FACTORS ASSOCIATED WITH STILLBIRTH AND ASSESSMENT OF MATERNAL HEALTH AWARENESS AMONG RESIDENTS OF NORTHERN GHANA

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JOSEPH ASAMOAH FRIMPONG

202001202

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MAIN SUPERVISOR: PROF. KABWEBWE HONORÉ MITONGA

(UNIVERSITY OF NAMIBIA)

ABSTRACT

Globally, 14 stillbirths per 1,000 births occur annually. Most of these deaths occur in Asia and sub-Saharan Africa. Ghana's stillbirth rate ranges from 13 – 20 per 1,000 births. The northern zone is as high as 20 per 1,000 births. The Early Newborn Action Plan aims at 12 per 1,000 births. This study sought to assess risk factors associated with stillbirth and assess maternal health awareness in northern zone of Ghana to develop a policy brief to inform strategies in reducing stillbirths. The study employed a convergent mixed method of qualitative and quantitative approach (Case-Control study, survey and grounded theory) among residents in the northern part of Ghana from November 2021 – May 2023. Muti-stage sampling was used to select participants for the survey, population proportionate to size was used for the case control, In-depth interviews was based saturation and focus group discussions were based on availability of respondents. Data was collected using a semi-structured questionnaire and interview guide through focused group discussions, in-depth interviews, and records review. Descriptive and analytic statistics were performed using Stata 16. Multivariate logistic regression was used to calculate adjusted odds ratios (aOR) and 95% confidence intervals (95%CI) for stillbirth. Qualitative data was analysed using the thematic content analysis approach with Nvivo version 10. Risk factors for stillbirth included being unmarried (aOR=9.78, 95%CI:16.48-57.98), family history of stillbirth (aOR=2.63, 95%CI: 1.67-4.12), no patograph use (aOR=2.14,95%CI:1.45-3.16), partner's tobacco use (aOR=2.19,95%CI:1.16-4.16), Rhesus negative (aOR=1.75,95%CI:1.12-2.73), sickle cell trait (aOR=2.29,95%CI:1.27-4.10), foetal malpresentation (aOR=2.67,95%CI:1.33-5.35), eclampsia (aOR = 9.00,95%CI:2.91-27.87) and premature rupture of membranes (aOR=2.64, 95%CI:1.17-5.95). Attending >4 antenatal care visits (aOR=0.53, 95%CI:0.30-0.93) was protective. Overall, 22.89%(276/1206) of the women studied had good knowledge of maternal health, 47.60%(574/1206) of them had good attitude, and 89.55%(1080/1206) had good practices towards maternal healthcare. Community members practiced both orthodox and traditional remedies, perceived some stillbirths are caused by evil spirits. Healthcare workers perceived their responsibilities included routine prenatal, antenatal and postnatal care, with many facilities reporting incapacity of handling severe maternal health conditions. In conclusion, risk factors for stillbirth in Northern Ghana include being unmarried, family history of stillbirth, not using patograph, tobacco use,

rhesus negative, sickle cell trait, premature rupture of membrane, foetal malpresentation and eclampsia. Knowledge and attitude on maternal health was poor but practice was high. Maternal healthcare was influence by traditional beliefs with mainly husbands having the right to decision making on maternal health seeking behaviour. Healthcare workers incapacity of handling severe maternal health conditions was identified. A policy brief has been developed to guide interventions by Ghana Health Service with recommendations on improving healthcare capacity, improving collaboration with traditional healers and empowering women to take up their role before and during pregnancy.

Keywords: Stillbirth, Maternal Health, Risk Factors, Ghana

LIST OF PUBLICATIONS DIRECTLY FROM THIS STUDY

1. Submitted to BMC Pregnancy and Childbirth | Maternal health awareness and practices during pregnancy among residents of northern Ghana, 2023
2. Submitted to Plos One | Socio-cultural practices and beliefs of community members towards maternal healthcare, Ghana, 2023
3. Submitted to BMC Public Health | Sociodemographic, obstetric, foetal and maternal medical health factors associated with stillbirth in Northern Ghana, 2023

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LIST OF ABBREVIATIONS

ANC – Antenatal Care

aOR – Adjusted Odds Ratio

CDC – Centers for Disease Control and Prevention

DHIMS - District Health Information Management System

ENAP - Early Newborn Action Plan

GHS – Ghana Health Service

HDSS - Health and Demographic Surveillance Site

KAP – Knowledge, Attitude and Practices

MoH – Ministry of Health

OR – Odds Ratio

PANC – Prenatal Care

PNC – Postnatal Care

UNICEF - United Nations International Children's Emergency Fund

WAHO - West African Health Organization

WHO – World Health Organization

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DEDICATION

I dedicate this work to the Almighty God, my lovely wife, Mrs. Martha Arkaa Frimpong, my children and parents of blessed memory.

DECLARATION

I, Joseph Asamoah Frimpong, hereby declare that this study is my own work and is a true reflection of my research, and that this work, or any part thereof has not been submitted for a degree at any other institution.

JOSEPH ASAMOAH FRIMPONG		APRIL 2025
Name of Student	Signature	Date

CHAPTER 1

INTRODUCTION AND BACKGROUND

1.1 BACKGROUND

Perinatal death is defined by the World Health Organisation as "A death occurring at 22 completed weeks of gestation and over, during childbirth and up to 7 completed days of life". These include neonatal deaths and stillbirths(1). Stillbirth is when a baby is born at 28 or more weeks with no sign of life. The dead baby can be classified as fresh or macerated based on the physical appearance at the time of birth(2). Childbirth complications (abnormal heart rate of the baby, Perineal tears, Shoulder dystocia etc.), post-term pregnancy, maternal infections in pregnancy (malaria, syphilis, and HIV), foetal growth restriction, congenital abnormalities, and maternal disorders (especially hypertension, obesity and diabetes) are known to be the leading causes of stillbirth(3). Majority of these causes are preventable(3).However, these factors may vary depending on the setting(4,5).

The World Health Organisation (WHO) has reported that globally, about 2.6 million stillbirth occurs annually with over 7000 occurring daily with 17 neonatal deaths per 1000 livebirths occurring annually. This implies one stillbirth occurring every 16 seconds. About 98% of global estimates occur in low- and middle-income countries(6). Most of these deaths occur in Asia and sub-Saharan Africa. Sixty percent of these deaths occur in rural settings (6). An estimated 1.9 million babies were stillborn between 22weeks and 28 weeks of pregnancy in 2019, with a global stillbirth rate of 13.9 stillbirths per 1,000 total births(7). There are disparities in the global burden as countries have varying experiences. With a risk that is up to 23 times more in the worst affected countries globally, report reveals huge differences in stillbirth rates (7). In Europe, Northern America and New Zealand, 1 in 321 babies are stillborn

accounting for 2% of the global burden of stillbirths. Latin America and the Caribbean do contribute 4% of the global stillborn babies with 1 in 126 stillbirths(7). Seven percent of the global burden is reported in Northern Africa and Western Asia with 1 in 87 stillbirths(7). One in 144 stillborn babies is also reported in Eastern and South-Eastern Asia contributing 11% while 34% of the global stillborn babies is in Central and Southern Asia with reports of 1 in 58 babies stillborn(7). The huge burden of 42% stillbirth is seen in Sub-Saharan Africa with 1 in 46 stillbirths reported(7).

The unequal burden of stillbirths is also observed within countries, as access to health care, maternal education and other socioeconomic factors differs (8). This is seen in the substantial disparities between income groups with low-income countries reporting 1 in 44 stillborn. Lower-middle income countries contribute 57% of global stillbirths with the least, 14% reported from Upper-middle income regions(7). Thus, higher stillbirth rates are reported in rural areas than in urban areas. These wide discrepancies reiterate the need for all countries to act and understand who carries the heaviest burden so that an end to preventable stillbirths for all women and families can be achieved.

Investigations of every stillbirth can be capital intensive; however, it is very critical for managing future pregnancies and preventing more stillbirths. These findings improve the understanding of the costs that may be averted if stillbirths can be prevented through primary prevention initiatives (9). An extensive 10 years review of literature by McClure et al., reveals majority of still birth burden in low-resource setting or countries is due to bacterial, viral and pathogens though undefined (10). The two regions accounting for three quarters of all stillbirths are sub-Saharan Africa and South Asia. In sub-Saharan Africa, the stillbirth rate of 21.7 per 1,000 total births was

seven times higher than the lowest regional rate of 3.1 found in the Europe, Northern America, Australia and New Zealand region (7).

Globally, substantial progress has been made over the past two decades, in the reduction of the stillbirth rate seeing a 35% decline from 21.4 stillbirth per 1,000 total births in 2000 to 13.9 in 2019 (7). This, however, is disturbing seeing a rather increasing trend of the global number of stillbirths in sub-Saharan Africa from 27% in 2000 to 42% in 2019. More than 66.67% of the 44 countries who have not seen any reduction in the number of stillbirths are unfortunately in sub-Saharan Africa (7).

In Sub-Saharan Africa, about 50% of stillbirths are reported from Botswana followed by Equatorial Guinea at 48%, 36% for Burundi, 33% Somalia, Democratic Republic of the Congo, Gabon, Gambia, Niger, Chad, South Sudan from 30% to 22% from 2000 to 2019(7). Nigeria within the same period recorded 15% increase of stillbirth, Madagascar, Mauritania and Uganda at 9%, Namibia and Seychelles 7%, Togo, Angola, Comoros, and Eritrea 6% increase, 4% for Cote d'lvoire and the least, 2% in Kenya(7). In a systematic assessment of the global, regional, and national estimates and trends in stillbirths from 2000 to 2019, countries in sub-Saharan Africa emerged as the region with the highest burden of stillbirth per 1,000 total births as shown in figure 1(11).

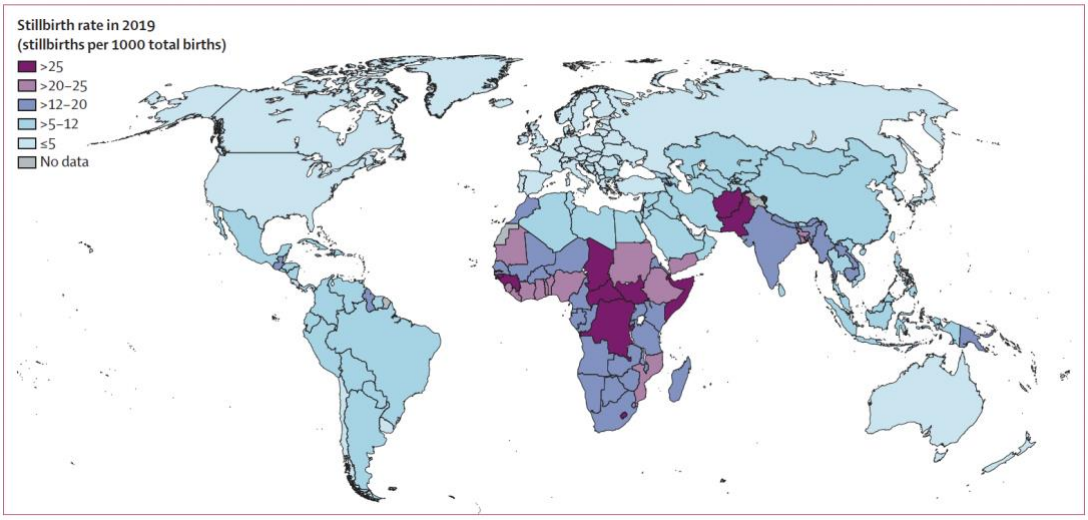

Figure 1:Stillbirth rate per country, 2000-2019 : Source: Lancet (11)

The Early Newborn Action Plan (ENAP) goasl is calling on countries to attain a rate of 12 stillbirths or fewer per 1,000 total births by 2030(12–14). United Nations International Children's Emergency Fund (UNICEF) is however proposing that if the current trend for sub-Saharan Africa is maintained, more than half of global burden on stillbirths will be from the region by 2030 with Ghana's number projected at about 18,000 stillbirths in 2030 (7). The actual incidence of stillbirth in Ghana is unknown though estimates range from 14 to 40 per 1,000 pregnancies(15,16). In 2017, the government of Ghana Maternal Health Survey approximated stillbirth rate at 40 per 1,000 pregnancies (17). The paucity information on stillbirth cause-of-death in Ghana, impedes the development of effective and economic interventions. The 2007 Ghana Maternal Health Survey (GMHS) Report indicated that 2% of pregnancies recorded 5 years prior to survey were stillbirths(18). These numbers did not change over time with 2% babies stillborn 10 years on (17,19). Stillbirths is a major challenge in low and middle-income countries, including Ghana (20). These include limited early evaluation and documentation of risk factors, limited early dating to prevent post-date miscarriages and stillbirths, a limited availability of diagnostic testing, a large

proportion of deliveries occurring outside of health facilities, lack of early identification of foetal distress and prompt delivery of such foetuses (21) together with incomplete health records.

With the major loss of life, stillbirth have other critical implication such as psychological cost, maternal depression, financial consequences for parents with a long-term economic loss to society. The grief experienced by women with stillbirths, added to the depression felt by mothers and families when a stillbirth occurs, exceed that associated with a neonatal death (22,23). Association of stillbirths with taboos in developing countries also prevent women openly grieving their loss which makes it an unspoken tragedy. This highlights the need to institute strategies to mitigate such (24). With the lifelong tragedy that stillbirth possess to families and the global community, there are still no clear policies, and programmes to help curb the situations as interventions implemented at various levels tend to also be underfinanced (23,25). Maternal health is known to have a bearing on stillbirth. Maternal health is the health of women during pregnancy, childbirth and the postnatal period. One of the outcomes of maternal health is stillbirth(26). It is relevant that as we seek to find risk factors for stillbirth, we also assess the maternal health factors and awareness within the study population. Improving maternal health is a key priority for the WHO, culminating in adopting a global strategy and goal of ending preventable perinatal deaths in all WHO member countries.

1.2 PROBLEM STATEMENT

The government of Ghana, through the Ministry of Health and its various health partners such as WHO and West African Health Organization (WAHO) had initiated a number of interventions such as Global Safe Motherhood Initiative in 1987 (27) and

Making Pregnancy Safer Initiative in 2007(28) to improve maternal health in the past years. A direct correlation has been established between maternal health care and stillbirth which gives an indication improving maternal healthcare will contribute to the reduction in stillbirths(26). Despite numerous interventions made to improve maternal health in Ghana including the Free Maternal Health Care Initiative, stillbirth rates in Ghana ranges from 13 – 22 per 1000 births (29). Data from the District Health Information Management System (DHIMS) showed that the stillbirth rate in some districts in northern Ghana went as high as 15 per 1,000 livebirth in 2017, reduced to 14 per 1,000 livebirth in 2018 and shot up again to 20 per l,000 livebirth in 2019(30). This highlights the need to not only assess risk factors but include an evaluation for knowledge, attitude and practices on maternal health in communities with high rates of stillbirth.

The five regions in northern part of Ghana have seen marginal increase of stillbirths from 2017 through to 2021 with a narrow escape seen in Northern and Upper West Regions(31). With a total of 146 stillborn babies recorded in 2017, North-East Region saw a 7.7% (225) increase by 2021. Stillborn babies in the Savannah Region also increased from 135 in 2017 to 166 in 2021, thus a 4.3% increase. In 2021, 599 stillborn were reported in the Upper East Region seeing a six percent increase from 454 stillbirths in 2017(31). The Upper West Region however reported a 0.1% decline of stillbirths from 2017 to 2021 while the Northern Region also saw a 2.3% decline of still born babies(32). These statistics however excludes events that happened in the community and therefore underestimate the true burden of stillbirth in northern Ghana. Despite the high rates of still birth in northern Ghana, there is no documented studies about the still births where representative data is used to assess risk factors by employing both qualitative and quantitative methods which will give a comprehensive

inference of the problem to drive targeted interventions. Most studies conducted in Ghana that sought to assess the determinants of Stillbirth have been mainly descriptive with few analytic studies, which focused on retrospective hospital data (33–38). In addition, retrospective studies do not provide an opportunity to assess maternal awareness, which may contribute to the current undesirable stillbirth rates. The traditional counsel, community leaders, heads of households including husbands, have great influence on decision making and serve as a major catalyst for behavioural change and cultural practises(39,40).

The lack of autonomy by women in their maternal health decisions pose a great risk. In a study which assessed the autonomy of women and the involvement of husbands in maternal health care found that husbands are involved in giving advice to their wife and arranging money and transportation for the delivery of the baby (41). The study also found that economic autonomy had a great impact on maternal health. These associations have not been dealt with critically to understand the views of husbands and how it can influence maternal health outcomes. This study provides current data, which will drive policies to mitigate the existing gaps. Therefore, we sought to explore the factors associated with stillbirth and assessed maternal health awareness among residents of northern Ghana.

1.3 PURPOSE OF THE STUDY

The purpose of the study was to explore factors associated with stillbirth and assess maternal health awareness among residents of northern Ghana to develop a policy brief that will inform strategies by the Ghana Health Service and Ministry of Health in reducing stillbirths.

1.4 SPECIFIC OBJECTIVES

1. To assess sociodemographic, obstetric, foetal and maternal medical health factors, associated with stillbirth
2. To assess the knowledge, attitude and practices (KAP) of maternal health during pregnancy, among residents of Northern Ghana
3. To explore the perceptions and describe the socio-cultural practices of community members with regards to maternal health
4. To explore and describe maternal healthcare of mothers who have been affected by stillbirth
5. To understand the diverse perspectives of healthcare workers on maternal care and stillbirth
6. To develop a policy brief on risk factors for stillbirth in Northern Ghana

n1.5 SIGNIFICANCE OF THE STUDY

The Early Newborn Action plan highlights strategic approaches with the aim of ending preventable newborn mortality and stillbirth. The plan has a goal to attain a rate of 12 stillbirths or fewer per 1,000 total births by 2030. This target is based on epidemiological evidence and lessons learned from members states of the 66th World Health assembly. To meet this target, we need to investigate and ascertain the driving factors which are still contributing to the increase in the stillbirth in northern Ghana. This required both qualitative and quantitative approach to explore factors associated with stillbirth and assessment of maternal health awareness among residents of northern Ghana. This study's findings on demographic, obstetric, maternal health and foetal factors associated with stillbirth, as well as knowledge attitude and practices on maternal health, placed northern Ghana in the right context for targeted interventions.

