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Assessment of Socio-economic Determinants of Maternal Mortality in Nigeria: A Case Study of Gombe North Senatorial District, Gombe State

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Abstract

Maternal mortality in Nigeria and Gombe state in particular continues to be a serious public health problem and contributes to low life expectancy among women. Sustainable Development Goal (SDG) five focuses on reducing maternal mortality and achieving universal access to reproductive health care. This study examines the socio-economic determinants of maternal mortality in Gombe North. The study adopts descriptive cross-sectional survey design. The population consists of 5, 22, 038 married women of child bearing. It also applies Taro Yamani's statistical formula in selecting the sample size of 400 respondents using stratified and simple random sampling techniques. The data obtain from questionnaire administration are analyzed using descriptive and inferential statistics in the form of binary logistic regression model. The findings of the study reveal that mother's level of education, age of mother, parity, traditional belief system, distance to health care facility, poverty, poor roads transport system and lack of access to maternal health care service are significant social and economic determinants of maternal mortality in Gombe North. The study recommends that girl-child education should be made a priority and encouraged since maternal mortality decreases with an increase in women level of education especially secondary and higher level. There should be continuous awareness and orientation on the need for pregnant women to patronize institutional health care for antenatal and delivery so as to reduce maternal mortality in rural communities.

Keywords: Antenatal, Logistic Regression, Maternal Mortality, Socio-economic Determinants

JEL Code: I00, II4, J14, C01

Contribution/Originality: This study contributes to the existing literature on the socio-economic determinants of maternal mortality in Gombe North, Gombe state, Nigeria. It is also one the scanty studies which investigates socioeconomic determinants of maternal mortality that contributes immensely in revealing the impact of maternal mortality on the economic growth and development discourse.

1.0 Introduction

As postulated by the health-led growth model hypothesis, health is considered as capital on which investment are made in order to bring about increased labour productivity, income, as well as general wellbeing of the populace. This has been practically illustrated in our present-day times wherein low life expectancy and ill-health are responsible for 50 percent of the marked difference in economic growth between developed and developing countries of the world (Ogu & Ephraim, 2017). This is not farfetched as revealed by World Health Organization (2016) that only 1% of maternal mortality case is normally reported for developed countries as against more than 90% of their developing

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counterpart. Thus, represents the largest discrepancy between developed and developing countries in all the health-related statistics.

Sadly, most of the statistics by World Health Organization, United Nations Childrens' Fund and World Bank revealed that 99% of the world's maternal mortality is from Asian continent and Sub-Saharan Africa (WHO, 2017). In particular, the state of high rate of maternal mortality in Nigeria is worrisome. According to United Nations Statistics, an estimated 145 women die daily in Nigeria either during birth or shortly after, making it one of worst countries for women to deliver babies in the world. Available statistics also show that Nigerian's annual maternal death is 59,000 (Akinlola).The situation in Nigeria has called for a serious alarm as the country still records maternal mortality rates in order of 800-1000 per 100,000 live births (National Population Commission, 2015) and thus ranked among the nations with highest number of maternal mortality.

The state of maternal health is one of the key indicators of the societal level of development as well as an indicator of performance of the health care delivery service. Therefore, in Nigeria, an increasing effort is needed in order to meet the fifth target of Sustainable Development Goals (SDGs) which is reducing the global maternal mortality rate by three quarter (75%) per 100,000 live births by the year 2030 (Muhammed & Ruslan, 2020).

Several Studies have been carried out on socio-economic determinants of maternal moterlity in Nigeria such as Shamaki and Amriah (2018), Apanga (2018), Adgoy(2018),Comfort (2018), Owesu (2018), Ogu and Emmanuel (2018), Adetoro (2017),Ahmed and Hyder (2017), Meh (2017) Bhatta, Abbah and charry (2017) Chimanka and Sahoo (2017), Ibrahim (2016), Harrison (2016), Isah and Igbekoyi (2015),Ugwu and Kok (2015), Derothy and Clifford (2014) Adeusi Adekeyi and Ebere (2014), Joseph and Uche (2014) and Fabamwo and Okonnofua (2010). However, most of these studies utilized secondary data and even content analysis. Thus, this study used primary data sourced through administration of questionnaire.

