Utilisation of antenatal care and skilled delivery services among mothers in Nanton District of Northern Ghana: a mixed-method study protocol

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ABSTRACT
Introduction Maternal morbidity and mortality are a global phenomenon with devastating effects on low-income and middle-income countries among which sub-Saharan Africa (SSA) is the hardest hit. Low utilisation of maternal health services has been recorded in recent times in the Nanton District of Ghana. This has raised concerns about the utilisation of antenatal care (ANC) and skilled delivery (SD) services in the district. However, we found no specific existing literature which has addressed these questions on ANC and SD utilisation in the study setting. Thus, this study seeks to explore the utilisation of ANC and SD services among mothers in the Nanton District of Northern Ghana.

Methods and analysis This will be an observational study. It will use a mixed-method approach, particularly, convergent parallel design to implement the study. This will include quantitative and qualitative aspects using a questionnaire and focus group discussion guide. The planned sample size is 411 participants. The data will be collected at the communities. Before participation in the study, the research team will receive individual written consent from the participants. Descriptive and inferential data analysis will be performed after the data collection. The results will be presented as frequency tables, bar charts and line graphs to indicate the proportions of the outcome indicators. The strength of association among variables will be determined at 95% CI and a significance level of alpha (0.05) will be used.

Ethics and dissemination Ethical clearance has been sought from the Ghana Health Service Ethics Review Board (GHS-ERC 027/03/22). The outcomes from this study may serve as a reference document for the District Health Directorate to use when developing strategies for ANC and SD services. The results will be published in open access and peer-reviewed journals.

INTRODUCTION
Worldwide, maternal deaths remain a major public health concern. The World Health Organization (WHO) reports that an estimated 800 women die every day during pregnancy and childbirth. Yet all of these deaths are preventable. In its 2017 reports, the United Nations reported that while 1 in 333 infants died in the first month of life in high-income countries, that ratio was 1 in 36 infants in sub-Saharan Africa. In the specific case of West Africa, the maternal mortality ratio is 674 per 100000 live births, according to the Population Reference Bureau. In Ghana, maternal mortality remains unacceptably high and continues to pose a daunting public health challenge with a ratio of 310 per 100000 live births. In response to this negative situation, the government of Ghana rolled out key strategies for reducing maternal mortality by promoting access to and utilisation of maternal and child health services such as antenatal care (ANC) and skilled delivery (SD). Some of the interventions introduced by the government of Ghana to accelerate access to and utilisation of maternal healthcare services (MHCS) include the implementation of free MHCS, the connection of maternal clinics to child welfare clinics in each district and training of individuals in safe motherhood skills. Other policy initiatives by the government and the Ghana Health Service (GHS) include the implementation of emergency obstetrics and neonatal care in all the then 10 regions in Ghana, healthcare provision by skilled personnel during the period of pregnancy.
and childbirth and lastly strengthening the Millennium Development Goals accelerated framework initiative to bolster activities regarding the reduction in maternal mortality rate. These measures were also intended to contribute to the achievement of targets 3.1 and 3.2 of the Sustainable Development Goals.

Despite these laudable initiatives, maternal deaths still persist. The reasons attributed to the continued persistence of this situation may be associated with a couple of factors including the level of utilisation of essential health services by pregnant women in certain geographical areas. From an analytical viewpoint, maternal health indicators revealed an improvement in the use of essential MHCS by women from the national perspective. Comparatively, evidence of utilisation of MHCS by women in urban and rural settings in Ghana and other sub-Saharan African countries demonstrates an uneven distribution in terms of access and use of these essential health services. In the specific case of the Northern region of Ghana, the majority of the population lives in rural areas. As such, most women during pregnancy and childbirth have uneven access and utilisation of essential health services.

With Ghana adopting the WHO recommendation for eight or more contacts for ANC attendance, the most recent Ghana Multiple Indicator Cluster Survey showed a sharp contrast in the level of attendance with 85.0% and 26.4% having ≥4 and ≥8 ANC contacts, respectively. However, there exists a variation within regional coverage. Evidence shows that, while Upper East had coverages of 95.4% and 31.3% for ≥4 and ≥8 ANC contacts, respectively, the Northern region had 82.3% and 16.0% contacts for ≥4 and ≥8 coverage of women receiving ANC from a skilled provider. According to the same survey, similar disparities exist between urban-rural divides while 90.3% and 36.3% had ≥4 and ≥8 ANC contacts in urban areas, 81.2% and 19.2% came from rural areas. Nanton is a rural district and located in the Northern region. These two characteristics combined, could therefore lead to a lower use of ANC and SD services. However, no study has been conducted in the area to investigate the problem and make evidence-based recommendations. The present study will thus assess the level of utilisation of ANC and SD among mothers of infants to inform policymakers on the necessary intervention to enhance the utilisation of essential health services in the district. This study will also highlight the factors influencing the utilisation of these services as well as ascertain the knowledge level of the target group on essential health services. Furthermore, the results of this study will assist stakeholders in designing specific interventions for the identified factors. Additionally, the study will generate useful information that can inform future studies.