Study findings helped to improve maternal healthcare by providing health workers with reliable current data which leveraged on previous studies for healthcare practises, and further interventions such as training, public health education/ community sensitization and best use of resources to reduce stillbirths. In addition, the identified risk factors informed maternal health programs on priority areas to focus their interventions to reduce stillbirth. In addition, unlike other studies that have been conducted in the northern zone to determine the risk factors for stillbirth, this study used qualitative methods to further explore the maternal healthcare of mothers, socio-cultural practises, and diverse perspectives of healthcare workers on maternal care and stillbirth, thereby providing a comprehensive information that was used to develop a policy brief to inform strategies by the Ghana Health Service in reducing stillbirths. The policy brief from this study is a concise summary of key issues related to stillbirth identified from this study, the policy options to deal with it, and some recommendations on the best option. The recommendations from the policy brief informed maternal health policy in Ghana to reduce stillbirth. The brief was aimed at government policymakers and other stakeholders who has the authority to influence policy.

1.6 LIMITATION OF THE STUDY

We expected to have minimal limitations from the study. Mothers with stillbirth were interviewed after one to six months after delivery. This may have to led to recall bias. Again, with the KAP survey, we interviewed households who have had a delivery over the past 6 months. This may have introduced some level of recall bias. Overall, we anticipated to have about 10% - 15% refusal rate. The estimate on refusal rate was based on a previous survey conducted in the region (42). We mitigated this by extending the study period till the desired sample size was attained. Recall bias was

mitigated by referring to hospital records and referring to memorable national, regional, district or community events that served as pointers for easy recall. The study was not able to test the hypothesis that discordant rhesus factor is associated with stillbirth without knowing the blood type of the foetus/ stillborn. However, this did not undermine the fact that the mother's rhesus factor had an association with birth outcome. Also, information on the gestational age at the time of stillbirth was not assessed as this was not adequately captured it the records. Odds Ratios are known to overestimate the risk ratio. With a baseline prevalence of 20%, the estimates presented may be a bit of an over estimation.

1.7 DELIMITATION OF THE STUDY

The study did not cover the whole of Ghana but was limited to the Northern part of Ghana which comprise of the Northern, North-East, Upper East, Upper West and Savannah regions. This study site was chosen due to the high burden of stillbirth compared to the other regions of Ghana. All major health facilities which provide maternal health services in the regions were included in the study. This was to ensure geographical representativeness of the data that was collected from the study site.

CHAPTER 2

LITERATURE REVIEW

The literature review provides an overview of stillbirth with focus on the determinants such as sociodemographic factors, obstetric and foetal factors and maternal medical health factors as well as maternal health awareness. An internet search was conducted using Google Scholar and PubMed using the following key words: Stillbirth, maternal health, child health, perinatal deaths, risk factors, awareness, attitudes and practises, obstetric, foetal and maternal health.

2.1 CONCEPTUAL FRAMEWORK

The study was guided by two major frameworks. These were the WHO Quality of Care Framework for Maternal and Newborn Health (figure 2) and Bastani's Health Behavioural Framework (Figure 3)**.** The Bastani's Health Behavioural Framework assess how health status or events are influenced by societal factors, health system, health care provider characteristics and practices, and demographic and individual characteristics. This was used to guide the development of the data collection tools in assessing the behavioural factors associated with stillbirth and maternal health in the study. The WHO Quality of Care Framework for Maternal and Newborn is categorized under eight standards of Quality of care. These are;

Standard 1: Every woman and newborn receive routine, evidence-based care and management of complications during labour, childbirth and the early postnatal period, according to WHO guidelines.

Standard 2: The health information system enables use of data to ensure early, appropriate action to improve the care of every woman and newborn.

Standard 3: Every woman and newborn with condition(s) that cannot be dealt with effectively with the available resources is appropriately referred.

Standard 4: Communication with women and their families is effective and responds to their needs and preferences.

Standard 5: Women and newborns receive care with respect and preservation of their dignity.

Standard 6: Every woman and her family are provided with emotional support that is sensitive to their needs and strengthens the woman's capability.

Standard 7: For every woman and newborn, competent, motivated staff are consistently available to provide routine care and manage complications

Standard 8: The health facility has an appropriate physical environment, with adequate water, sanitation and energy supplies, medicines, supplies and equipment for routine maternal and newborn care and management of complications.

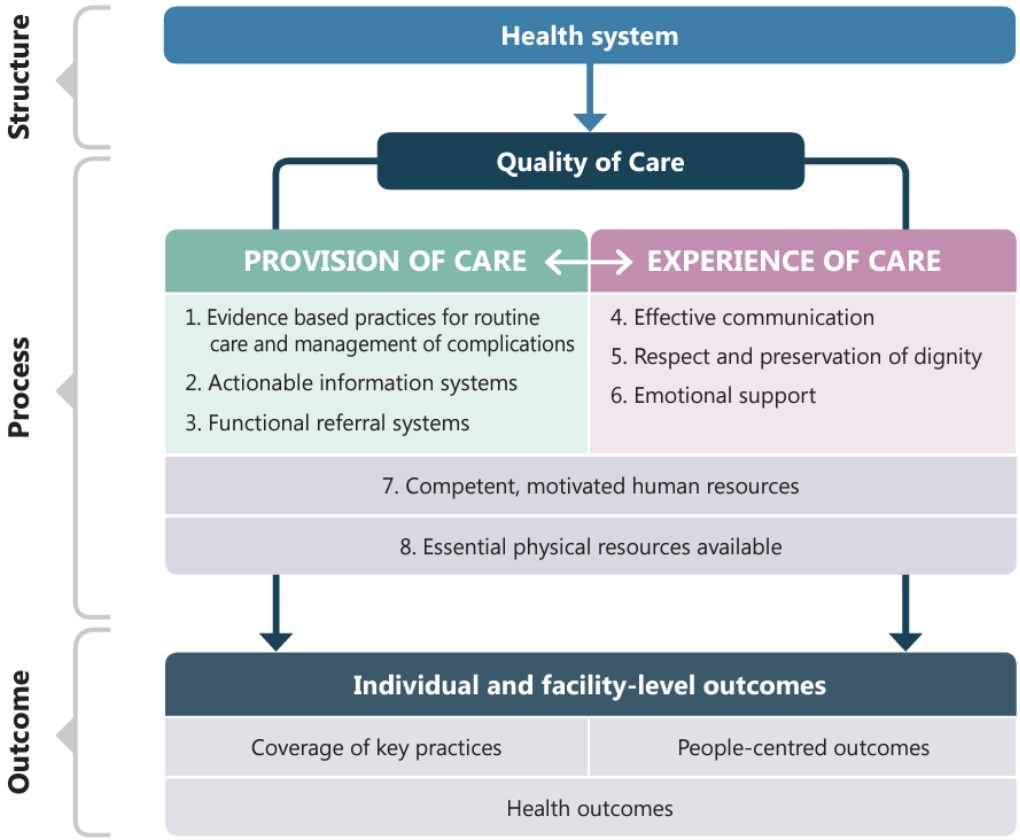

Figure 2: WHO Quality of Care Framework for Maternal and Newborn Health.

Source: World Health Organization

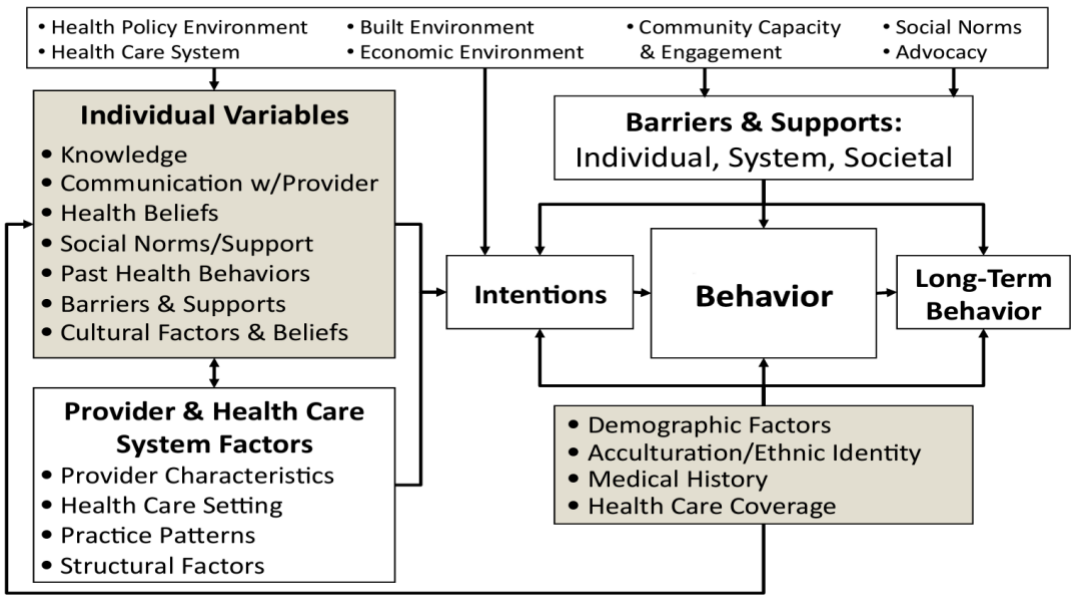

Figure 3: The Bastani's Health Behavioural Framework (43)

The indicators derived from the WHO Quality of Care Framework for Maternal and Newborn Health guided the development of the data collection tools especially for assessing the risk factors for stillbirth. Figure 4 shows a schematic diagram which illustrates the conceptual framework for the study.

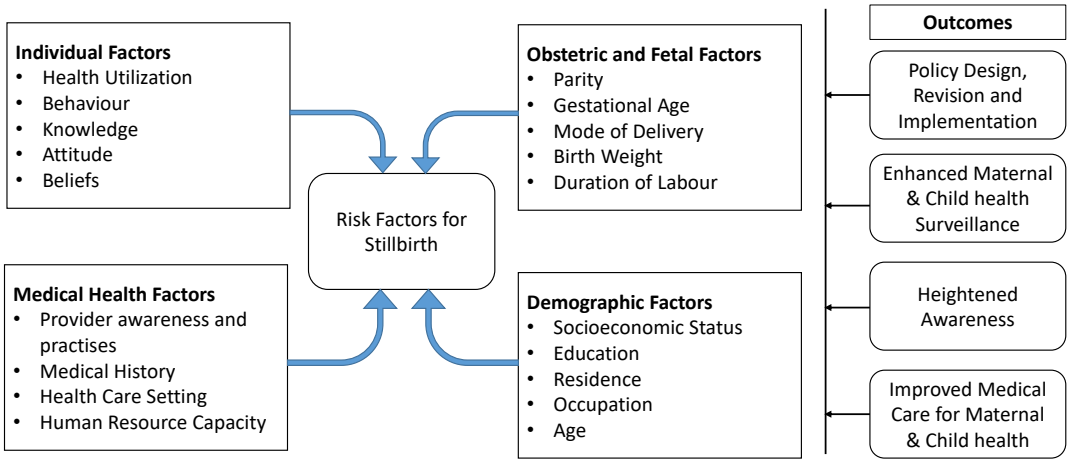

Figure 4: Conceptual framework for exploring factors associated with stillbirth and assessment of maternal health awareness among residents of northern Ghana, 2020

2.2 SOCIODEMOGRAPHIC FACTORS AND STILLBIRTH

Tackling significant risk factors of stillbirth is a major public health concern, especially in Africa with limited relevant data and literature. (44–48) A number socio-demographic and socio-economy factors have been linked with stillbirths in different populations.(47–51) Socio-demographic factors like maternal age, education, ethnicity, parity, and living in rural areas have shown to correlate with maternal health. (52) A prospective, multi-centre observational cohort in USA reported that non-Hispanic black race, low education and low socioeconomic status were associated with stillbirth despite receiving prenatal care.(50). Similarly, in a systematic review by

Poudel et al.(53) identified a number of sociodemographic characteristics in four countries of South Asia: India, Bangladesh, Nepal, and Pakistan. Older age of mother (increasing age) in India, maternal age≥35 years, maternal education (Secondary and higher), use of polluting fuels, daily smokeless tobacco consumption >5 times, and poor household in Bangladesh. Whilst maternal age≥25years, mothers whose religion was Hindu, Muslim, Christian and others, mothers who had no schooling or primary level of education, mothers whose major occupation is agriculture, open defecation, father with no schooling, poor wealth quintile and lower maternal education in Nepal (53).

In effort to identify mortality trends and risk factors associated with stillbirths and neonatal deaths, a population-based cross-sectional study using the 1982 -2011 Health and Demographic Surveillance Site (HDSS) was conducted in Uganda among women aged 15–49 years. Although stillbirths were associated with several risk factors such as multiple births (aOR 2.57), previous adverse outcome (aOR 6.16) and grand multiparity among 35- to 49-year-olds (aOR 1.97), none of the sociodemographic factors such as education, marital status and household wealth were associated with the outcomes.(54). These are interesting findings especially with no association with marital status. In the northern part of Ghana, as per their cultural norms, husbands are known take most decisions. It is however empirical that we assess this factor as part of our study to identify the peculiarity of the setting and how marital status will influence maternal health outcomes.

2.2.1 Maternal Age

Maternal age is a significant factor of stillbirth worldwide. Studies have reported an increasing risk of stillbirth among younger and much older women compared with

middle age women. (47,49,55,56). A study by Zhu et al. (49) in China reported that stillbirth rate was high for women younger than 15 years of age (59·9 stillbirths per 1,000 births). Subsequent logistics regression model revealed that young mothers aged under 15 years (aOR=4·29,) and much older mother of age 45 years above (aOR=2·01) had an increased odds of stillbirth compared with women aged 25–29 years. (49). Another study reported similar increased odds of stillbirth among young maternal age, who had 4 folds higher odds of stillbirth than maternal age between 21 and 35 (aOR: 4.1).(55).

In Nepal, the proportion of women who had experienced stillbirth was highest in the age group of 40-49 years (9.0%), followed by 30-39 years (6.3%). Further analysis indicated that women aged 40- 49 years (aOR=4.78) had a higher odds of stillbirth compared to younger age group. (56). However, a multicentre population-based study from four low-and-middle income countries (Bangladesh, Ethiopia, Ghana, Guinea-Bissau and Uganda) found no significant association between maternal age and stillbirth.(47). Although age seems to appear as a driving factor, there could be other possible confounders contributing to these disparities in outcomes in relation to age.

The impact of maternal age on stillbirth can be explained biologically. Although a direct effect of maternal aging may exist, there are a number of biological mechanisms that increase stillbirth risk with advanced maternal age.(57) Older women are likely to experience poor uterine vasculature which is associated with low uteroplacental perfusion. The increased risk could also be attributed to older age associated medical conditions such as chronic diseases and medical or obstetric complications which have some linkage with the risk of stillbirths. For instance, older women will have greater risk of experiencing pregnancy-induced hypertension or gestational diabetes compared to middle age. These underlying medical condition may increase the risk of

stillbirths.(57–59). Younger women under 20 years also have higher odds of still birth compared to those above 20 (60).

2.2.2 Marital Status

According to a population-based cohort study on all births in the United States between 1995 and 2004, as compared with births from married women, births from unmarried women were at an increased risk of stillbirths (RR, 1.24; 95% CI, 1.21–1.26) (61). Among unmarried women, those at a higher risk of foetal and infant death were African-American women, and those who received no prenatal care (61). The study in China found that marital status was strongly associated with stillbirths in the crude analysis, however, this relationship was lessened after adjustment for other sociodemographic factors although it still remained significant. (49). In another study where the researchers assessed prevalence of stillbirth and its associated factors in East Africa, women who were not married were about 3 times increased odds of having a stillbirth compared to those who were married (62). These outcomes are probably driven by the lack of emotional support and financial difficulty. In Ghana, a secondary analysis of Ghana Maternal Health Survey data of women in reproductive age revealed that women who never married had 3 folds higher odds of experiencing a stillbirth compared to those who were married(63). The findings from Ghana was consistent with aforementioned studies in United States (61), China (49) and East Africa(62). This finding could underscore the positive influence of male spouses on maternal and child health. Male partners are more likely to influence the decision-making process about the welfare of both the wife and unborn baby either negatively or positively. As such they play crucial role in the maternal health of their spouse.

2.2.3 Educational Level

The impact of maternal education is also shown for neonatal mortality in Bangladesh and for Nordic stillbirths(64). The impact of education can only be explained to some extent. Some findings could be linked to increased health consciousness, access, and use of maternal health services etc (52). It is easy to envision that an educated woman will have higher self-determination; she will avoid high risk adolescent pregnancies and marry later. More educated women are generally expected to seek antenatal health care. It is more likely that she will improve her nutritional status, which among other things has positive effects on her pregnancy(52). A study conducted in Nepal showed that women who had attained a secondary or higher level of education (aOR, 0.53; 95% CI, 0.39 to 0.74) had a lower chance of stillbirth than those with a primary level of education (aOR, 1.02; 95% CI, 0.79 to 1.33) (56).

In a population-based retrospective cohort of all births, using the Shenzhen Birth Registry Database in China found that, births with maternal education of primary school and below had a significantly higher stillbirth rate than those with a college education and above (aOR=2.0, 95% CI: 1.5–2.7).(55). In another study by Zhu et al, women with no formal education has an increased odds of stillbirth compared with women who completed college or higher (aOR, 1·75; 95% CI, 1·45–2·12) (49). Another study which assessed the interaction between education level and area of settlement showed that mothers with no formal education had the highest odds of a stillbirth and this association was amplified for those from rural settings compared with those in an urban environment with secondary school level of education (aOR: 10.20) (51). A systematic review of determinants of stillbirths in sub-Saharan Africa revealed that women we had no formal education had increased odds of stillbirth compared to women who have had any form of formal education(65). However, other

studies also did not see any association between educational level and stillbirth including a qualitative study that was conducted in Ghana (66,67). This may probably be due to variations in other factors such economic level and environmental factors.

2.2.4 Ethnicity and Race

Ethnic and race disparities of stillbirth rates among women in reproductive ages have been documented in developed countries such as UK, Australia and USA. (58,68–70). A UK study sought to investigate inequalities in stillbirth rates by ethnicity to facilitate development of initiatives to target those at highest risk. This study analysed data from a population-based perinatal mortality surveillance linked to national birth and death registration. The findings of this study revealed that the adjusted absolute differences in stillbirth rates were higher for babies of black African, black Caribbean and Pakistani ethnicities compared with white ethnicities (68). Higher proportions of babies of Bangladeshi (42%), black African (39%), other black (39%) and black Caribbean (37%) ethnicities were from most deprived areas, which were associated with an additional risk of 1.50 stillbirths per 1000 births (68).

On the primary cause of stillbirth, Matthews et al. (68) reported a higher stillbirth rates due to congenital anomalies in babies of Pakistani, Bangladeshi and black African ethnicities (range 0.63–1.05 per 1000 births) and more placental causes in black ethnicities (range 1.97 to 2.24 per 1000 births) (68). On the same subject, another study in the United States indicated that the occurrence of stillbirths were twice more likely in Black women compared to White women. (58) Further, the most common causes of stillbirth were different in Black women than in White women. For instance, stillbirths to non-Hispanic Black women tended to be caused by infection or complications of pregnancy and labour than those experienced among White women

and Hispanic women(58). It was also noted that women who had experienced major financial, emotional, traumatic, or partner-related events in the year before delivery were twice more likely to report stillbirth than those women without prior experienced of these events(58). The study suggested that black women were more likely to have experienced at least three of such stressful events than their White women counterpart.(58).