Furthermore, many socioeconomic determinants of maternal mortality have been identified in the literature in other places unlike Gombe State; there is need to conduct a study in Gombe being one of the North Eastern States where a maternal death of 160 women was recorded in 2018 (Gombe State Primary Health Care Development Agency, 2018). However, majority of the studies conducted in Nigeria concentrated on medical causes or determinants of maternal mortality with little concern on non-medical causes such as socio-economic determinants of maternal mortality. Therefore, the aim of this study is to examine the socioeconomic determinants of maternal mortality in Gombe North Senatorial District of Gombe State. This is because more than 70% of maternal mortality cases in Gombe State is accounted by Gombe North Senatorial District as reported by Gombe State Primary Health Care Development Agency (2018).

Numerous studies have been conducted on the determinants of maternal mortality to mention, but a few are Shamaki and Amriah (2017) which examined the socio-cultural determinants of maternal mortality in Sokoto. Another study by Muhammed and Ruslan (2020) which looked at the trends and determinants of maternal mortality in Jigawa State. While Confort (2018) explored the social and cultural factors associated with maternal mortality in Ekiti state, Nigeria. Each of these studies has some short comings. Therefore, this paper bridges the gap by using primary data and Gombe State as the study area.

The rest of the study is structured into four sections. Section two presents literature review, while section three focuses on methodology of the study. Empirical results and conclusion are presented in section four and five, respectively.

2.0 Literature Review

2.1 Theoretical Framework

The theory adopted by this study is health inequality theory**.** This theory is an advancement of the Grossman's theory of Health outcome developed by two health economists called Galama and Van in 2010. According to the proponents, the theory has a lot to offer in terms of informing and directing researches into health inequality that dominates most of the developing countries. The theory also helps in identifying a mechanism through which specific socio-economic indicators and health interact.

The theory argues that health is a basic necessity of life. Inequality in health constitutes inequalities in people's capability to function. The right to the highest attainable level of health is enshrined in the Charter of the World Health Organization (WHO) and in many International Treaties (e.g. Article 25 of the Universal Declaration of Human Rights). Yet, majority of people especially in developing countries do not enjoy health that is biologically possible; socially and economically disadvantaged generally experienced worse health outcomes.

Health inequality is not only an infringement of equity; the avoidable mortality and morbidity of lower socio-economic groups also impedes their productivity and threatens to undermine economic growth and prosperity at large. It is therefore necessary for all developing countries to make their primary goal an establishment of health policies that aim at reducing health inequality in order to reduce the gap between developed and developing countries in terms of productivity and growth at large.

Furthermore, there are six stylized facts on health inequality identified by the health inequality theory:

i. Health is strongly associated with socio economic status, irrespective of the measures used and irrespective of the institutional setting.
ii. Health inequality between low and high socio-economic status (SES) group increase over life cycle until age 60, after which they narrow.
iii. Lack of access to health care only explains a small portion of health inequalities- occupation, health behaviour and inability to process health information wisely seen more important.
iv. There exists an important reverse causality effect of ill-health on labour force participation income and wealth.
v. Among the dimensions of socio-economic status, education seems to be the most important determinant of health.

vi. A large part of gradient may be due to early childhood endowment. Evidence combined shows that parental, especially maternal socio-economic status influences the evolution of child health.

The above-mentioned theory was chosen to serve as the theory underpinning the study because it explains the true picture of most health care sectors in the developing countries which Nigeria is inclusive

2.2 Empirical Literature

The Socioeconomic determinants of maternal mortality has elicited large volume of empirical studies among health economists and health specialists with related findings using cross sectional, time series and panel data. Thus, this section reviews literature relevant to the study.