**OBJECTIVES**

The study aims to investigate the utilisation of ANC and SD services among mothers of infants in the Nanton District of the Northern region.

The specific objectives are:

- To estimate the proportion of mothers of infants using ANC and health facility/SD.
- To assess the level of knowledge of mothers of infants on ANC and SD services.
- To identify the factors influencing the utilisation of ANC, health facilities and SD among mothers of infants in the Nanton District.
- To determine the relationship between ANC attendance and SD.

**METHODS AND ANALYSIS**

**Study setting**

Ghana is located in West Africa with 16 administrative regions including the Northern region. The Northern region also has 16 districts (Metropolitan, Municipal and Districts). The Nanton District is one of the districts of the Northern region which was carved out of the Savelugu Municipality in 2018. It is about 80 km² and shares boundaries with the Sagnarigu Municipal to the north, Karaga District to the east, Tamale Metropolis to the west and the Savelugu Municipal to the south. The population is mostly rural. It has 84 communities with a population density of 8.7/km². The area is predominantly inhabited by the Dagomba ethnic group. The district has a total population of 63,450 inhabitants. The majority of the inhabitants are within the poverty line with low incomes. Thus, making it a challenge in accessing their healthcare when needed.

There are 16 health facilities in the district. These include 4 health centres and 12 functional Community-based Health Planning and Service (CHPS) zones to promote health in the district. A CHPS compound is the smallest unit of the health system providing primary healthcare. The services include outpatient care, ANC, child welfare clinics and delivery services. Due to the size of the district, physical accessibility poses a great challenge to vulnerable populations such as women and children. Additionally, the unavailability of a district hospital, poor road network and the weak referral system during health emergencies impacts on essential health services utilisation in the study setting.

**Study design**

This will be an observational study using a mixed-method approach and a convergent parallel design to assess the level of utilisation of ANC and SD services by mothers of infants in the Nanton District. According to Creswell and Plano Clark, a convergent parallel design entails that the researcher concurrently conducts the quantitative and qualitative components in the same phase of the research process, weights the methods equally, analyses the two components independently and interpret the results together. Thus, this method allows for the simultaneous
collection and analysis of quantitative and qualitative data on the research problem. The analysis of data using both methods will be mutually reinforcing.

**Study population**

The study participants will be mothers with infants (children under 1 year of age). They will be selected using multistage technique. In the district, there are 84 communities in 2 subdistricts (Nanton and Tampion). Nanton subdistrict has 45 communities while Tampion subdistrict has 39 communities. In each subdistrict, nine communities will be randomly selected. Thus, a total of 18 communities will be included in the study. At each community, about 23 mothers with infants will then be randomly selected to participate in the study.

**Sample size determination**

**Quantitative study**

The sample size for the quantitative study will be determined using Cochran’s (1977) formula as follows:

\[ n = \frac{Z^2 PQ}{d^2} \]

where:

- \( n \) = desired sample size;
- \( Z \) = the standard normal deviation, set at \( \alpha = 0.05 \) based on 95% CI = 1.96;
- \( P \) = sample proportion of ANC attendance (41.9% or 0.419);
- \( Q \) = the acceptable deviation from the assumed proportion \( = (1 - p) \);
- \( d \) = allowable margin of error = 5.0%.

With the district having at least eight+ ANC attendance of 41.9%, the estimated sample size is 374. A non-response rate of 10.0% (37) will be included. Thus, a total of 411 participants will be selected and interviewed in this part of the study.

**Qualitative study**

For the qualitative study, each focus group discussion (FGD) will have 6–10 participants. The FGDs will be conducted till the point of saturation (sample size). The saturation will be achieved if there is no new information from the participants. After reaching the point of saturation, two additional FGDs will be conducted. Participants for the FGDs will be selected purposively to include at least three first-time mothers of infants and three mothers with two or more children with the last child being an infant. In situations where the number of participants falls below the set criteria, the available category participants will be engaged. This will ensure that diverse groups of mothers are involved in each FGD. Thus, this will enrich the quality of the discussions.

**Inclusion and exclusion criteria**

**Quantitative study**

In our study, an infant is a child between 0 and 11 months of age. A woman between 15 and 49 years of age with an infant is eligible to be included in the study. In addition, the woman should have lived in the community for the past year.

A woman without an infant will be excluded. Similarly, women with children aged 1 year and older will be excluded in this study. Additionally, mothers with infants but have not lived in the district for the past year will also be excluded.

**Qualitative study**

In addition to the criteria above, women who will take part in the quantitative study will be excluded from the qualitative study.