2.2.5 Type of Settlement

Residential status have been linked to pregnancy outcomes including stillbirths. (44,51,56). Among factors associated with stillbirth in Nepal, Bhusal et al. (56) reported that women who lived in rural areas had a higher odds of stillbirth (aOR, 1.31) than those who lived in urban areas.This is more important in developing countries like those in the Sub-Saharan Africa where good roads and medical infrastructure are skewed in urban communities. Moreover, Negandhi et al.(44) closely linked intrapartum stillbirths to characteristics of place of residence such as the availability and accessibility of appropriate medical care. It noted that timely and appropriate treatment and care, provided by a trained and skilled health worker during pregnancy and labour, as well as soon after delivery, is an absolute requirement for averting these stillbirths.(44). With the aim to identify the determinants of stillbirth among deliveries in the Murtala Muhammad Specialist Hospital (MMSH) in Nigeria, Milton et al. (51) explored two study designs: a case-control study and a prospective cohort study. The unadjusted results revealed that those residing in semi-rural or rural locations had higher odds of stillbirth compared with an urban area [(semi-rural: OR: 2.21) (rural: OR: 5.98 95%)] (51). In the adjusted model, the odds of stillbirth for the mothers living in a semi-rural area with access to clean water were 7 folds higher than the mothers in an urban area with access to clean water (OR: 7.78) (51).

Moreover, mothers with history of stillbirth(s) and lived in a rural area were over 5 folds more likely to deliver a stillborn baby compared with mothers living in an urban setting and not having had a previous stillbirth (OR: 5.39) (51). Also, mothers who had not previously had a stillbirth but reported living rurally had an increased (13 folds) odds again compared to mothers living in an urban areas and having not had a previous stillbirth (OR: 12.99) (51). In Ghana, Women living in the Northern regions have over two times higher odds of experiencing a stillbirth compared to women in the Greater Accra region. This is because resource allocations in the health sector vary significantly between rural and urban communities. For this study, we will also compare the rural and urban setting to ascertain of variations in settlement will have any impact on their level of knowledge and practices pertaining to maternal health.

2.2.6 Employment status

As cited by Löfwander (52), a population-based study in Sweden reported that blue collar workers had a two-fold higher risk of stillbirth than white-collar workers(52). Furthermore, Bhusal et al. (56) utilized the individual women's dataset from the Nepal Demographic and Health Survey in 2016 to identify factors associated with stillbirth in ever-pregnant women. It was reported that women who worked in an office were less likely to experience stillbirth (aOR, 1.05; 95% CI, 0.76 to 1.47) than those who worked in agriculture (aOR, 1.57; 95% CI, 0.64 to 1.80).(56).

2.2.7 Household income/ Wealth status

The influence of household income and wealth status on the incidence of stillbirths have been assessed among different settings(47,51,56). In terms of the wealth index, stillbirth was found to be most common in women belonging to the poor class from Nepal Demographic and Health Survey conducted in 2016 (56). This implies people

with low wealth index have a higher risk of having stillbirth compared to those with high wealth index.

A population-based survey of women of reproductive age in five Health and Demographic Surveillance System sites in Bangladesh, Ethiopia, Ghana, Guinea-Bissau and Uganda (2017–2018), Stefano et al. (47) reported that women in the wealthiest quintile had 43% lower odds of reporting a stillbirth compared to women in the poorest quintile (aOR 0.57, 95% CI 0.40–0.80) (47).

In the quest to identify the determinants of stillbirth among deliveries in Nigeria, Milton et al. (51) conducted two study designs (a case-control study and a prospective cohort study) in the Murtala Muhammad Specialist Hospital (MMSH). The findings showed a correlation between wealth index and area type, household income, and stillbirth. The findings indicated that mothers from rural areas with very low household income were 40 times more likely to deliver a stillborn baby than the mothers living in an urban setting with extremely low income (OR: 40.44). (51). This is a probable indication that improving wealth index can contribute to improving maternal health, thereby reducing the risk of stillbirth.

2.2.8 Place of birth

Poor access to appropriate hospital or medical care centre for delivery could be a contributing factor for the high incidence of stillbirth in developing countries.(45,48,51,54) This is likely to be influenced by residential status of the women. A study in Nigeria indicated that having an extended travel time to the hospital was associated with higher odds of stillbirth; compared with <1hour journey time. (51).

There is a reported increased risk of stillbirth among migrant women than permanent populations.(55) It is important to emphasize that these migrant or floating population may have limited access to healthcare during pregnancy and at labour. As reported in Shenzhen China, migrating populations are faced with limited health care options and are at a higher risk for maternal and infant health issues (71).

In order to estimate the trend in stillbirths and the related socio-demographic characteristics in Shenzhen China, Ma and Zou(55) conducted a population- based retrospective cohort of all births from January 2010 to December 2019. The study utilized the Shenzhen Birth Registry Database where the overall stillbirth rate and year-specific stillbirth rate were calculated. Also, the associations between the risk of stillbirth and maternal socio-demographic status were assessed using logistic regression. The finding of the study showed an overall stillbirth rate of 4.5 per 1000 births was estimated in a total of 492,184 births. Migrant women accounted for 87% of the total population but had a higher stillbirth rate (4.8 per 1000 births) than the permanent population (2.8 per 1000 births) (55).

Similar study by Zhu et al. (49) reported that women who delivered in a township hospital or at home were more than twice as likely to have a stillbirth than those who gave birth in a county hospital. Moreover, women who delivered at home were 2 folds more likely to experience stillbirths than those who delivered in provincial hospital. (49). This finding underscores the benefits of being delivered by a skilled birth attendant as to unskilled birth attendant. We seek to assess the perception and attitude of women towards choice of place of delivery and the driving factors to guide policy recommendations.

2.2.9 Tobacco use

A study with aim of examining the association between exposure to tobacco smoke in utero and the risk of stillbirth and infant death in a cohort of 25,102 singleton children of pregnant women scheduled to deliver at Aarhus University Hospital, Aarhus, Denmar, showed that tobacco smoking reduced fetal oxygenation through increased blood levels of carboxyhemoglobin and through impairment of oxygen unloading, leading to stillbirth and infant mortality (72).

2.2 FOETAL AND OBSTETRIC FACTORS AND STILLBIRTH

A systemic literature review involving studies carried out in 49 countries across 6 continents reported that gestational age at birth, foetal sex, birthweight, parity, multiple gestation and maternal morbidity were the most frequent factors associated with stillbirth (73).Foetal malpresentation was the most frequently observed foetal factor, while prolonged labour was the most frequently reported obstetric complication in Bangladesh(74). Another study with an aim to estimate the incidence, causes, and maternofoetal outcomes of obstructed labour among mothers who gave birth in Ethiopia goes further to clarify that foetal malpresentation directly increased obstructed labour leading to increase in stillbirth (75).

Significant predictors of stillbirth included twin delivery, partograph use, previous history of stillbirth, and labour complications(76). In Northern Tanzania, a study revealed that maternal factors such as placental abruption, pre-eclampsia, anaemia and less than 4 antenatal visits were associated with stillbirth(77). Foetal factors significantly associated with an increased odds of stillbirth included pre and post-term births, non-cephalic foetal presentation and birth weights > 4000g or < 2500g (77). A

study in Peru discovered that mothers aged 40 years and older that did not attend antenatal visits as scheduled were significantly associated with stillbirth(78).

A study conducted in Ghana suggested that neonates that were pre-term, male or with an extreme low birth weight were more likely to be born still and mothers older than 35 years, nulliparous and unemployed women were more likely to have stillbirths(79).A cohort study carried out in England revealed that stillbirth rates were reduced in second pregnancies as compared to the first, third, and subsequent pregnancies. In addition, the risk of stillbirth was increased in mothers who registered for antenatal after 13 weeks' gestation (80). Having reviewed more than 30 million births from studies conducted around the world, it was discovered that stillborn females were less than stillborn males in the crude mean rate (stillbirths/1,000 total births) and male foetuses have a 10% higher chance of stillbirth(81). The Sydney stillbirth study also revealed that stillborn foetuses were more likely to be male than females(82).

Second births also had the lowest rate of stillbirth in comparison to first, third, fourth or more births (83). In a study conducted in Southern California, younger women and women who sought antenatal care late during pregnancy were revealed to have stillbirths with their first pregnancies(84). Another study by Dahiru and Aliyu, stillbirth was found to be higher in higher in primiparity and among first births(85). In addition, those who received antenatal care and female babies had a higher rate of stillbirths (85). Of 319 singleton stillbirths and 1,119 singleton live births in 59 hospitals in 5 geographic areas in the USA, stillborn infants had a reduced gestational age, lower birthweight and had a congenital abnormality as compared to live born infants(86). In a study conducted in Zambia, stillborn foetuses were observed to have undergone operative vaginal delivery (forceps or vacuum), weighed less than 1,500g

and were born before 28 weeks of gestation(87). In the absence of absolute contraindications, the safest mode of delivery in case of stillbirth is vaginal birth. Caesarean sections should be performed only in specific situations such as placental abruption, placenta previa and persistent transverse foetal position(88).

In another study in the UK, the risk of stillbirth increased in both nulliparous and parous women as the gestation progressed. This increase was similar for both groups of women up to 40 weeks gestation. However, the risk of stillbirth was significantly higher in nulliparous women than in parous women after 42 weeks of gestation(89). Prematurity, low birth weight, multiple gestations, breech presentation, antepartum haemorrhage, caesarean delivery, and cord prolapse were all linked to an increased risk of perinatal death in Uganda(90). In a study conducted in Ethiopia, risk factors found to be significant predictors of stillbirth were parity, previous stillbirth, previous preterm birth, history of having a child with congenital abnormalities, antenatal care for the current pregnancy, antepartum haemorrhage in pregnancy, method of delivery, and multiple birth (91).

Numerous studies have documented the link between antenatal care and stillbirth. In a Tunisian population, the lack of antenatal care increased the chance of stillbirth(73). Similar findings were reported from Vietnam, Jamaica, Peru and Nigeria(73). Also, the mode of delivery and history of previous stillbirth were obstetric factors associated with stillbirth(73). In a study conducted in East Africa, the odds of having a stillbirth through a caesarean section was 1.81 times higher than through vaginal delivery(92). In comparison to liveborn babies, stillborn babies had lower gestational age, lower birthweight and a higher percentage of congenital anomalies(86). In a hospital in Ethiopia, the odds of a stillbirth were 4.9 times higher in mothers with a history of labour complications than in mothers without complications. The odds of stillbirth

were 6.7 times higher in mothers of twins than in mothers of singletons. Compared to mothers who had not used a partograph, mothers whose labour had been monitored by a partograph had a 75% lower risk of stillbirth(76).

Mother's parity has been identified as a major risk factor of stillbirth in several studies. Both primiparity and multiparity are proven risk factors of stillbirth. In a systematic review and meta-analysis study on 'Major risk factors for still births in high-income countries', primiparity was found to have contributed up to 15% of stillbirths from all the 96 population-based studies included (93). Meanwhile, a hospital-based prospective cohort study on Effect of Grand Multiparity on Adverse Birth was conducted in the Sidama Regional State of Ethiopia in 2021. The study initially enrolled 837 women and ended with 816 women, reasons being loss to follow-up and refusal to participate. The findings of this study revealed that women with grand multiparity gave birth to babies with a higher risk of stillbirth.(94)

In a study in 2017 by Nkwabong and Timeola Goula, placenta was identified as a risk factor in stillbirths(95). In their study "Placenta abruption surface and perinatal outcome" identified the various degrees of placental surface detachment and how they affect perinatal outcomes. The study employed a prospective descriptive method carried out over a period of 8months. Findings showed that, out of the 47 placental abruptio occurrences, a detachment of >45% was always associated with stillbirths.(96) In addition, central separation of placenta was significantly associated with stillbirth. In the systematic review and meta-analysis by (93) which assessed risk factors for stillbirths, Placental abruption was highlighted because it was one of the major risk factors , contributing to 15% of stillbirths. A recent study has contributed to placental factors as a risk factor for stillbirths. In their findings, it was shared that 31/341(31%) represented placental causes of stillbirth(97). About 5.3%

represented placental abruptio while 2.3% represented placental insufficiency. Several other studies have reported placental insufficiency and other placental factors contribute significantly to the occurrence of stillbirth (98,99)

2.3 MATERNAL MEDICAL RISK FACTORS OF STILLBIRTH

Several recent and earlier studies have proven that there exists an association or there exists no association at all between several maternal medical factors and the rate of occurrence of Stillbirth.

2.3.1 Blood group and Rhesus factor

Blood group and Rhesus factors are proven risk factors for stillbirths. A multisite population-based case-control study was conducted in 59 United States tertiary care and community hospital. Study subjects included 614 cases and 1816 control. Study was limited by the retrospective collection of some information due to missing variables. Findings of this study suggested that the maternal blood AB was independently associated with stillbirths [aOR:1.96; 95% CI 1.16 – 3.30]. (100) Hassan in his study "ABO compatibility and incompatibility among Basrah Families" in Iraq revealed that stillbirth was higher in incompatible than compatible ABO mating(101). Stillbirths contributed to 2.79% in incompatible mating as compared to 2.33% in compatible mating (n =1472 total pregnancies)(102). However, in a prospective cohort investigation carried out in 2014 with the objective of determining whether maternal blood group ABO is associated with risk if stillbirth; it was concluded that maternal blood ABO was not associated with stillbirth (101).

A study published in 2014 using data from 1,022,569 singleton births from 668,952 mothers examined the associations of maternal alloimmunization with specific red

blood cell antibodies and the risks of preterm birth and stillbirth in the Swedish population(103). This study found out that alloimmunization with anti-D, anti-E, anti-C and anti-c was associated with increased risk of both stillbirth and preterm birth(103).

Another study conducted in South Ethiopia explained that the genetic chromosomes of Rhesus negative mothers led to sensitization (a reaction between Rhesus negative mothers and RhD-positive foetal blood cells in her circulation by developing anti-D antibodies)(104) . This sensitization served as a template for future Rhesus positive foetuses to be treated as antigens resulting in jaundice, anaemia, developmental problems, or stillbirth.

2.3.2 Gestational Diabetes and Hypertension

Gestational diabetes and pregnancy-induced hypertension are established risk factors of stillbirths. Holman et. al conducted a prospective cohort study in three English Regions. One cohort comprised of data on pregnancies in 2007 and 2008 for women with pre-gestational diabetes in three English regions.(105). With the second cohort, data was collected on all pregnancies between June 2010 and May 2011in one region and across 13 other units in England. Then the data on all singleton pregnancies were put together. The study found 29 out of 2085 singleton pregnancies in the cohort of women with pre- gestational diabetes resulted in stillbirths representing 13.9 per 1,000 (105). This study concluded that women with diabetes have a significantly higher risk of stillbirth at all gestations after 32weeks.(105).

Meanwhile a systematic review and meta-analysis study involving 66 cohort studies, 7 case control studies and a total of 70, 292,090 participants discovered that gestational diabetes was not associated with stillbirth and that the absolute risk of stillbirth with

gestational diabetes was increased only in late stillbirth i.e., after 28 weeks of gestation (106). Authors however indicated that this finding should be interpreted cautiously due to heterogeneity noticed across the various studies used.

Similarly, in another study on stillbirth, hypertensive disorders of pregnancy and placental pathology established a link between stillbirths and hypertension in pregnancy. The study employed a population-based cohort study of all stillbirths and some live-births across five catchment areas and found that 79 out of 518 stillbirths had gestational hypertension.(107). Two Indian researchers identified pregnancy induced hypertension as a cause of stillbirth. The study identified that out of 96 stillbirths, pregnancy-induced accounted for 14.6% (108)

Studies by Flenady et al and Liu,Wang Yu and Su, have also pointed out gestational hypertension and diabetes mellitus as risk factors of stillbirth (93,109). A retrospective cohort study was conducted at two tertiary care hospitals, Aga Khan Hospital (AKU) and Liaquat National Hospital (LNH) in Karachi, Pakistan to assess the impact of hypertensive disorders of pregnancy on stillbirths and other perinatal outcomes among women in Karachi, Pakistan. The study found out that the complications of pregnancy were higher among pregnant women with hypertensive disorders as compared to those who were normotensive. In this study, among women who had hypertensive disorders of pregnancy, the odds of having a stillbirth was two times more than that for normotensive women (aOR=2.62, 95% CI=1.46-4.40) (93,109). Among the four types of hypertensive disorders of pregnancy (HDP), eclampsia was associated with the greatest odds of adverse events with five times the odds of having a stillbirth (aOR=5.16, 95% CI=1.42-18.68)(110).

In another study conducted in Ethiopia, women with HDP conditions like eclampsia, pre-eclampsia and chronic hypertension, were at higher risk of stillbirth (RR = 2.02, 95% CI: 1.11, 3.01) than normotensive women (111). This study clarifies that HDP is associated with disturbed vascular manifestations, oxidative stress and endothelial damage, which affect placental function resulting in poorer perfusion and nutrient supplementation to the foetus that enhance adverse perinatal outcomes like stillbirth (111).

2.3.3 Folic Acid Supplementation and Stillbirths

Folic acid and some other micronutrients have been found to be linked to stillbirths in one way or another. Dixon, Kancherla, Magana, Mulugeta and Oakley used secondary data from multiple sources to estimate percentage reductions in stillbirth and other peri-natal deaths in Ethiopia (112) They estimated that folic acid intake would have prevented up to 31,380 stillbirths in Ethiopia (112). In a two-stage meta-analysis including 112,953 women, researchers compared the use of micronutrients supplements containing folic acid against the use of folic acid only in their meta-analysis study including 17 random controlled trials in low-income and middle-income countries. Their results indicated that the use of micro-supplements did not increase the risk of stillbirth (113). Other studies published in 2011 have indicated that folic acid supplementation reduces stillbirths and further recommended it in the prevention of stillbirths.(114,115)

2.3.4 Malaria in Pregnancy

In the Ashanti Region of Ghana, a cross-sectional study was conducted to assess the Plasmodium/intestinal helminth and other risk factors for stillbirth. The findings of the study suggested malaria as one of the risk factors associated with stillbirth (aOR:

1.9,95% CI 1.2 - 9.3) (116). The study also showed that out of the 37 stillbirth cases identified, only 10.8% had received third dose of Sulfadoxine pyrimethamine (116). Harrington et al in their research established falciparum malaria to increase the risk of gestational hypertension thereby increasing the risk of stillbirth(117). Other studies - (107,118) have found malaria in pregnancy to be a major risk factor of stillbirth. On the other hand, the study by Kalanda et al on the contrary didn't realize any relation between malaria parasite density and occurrence of stillbirths (119).