Muhammed and Ruslan (2020) assessed the trends and causes of maternal mortality at the general hospital Jigawa North-West Senatorial district. The research utilized a retrospective data of maternal deaths recorded from 2010 to 2015 which was analyzed using descriptive statistics. The findings revealed that major obstetrics complication that caused the deaths in the study area are haemorrhage, anemia, pregnancy eclampsia, retained placenta, sepsis, obstructed labour, malaria, labour pain high blood and pressure. Also, Mukesh, Marjolein, Vincent and Tjard (2020) identified social factors influencing maternal mortality in India. The study employed scoping literature review on quantitative and qualitative studies conducted in India. The findings from the study showed that economic status, education, ethnicity, gender, religion, culture, place of residence, parity and age were significant determinants of maternal mortality in India, Lisa (2019) examined the determinants of maternal mortality in Indonesia. The study utilized observational study from Indonesian population census with a sample size of 8075 pregnant women. The data collected were analyzed using multilevel logistic regression. The results found that education, distance to health care facility and access to health care service are significant determinants of maternal mortality. Apanga (2018) examined the determinants of maternal mortality in the Upper East Region of Ghana. The study used primary data; a sample of 400 pregnant women was selected using simple random sampling and was analyzed using descriptive statistics. The outcome of the study showed that poorly resourced healthcare system in developing countries like Ghana affects the provision of essential maternal healthcare services

In the same vein, Comfort (2018) investigated the socio-cultural factors associated with maternal mortality and morbidity in Nigeria particularly in rural areas. The study used secondary data which was estimated and analyzed using descriptive statistic. The result of the study concluded that socio cultural factors such as poverty, gender discrimination and cultural practices contribute to high maternal mortality and morbidity in the rural areas2018) investigated socio- cultural factors associated with maternal mortality and morbidity in Ghana. The study used cross sectional survey with a sample of 368 married women selected using simple random sampling. The study applied chi-square and descriptive statistics. The result revealed that women's reproduction is influenced by cultural and traditional practices which put them at high risk during pregnancy, delivery and after birth.

Adgoy) 2018) explored the key social determinants of maternal health among African countries. Data were sourced using narrative literature review design. The finding indicated that healthcare provider attitude, economic inequality, transportation problem, marital status, age, education, gender equality and tradition are social determinants of maternal health among African countries which causes high maternal deaths. Shamaki and Amriah (2018) explored socio cultural and traditional practices associated maternal mortality in Sokoto, Nigeria. The study utilized primary data. A sample of 250

married women was selected using multistage sampling and was analyzed using descriptive statistics. The finding revealed that cultural practices such as unattended labour and delivery, low level of education, hot birth (*wankanjego*), use of herbs and female genital mutilation account for the high maternal mortality rate in the state. Moreover, Singh, Seem and Geeta (2018) investigated the maternal mortality in India, an overview of the social causes. The study utilized secondary data and reviewed past and present health records. The findings revealed that social factors such as socio-economic disparity, education, antenatal and postnatal care, urban and rural differences and nutritional inequality are significant determinants maternal deaths in India. Adetoro 2017) examine socioeconomic determinants of maternal mortality in Nigeria. The study utilized secondary data. The result showed that inadequate essential drugs, inadequate medical personnel, ignorance of women, lack of access to resources and government under funding of health care sector are significant determinants of maternal mortality in Nigeria.

Ibrahim (2016) examined the socio-economic determinants of maternal mortality in rural areas of Oyo State. The study employed descriptive survey research design. A sample of 2,200 women of child bearing was selected using systematic sampling techniques. The data were analyzed using descriptive statistics and multiple regression analysis. The study found that educational status, income level, proximity to health facilities; purchasing power and traditions are significant determinants of maternal mortality in Oyo state.

Meanwhile, Kumar, Singh and Chundan (2016) ssessed the difference in utilization of maternal healthcare services between women from households that experience maternal death and women from any households that did not experience maternal death in India using Indian District Level Households and Facility survey (2007-08). The result revealed that women belonging to households that experience maternal death were less likely to opt for full antenatal care compare with women from households that did not experience any maternal death. Furthermore, Igberese, Isah, and Igbekoyi (2015) assessed the awareness and perception of maternal mortality among women in urban community of Niger Delta of Nigeria. Descriptive cross-sectional survey was used. A sample of 400 women was selected and was analyzed using SPSS. The study discovered that cultural practices, purchasing power, level of education are among the most determinants of maternal mortality in the region.

Meanwhile, Ugwu and De Kok (2015) explored how socio-cultural factors contribute to maternal mortality in Nigeria. They used both qualitative and quantitative survey. Data were collected using semi-structured interview and informal observation with a sample of 1200 which was analyzed using descriptive statistics. The finding of the study found that socio- cultural factors such as gender roles, religious ideologies, norms, values and traditions are significant determinants of maternal mortality in Nigeria.