**Study variables**

The study will assess both dependent and independent variables to determine their level of association.

**Dependent variable**

The dependent variable of the study is the utilisation of ANC and SD by mothers of infants. Mothers of infants who have ANC contacts (attendance) will be divided into four categories: no contact, one to three contacts, four to seven contacts and eight or more contacts. The categorisation will be based on the WHO earlier recommendation of a minimum of four ANC visits in 2006 and the later
recommendation of a minimum of eight ANC contacts in 2016 with skilled ANC providers. Also, mothers who have eight or more contacts with a skilled provider will be assessed as having adequately used the ANC service as recommended by the new WHO standards. To ascertain this, ANC cards of the mothers will be checked to determine this adequacy or otherwise of the ANC contacts. The mothers of infants who will have less than eight contacts will be deemed as inadequate utilisation of ANC service. Similarly, mothers of infants who delivered at health centre, CHPS compound or hospital by an accredited health professional will be considered as having used SD. The mothers who are delivered by Traditional Birth Attendants, home delivery and delivery in spiritual homes among others by an unaccredited birth attendant will be deemed as unskilled delivery. In this study, we will use the WHO definition of skilled care at birth as being a delivery service provided by an accredited health professional, such as a midwife, doctor or other nurse, who has been educated and trained in the skills necessary to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and to identify, manage and refer complications in women and newborns.

Independent variables
The independent variables of the study will be centred on the literature review and the modified version of the Anderson behavioural model. Socioeconomic and demographic factors including maternal age, maternal education level, marital status, partner educational level, maternal occupation, religion, parity, average monthly income, use of ANC and health insurance status will be considered. Other variables will include the distance to a health facility, availability of health staff, health supplies, for example, drugs and transport.

Themes of the qualitative study
The qualitative data will be categorised into themes such as knowledge of mothers on ANC utilisation, factors influencing ANC utilisation, knowledge of mothers on SD and factors influencing utilisation of SD services. The other themes include approaches to improve access and use of ANC and SD in the study setting. This is very vital as it will help unravel relevant information from the participants. The complete list of themes that the qualitative section will explore is available in online supplemental file 1.

Data collection methods
The research team will collect data on participants’ demographic characteristics, socioeconomic, education factors, knowledge on ANC and SD services for mothers of infants will be collected through face-to-face interviews using a questionnaire. Also, FGDs will be conducted for selected participants. The study will employ both quantitative and qualitative research methods to determine the level of utilisation of ANC and SD services by mothers of infants in the district. The study implementation approach is resumed in online supplemental file 2.

Quantitative study
The quantitative data will be collected through the use of a structured questionnaire. It will be administered to selected mothers of infants. The women will be selected from 18 communities in the 2 subdistricts. For the selection process, any woman between the ages of 15 and 49 years with an infant will be eligible for the study. In the community, any household with a mother having an infant will be eligible for an interview.

Qualitative study
Qualitative data will be collected using an interview guide (FGD guide). The FGDs will be conducted with at least 6–10 mothers. Participants for the FGDs will be selected purposively to include at least three first-time mothers of infants and three mothers with two or more children with the last being an infant. In situations where the number of participants is less than the set criteria, the available mothers will be engaged. This will ensure that diverse groups of mothers are involved in the discussions. FGDs will be conducted with selected participants of the beneficiary communities till the point of saturation. After reaching the point of saturation, two additional FGDs will be conducted. The FGDs will be carried out at a serene and conducive environment devoid of interference and distraction. The FGDs will be conducted in the Dagbanli language which is the indigenous language. Tape recorders will be used to record the FGDs. Recorded tapes will be transcribed from the Dagbanli language into English. Content analysis will be employed to analyse the qualitative data. This will be done by categorising the data into various thematic areas as reflected in the interview guide. With this, the researchers will be able to critically analyse the perspectives of participants on the various themes.

Data collection tools
The study will use a structured questionnaire and FGDs guide to collect the data (online supplemental file 3). The structured questionnaire will be divided into four sections. The first section (A) will cover demographic data of participants, sections B, C and D will contain the three specific objectives. Some of the questions will use the Likert scale of measurement. This scale will be used to determine the opinions of subjects. It will contain a number of statements with a scale after each statement. Participants will be required to select from these statements that represent their opinion or interest.