2.3.5 Maternal Viral Infections and Stillbirth

A systematic review by McClure et. al show that several infections have been associated with stillbirths over the past 10years. Rubella, HIV, Syphilis were found to be associated with stillbirths. Syphilis was distinguished to be one of the infections which has strong associations with stillbirth with about a two-fold risk(120). Kupka, Kassaye, Saathoff, Hertznark, Msamanga and Fawzi, in the research on "Predictors of stillbirth among HIV-Infected Tanzanian women" discovered that risk of stillbirth among HIV-infected women was 50 per 1000 deliveries (121). This same study exposed an association between gonorrhoea and stillbirth. Findings indicated that a gonorrhoeal infection may be a risk factor for stillbirth – this finding is however limited by a small number of endpoints to examine the association (121).

In a systematic review of studies regarding factors associated with stillbirth in low and middle-income countries reported Syphilis, positive HIV status with low CD4 count and other maternal factors accounted for up to 50% of stillbirths (98). Additionally, Syphilis contributed to 7.7% of stillbirths in another study (122). Feleke, Feleke, Nigussie and Misgan, in their longitudinal study established hepatitis B as a risk factor for stillbirths. Out of 1091 women who had experienced stillbirths, Hepatititis B

accounted for 3.2% while Hepatitis C was found in 0.3% of the stillbirths.(123). Conversely, the study on stillbirths in Botswana concluded that HIV infection is rarely associated with stillbirths (99).

2.3.6 Maternal Haemoglobin, Anaemia

Maternal haemoglobin and anaemia are linked to stillbirths as reported in several studies. Nair, Churchill, Robinson, Nelson-Piercy Stanworth and Knight in the study "Association between maternal haemoglobin and stillbirth: a cohort study among a multi-ethnic population in England" examined the association of maternal haemoglobin with stillbirth and perinatal death. A retrospective cohort analysis was done using maternity information from 14001 women, form two hospitals between 2013 and 2015. The study found an association between maternal haemoglobin concentration at 28weeks and stillbirth (124). Although the association was not statistically significant, a linear inverse association was observed. In the same study, the odds of stillbirth were fivefold higher among pregnant women with moderate to severe anaemia at 28 weeks compared with women with no anaemia (124). A retrospective case control study conducted at Kissala Hospital in Eastern Sudan study by Ali, Rayis, Abdallah, Elbashir and Adam showed that the risk of stillbirth increased in severe anaemia. The study as well established an association between severe anaemia and pre-eclampsia where the risk of pre-eclampsia increased in severe anaemia.(125).

2.3.7 Genetics and Stillbirth

A study conducted in the US on the Utah population revealed that that there is familial aggregation of stillbirth, in effect that an occurrence of stillbirth in the previous generations of one's family can increase risk of reoccurrence. In this study, it was

shown that stillbirth risk was however higher in the male relatives of affected pedigrees. This study posited that their findings supported the genetic underpinnings of stillbirth (126).

Another study titled “Genetics and Stillbirth” explains this genetic underpinnings by expounding on how cytogenetics affect stillbirth, stating how recent innovations such as florescent in-situ hybridization (FISH) and comparative genomic hybridization (CGH) could be helpful in screening for subtle chromosome abnormalities, which were hitherto unavailable with the use of karyotyping methods(127).

A review conducted by Jain *et al* in 2019 also show the importance of genetics in linking sickle cell disease and childbirth. This paper explains that the different genotypes of homozygous HbS sickle cell anaemia (SS), double heterozygote states of sickle haemoglobin C disease (SC), sickle beta plus thalassemia (Sβ+Thal), sickle beta zero thalassemia (Sβ0thal), sickle cell anaemia with alpha thalassemia (SS αthal), and sickle cell anaemia with high foetal haemoglobin (SS+F), can result in perinatal mortality and maternal mortality(128). The paper laid its claim on the fact that the genes of Sickle Cell disease patients results in certain physiological adaptation in the circulatory, hematologic, renal and pulmonary systems of both mother and baby, increasing risk of mortality(128).

An example of such a situation is revealed by a case report of a sickle cell disease mother and her sister who also had sickle cell disease, who both had complications during and after pregnancy(129). The patient in question was hospitalized on several occasions for acute pain, received red cell transfusions for anaemia at 20 and 24 weeks gestation, delivered a 3.2-kg healthy infant vaginally without complications and reported with red blood cell complications a few days later. Her sister however had

frequent acute pain complications, had pre-eclampsia complications, delivered at 33 weeks gestation which was complicated by a massive pulmonary embolus that required intensive care unit admission and intensive care unit admission of her twin.

2.4 MATERNAL HEALTH AWARENESS AND STILLBIRTH

Maternal Health Awareness is the knowledge or perception that individuals or group of people have about maternal health and its various components, factors that influence it, and actions and beliefs that promote or hinder it (130,131). The WHO has explained in previous publications that the awareness does not only entail informing stakeholders, but also involves provision of a pivotal consciousness that builds individual and collective capacity to support actions that realize rights to more accessible and responsive care (132). Again, maternal health awareness, if structured effectively, should not target women and mothers alone, but however collaboratively target individuals, families, communities and healthcare givers (133).

A multinational review study conducted by WHO to assess the relationship between maternal health awareness and other aspects of maternal and new born health evinced that awareness had an influence on maternal health (132). In this review, studies used Cluster Randomized Control Trials (RCTs) and Pre-post Evaluation programs to report on the influence of awareness of maternal health rights on healthcare practices, patronizing antenatal clinics, rates of skilled birth attendance and accessing facilities. Studies that have been previously conducted have utilized various study designs, including qualitative, qualitative and mixed-methods designs, to determine and/or assess the Knowledge Attitudes and Practices (KAP) of various stakeholders of maternal health care, whiles employing data collection methods like focus group discussions, in-depth interviews, key-informant interviews, direct observations (134–

137). KAP surveys of maternal health have been conducted among caretakers (male and female), lactating mothers, social and religious group leaders, households, communities and health workers (136,138–143). Some of the finding from these studies showed that, increasing awareness improved ANC seeking behaviour, increased patronization of public facilities for maternal healthcare provision, and improved diet and nutrition, antenatal and delivery-related practices, potentially reducing the risk of stillbirth and maternal health complications(136,138–143).

Another study in India asserted an increase in prenatal examinations with an increase in awareness. The outcomes of these studies have been shown to directly access stillbirths. The study hence considered that in the implementation of interventions to promote maternal health awareness, it will be necessary that awareness should be a constant process among all stakeholders and not limited to periods of pregnancy and childbirth. Awareness raising efforts should be flexible enough to allow incorporation into pre-existing approaches and systems whiles making provision for monitoring and evaluation and that healthcare providers should be regularly trained and sensitized on their roles in increasing maternal health care awareness (132).

In a community based cross-sectional study to assess the KAP of birth preparedness and complication readiness among 549 pregnant women in Sissala West and East District of rural Northern Ghana (144), the authors found out that less than half (4.7%) of pregnant women had adequate knowledge of warning signs of complications during pregnancy. Only 46.5% of the mothers were identified to be well prepared when assessed for birth preparedness and complication readiness(144). Education was found to be significantly associated with preparation for neonatal and maternal outcomes. Respondents who had attended primary (aOR = 1.77, 95% CI: 1.15, 2.73), secondary (aOR = 4.43, 95% CI: 2.61, 7.52) or tertiary education (aOR = 4.78, 95% CI: 1.89,

12.11) were significantly associated with good birth preparedness and complication readiness(144). In this study, pregnant Islamic women were less likely to have adequate knowledge of warning signs during pregnancy as compared to Christian women (aOR = 0.14, 95% CI:0.02, 0.81) (144).

In 2017, a study conducted in Hawassa in Ethiopia used an institution based cross-sectional study that was conducted among 634 Health Care Practitioners (HCPs) working in public health institutions (PHI) of Hawassa via a validated instrument called the 'Andarg-Ethio PCC-KAP Questionnaire' to determine HCP's Preconception Care (PCC) practice and factors associated with the non-implementation of PCC (145). The authors justified their study's focus on evaluating Knowledge Attitudes and Practices of PCC with the fact that Adverse Pregnancy Outcomes (APOs) are largely avoidable, especially at the preconception stage, and hence interventions that target antenatal and postnatal care in prevention still births may be somewhat. Healthcare professionals included in the study included Medical Doctors, nurses, midwives, Public Health Officers and Health Extension Workers. Though more than half of the health workers interviewed had stated that it was duty of all health workers to provide PCC, very few, 97(15.3%), of the practitioners were found practicing PCC and those 97 practicing PCC practiced less than 50% of items measuring PCC(145). About 87% practiced none (0%) of any of the PCC indicators like providing counselling on preconception folic acid supplementation, importance of environmental hazard and toxins, importance of partner involvement in PCC, assessment of patient's exposure with environmental hazard & toxins, assessment of history of dental care or check-ups, preconception folic acid supplementation, cigarette, alcohol and other substance use cessation, genetic screening tests, immunizations other than TT Vaccines 0 0% and Haemoglobin A1c screening for

Diabetes patients(145). The study also showed that there was a significant association between knowledge and PCC practice, showing that HCPs with poor PCC knowledge had 4 times higher odds of not practising PCC (145). In another Ethiopian study conducted in Eastern Ethiopia, that 60.2% of MHCPs had good knowledge of PCC, with educational level, work experience, type of public health institutions, reading PCC guidelines, and training on PCC or related topics identified as being statistically significant with MHCPs' knowledge of PCC (139).

Makokha-Sandell et al conducted a study in 2020 among 29 HCPs (10 midwives and 11 specialists (medical doctors with at least a master of medicine degree in obstetrics and gynecology, three administrators, five residents) in the highest referral and teaching facility(about 900 deliveries are performed in this facility per year) in Tanzania to assess reason of low patronizing of health practices that could improve maternal and neonatal health outcomes (146). A cross sectional study conducted among 791 women in the periconceptional period (14 weeks before and 10 weeks after conception) in two provinces of China, used questionnaires and on-to-one interviews to investigate the women's eugenic KAP level on adverse pregnancy outcomes (still births and maternal deaths) (147). Ten questions were asked on terms of knowledge related to periconceptional health care, with one point given for the correct answer of each item. Scores were then averaged for all participants and the overall average score of the knowledge level was obtained. The authors of this study stated in their findings that the average score of periconceptional healthcare knowledge awareness was 6.32 ± 1.78, however 28.8% of women measured KAP levels below the estimated benchmarks(147). Out of the 791 women, 50.2% had planned to or had undergone premarital and 62.5% had participated or planned to participate in pre-pregnancy examinations(147). Less than half (42.0%) of the women started taking folic acid (FA)

before pregnancy, and only 37.9% of them took FA regularly at the right time(147). Age was found to be significantly associated with the attitude and practice level of women during the periconceptional period and showed a positive influence on the awareness of right timing of folic acid supplementation, and high rates of premarital and pre-pregnancy examinations(147). Also, there was a significant increase in knowledge pass rate with increased education level. Fewer women who had had previous birth experiences were willing to take FA consistently at the right time compared to those women without birth (147).

In a study conducted in a teaching hospital among 157 Ethiopian women to assess the knowledge, attitude and practice on birth preparedness and complication readiness among women attending ANC, it was realized that 106 had no history of abortion, 126(80.3%) participants didn't have history of stillbirth 29(18.4%) had 1 or 2 still births (148). Out of the 157 women that participated in the study, 125 (79.6%) had a favourable attitude towards birth preparedness and complication readiness. About 113 (72%) were knowledgeable about danger signs during pregnancy, 110 (70.1%) were knowledgeable about danger signs during labour and 80 (51%) knew what danger signs to look out for in the postpartum period(148). About 103 (65.5%) were informed about birth preparedness and complication readiness, 50 (31.8%) identified and mentioned the place of delivery, 44 (28%) were informed about quality yet affordable healthcare, 6 (3.2%) had identified means of transportation, but 141 (89.8%) of respondents were not arranging blood donor and 139 (88.5%) had not identified a way to communicate with source of help. In this study, 137 (87.3%) of women had saved money during pregnancy and 131 (83.4%) had prepared essential items for delivery and the postpartum period (148). This highlights the need to improve our insurance

policies to drive equity in impoverished societies thereby averting catastrophic situations driven by economic hardship.

CHAPTER 3

RESEARCH METHODS

3.1 RESEARCH DESIGN

The study was conducted in two phases with phase one have two sections. The phase one provided a situation analysis which covers the quantitative and qualitative approaches and design. The phase one employed a convergent mixed method approach which involved the separate collection and analysis of qualitative and quantitative data. The results were subsequently merged, and the interpretation or inference drawn from the two and discussed side by side. In this research, the quantitative results were discussed together with the qualitative data to examine to which extent the qualitative results confirm the findings from the quantitative and how the results of the from the two methods diverge from each other with plausible explanations. A combination of these designs provided a complete understanding, diverse perspectives of the outcomes, helped to validate one database over the other and served as a basis for development of a policy brief . Figure 5 shows a simple graphical representation of a convergent mixed method study design.

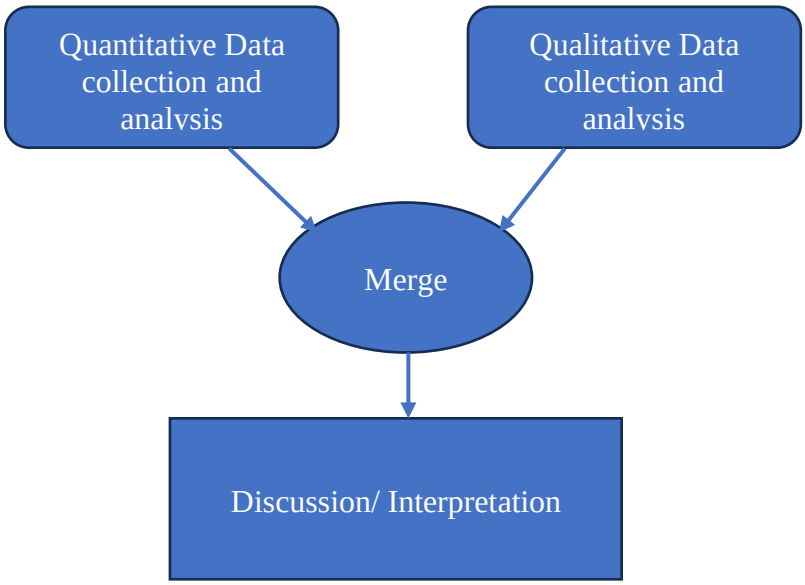

Figure 5: Convergent mixed method design

The quantitative studies comprised of a case-control study to assess sociodemographic, obstetric, foetal, and maternal medical health factors, associated with stillbirth; a cross-sectional survey to assess the knowledge, attitude and practices (KAP) of maternal health during pregnancy, among residents of Northern Ghana.

The qualitative study used for this study was grounded theory using focus group discussion and in-depth interviews to explore the perceptions and describe the socio-cultural practices of community members with regards to maternal health; explore and describe maternal health care of mothers who have been affected by stillbirth; understand the diverse perspectives of healthcare workers on maternal care and stillbirth. Phase two covered the development of a policy brief on risk factors for stillbirth in northern Ghana. The results of phase one informed the development of the policy brief in phase two.

3.2 STUDY SETTING

The study was conducted in northern Ghana. The Northern sector of Ghana is made up of 5 regions namely Upper West, Upper East, North-East, Savannah and Northern with a cumulative population of **6,651,717**. Figure 6 shows the map of Ghana highlighting the study sites.

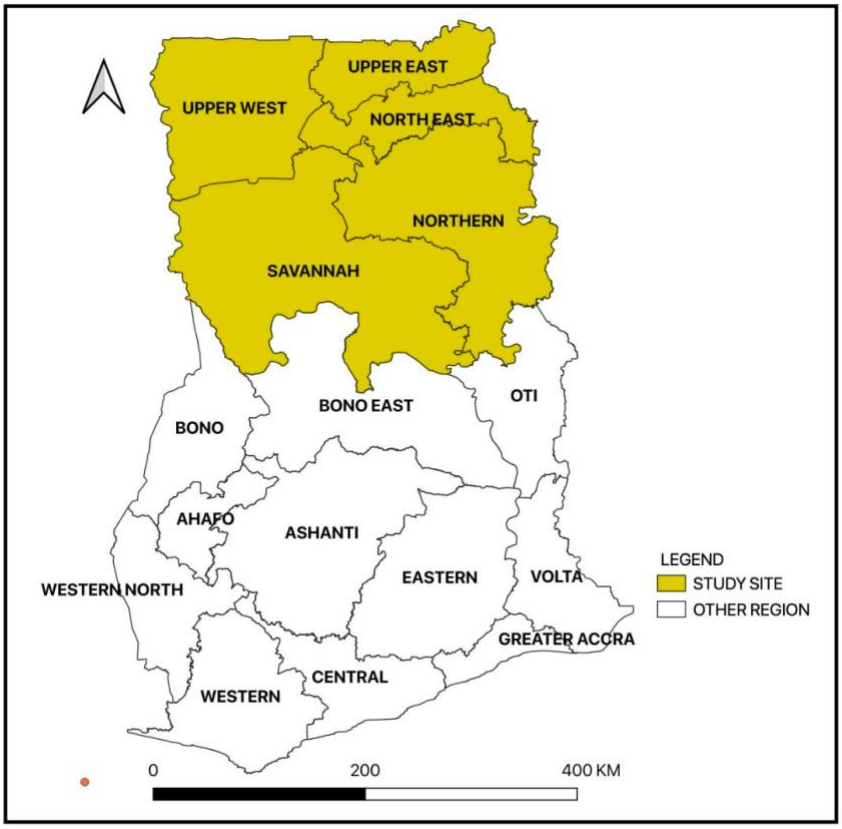

Figure 6: map of Ghana highlighting the study sites in the Northern zone

3.2.1 Upper West Region

The Upper West Region, situated in the north-western part of Ghana lies between longitude 1° 25'' W and 2° 45'' and latitudes 9° 30'' N and 11°N. It is bordered to the south by the Northern region, to the north and West by Burkina Faso and to the east by the Upper East region. With an area of 18,476 km^2, the region's population density stands at 40 persons per square kilometre. The projected population for 2022 based on the 2020 Population and Housing Census growth rate of 2.1% was ***920,434*** The regional population specific targets for children under one year/expected pregnancies and women in the fertile age (WIFA) have been given as 4% and ***24%*** respectively.

The predominant activity is farming, the long dry season means that many people are idle for so many months each year resulting in a lot of seasonal migration to the southern parts of the country especially Brong-Ahafo, Ashanti and Eastern regions.