In summary, from the literature review so far, the major determinants of maternal mortality are education level of mother especial secondary or higher level, parity, age of mother, distance to health care facility, poverty, poor roads transport system, culture and tradition, religion, health care availability, and place of residence. This study contributes to the existing literature on the socio-economic determinants of maternal mortality in Gombe North, Gombe state, Nigeria. It is also one the scanty studies which investigates socioeconomic determinants of maternal mortality that contributes immensely in revealing the impact of maternal mortality on the economic growth and development discourse.

3.0 Data and Methodology

The descriptive survey research design was used to investigate the social-economic determinants of maternal mortality in Gombe North Senatorial District, Gombe state, Nigeria. Multi-stage sampling techniques was used to select four hundred (400) women of child-bearing aged 15-49 from urban and rural communities of Gombe North which was determined using Taro Yamani's formula. The respondents were selected from fifty-three wards of the five local government areas of Gombe North, Gombe state. A simple random sampling technique was applied in selecting the respondents in order to give every woman of child-bearing in study areas an equal chance of being selected in the sample. The instrument for data collection for the study was a self-developed and validated questionnaire. The socio-demographic characteristics of the respondents were captured in section A of the questionnaires including local government areas, place of residence, marital status, religion, occupation of the respondents respectively. While Section B captures information on dependent and independent variables.

Also, the study employed both descriptive and inferential statistics in analyzing the data collected. The descriptive statistics in the form of tables, simple percentages and mean score to explain the socio-demographic characteristics of the women of child bearing in the study area. While the inferential statistics was used in the form of binary logistic regression model. Since the dependent variable is categorical, the ordinary least square (OLS) method can no longer be used as the best linear unbiased estimator (Long, 1997) & Gujarati, 1995). According to So (1996) the standard alternative is to use Categorical Dependent Variable Model (CDVM). Therefore, logistic regression model (LRM) was used.

3.1 Binary Logistic Regression Model

Binary logistic regression model is a foam of regression analysis that is used when a dependant or response variable is binary or dummy in nature. Binary response models are usually expressed as linear functions of a set of regressors. The estimates of Y given X are conditional probabilities of the event Y occurring (i.e. When it is 1). Therefore, the conditional probabilities are expected to lie between 0 and 1. However, if OLS is used, conditional probabilities are more likely to lie outside the (0,1) range. The statistical model for logistic regression is:

$$Log\left\{\frac{\Pr(MMRT)}{1-\Pr(MMRT)}\right\}=\alpha_i+\sum\beta_1 X_i+\mu_i \quad \text{.....3.1.1}$$

Where:

$\Pr(MMRT)$ is the conditional probability for maternal mortality occurring ; $1-\Pr(MMRT)$ is the conditional probability for maternal mortality not occurring. X_i is a vector of social and economic variables, α_i is a constant and μ_i is the error term.

3.1.1 Model Specification

The model for this study was based on a modified Health Inequality theory of Van and Galama. Therefore, health education on maternal health was used as a proxy for maternal mortality; mother's level of education, husband's level of education, age of mother, birth parity, traditional belief system, distance to health care facility, household's wealth index, poor roads transportation system and cost maternal health care service were variables considered in the study for the purpose of

achieving the objectives of the research. The dependant variable is maternal mortality while the independent variables are the regressors. Specifically, the model is expressed as follows:

$$\Pr(MMRT\ )) = \alpha + \beta_1 MEDC_i + \beta_2 FEDC_i + \beta_3 HWIX_i + \beta_4 CMES_i + \beta_5 TRBS_i + \beta_6 DHCF_i + \beta_7 AGER_i + \beta_8 BTOR_i + \beta_9 PRTS_i + \beta_{10} AMHS_i + \mu_i \quad \text{----------3.1.2}$$

Where:

P_r (MMRT) = is the Probability for the occurrence of maternal mortality

$1 - \Pr(MMRT)$ = is the probability for not occurrence of maternal mortality

α; = the constant parameter of the equation

β_s= the coefficient of the independent variables

MLEDC= mother's level of education

HLEDC=husband's level of education

HWIX = household's wealth index

TRBS= traditional belief system

DHFC= distance to health care facility

AGER=mother's age

BTOR= birth order

PRTS= Poor roads transportation system

CMHS= cost of medical antenatal care service

AMHS=access to maternal health care services

μ_i = Error term

4.0 Empirical Results

This section discusses the empirical results which consist of the demographic characteristics of the respondents, estimated coefficients and marginal effects of the socioeconomic determinants of maternal mortality.