The FGDs guide will contain open-ended questions that will be used to facilitate discussion with specific target groups such as first-time mothers and mothers with previous deliveries. The qualitative data will be categorised into themes such as knowledge of mothers on ANC utilisation, factors influencing ANC utilisation, knowledge of mothers on SD and factors influencing utilisation of SD services. This is very vital as it will help unravel relevant information from the participants.
Data management plan and quality control

Data will be collected by a four member team: the principal investigator (PI) and three research assistants (RAs). The RAs will be selected based on their understanding and ability to speak fluently the Dagbanli language. Also, their previous experience in surveys will be considered during the recruitment. A 1 day training session will be organised by the PI to educate the RAs on the key issues of the research work. This training will cover areas such as orientation on the data collection tools, issues bordering on data collection ethics (such as privacy and confidentiality) as well as obtaining informed consent before initiation of the interview. In addition, there will be a 1 day pretesting of data collection tools to ensure that they are standard and adequate for the study. The pretest is important as it will help to identify lapses on the tools. Finally, the researcher will adhere to high standards of data quality control. This will be achieved by cross-checking all administered questionnaires daily by the RAs to ensure their completeness and errors for correction.

Statistical analysis

Quantitative study

Data from the quantitative study will be analysed using SPSS V.22. After checking for completeness and cleaning, data will be analysed descriptively and inferentially according to the objectives. The results will be presented using tables, graphs and charts. The continuous data will be analysed through the IQRs, means and the SDs. The categorical variables will be presented as frequencies and percentages. The first part will deal with the sociodemographic data that will be summarised with frequencies and percentages. The second portion will be on objective one, which is about the proportion of mothers using ANC and SD services. The results of this objective will be summarised in frequencies and percentages, likewise objectives 2, 3 and 4 which are on; knowledge of mothers on ANC and SD; factors influencing utilisation of ANC and SD and to determine the relationship between ANC attendance and SD. In addition, inferential statistics will be applied to assess the possible relationship between the dependent variables (ANC and SD utilisation) and independent variables (socioeconomic, demographic factors and knowledge). The factors associated with the utilisation of ANC and SD services will be tested with Pearson’s χ² test and a multivariate logistic regression test. Before conducting the regression analysis, independent variables to be included in the subsequent regression analysis will be selected using the χ² test. The significance level will be determined by or set at a p value of 0.05. Multivariate analysis including binary logistic regression and χ² test for bivariate will be used where appropriate. The multivariate analysis will be used to compare the utilisation of ANC and SD services, knowledge of mothers using these services and the factors influencing their utilisation to the demographic characteristics. The results will be presented as OR with 95% CIs to quantify possible associations between the variables.

Qualitative study

Data generated by the qualitative study will be collected using an interview guide (FGDs guide). After the transcription, the transcripts will be subjected to content analysis based on the various thematic areas of the FGD guide. The participants’ opinions and perspectives under each thematic area will be pulled together and analysed to unravel the context and viewpoints. In relation to knowledge on ANC and SD, participants expressing their opinion on a particular knowledge item more frequently will be considered high knowledge on that item. Similarly, less expression on a particular knowledge item will also be considered low knowledge. Regarding the factors influencing ANC and SD utilisation, the majority of participants stating particular factors will be considered to be priority factors and reverse versa. During analysis, the opinions of participants will be represented by numbers assigned to them during the discussion phase so as to differentiate individual as well as community opinions.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

ETHICS AND DISSEMINATION

The study will uphold high ethical standards in conformity with research ethics. By this, ethical clearance has been sought from the Ghana Health Service Ethics Review Board (GHS-ERC 027/03/22) (online supplemental file 4). Permission has also been sought from the Regional Health Directorate of Ghana Health Service, DHA of Nanton District as well as the subdistricts and CHPS compounds that will be participating in the study. Additionally, an informed consent (online supplemental file 5) will be obtained from participants with clear explanation of the procedure as well as ensuring their privacy and confidentiality in the process of data collection. Participants will be given the option to withdraw if they do not feel comfortable of being part of the study at any stage. In addition, participants will be assured that responses will be accessible and available to the research team for the specific research work that is being conducted.

In relation to COVID-19, the researcher will put in mitigation measures in conformity with the COVID-19 protocols by GHS to protect the research team and the participants against infection and its spread. This will be done through the provision of hand sanitisers to each research team member when visiting the community for use against infection and its spread. Additionally, the researcher will make available appropriate face mask to the research team for use when visiting the field. In addition, social distancing will also be observed during interviews and FGDs and other interactions. Copies of the final report of the study will be sent to the District Health Directorate where the research will be conducted. This will serve as a reference document for the Directorate.
to consult when developing strategies on ANC and SD. Furthermore, a copy will be placed in the University for Development Studies, Tamale, Ghana library repository as consulting material for students and staff. Additionally, a manuscript will be written for publication in a peer-reviewed journal. The research findings and their implications will also be presented at seminars and other platforms including conferences.

**Timeline of the study**

Data collection for the present study will start in July 2022. It will be followed by the planned statistical analysis and then reports and manuscript writing.

**Contributors** AA and MNA participated in the conceptualisation and the methodology, J-PG and MNA drafted the manuscript. AA, J-PG and MNA reviewed and edited the original draft. All authors contributed to revision of the manuscript. MNA coordinated and supervised the completion of the manuscript.

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