The Upper West Region has a total of eleven (11) administrative districts. There is a total of four hundred and ninety-seven (497) health facilities providing various types of services in the region. There are three (4) district government hospitals, one (1) Regional hospital, two (2) CHAG Agency hospitals and three (3) private hospitals. The rest are five (5) Polyclinics, seventy-Two (72) health centres, ten (10) clinics and three hundred and twenty-five (325) CHPS Compounds and four (4) maternity homes.

(Source: Upper West Regional Health Directorate, Regional Profile, 2022)

3.2.2 Upper East Region

Upper East Region has a total land area of about 8,842 sq. km and in terms of the land size it is the smallest region in Ghana with a population density. The population is largely rural (74.6%) with the population density of 147 per km^2 compared to the national density of 134 per km^2. It shares boundaries with Burkina Faso to the north and republic of Togo to the east. It has an estimated population of 1,328,551 million in 2022 with a growth rate of 1.2% with 24% of women in their reproductive age. Settlement pattern is highly dispersed in all communities. The region is divided into fifteen administrative districts. The road infrastructure is very poor; with 15% tarred. Population literacy is about 34%. Economically, the region is one of the poorest and deprived regions in the country. Subsistence agriculture is the main economic activity.

The Region is divided into thirteen (13) administrative districts and ninety-one (91) health sub-districts. The region has 588 health facilities and Ghana Health Service

operates about 90% of all health facilities in the region. The number of health facilities can be broken down by ownership as Government - 527, Mission -19, Private – 41, Quasi Government - 1. Only 60% of the people are within 8km radius of a health facility.

(Source: Upper East Regional Health Directorate, Regional Profile, 2022)

3.2.3 Savannah Region

The Savannah Region is approximately, 35,853 sq Km and the largest region in Ghana covering about 15% of the total area of Ghana. The region is divided into seven administrative districts and shares boundary with Cote D'Ivoire and Burkina Faso to the West. The 2022 estimated population was **653,266** with a population density of 17 per square kilometer and an annual growth rate of **3.1%**.

The population is characteristically distributed in small settlements with populations of 200 - 500 people. There are over 1,250 settlements in the Region, out of which about 17% have population less than 200 people. The distances between settlements are far apart. This peculiar pattern of distribution of population in the region has adverse implication for service delivery, as sub-district health teams (SDHTs) going on out-reach services travel long distances only to reach a small proportion of their target population. Most of the inhabitants are poor and cannot afford basic health services. Agriculture is the predominant economic activity, with over 90% of the productive age group being peasant farmers. Most roads are not motorable in the rainy season thus hampering health service delivery. There are 195 health facilities in the region comprising 4-Hospitals, 4-Polyclinics, 24-Health Centers and 145-CHPS.

(Source: Savannah Regional Health Directorate, Regional Profile, 2022)

3.2.4 North East Region

North-East Region has a land size 10,484 Sq Km with an estimated population of 686,912. The Region is divided into six (6) administrative Metropolitan, Municipal and District Assemblies (MMDAs). The six (6) MMDAs consist of two (2) Municipalities and four (4) Districts. . It shares boundaries with the Upper East to the North, Northern to the south, the Republic of Togo to the East and Upper West and Savannah Regions to the West. Most people in the region are engaged in agriculture. The crops that they produce include yam, millet, guinea corn, rice, groundnuts, beans, soya beans and cowpea. Occupation distribution of the region shows that 71.2% of the populations are into Agriculture, while 5.7% are in the Professional/Administrative Class and 23.1% are in the Trade and Services Sector.

The state of the roads in the Region is generally bad. The only tarred roads are Nalerigu through Walewale to Bolgatanga stretches. Apart from the above most roads are not motorable especially in the rainy seasons, thus hampering mobility in the region. The Region has poor network with all network providers in the region due to her closeness to Togo boarder hence the difficulty to make calls. Most of the district capitals can be reached by cell telephone.

Two temporary structures currently host the Regional Health Directorate in Gambaga. The main office is still under construction. Two out of the six districts have no office accommodation for the District Health Administration (Bunkpurugu-Nakpanduri and Yunyoo-Nasuan Districts). There are four hospitals, one polyclinic, twenty health centres, nine clinics and ninety-seven functional CHPS zones with fifty-five compounds.

(Source: North-East Regional Health Directorate, Regional Profile, 2022)

3.2.5 Northern Region

The Northern Region has a total land area of about 70,384 sq km. It is located between latitude 8 30" and 10 30" N and lies within in the savannah belt of Ghana. It has Togo and La Cote D'Ivoire to the East and West respectively, as its international neighbours. Further south, the region shares boundaries with Savannah Region, and to the north it shares borders with North-East Region. It is divided into sixteen (16) political/administrative districts headed by the Metropolitan, Municipal and District Chief Executives. The districts are further subdivided into 84 health sub-districts and 430 electoral areas. The below map and a table show the summary of health infrastructure and geographical locations of districts in Northern region**.**

At a growth rate of 2.9 per annum, the projected population of the region for 2020 stands at **3,062,554** which is about 10.4% of the national population with 51.9% as females. The population is characteristically distributed in small settlements with populations of 200 - 500 people. There are over 2,000 settlements in the Region, out of which 54.4% have population less than 200 people. The distances between settlements are far apart. This peculiar pattern of distribution of population in the region has adverse implication for service delivery, as sub-district health teams (SDHTs) going on out-reach services must travel long distances only to reach a small proportion of their target populations.

Poverty is high and widespread, and many cannot afford the cost of basic health services. Agriculture remains the predominant sector, with over 90% of the productive age group being peasant farmers. Mechanized agriculture is possible on this terrain although limited in practice because of the high cost of inputs. However, the peasant

farmer produces the bulk of the cereals, tubers, and groundnuts in the region. Shea nut is the most important cash crop in the region.

3.3 RESEARCH APPROACH

3.3.1 Assess the associated factors with stillbirth among residents of Northern Ghana

3.3.1.1 Study Design

To determine the associated factors for stillbirth among residents of northern Ghana, a Case- Control study was used.

3.3.1.2 Study Population

The population for the case control study was women who have lived in the study site for a minimum of 6 months and 18 years of age or above who delivered in the selected health facilities in both rural and urban communities in Northern Ghana.

Definition of a case: A case was defined as any woman who delivered a stillbirth 6 month before and during the study period (Between 10th November 2021 and 9th May, 2023) and is a resident of Northern Ghana.

Definition of a Control: A control was defined as any woman who delivered a live-birth 6 month before and during the study period (Between 10th November 2021 and 9th May 2023) and is a resident of Northern Ghana.

3.3.1.3 Sample Size and Sampling Method

With the use of Epi Info Version 7, the sample size for the case control study was determined using a power of 80%, ratio of cases to controls = 1:2, percentage of controls exposed = 20% and odds ratio of 2. These computations gave a sample size of 516 comprising of 172 cases and 344 controls. Simple random sampling was used

to select study participants. Data on stillbirths that have occurred in Northern Ghana by all facilities were first extracted from the Demographic Health Information Management System II (DHIMS-2) of the Ghana Health Service into a Microsoft excel template. The data was stratified into five regions: Northern, North-East, Savannah, Upper East, and Upper West. With a required minimum sample of 172 cases across the five regions, the number of cases to be drawn from each participating facility was determined by calculating for the number of stillbirth cases in each facility proportional to the total minimum sample size. Facilities were visited and a line list of cases were generated from the hospital ward and maternity registers. The required number of cases per facility were randomly selected from the pool of recorded stillbirths by using the RANDBETWEEN function to generate random numbers for selection of cases. Based on the location of cases and their respective age, the 344 controls were selected matched by the age and communities of the respective cases.

3.3.1.4 Research Instrument for data collection

A Semi-structured electronic data collection tool was developed using Open Data Kit (ODK) to help assess the risk factors for maternal health. Questions were categorized to collect information on sociodemographic, obstetric, foetal, and maternal medical health factors associated with stillbirth. The dependent variable was stillbirth and the independent variables include sociodemographic, obstetric, foetal, and maternal medical health factors (annexure G). The data collection tool was piloted among communities with similar characteristics as the study population but not part of the study subject. As such the results were not included in the actual study. The purpose of the study procedure was explained to the pilot participants. Administration of the tool was done after consent was given by the participants. After the piloting, the

inconsistencies in the data collection tool and any form of ambiguities were rectified before using the tool for the actual data collection.

3.3.1.5 Data Collection procedure

Cases were traced to the various locations in the community and consent was obtained prior to data collection. All cases who could not be traced or refused to participate in the study were replaced. The same approach was used in the selection of controls matched by age and community. The semi-structured questionnaire was used to collect data from cases and controls. Each data collection process using the ODK lasted for about 15 – 20 minutes.

Inclusion Criteria: any woman who delivered a stillbirth or live birth 6 month before and during the study period (Between 10th November 2021 and 9th May, 2023) and is a resident of Northern Ghana.

Exclusion Criteria: Women who delivered non-singleton stillbirth or live birth were excluded from the study. This was because using singleton stillbirth would aid in generalisability to the broader population. In addition, it also helps to isolate the specific risk factors associated with stillbirth without the findings being confounded by the mere fact of having non-singleton. Also, the study did not set out to compare stillbirth among those two groups.

3.3.1.7 Data Analysis

Data collected was cleaned and exported into Stata version 16 for analysis. Descriptive and analytic statistics was performed on the imported data. Mean, Standard Deviation, median, frequency and proportions were used to describe the data by person, place and time. Categorical variables were expressed in frequencies and relative frequencies. Continuous variables were summarized using the appropriate measures of central

tendency and their corresponding measures of dispersion. Odds Ratios (OR) and their corresponding 95% confidence intervals (CIs) were calculated using logistic regression to assess the association between the independent variables and stillbirth. Significant level of association was set at p-value less that 0.05. Independent variables which were found to be significantly associated with stillbirth were put into a multivariate logistic regression model to detect independent determinants.

3.3.2 Assess the knowledge, attitude, and practices (KAP) of maternal health during pregnancy, among residents of Northern Ghana

3.3.2.1 Study Design

Cross Sectional Quantitative Study was conducted to assess the knowledge, attitude, and practices (KAP) of maternal health among residents of Northern Ghana.

3.3.2.2 Study Population

The specific study population was women who have lived in the study site for a minimum of 6 months and 18 years of age and above and have had a baby in the past 6 months prior to the study in selected clusters in both rural and urban communities in Northern Ghana. A cluster was defined as enumeration areas (EA) in the region as per the National Population and Housing Census.

3.3.2.3 Sample Size and Sampling Method

The parameters for sample size were: expected frequency of Stillbirth = 50%. margin of error = 5%, confidence level=95%, design effect = 3.0, and number of clusters= 60.

These computations gave a minimum sample size of 1200 households in 60 EAs (20 households per EA) to be sampled throughout Northern Ghana. A systematic sampling technique was used. The population of Northern Ghana was divided in the 5 strata as

per the regions (Northern, North-East, Upper West, Upper East and Savannah). Based on the population sizes, the number of EAs to be sampled per region were determined. Using the same approach, the EAs per region were sub-divided into Rural and Urban EAs. To ensure that all households in the EAs have the same probability of selection irrespective of the size of their EA, 20 households were sampled from each EA.

From a list of districts and EAs with their populations and household size, which we obtained from the Ghana Statistical Service, we used the Microsoft Excel RANDBETWEEN function to assign random numbers to the data and sort them in descending order using the random numbers column as reference. The cumulative populations were calculated. It was ensured that the cumulative population was equivalent to the total population of all the districts. The sampling interval was determined by dividing the total population by 60 (total number of clusters). To determine the starting point for selecting the districts and the respective number of EA, the RANDBETWEEN function and the sampling interval was used to generate a random number. The district with the cumulative population frequency that contains the random number was selected as the starting point. The next cluster location was selected by adding the sampling interval to the starting number and matched against the cumulative population frequency to identify the next sampling point. The next cluster was identified by adding the previous number to the sampling interval. This was continued until the required number of clusters were selected.

3.3.2.4 Research Instrument for data collection

A Semi-structured electronic data collection tool was developed using ODK. Survey questions covered knowledge on maternal health, attitude towards maternal health and practices in terms of maternal health. The data collection tool was piloted among communities with similar characteristics as the study population but not part of the

study subject. As such the results were not included in the actual study. The purpose of the study procedure was explained to the pilot participants. Administration of the tool was done after consent was given by the participants. After the piloting, the inconsistencies in the data collection tool and any form of ambiguities were rectified before using the tool for the actual data collection.

3.3.2.5 Data Collection procedure

To recruit respondents in each household within a selected EA, we identified a predetermined starting point in each EA as used by the Ghana Statistical Service. A pen was then span at the reference. As the pen spins and comes to rest, the direction of its nib was taken to determine the movement route in the EA. Each other house along the direction of the pen nib after the spin was selected to be visited. In each visited house, the first household is recruited after an eligible woman consents to participate in the study. All women in other households in that same house were excluded from the study. This spinning of the pen was done after each recruitment to determine the next household until the total sample size for that EA has been reached.

For households that had no eligible member, we continued with the same route as before until an eligible member of a household is recruited after which the pen is span again. This process was continued until the desired sample size was attained.

3.3.2.6 Data Analysis

For the KAP survey, characteristics of the study population were summarized as frequencies and percentages, mean and standard deviation (SD), range and percentiles. The t-test, one way analysis of variance or chi-square tests were used to evaluate the association between demographic variables and respondents' knowledge, attitude, or practice. Logistic regression analyses were performed to determine the potential

impact of the variables as being significant with $p < 0.05$. All the tests for significance were two-sided and p values < 0.05 were considered statistically significant. Stata version 16 was used for the analysis.

3.3.3 Explore the perceptions and describe the socio-cultural practices of community members about maternal health.

3.3.3.1 Study Design

A grounded theory was conducted to explore the perceptions and describe the socio-cultural practices of community members about maternal health.

3.3.3.2 Study Population

The specific study population was representatives of the community who have lived in the study site for a minimum of 6 months and 18 years and above of age. Consultative meetings were conducted with community leaders who also helped to identify key people who are familiar with the topic and willing to volunteer about 2 hours of their time for the FGD. This was stratified by community leaders, husbands of women who have had stillbirth and livebirths, mothers who had stillbirth and livebirth, faith-based leaders, public health leaders. The nominees were contacted, and consensus was reached on the location and time for the focused group discussion.

3.3.3.3 Sample Size and Sampling Method

Ten (10) focused group discussion were conducted; two in each region, one rural and one urban community. A simple random technique was used to select the communities and participants were purposively selected. Selection of the communities was done using RANDBETWEEN function in Microsoft Excel. Each group involved 6 – 10 participants.

3.3.3.4 Research Instrument for data collection

A discussion guide with set of topics relevant to the study was developed and used. ODK was used to capture the data and record the discussions. The discussion guide was piloted and improved based on feedback from the pilot. The data collection tools were piloted among communities with similar characteristics as the study population but not part of the study subject. As such the results were not included in the actual study. The discussion guide was piloted among select group of community members. After administering the tool, we found out that some of the questions were a bit guiding and some questions were not clear to the participants. The tool was revised and agreed to use both deductive and inductive approaches.

3.3.3.5 Data Collection procedure

Each focused group discussion was led by a moderator and an assistant moderator. The moderator facilitated the discussion whiles the assistant moderator took notes and recorded the discussion using the ODK.

Participants were welcomed and an overview of the FGD was provided. Subsequently, the informed consent form was administered and ensured that all consented participants appended their signature or thumbprint. Demographic information and other attributes relevant for correlation with the focused group discussion were collected.

Ice breakers and probing questioned were used intermittently to make the participant lively and more engaging. Beverage and light snack were served for all the participants. The recordings were subsequently transcribed for analysis.

3.3.3.7 Data Analysis

Recorded responses were transcribed verbatim. First, a code scheme was developed based on the topic guides, preliminary findings from the quantitative study and published literature. Direct qualitative content analysis was conducted. Deductive approach was initially used to analyse the data for the pre-defined codes. Summaries that did not relate to the to the pre-defined codes were giving new codes using inductive approach. The diversity of verbatim responses was shortened using coding operations into fewer content categories and classified as themes and subthemes in line with the objectives of the study. Going back and forth between the summaries and transcripts, more themes and over-arching themes emerged. The data was analysed with the aid of Nvivo version 10.

3.3.4 Explore and describe maternal health care of mothers who have been affected by stillbirth

3.3.4.1 Study Design

A grounded theory was conducted to explore and describe maternal health care of mothers who have been affected by stillbirth.

3.3.4.2 Study Population

The specific study population was mothers who have had a stillbirth and have lived in the study site for a minimum of 6 months and 18 years and above of age. The selection of the members of the FGD was done in consultation with community leaders who helped to identify and engage mothers who had stillbirth and willing to volunteer about 2 hours of their time for the FGD. The nominees were contacted, and consensus was reached on the location and time for the focused group discussion.

3.3.4.3 Sample Size and Sampling Method

Ten (10) focused group discussion were conducted; two in each region, one rural and one urban community. A simple random technique was used to select the communities and participants were purposively selected. Selection of the communities to identify mothers who have had stillbirth was done using RANDBETWEEN function in Microsoft Excel. Each group involved 6 – 10 participants.

3.3.4.4 Research Instrument for data collection

A discussion guide with set of topics relevant to the study was developed and used. The discussion guide was piloted and improved based on feedback from the pilot. ODK was used to capture the data and record the discussions. The data collection tools were piloted among communities with similar characteristics as the study population but not part of the study subject. As such the results were not included in the actual study. The discussion guide was piloted among select group of community members. After administering the tool, we found out that some of the questions were a bit guiding and some questions were not clear to the participants. The tool was revised and agreed to use both deductive and inductive approaches.

3.3.4.5 Data Collection procedure

Each focused group discussion was led by a moderator and an assistant moderator. The moderator facilitated the discussion whiles the assistant moderator took notes and recorded the discussion using the ODK. Participants were welcomed and an overview of the FGD was provided. Subsequently, the informed consent form was administered and ensured that all consented participants appended their signature or thumbprint. Demographic information and other attributes relevant for correlation with the focused group discussion were collected.

Ice breakers and probing questions were used intermittently to make the participant lively and more engaging. Beverage and light snack were served to all the participants. The recordings were subsequently transcribed for analysis.

3.3.4.6 Data Analysis

Recorded responses were transcribed verbatim. First, a code scheme was developed based on the topic guides, preliminary findings from the quantitative study and published literature. Direct qualitative content analysis was conducted. Deductive approach was initially used to analyse the data for the pre-defined codes. Summaries that did not relate to the to the pre-defined codes were giving new codes using inductive approach. The diversity of verbatim responses was shortened using coding operations into fewer content categories and classified as themes and subthemes in line with the objectives of the study. Going back and forth between the summaries and transcripts, more themes and over-arching themes emerged. The data was analysed with the aid of Nvivo version 10.