Table 4.1 Demographic characteristic of the respondents

Variable	Frequency	Percentage	Cumulative Percent
Place of resident			
Rural area	291	72.75	72.75
Urban area	109	27.25	100.00
Local government			
Gombe	102	28.00	28.00
Kwami	74	16.75	44.75
Funakaye	79	19.00	63.75
Dukku	91	22.50	86.25

Nafada	55	13.75	100.00
Marital status			
Married	349	87.47	87.47
Single	0	0.00	95.49
Divorced	32	8.02	98.50
Separated	18	4.80	100.00
Religion			
Islam	346	86.50	86.50
Christianity	49	12.50	98.75
No religion	5	12.50	100.00

Source: Field survey, 2020

The result of demographic characteristics of the respondents is presented in Table 4.1. Out of 400 respondents, 291 of them (representing 72.755%) were residing in rural areas while 109 respondents (representing 27.25%) were residing in urban area. Also, the result showing various local governments origin of the respondents revealed that 102 respondents (representing 28%) were from Gombe local government, 74 respondents (representing 16.75%) were from Kwami local government, 79 were from Funakaye local government (representing 19%), 91 were from Dukku local government (representing 22.50%) and 55 were from Nafada local government (representing 13.75%), respectively. More so, the results portray the marital status of the respondents. From the result, majority of the sampled respondents were married, this is because 349 out of 400 sample were married (representing 87.47%), while only 32 and 18 were divorced (representing 8.02%) and separated (representing1.25%), respectively.

In terms of religious distribution of the respondents, out of the 400 sampled respondents, 346 were Muslims (representing 86.50%) while 49 respondents were Christians (representing12.50%). Only 5 out of the 400 respondents said they do not have religion. The reason for the above difference in religion could be due the fact that Gombe north senatorial district is a Muslim dominated area.

Table4. 2: Binary Logistic Regression Results (Coefficients).

Variables	Coefficients	Stand. Error	z-statistics	Prob values
MLEDC	-0.051222*	0.1736028	0.30	0.0091
HLEDC	-0.093806	0.1919024	-0.49	0.625
MAG	0.1901301**	0.3510443	0.54	0.0488
BTOR	0.2528348*	0.2807696	-0.90	0.000
DHFC	1.136345*	0.1793129	-4.10	0.000
TRBS	0.7352368*	0.7256481	-4.37	0.000
HWIX	1.152839*	0.2188004	-4.26	0.000

CMHS	0.1233767	0.2188004	0.56	0.573
PRTS	1.200356*	0.1583543	-7.58	0.000
No of observations	= 400			
LR chi2 (7)	=245.40			
Prob.>	=0.0000			
Pseudo R^2	0.56112			

Source: compiled by the authors. Note: * significant at 1% level; ** significant at 5% level.

From the results in table 4.2 a, mother's level of education is negative and significant at 1% level of significance, which is in line with the a priori expectation. Therefore, the hypothesis suggesting that mother's level of education is a significant social determinant of maternal mortality is accepted. This implies that mother's level of education is more likely to reduce maternal mortality. In contrast, the coefficient of husband's level of education is negative but not significant. Therefore, husband's level of education may not likely be a significant social determinant of maternal mortality. This finding concurs with the finding of Mungai (2015) and Ibrahim (2016).

The age of mother is positive and significant at 5% level of significance, which is in line with the a priori expectation, suggesting that age of mother is more likely to be a significant social determinant of maternal mortality. Also, birth parity is positively related to maternal mortality and significant at 1% level of significance, suggesting that an increase in birth parity leads to an increase in the probability of maternal mortality. This finding also agrees with finding of Ogu and Emmanual (2018).

Furthermore, the coefficient of distance to health facility is positively related to maternal mortality and significant at 1% level of significance and conforms to the a priori expectation. This suggests that the higher the distance to a health care facility, the higher the probability for the occurrence of maternal mortality. Similarly, traditional belief system is positively related to maternal mortality and significant at 1% level of significance. This implies the likelihood that traditional belief system is a significant social determinant of maternal mortality. This finding is in line with the finding of Bhatta (2017).

