health seeking behaviour of the people especially women should be improved, hospitals should be well equipped with necessary instruments in the delivery room, medical personnel should be trained and retrained constantly and lastly, the relevant stakeholders: religious groups, women leaders, and health workers, should embark on public awareness programmes to educate the women on the need to consult a government-approved medical centre during pregnancy to the time of delivery and after delivery for post natal care.

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249

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