3.3.5 Understand the diverse perspectives of healthcare workers on maternal care and stillbirth

3.3.5.1 Study Design

Grounded theory was employed to understand the diverse perspectives of healthcare workers on maternal care and stillbirth.

3.3.5.2 Study Population

The specific study population were healthcare workers in health facilities that provide maternal health services to the community members who have lived in the study site for a minimum of 6 months and 18 years of age or above. The healthcare workers

comprised midwives, community health nurses, general nurses, public health nurses, gynaecologists, and physician assistants.

3.3.5.3 Sample Size and Sampling Method

A total of 58 in-depth interviews were conducted with 28 in rural communities and 30 in urban communities. This sample size was attained based on the data saturation from the interviews at each facility level in urban and rural communities. A simple random technique was used to select the communities and participants were purposively selected.

3.3.5.4 Research Instrument for data collection

For the In-depth interviews, an interview guide with questions that provide a complete understanding, and diverse perspectives of maternal health was used. The data collection tools were piloted among communities with similar characteristics as the study population but not part of the study subject. As such the results were not included in the actual study. The interview guide was piloted among selected health workers. After administering the tool, we found out that some of the questions were a bit guiding and some questions were not clear to the participants. The tool was revised and agreed to use both deductive and inductive approaches.

3.3.5.5 Data Collection procedure

A interview guide with set of topics relevant to the study was developed and used. The interview guide was piloted and improved based on feedback from the pilot. ODK was used to capture the data and record the discussions.

3.3.5.7 Data Analysis

Recorded responses were transcribed verbatim. First, a code scheme was developed based on the topic guides, preliminary findings from the quantitative study and

published literature. Direct qualitative content analysis was conducted. Deductive approach was initially used to analyse the data for the pre-defined codes. Summaries that did not relate to the to the pre-defined codes were giving new codes using inductive approach. The diversity of verbatim responses was shortened using coding operations into fewer content categories and classified as themes and subthemes in line with the objectives of the study. Going back and forth between the summaries and transcripts, more themes and over-arching themes emerged. The data was analysed with the aid of Nvivo version 10.

3.4 DATA TRIANGULATION

The quantitative and qualitative data were analysed separately. However, the inferences drawn from the two databases were brought together during the discussion to create a side-by-side comparison of the findings. This helped to appreciate how the qualitative data confirms or differ from the quantitative data and vice-versa.

3.5 MEASURES TO ENSURE TRUSTWORTHINESS FOR QUALITATIVE COMPONENT

Credibility: The credibility of the study was endured through prolonged engagement of the respondent, the use of mixed method approach, regular debriefing, and teamwork.

Confirmability: The confirmability of the study was achieved by allowing external audits by supervisors, biostatistician, senior epidemiologists from the University of Ghana School of Public Health and Noguchi Memorial Institute for Medical Research as well as other key stakeholders who were identified during the study.

Transferability: To ensure transferability of the results from this study in other context or settings, the methods, research context and the assumptions that were vital to the research were thoroughly described.

Dependability: This study is dependable in the sense that, it could be replicated in another setting using the same data collection methods and sampling strategy. The research described the changes that occurred in the setting and how these changes would influence the approach used in the study.

3.6 VALIDITY AND RELIABILITY

The sample design was stratified into by urban and rural to give both representations and perspectives(149). The data collection tools were checked for content validity by collaborating with supervisors throughout the research process and peer examination via seminar presentation to address comprehensive inclusion of the content that covers the study objectives(150).

The face validity was also checked by supervisor to ensure the component and structure of the instrument covers the concept it purports to measure. A panel comprising the researcher and health care professionals (gynaecologists, public health nurses, phycologist), a data manager, a biostatistician, and supervisors from University of Namibia reviewed the discussion guide to ensure it meets the expected institutional standards(150).

Contract validity was checked by employing statistical methods and approaches of the quantitative studies to ensure appropriateness of inferences made based on observations or measurements. As part of the strategies to ensure validity of the study, we employed the member-checking approach by going back to the participants to with

the results to validate if it's a true reflection of their responses and experiences. The rich, thick description was also used whereby detailed narratives were provided to describe experiences. In addition, an external auditor was who not part of the research was engages to assess the approaches and methods and validate if the results match the responses from the participants. Lastly, peer -debriefing was conducted to make room for challenging of procedures, results, ask questions and make recommendations(151,152). To ensure reliability of the study, the transcripts were checked for mistakes and consistency by engaging independent third parties to listen to audio and compare with transcripts for accuracy and errors. Results were double checked to ensure that there was no drift in codes by continuous assessment of codes to make sure that the codes are being assessed according to the initial definitions that were laid out from the very beginning (151,152). The data collection tools were piloted among communities with similar characteristics as the study population but not part of the study subject. The tool was revised to address ambiguities identified from the pilot(153,154). In addition, the use of the mixed methods design helped to build a greater validity for the results of this study(155). Study sites were visited twice a week to monitor study procedures to ensure credibility of the findings. Field staff were trained, and regular meetings were conducted with field staff to address challenges and merge data for preliminary analysis monthly. A Cronbach alpha test was conducted to check internal consistency of data collection tool which gave an alpha score of 0.91.

3.7 ETHICAL CONSIDERATIONS

Ethical clearance was obtained from University of Namibia Ethical Review Board and subsequently from the Ghana Health Service Ethical Review Board prior to the study. Written consent was sought from participants who were informed of their right to decline or withdraw from the study at any time without any adverse consequences. A

psychologist was engaged to ensure the emotional trauma of stillborn mothers were not downplayed. Logistics for Infection Prevention and Control (IPC) was made available to everyone involved in the data collection to prevent COVID-19 infection.

Right to Confidentiality, Anonymity and Autonomy

Information collected from all participants were kept confidential. All data collected were secured under lock and key with password protection for all electronic data. Access to the data was strictly controlled for this study. It was ensured that all data collected was anonymized to avoid tracking to a specific individual on the study. The autonomy of all participants was respected by reserving their rights to drop out of the study.

Principle of Justice and Privacy

It was ensured that the principle of justice and privacy was duly applied. All participants were treated equally and fairly throughout the study. Participants were at liberty not to answer any question if they were not comfortable without any coercion. It was ensured that participants did not experience any form of physical, social, emotional, and psychological harm from the study. Participants were provided with multiple decision points throughout the interview giving them an opportunity to continue with the interview or not. New line of questioning was always introduced before proceeding. Sensitive questions were moved to the middle or towards the end of the survey to allow room for the interview to first build rapport. Emotionally charged words were limited. Interviewer training covered interviewing procedures, trauma, and trauma responses. It was ensured that interviewers can engage with people of different backgrounds in an empathetic, non-judgmental way. Interviewers were also trained to be patient, emotionally mature, and able to deal with sensitive issues

without these experiences overwhelming the interviewer. Role play session were conducted during the training sessions to ensure the interviewers have grasped the principles and skills thought during the training.

During the study, we built in a time for reflection and debrief for everyone involved in the process.

3.8 DEVELOPMENT OF POLICY BRIEF

Findings from this study was used to develop a policy brief to provide evidence-based policy advice or recommendations to help the Ghana Health Service under the Ministry of Health to make informed decisions on maternal health and stillbirth. The policy recommendation was aligned to the WHO Quality of Care Framework for Maternal and Newborn as per the eight standards of care and 31 quality indicators to ensure transferability.

The policy brief would serve as an instrument that will aim at influencing the national policy on maternal and child healthcare. The target audience of the policy brief is the leadership of the Ministry of Health, Ghana Health Service who are part of the government policymakers and other stakeholders who have the authority to influence policy. The policy brief was narrowed down to the problem based on the objectives and conclusions of the study. The brief was developed in consultation with public health leaders from both the public and private sector who contribute to the development of policies. Subsequently, information and evidence which comprised of data used to contextualize the problem and findings from the study that was used to assess the situation, expose alternatives, and support the recommendations based on empirical evidence from scientific articles and research reported were gathered. Policy alternatives that are most relevant were provided. This was done taking into

consideration the criteria policy makers use to evaluate policy alternatives which is based on efficiency, equity, feasibility, or political acceptability. Subsequently the expected results of each line of action and design recommendations or key messages was projected. Collectively, the policy brief was documented with the following sections;

Overview: This section provided a concise overview policy brief.

Introduction and Scope of Problem: The introduction placed the study into context and conveyed the argument as to why the issues of the policy brief are important. It also explained the reasoning behind the policy recommendations.

Methods, Approaches and Results: This section briefly described the project approach and findings by interpreting the findings in a way that is accessible and clearly connected to the policy recommendations.

Conclusions: The concluding section of the policy brief reinforced the key message to take away from the policy brief.

Policy Implications: This section outlined implications of the research and feasible policy recommendation to the Ministry of Health/ Ghana Health Service.

3.9 LANGUAGE

All the data collection was done in English for participants who could read and write. Else the local languages were used for the interviews. These languages are Akan, Buli, Gurune, Kusaal, Kaseem, Bissa, Dagari, Waali, Mampruli, Dagaaba and Kusaasi.

CHAPTER 4

RESULTS

4.1 ASSESSMENT OF FACTORS ASSOCIATED WITH STILLBIRTH AMONG RESIDENTS OF NORTHERN GHANA

The purpose of the case control study was to determine the risk factors associated with stillbirth in the Northern zone of Ghana. Overall, a total of 516 participants were enrolled in the case – control study consisting of 172 women who have experienced stillbirth as cases and 344 mothers who have had live births as controls. The median age of the cases was 27years (Range: 18 – 52) and median age of controls was found to be 27 years (Range: 18 – 45). Cases and controls were recruited from 27 facilities across five regions in the Northern Zone. Northern region had the highest proportion of cases with 54.65% (94/172) and Savannah recorded the least with 4.07% (7/172). Table 1 shows the distribution of cases and controls by regions and facility recruited from in the Northern zone of Ghana and Figure 7 shows the geospatial distribution of cases and controls in the case-control study.

Table 1:Sample size distribution by health facility in Northern zone of Ghana, 2023

Region	Facilities	Total SBs (n=516)	Cases (n=172)	Controls (n=344)
North-East				
	Baptist Medical Centre	24	8	16
	Binde Hospital	6	2	4
	Walewale Municipal Hospital	9	3	6
Northern				
	ECG Hospital	9	3	6

Region	Facilities	Total SBs (n=516)	Cases (n=172)	Controls (n=344)
	Kings Medical Center	6	2	4
	Kpandai District Hospital	6	2	4
	Savelugu Hospital	12	4	8
	Tamale Central Hospital	27	9	18
	Tamale SDA Hospital	15	5	10
	Tamale West Hospital	36	12	24
	Tatale Polyclinic	12	4	8
	Tolon District Hospital	15	5	10
	Tamale Teaching Hospital	93	31	62
	Yendi Municipal Hospital	39	13	26
	Zabzugu District Hospital	12	4	8
Savannah				
	Salaga Municipal Hospital	9	3	6
	West Gonja Hospital	12	4	8
Upper East				
	Akunye Memorial Hospital	9	3	6
	Regional Hospital	42	14	28
	Sandema Hospital	15	5	10
	St Lucas Hospital	3	1	2
	War Memorial Hospital	18	6	12
	Zebilla District Hospital	9	3	6
Upper West				
	St Joseph Hospital	9	3	6
	Upper West Regional Hospital	21	7	14
	Wa Municipal Hospital	42	14	28
	Wa West District Hospital	6	2	4

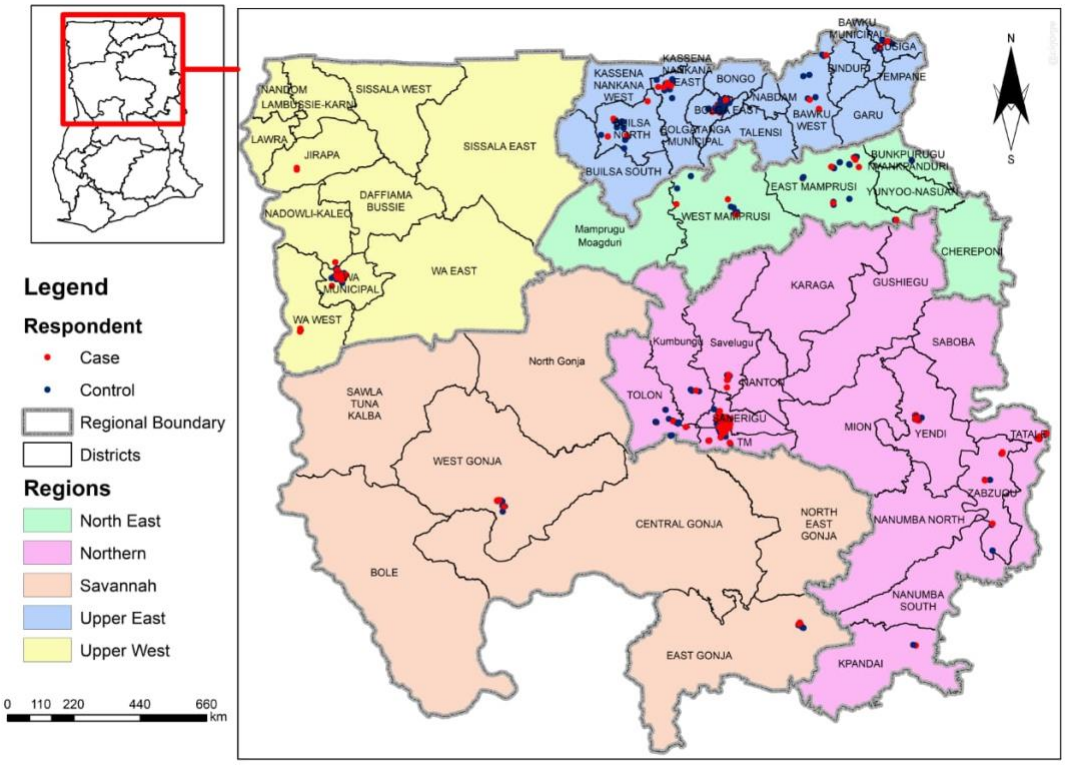

Figure 7: Geospatial Distribution of cases and controls in the case-control study, Northern zone of Ghana, 2023

4.1.1 Sociodemographic factors associated with stillbirth in Northern Zone of Ghana

Out of 20 sociodemographic variables assessed, the bivariate logistic regression analysis revealed a statistically significant association between marital status, family history of stillbirth, person responsible for the pregnancy, partner's occupation, partner's tobacco use, and the occurrence of stillbirths among the women studied. However, age of women, region, maternal height, maternal weight, educational level, settlement type, region, occupation of women, alcohol and tobacco intake among the women, partners educational level, occupation and ethnicity were not significantly associated with the occurrence of stillbirths among the women studied.

Majority 12.21% (21/172) of unmarried women in the study experienced stillbirth compared to 2.62% (9/344) of unmarried women who did not experience stillbirth. On partner's tobacco use, among women who reported tobacco use among their partners, 13.37% (23/172) experienced stillbirths compared to 6.98% (24/344) women who did not. A significant proportion 34.30% (59/172) of women with stillbirths had a family history of stillbirth. Also, 13.37% (23/172) of the women who experienced stillbirths reported tobacco use among their husbands.

Women who were not married had almost 5 times increased odds of having a stillbirth compared to women who were married (cOR = 4.69, 95% CI: 2.03 - 10.83). Women who had a family history of stillbirth had two times increased odds of having stillbirth compared to women who didn't have a family history of still birth (cOR = 2.47, 95% CI: 1.623 - 3.77). It was also observed that women who were impregnated by someone other than their husband had almost 3 times increased odds of having stillbirth compared to those who were impregnated by their husbands (cOR = 2.83, 95% CI: 1.39 - 5.79). Compared to women whose partners had a formal occupation, women whose husbands were Artisans were found to have almost two times increased odds of having a stillbirth (cOR = 1.942, 95% CI: 1.09 - 3.46). Women whose partners were using tobacco had two times increased odds of having a stillbirth compared to women whose partners were not using tobacco (cOR = 2.00, 95% CI: 1.08 - 3.68). Table 2 illustrates the bivariate analysis of sociodemographic factors associated with stillbirth among women recruited from the Northern zone of Ghana.