In addition, the coefficient of household wealth index has positive sign and significant at 1% level which is in line with the a priori expectation. This suggests that wealth index of a household (specifically poverty) is more likely to increase maternal mortality. Also, the coefficient of cost of maternal health care service is negatively related to maternal mortality but not significant; suggesting that cost maternal health care services is less likely to be a significant economic determinant of maternal mortality. This finding is supported by the finding of Fidence (2017).

In the same vein, the coefficient of poor roads transportation system is positively related to maternal mortality and significant at 1% level of significance, which is in conformity with the a priori expectation. This implies that poor roads transport system is a significant economic determinant of maternal mortality; that is poor roads increases the probability of maternal mortality. This is in consistent with the finding of Shamaki and Amriah (2018).The likelihood Ration (LR) Chi2 value is 0.0000, which is significant at 1% level of significance, suggesting that model used is adequate and fit.

Table4. 3: Binary logistic Regression Results (Marginal Effects).

Variables	Maginal effect	Strd. Error	Z	p>z	95% confidence interval
MLEDC	-0.1187388	0.03994	0.30	0.041	0.090159
HLEDC	-0.0216186	0.4432	-0.49	0.626	0.06525
MAG	0.4381760	0.08084	0.54	0.0398	0.202253
BTOR	0.5826686	0.0647	-0.90	0.000	0.06855
TRBS	0.3148895	0.04193	-4.04	0.000	-0.087255
DTHCF	0.1694412	0.07238	4.35	0.000	-0.173022
HWIDX	0.2592658	0.06008	4.32	0.000	-0.141513
PRTS	0.2699522	0.04923	5.34	0.573	0.068739
CMHCS	-0.2699522	0.03657	7.58	0.000	-0.198283

Logistic regression

No. of observation= 400

LR Chi 2 (7) = 245.40

Prob chi 2 = 0.000

Log likelihood = 175.39941

Pseudo R^2 = 0.5645

Source: compiled by the authors. Note: * Significant at 1 % level;** Significant at 5% level.

Table 4.3 shows a P value of 0.0000 which is significant at 1% level, indicating that the variables used in the model are significant in explaining the social and economic determinant of maternal mortality in Gombe North. The Pseudo R2 (0.5645) is also given which is fit. The likelihood (-175.39941) is also given.

From the result of the model, mother's level of education, age of mother, birth parity, distance to health care facility, traditional belief system, household wealth index, poor roads transportation were statistically significant in determining the maternal mortality in Gombe North, while husband's level of education and cost of maternal health care service were not statistically significant at all levels.

Mother's level of education had a negative impact on maternal mortality whereby a unit increase in mother's level of education will reduce the probability of maternal mortality by 11.87percentage point. Age of mother is had positive impact on maternal mortality such that unit increase in age of

mother will increase the probability of maternal mortality by 4.38 percentage point. Birth parity is significant and had positive impact on maternal mortality whereby a unit increase in birth parity will increase the probability of maternal mortality by 58.27percentage point. Similarly, distance to health care facility had positive impact on maternal mortality in that a unit increase in distance to health care facility will increase the probability of maternal mortality by 16.94 percentage point.

Furthermore, a unit increase in traditional belief system will increase the probability of maternal mortality by 31.49 percentage point. Also, household wealth index but poverty in particular had positive influence on maternal mortality whereby a unit increase in poverty will increase the probability of maternal mortality by 25.93 percentage point. Finally, poor roads transportation had positive impact on maternal mortality; a unit increase in poor roads status will increase the probability of maternal mortality by 27 percentage point.

5.0 Conclusion and Recommendation

Based on the findings of this study, it is concluded that mother's level of education, age of mother, birth parity, traditional belief system, distance to health care facility, poverty, poor roads transportation problem and lack of access to maternal health care service are significant social and economic determinants of maternal mortality in Gombe North. Based on the findings of this study, it is recommended that girl-child education should be made a priority and encouraged in Gombe North especially secondary and higher level. More primary health care and modern health care facilities need to be provided so as to meet the objective of universal health care which are accessible, available and affordable for both rural and urban communities of Gombe North. There should be continuous awareness and orientation on the need for pregnant women to patronize hospitals and clinics for antenatal care and delivery so as to reduce maternal mortality especially in the rural areas.

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