Table 2: Bivariate logistic regression analysis of sociodemographic factors associated with stillbirth in Northern Zone of Ghana, 2023

Determinants	Case n=172 (%)	Control n=344	cOR(95%CI)	X^2 P-Value
Age				0.120
Below 20	16 (9.30)	15 (4.36)	2.35 (1.11 - 4.96)	
20-29	89 (51.74)	196 (56.98)	Ref	
30-39	61 (35.47)	125 (36.34)	1.08 (0.72 - 1.60)	
40+	6 (3.49)	8 (2.33)	1.65 (0.56 - 4.90)	
Region				1.000
North East	13 (7.56)	26 (7.56)	Ref	
Northern	94 (54.65)	188 (54.65)	1.00 (0.49 - 2.04)	
Savannah	7 (4.07)	14 (4.07)	1.03 (0.33 - 3.19)	
Upper East	32 (18.6)	64 (18.6)	1.00 (0.45 - 2.21)	
Upper West	26 (15.12)	52 (15.12)	1.04 (0.46 - 2.36)	
Maternal Height (cm)				0.809
150+	159 (92.44)	320 (93.02)	Ref	
Below 150	13 (7.56)	24 (6.98)	1.02 (0.50 - 2.10)	
Maternal weight (kg)				0.093
60+	107 (62.21)	238 (69.59)	Ref	
Below 60	65 (37.79)	104 (30.41)	1.33 (0.90 - 1.98)	
Educational level				0.812
Tertiary	21 (12.21)	53 (15.41)	Ref	
Senior High School	26 (15.12)	45 (13.08)	1.38 (0.69 - 2.79)	
Junior High School	38 (22.09)	76 (22.09)	1.12 (0.58 - 2.14)	
Primary	42 (24.42)	89 (25.87)	1.16 (0.62 - 2.18)	
No education	45 (26.16)	81 (23.55)	1.30 (0.69 - 2.44)	
Marital status				**0.001**
Married	151 (87.79)	335 (97.38)	Ref	
Not Married	21 (12.21)	9 (2.62)	4.69 (2.03 - 10.83)	
Settlement type				0.789
Urban	123 (71.51)	242 (70.35)	Ref	
Rural	49 (28.49)	102 (29.65)	1.06 (0.71 - 1.59)	
Religion				
Christian	54 (31.40)	103 (30.12)	Ref	
Muslim	114 (66.28)	234 (68.42)	0.93 (0.62 - 1.38)	
Traditionalist	2 (1.16)	4 (1.17)	0.94 (0.17 - 5.29)	
None	2 (1.16)	1 (0.29)	4.19 (0.37 - 47.35)	

Determinants	Case n=172 (%)	Control n=344	cOR(95%CI)	X^2 P-Value
Ethnicity				0.189
Dagomba	57 (33.14)	138 (40.12)	Ref	
Konkomba	15 (8.72)	22 (6.40)	1.54 (0.74 - 3.20)	
Gonja	12 (6.98)	17 (4.94)	1.81 (0.81 - 4.03)	
Mamprusi	15 (8.72)	23 (6.69)	1.62 (0.79 - 3.35)	
Gurune	13 (7.56)	24 (6.98)	1.28 (0.61 - 2.69)	
Kusaasi	8 (4.65)	15 (4.36)	1.35 (0.54 - 3.36)	
Waalah	17 (9.88)	15 (4.36)	2.83 (1.32 - 6.07)	
Dagaaba	8 (4.65)	23 (6.69)	0.90 (0.38 - 2.13)	
Others	27 (15.7)	67 (19.48)	1.01 (0.58 - 1.73)	
Occupation				0.166
Formal Work	21 (12.21)	44 (12.79)	Ref	
Farmer	61 (35.47)	98 (28.49)	1.21 (0.66 - 2.24)	
Trader	20 (11.63)	48 (13.95)	0.82 (0.39 - 1.72)	
Artisan	26 (15.12)	38 (11.05)	1.35 (0.66 - 2.78)	
Housewife	15 (8.72)	51 (14.83)	0.55 (0.25 - 1.21)	
Unemployed	10 (5.81)	32 (9.30)	0.54 (0.22 - 1.33)	
Others	19 11.05)	33 (9.59)	1.09 (0.50 - 2.37)	
Alcohol intake				0.901
No	160 (93.02)	321 (93.31)	Ref	
Yes	12 (6.98)	23 (6.69)	1.03 (0.50 - 2.13)	
Tobacco use				0.384
No	169 (98.26)	341 (99.13)	Ref	
Yes	3 (1.74)	3 (0.87)	1.99 (0.40 - 9.96)	
Family history of SBs				**0.001**
No	113 (65.70)	283 (82.27)	Ref	
Yes	59 (34.30)	61 (17.73)	2.47 (1.62 - 3.77)	
Person responsible for pregnancy				**0.001**
Husband	150 (87.21)	329 (95.64)	Ref	
Other	22 (12.79)	15 (4.36)	2.83 (1.39 - 5.79)	
Partners educational level				0.080
Tertiary	42 (24.42)	117 (34.01)	Ref	
Senior High School	16 (9.30)	16 (4.65)	2.62 (1.20 - 5.72)	
Junior High School	26 (15.12)	50 (14.53)	1.37 (0.76 - 2.48)	
Primary	51 (29.65)	100 (29.07)	1.33 (0.82 - 2.18)	
No education	37 (21.51)	61 (17.73)	1.58 (0.92 - 2.74)	

Determinants	Case n=172 (%)	Control n=344	cOR(95%CI)	X^2 P-Value
Partner's religion				
Christian	52 (30.23)	100 (29.24)	Ref	
Muslim	113 (65.70)	234 (68.42)	0.94 (0.63 - 1.41)	
Traditionalist	4 (2.33)	6 (1.75)	1.20 (0.32 - 4.47)	
None	3 (1.74)	2 (0.58)	1.95 (0.30 - 12.68)	
Partner's ethnicity				0.321
Dagomba	62 (36.05)	138(40.12)	Ref	
Komkomba	13 (7.56)	20 (5.81)	1.39 (0.65 - 2.98)	
Gonja	15 (8.72)	18 (5.23)	1.94 (0.92 - 4.12)	
Mamprusi	10 (5.81)	25 (7.27)	0.91 (0.41 - 2.01)	
Gurune	12 (6.98)	27 (7.85)	0.95 (0.45 - 2.01)	
Kusaasi	7 (4.07)	15 (4.36)	1.08 (0.42 - 2.79)	
Waalah	18 (10.47)	19 (5.52)	2.15 (1.05 - 4.38)	
Dagaaba	7 (4.07)	24 (6.98)	0.7 (0.29 - 1.71)	
Others	28 (16.28)	58 (16.86)	1.12 (0.65 - 1.93)	
Partner's occupation				**0.025**
Formal employment	43 (25.00)	114 (33.14)	Ref	
Trader	30 (17.44)	44 (12.79)	1.66 (0.92 - 2.99)	
Artisan	33 (19.19)	43 (12.5)	1.94 (1.09 - 3.46)	
Farmer	49 (28.49)	87 (25.29)	1.45 (0.88 - 2.38)	
Unemployed	6 (3.49)	30 (8.72)	0.42 (0.16 - 1.12)	
Others	11 (4.40)	26 (7.56)	1.10 (0.50 - 2.42)	
Partner's alcohol intake				0.766
No	154 (89.53)	305 (88.66)	Ref	
Yes	18 (10.47)	39 (11.34)	0.92 (0.51 - 1.65)	
Partner's tobacco use				**0.017**
No	149 (86.63)	320 (93.02)	Ref	
Yes	23 (13.37)	24 (6.98)	2.00 (1.08 - 3.68)	

4.1.2 Foetal and obstetric factors associated with stillbirth in Northern Zone of Ghana

In a bivariate analysis, gravidity, gestational age at first ANC visit, number of ANC visits, labour indication, foetal malpresentation, foetal malformation, mode of delivery, partograph use and obstructed labour indication were significantly associated

with stillbirth among the women studied. However, parity, sex of baby and skilled attendance during childbirth were not significantly associated with stillbirth among the women.

A significant proportion 19.19% (33/172) of women with stillbirth made less than four ANC visits during the antenatal period. Among the women with stillbirth, 33.14% (57/172) reported no labour indication at their time of delivery. Also, majority 60.47% (104/172) of the women with stillbirth were not monitored using a partograph at the time of delivery. Women with gravidity of 2 -3 had 38% reduced odds of still birth compared to women with gravidity of one (cOR = 1.19, 95% CI: 0.67 - 2.09). Women who had their first ANC visit between 25 – 36 weeks of gestation had 3.74 increased risk of having still birth compared to women who had their first ANC visit 1 – 12 weeks of gestation (cOR = 3.74, 95% CI: 1.48 - 9.45). In terms of utilization of antenatal care, women who had at least four visits during their pregnancy had 49% reduced odds of having a stillbirth compared to those who had less than four visits (cOR = 0.51, 95% CI: 0.30 - 0.85). Women who went into labour also had 70% reduced odds of have a stillbirth compared to those who did not go into labour (cOR = 0.30. CI: 0.19 - 0.48). Among the women studied, having foetal malpresentation increased odds of having a stillbirth by 3.82 compared to those with normal presentation. Women who had foetal malformation had an increased odds of 15.22 times compared to women who did not have foetal defect (cOR = 15.22, CI: 1.87 - 123.67). In women where partograph was not used during labour, their odds of having a stillbirth were found to be increased by two times compared to those where partograph was used (cOR = 2.14, CI:1.47 - 3.10). Among the women studied, caesarean section was found to increase the odds of having a stillbirth by 2.22 compared to those who had a spontaneous vaginal delivery (cOR = 2.22, CI: 1.39 -

3.54). Finally, an indication of obstructed labour was also found to increase the odds of stillbirth by 2.46 times compared to women who did not have any indication of obstructed labour (cOR = 2.46, CI: 1.22 - 4.96). Table 3 summarizes the bivariate logistic regression analysis of foetal and obstetric factors associated with stillbirth in Northern zone of Ghana.

Table 3:Bivariate logistic regression analysis of foetal and obstetric factors associated with stillbirth in Northern Zone of Ghana, 2023

Risk Factor	Case n=172 (%)	Control n=344 (%)	cOR(95%CI)	X^2 P-value
Parity				0.438
0 - 1	79 (45.93)	137 (40.06)	Ref	
2 - 3	63 (36.63)	141 (41.23)	0.81 (0.53 - 1.25)	
4+	30 (17.44)	64 (18.71)	0.76 (0.41 - 1.42)	
Gravidity				**0.008**
1	56 (32.56)	88 (25.73)	Ref	
2 - 3	53 (30.81)	154 (45.03)	0.62 (0.38 - 1.00)	
4+	63 (36.63)	100 (29.24)	1.19 (0.67 - 2.09)	
Gestational age first ANC				**0.013**
1-12	70 (40.7)	165 (47.97)	Ref	
13-24	85 (49.42)	168 (48.84)	1.17 (0.80 - 1.71)	
25-36	13 (7.56)	8 (2.33)	3.74 (1.48 - 9.45)	
Above 36	4 (2.33)	3 (0.87)	3.33 (0.73 - 15.26)	
ANC visits				**0.007**
< 4	33 (19.19)	36 (10.53)	Ref	
4 +	139 (80.81)	306 (89.47)	0.51 (0.30 - 0.85)	
Labour indication				**0.001**
No	57 (33.14)	46 (13.37)	Ref	
Yes	115 (66.86)	298 (86.63)	0.30 (0.19 - 0.48)	
Sex of baby				0.152
Male	78 (45.35)	179 (52.03)	Ref	
Female	94 (54.65)	165 (47.97)	1.34 (0.92 - 1.93)	
Fetal malpresentation				**0.001**
No	144 (83.72)	325 (95.03)	Ref	
Yes	28 (16.28)	17 (4.97)	3.82 (2.02 - 7.21)	

Risk Factor	Case n=172 (%)	Control n=344 (%)	cOR(95%CI)	X^2 P-value
Malformation (birth defect)				**0.001**
No	164 (95.35)	343 (99.71)	Ref	
Yes	8 (4.65)	1 (0.29)	15.22 (1.87 - 123.67)	
Partograph use				**0.001**
Yes	68 (39.53)	201 (58.43)	Ref	
No	104 (60.47)	143 (41.57)	2.14 (1.47 - 3.10)	
Mode of delivery				**0.001**
a) SVD	129 (75.00)	298 (86.63)	Ref	
b) C/S	43 (25.00)	46 (13.37)	2.22 (1.39 - 3.54)	
Obstructed labour indication				**0.013**
No	154 (89.53)	326 (95.32)	Ref	
Yes	18 (10.47)	16 (4.68)	2.46 (1.22 - 4.96)	
Skilled assistance during childbirth				0.600
Yes	161 (93.60)	324 (94.74)	Ref	
No	11 (6.40)	18 (5.26)	1.22 (0.56 - 2.66)	

4.1.3 Maternal medical health factors associated with stillbirth in Northern Zone of Ghana

Women with Rhesus factor negative (cOR = 1.65, 95% CI: 1.10 - 2.48), malaria in pregnancy (cOR = 2.37, 95% CI: 1.29 - 4.34), SP doses taken 1-2 (cOR = 3.70, 95% CI: 1.14 - 12.03), sickle cell Positive (cOR = 1.88, 95% CI: 1.096 - 3.235), gestational diabetes (cOR = 3.40, 95% CI: 1.21 - 9.54), pregnancy induced hypertension (cOR = 2.296, 95% CI:1.15 - 4.58), eclampsia (cOR = 9.42, 95% CI: 3.77 - 23.57), preeclampsia (cOR = 2.68, 95% CI: 1.51 - 4.74), anaemia (cOR = 1.50, 95% CI: 1.02 - 2.19), antepartum haemorrhage (cOR = 2.84, 95% CI: 1.45 - 5.56) and premature rupture of membranes (cOR = 4.53, 95% CI: 2.24 - 9.16) were all found to have significant increased odds of stillbirth compared to women who did not have any of these factors. However, women who took TT doses of 2+ had 64% reduced odds of

stillbirth compared to those who did not take any TT dose (cOR = 0.36, 95% CI: 0.18 - 0.72).

Majority 73.26% (126/172) of the women with stillbirth were rhesus negative. Also, a significant proportion 13.95% (24/172) of women with stillbirth had malaria in pregnancy. However, blood group, hemoglobin level at 36 weeks, state of periteum, HIV status, hepatitis B status, syphilis status, placenta previa, placenta abruption, sepsis, female genital mutilation, and use of unprescribed medication during pregnancy were not significantly associated with stillbirth among the women studied. Table 4 illustrates the association between maternal medical health factors and stillbirth among women in Northern zone of Ghana.

Table 4: Bivariate logistic regression analysis of maternal medical health factors associated with stillbirth in Northern Zone of Ghana, 2023

Determinants	Case n=172 (%)	Control n=344 (%)	cOR(95%CI)	X^2 P value
Blood group				0.899
A	35 (20.35)	70 (20.35)	Ref	
B	54 (31.40)	113 (32.85)	0.94 (0.56 - 1.59)	
O	66 (38.37)	122 (35.47)	1.06 (0.64 - 1.76)	
AB	17 (9.88)	39 (11.34)	0.87 (0.43 - 1.75)	
Rhesus factor				**0.026**
Positive	46 (26.74)	126 (36.63)	Ref	
Negative	126 (73.26)	218 (63.37)	1.65 (1.10 - 2.48)	
Malaria in pregnancy				**0.007**
No	148 (86.05)	321 (93.31)	Ref	
Yes	24 (13.95)	23 (6.69)	2.37 (1.29 - 4.34)	
SP Doses taken				**0.002**
0	4 (2.33)	15 (4.36)	Ref	
1-2	54 (31.40)	62 (18.02)	3.70 (1.14 - 12.03)	
3-4	94 (54.65)	200 (58.14)	1.95 (0.62 - 6.14)	
5+	20 (11.63)	67 (19.48)	1.21 (0.36 - 4.12)	

Determinants	Case n=172 (%)	Control n=344 (%)	cOR(95%CI)	X^2 P value
TT doses taken				**0.019**
0	20 (11.63)	17 (4.94)	Ref	
1	36 (20.93)	70 (20.35)	0.42 (0.20 - 0.90)	
2+	116 (67.44)	257 (74.71)	0.36 (0.18 - 0.72)	
Haemoglobin level at 36weeks (g/dl)				0.184
Below 7	4 (2.33)	2 (0.58)	Ref	
7-10	64 (37.21)	122 (35.47)	0.24 (0.04 - 1.36)	
Above 10	104 (60.47)	220 (63.95)	0.22 (0.04 - 1.23)	
State of perineum				0.690
Normal	128 (74.42)	262 (76.16)	Ref	
Abnormal	44 (25.58)	82 (23.84)	1.04 (0.68 - 1.59)	
HIV status				0.658
Negative	168 (97.67)	338 (98.26)	Ref	
Positive	4 (2.33)	6 (1.74)	1.29 (0.36 - 4.69)	
Hepatitis B status				0.091
Negative	148 (86.05)	313 (90.99)	Ref	
Positive	24 (13.95)	31 (9.01)	1.70 (0.96 – 3.00)	
Syphilis status				0.482
Negative	170 (98.84)	342 (99.42)	Ref	
Positive	2 (1.16)	2 (0.58)	2.13 (0.30 - 15.22)	
G6PD Deficiency				0.753
No	165 (95.93)	328 (95.35)	Ref	
Yes	7 (4.07)	16 (4.65)	0.88 (0.36 - 2.20)	
Sickle cell status				**0.037**
Negative	144 (83.72)	310 (90.12)	Ref	
Positive	28 (16.28)	34 (9.88)	1.88 (1.10 - 3.24)	
Gestational Diabetes				**0.012**
No	162 (94.19)	338 (98.26)	Ref	
Yes	10 (5.81)	6 (1.74)	3.40 (1.21 - 9.54)	
Pregnancy induced hypertension				**0.013**
No	154 (89.53)	327 (95.06)	Ref	
Yes	18 (10.47)	17 (4.94)	2.30 (1.15 - 4.58)	
Pre-eclampsia				**0.001**
No	143 (83.14)	319 (92.73)	Ref	
Yes	29 (16.86)	25 (7.27)	2.68 (1.51 - 4.74)	
Eclampsia				**0.001**
No	148 (86.05)	338 (98.26)	Ref	
Yes	24 (13.95)	6 (1.74)	9.42 (3.77 - 23.57)	

Determinants	Case n=172 (%)	Control n=344 (%)	cOR(95%CI)	X^2 P value
Anaemia				**0.036**
No	99 (57.56)	229 (66.96)	Ref	
Yes	73 (42.44)	113 (33.04)	1.50 (1.02 - 2.19)	
Placental abruption				0.171
No	76 (44.19)	173 (50.58)	Ref	
Yes	96 (55.81)	169 (49.42)	1.30 (0.90 - 1.89)	
Placenta previa				0.331
No	100 (58.14)	214 (62.57)	Ref	
Yes	72 (41.86)	128 (37.43)	1.22 (0.84 - 1.78)	
Antepartum haemorrhage				**0.003**
No	151 (87.79)	327 (95.06)	Ref	
Yes	21 (12.21)	17 (4.94)	2.84 (1.45 - 5.56)	
Premature rupture of membrane				**0.001**
No	148 (86.05)	331 (96.22)	Ref	
Yes	24 (13.95)	13 (3.78)	4.53 (2.24 - 9.16)	
Obstructed labour				**0.013**
No	154 (89.53)	326 (95.32)	Ref	
Yes	18 (10.47)	16 (4.68)	2.46 (1.22 - 4.96)	
Sepsis				0.134
No	166 (96.51)	339 (98.55)	Ref	
Yes	6 (3.49)	5 (1.45)	2.63 (0.79 - 8.73)	
Female genital mutilation (FGM)				0.205
No	171 (99.42)	337 (97.97)	Ref	
Yes	1 (0.58)	7 (2.03)	0.30 (0.04 - 2.45)	
Unprescribed medication use during pregnancy				0.140
No	133 (77.33)	285 (82.85)	Ref	
Yes	39 (22.67)	59 (17.15)	1.42 (0.90 - 2.23)	

4.1.4 Multivariate logistic regression analysis of sociodemographic, foetal, obstetric, and maternal medical health factors associated with stillbirth in Northern Zone of Ghana, 2023

After running the significant variables from the bivariate analysis of sociodemographic, foetal, obstetric, and maternal medical health factors in a multivariate logistic regression model, we found out that marital status, family history

of stillbirth, person responsible for pregnancy, partners tobacco, number of ANC visits, labour indication, partograph use, foetal malpresentation, obstructed labour indication, Rhesus factor, TT dose of 2+, sickle cell status, eclampsia, antepartum haemorrhage, premature rupture of membranes and SP Doses of 1-2 remained significantly associated with stillbirth among the women studied.

Women who were never married had almost 10 times increased odds of stillbirths compared to those who were ever married (aOR =9.78, 95%CI: 16.48 - 57.98). This is a twofold increase in odds compared to the bivariate analysis. Women who had a family history of stillbirth had 2.6 times odds of stillbirth compared to women without family history of stillbirth (aOR =2.63, 95%CI: 1.67 - 4.12) which is a marginal increase in odds from the bivariate analysis. Women who reported another person being responsible for their pregnancy aside from the husband had almost three times the odds of stillbirth compared to those whose husbands were responsible for their pregnancy (aOR =2.97, 95% CI: 1.43 - 6.18). There was marginal increase in the odds compared to the bivariate analysis. Partner's use of tobacco remained statistically significant in the multivariate logistic regression model with women whose partners were using tobacco having an increased risk of 2.63 compared to those whose partners were not (aOR = 2.19, 95% CI: 1.16 - 4.16). There was also a marginal increase in the odds compared to the bivariate analysis.

Women who made four or more visits to antenatal clinic during pregnancy had 47% reduced odds of stillbirth compared to those who made less than four ANC visits (aOR = 0.531, 95% CI:0.30 - 0.93) which was not much different from what was observed in the bivariate analysis. Women with report of foetal malpresentation during labour had 2.67 times odds of stillbirth compared to those without foetal malpresentation (aOR = 2.669, 95%CI: 1.333 - 5.346) which is slightly lower than the bivariate odds

ratio. Also, in women where partograph were not used during labour, there was 2.14 times odds of stillbirth compared to those partographs were used to monitor them (aOR = 2.141, 95%CI:1.450 - 3.160). The same value was observed for the bivariate analysis. Women who had labour indication had 2.80 increased odds of having stillbirth compared to those who did not (aOR = 2.80, 95% CI: 1.70 - 4.60**).** Lastly, women with obstructed labour indication had 2.84 increased odds of stillbirth compared to women who did not have obstructed labour indication (aOR = 2.84, 95% CI: 1.38 - 5.82). This observed measure of odds was very close to what was observed at the bivariate level of analysis.

Women who were Rhesus negative had 1.75 increased odds of stillbirth compared to women who were Rhesus positive (aOR = 1.745, 95%CI: 1.12 - 2.73). Women who had taken 2+ TT doses had 43% reduced risk of stillbirth, compared women who had not taken any dose.

Women who were sickle cell positive during pregnancy had a 2.29 times odds of stillbirth compared to women who were sickle cell negative (aOR = 2.286, 95%CI:1.274 - 4.100). Also, women with eclampsia during pregnancy had 9.0 times odds of stillbirth compared to women without the condition (aOR = 9.004, 95%CI:2.910 - 27.865). Women who had pre-mature rapture of membrane had 2.64 times increased odds of having stillbirth compared to women who did not have premature rupture of membrane. It was also noticed that women who took 1-2 doses of SP had 4.24 times increased odds of stillbirth compared to women who did not take any dose.

However, malaria in pregnancy, gestational diabetes, pre-eclampsia, pregnancy induced hypertension, anaemia and obstructed labour were not found to be associated

with stillbirth at the multivariate analysis level. Table 5, 6 and 7 describes the findings from the multivariate logistic regression analysis of maternal medical health factors associated with stillbirth in Northern Zone of Ghana.

Table 5: Multivariate logistic regression analysis of sociodemographic factors associated with stillbirth in Northern Zone of Ghana, 2023

Determinants	adjusted Odds Ratio	95% Confidence Interval
Marital status		
Ever married	Ref	
Never married	9.78	**(1.65 - 57.98)**
Family history of SBs		
No	Ref	
Yes	2.63	**(1.67 - 4.12)**
Person responsible for pregnancy		
Husband	Ref	
Other	2.97	**(1.43 - 6.18)**
Partner's occupation		
Formal employment	Ref	
Trader	1.66	(0.92 - 3.02)
Artisan	1.96	**(1.09 - 3.52)**
Farmer	1.32	(0.79 - 2.20)
Unemployed	0.38	(0.14 - 1.03)
Others	1.17	(0.53 - 2.59)
Partner's tobacco use		
No	Ref	
Yes	2.19	**(1.16 - 4.16)**

Table 6: Multivariate logistic regression analysis of foetal and obstetric factors associated with stillbirth in Northern Zone of Ghana, 2023

Determinants	adjusted Odds Ratio	95% Confidence Interval
Gravidity		
1		Ref
2 – 3	0.61	(0.37 - 1.02)
4+	1.03	(0.56 - 1.89)
ANC visits		
< 4		Ref
4 +	0.53	**(0.30 - 0.93)**
Labour indication		
No		Ref
Yes	2.80	**(1.70 - 4.60)**
Foetal malpresentation		
No		Ref
Yes	2.67	**(1.33 - 5.35)**
Malformation (birth defect)		
No		Ref
Yes	6.91	(0.81 - 59.03)
Partograph use		
Yes		Ref
No	2.14	**(1.45 - 3.16)**
Mode of delivery		
SVD		Ref
C/S	1.48	(0.86 - 2.56)
Obstructed labour indication		
No		Ref
Yes	2.84	**(1.38 - 5.82)**
Gestational age first ANC		
1-12		Ref
13-24	1.01	(0.64 - 1.58)
25-36	2.81	(1.00 - 7.92)
Above 36	3.13	(0.53 - 18.57)

Table 7: Multivariate logistic regression analysis of maternal medical health factors associated with stillbirth in Northern Zone of Ghana, 2023

Determinants	adjusted Odds Ratio	(95%CI)
Rhesus factor		
Positive		Ref
Negative	1.75	**(1.12 - 2.73)**
Malaria in pregnancy		
No		Ref
Yes	1.50	(0.74 - 3.04)
TT doses taken		
0		Ref
1	0.48	(0.21 - 1.10)
2+	0.44	**(0.21 - 0.94)**
Sickle cell status		
Negative		Ref
Positive	2.29	**(1.27 - 4.10)**
Gestational Diabetes		
No		Ref
Yes	2.31	(0.75 - 7.17)
Pregnancy induced hypertension		
No		Ref
Yes	1.14	(0.49 - 2.66)
Pre-eclampsia		
No		Ref
Yes	1.08	(0.48 - 2.41)
Eclampsia		
No		Ref
Yes	9.00	**(2.91 - 27.87)**
Anaemia		
No		Ref
Yes	1.15	(0.76 - 1.75)
Antepartum haemorrhage		
No		Ref
Yes	2.84	**(1.34 - 6.02)**
Premature rupture of membrane		
No		Ref
Yes	2.64	**(1.17 - 5.95)**
Obstructed labour		
No		Ref
Yes	1.46	(0.64 - 3.34)

Determinants	adjusted Odds Ratio	(95%CI)
SP Doses taken		
0		Ref
1-2	4.24	**(1.21 - 14.91)**
3-4	2.18	(0.65 - 7.38)
5+	1.66	(0.45 - 6.09)

4.2 ASSESSMENT OF KNOWLEDGE, ATTITUDE, AND PRACTICES (KAP) OF MATERNAL HEALTH DURING PREGNANCY, AMONG RESIDENTS OF NORTHERN GHANA

Table 8 describes the sociodemographic characteristics of the participants of the KAP survey. A total of 1206 women who have lived in the study site for a minimum of 6 months and have had a baby over the past 6 months prior to the start of the study were enrolled into the survey. Out of the 1206 women who were enrolled, 45.61% (550/1206) were from the rural sector and the rest were from the urban sector. Overall, Northern region had the highest proportion of recruits with 39.80% (480/1206) while both North-East and Savannah recorded the least with 11.61% (140/1206). Married women accounted for 91.96% (1109/1206). Among the ethnic groups, Dagaaba accounted for 35.99% (434/1206) of participants being the highest. In assessing the education level, those with no formal education was the highest recorded with 32.17% (388/1206) with 10.20% (126/1206) tertiary education being the least. Trading was the predominant occupation in Northern zone of Ghana followed by farming with 29.85% (360/1206) and 24.13%(291/1206) respectively. Islamic region was practiced among 62.10% (749/1206) of the participants. Only 9.62% (116/1206) of the women indicated that have ever attempted delivery outside a health facility. Figure 8 shows the geospatial distribution of respondents of the survey.

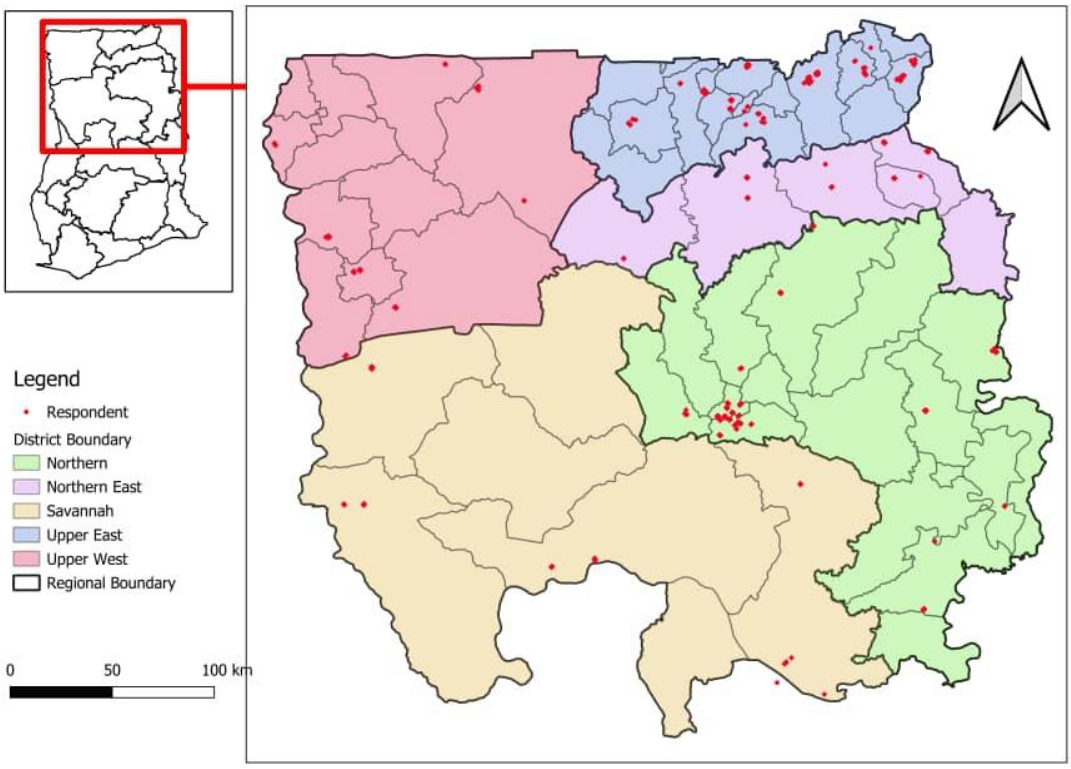

Figure 8: Distribution of respondents of KAP survey, Northern Ghana, 2023

Table 8: Sociodemographic characteristics of participants of KAP Survey, Northern Ghana, 2023

Variable	Rural (N=550) n(%)	Urban (N=656) n(%)	Total (N=1206) n(%)
Age Group			
Below 20	48(8.73)	15(2.29)	63(5.22)
20-29	325(59.09)	331(50.46)	656(54.4)
30-39	146(26.54)	245(37.35)	391(32.42)
40+	31(5.64)	65(9.90)	96(7.96)
Region			
North East	100(18.18)	40(6.10)	140(11.61)
Northern	65(11.82)	415(63.26)	480(39.8)
Savannah	92(16.73)	48(7.32)	140(11.61)
Upper East	177(32.18)	91(13.87)	268(22.22)
Upper West	116(21.09)	62(9.45)	178(14.76)

Variable	Rural (N=550) n(%)	Urban (N=656) n(%)	Total (N=1206) n(%)
Marital Status			
Single	34(6.18)	37(5.64)	71(5.89)
Married	511(92.91)	598(91.16)	1109(91.96)
Divorced/separated	5(0.91)	21(3.20)	26(2.15)
Ethnicity			
Dagaaba	139(25.27)	295(44.97)	434(35.99)
Gonja	30(5.45)	59(8.99)	89(7.38)
Gurune	55(10.00)	56(8.54)	111(9.20)
Komkomba	24(4.36)	48(7.32)	72(5.97)
Kusaasi	85(15.45)	16(2.44)	101(8.37)
Mamprusi	54(9.82)	38(5.79)	92(7.63)
Sissala	33(6.00)	30(4.57)	63(5.22)
Waalah	36(6.55)	17(2.59)	53(4.40)
Others	94(17.10)	97(14.79)	191(15.84)
Educational Level			
No education	198(36)	190(28.96)	388(32.17)
Primary	93(16.91)	83(12.65)	176(14.60)
JHS	154(28)	127(19.36)	281(23.30)
SHS	81(14.73)	157(23.93)	238(19.73)
Tertiary	24(4.36)	99(15.10)	123(10.20)
Occupation			
Unemployed	105(19.09)	139(21.19)	244(20.23)
Farmer	213(38.73)	78(11.89)	291(24.13)
Artisan	80(14.55)	110(16.77)	190(15.75)
Trader	118(21.45)	242(36.89)	360(29.85)
Formal employment	24(4.36)	82(12.50)	106(8.80)
Others	10(1.82)	5(0.76)	15(1.24)
Religion			
Christianity	246(44.73)	174(26.52)	420(34.83)
Islamic	292(53.09)	457(69.67)	749(62.10)
Traditionalist	12(2.18)	25(3.81)	37(3.07)
History of attempted delivery outside HF			
No	513(93.27)	577(87.96)	1090(90.38)
Yes	37(6.73)	79(12.04)	116(9.62)
History of Stillbirth			
No	547(99.45)	626(95.43)	1173(97.26)
Yes	3(0.55)	30(4.57)	33(2.74)

4.2.1 Knowledge of maternal health among mothers resident in Northern Ghana

Regarding the knowledge of mothers on maternal health, 37.65% (454/1206) mentioned women below 18 years are the only people at risk of experiencing

complications during pregnancy. Out of the 454 women, majority, 55.73% (253/454) were urban residents. Also, 27.78% (335/1206) of the women believed any pregnant women is at risk of developing complications during pregnancy. On the type of people who are supposed to seek preconception care, 29.60% (357/1206) knew that any woman planning to get pregnant should seek preconception care. Two years or more was mentioned by majority, 80.35% (969/1206) of the women as the recommended interval for good birth spacing. Also, stillbirth was mentioned by 19.98% (241/1206) of the women studied as a risk associated with poor birth spacing. In terms of the effect of smoking during pregnancy and benefits of healthy meals during pregnancy, majority 33.25% (401/1206) stated congenital malformation as a complication of smoking and 84.58% (1020/1206) stated enhance fetal growth as a benefit of healthy meals during pregnancy. Only 32.84% (396/1206) of the women studied knew that folic acid prevents birth defects. In assessing the knowledge of the study participants on the risk of maternal anaemia, 53.90%(650/1206) knew about low birth weight. Only 49.17%(593/1206) were aware that best time to start ANC visit is as soon as pregnancy is detected. In their responses, 26.78%(323/1206) indicated that ANC visit should start only when husbands agree. Majority, 79.85%(963/1206), knew the recommended minimum of 4 ANC visits. Also, 75.62%(912/1206) mentioned that one of the benefits of ANC visit is to assess the state of health of the mother and fetus early in pregnancy. Lastly, 19.57% (236/1206) of the women studied knew that one of the benefits of health facility delivery is to help monitor progress of the pregnancy. Only marginal variations were observed between the response from urban and rural settlements. Overall, only 22.89% (276/1206) of the women studied demonstrated good knowledge on maternal health. Table 9 illustrates the knowledge of women in Northern zone of Ghana on maternal health.

Table 9: Assessment of knowledge on maternal health among mothers resident in Northern Ghana, 2023

Variable	Rural (N=550) n(%)	Urban (N=656) n(%)	Total (N=1206) n(%)
Women at risk of experiencing complications during pregnancy			
Women below 18yrs only	201(36.55)	253(38.57)	454(37.65)
Women with first pregnancy at 35yrs and above only	50(9.09)	54(8.23)	104(8.62)
Hypertensive women only	42(7.64)	44(6.71)	86(7.13)
Diabetic women only	10(1.82)	9(1.37)	19(1.58)
Any pregnant woman	145(26.36)	190(28.96)	335(27.78)
Don't know	102(18.55)	106(16.16)	208(17.25)
People who are supposed to seek preconception care			
Women below 18yrs only	141(25.64)	194(29.57)	335(27.78)
Women with first pregnancy at 35yrs and above only	48(8.73)	45(6.86)	93(7.71)
Hypertensive women only	35(6.36)	33(5.03)	68(5.64)
Diabetic women only	31(5.64)	25(3.81)	56(4.64)
Any woman planning to get pregnant	139(25.27)	218(33.23)	357(29.6)
Don't know	156(28.36)	141(21.49)	297(24.63)
Recommended interval for good birth spacing			
Any interval	41(7.45)	65(9.91)	106(8.79)
Less than 2 years	28(5.09)	53(8.08)	81(6.72)
2 years and above	460(83.64)	509(77.59)	969(80.35)
Don't know	21(3.82)	29(4.42)	50(4.15)
Risks associated with poor birth spacing*			
Congenital disorders/malformation	82(14.91)	105(16.01)	187(15.51)
Premature labour	118(21.45)	115(17.53)	233(19.32)
Low birth weight	142(25.82)	221(33.69)	363(30.1)
Miscarriage	109(19.82)	198(30.18)	307(25.46)
Stillbirth	72(13.09)	169(25.76)	241(19.98)
Placenta abruption	39(7.09)	35(5.34)	74(6.14)
Small for gestational age	173(31.45)	162(24.70)	335(27.78)

Variable	Rural (N=550) n(%)	Urban (N=656) n(%)	Total (N=1206) n(%)
Effects of smoking during pregnancy*			
Congenital malformation	185(33.64)	216(32.93)	401(33.25)
Premature labour	143(26)	174(26.52)	317(26.29)
Infant mortality	166(30.18)	231(35.21)	397(32.92)
Low birth weight	129(23.45)	193(29.42)	322(26.7)
Miscarriage	189(34.36)	205(31.25)	394(32.67)
Benefits of having a healthy meal during pregnancy*			
Enhances fetal growth	488(88.73)	532(81.10)	1020(84.58)
Prevents maternal anaemia	420(76.36)	462(70.43)	882(73.13)
Reduces risk of adverse pregnancy outcome	271(49.27)	276(42.07)	547(45.36)
Benefits of Folic acid supplementation*			
Prevents birth defects (Neural tube defects)	179(32.55)	217(33.08)	396(32.84)
Boost blood/Hb of pregnant woman	488(88.73)	541(82.47)	1029(85.32)
Risk of maternal anaemia for baby*			
Low birth weight	283(51.45)	367(55.95)	650(53.9)
Likelihood of developing childhood anaemia	179(32.55)	217(33.08)	396(32.84)
Potential for poor cognitive development	72(13.09)	114(17.38)	186(15.42)
Congenital malformation/defects	117(21.27)	167(25.46)	284(23.55)
Best time to go for first ANC visit			
When your husband agrees	135(24.55)	188(28.66)	323(26.78)
As soon as pregnancy is detected	289(52.55)	304(46.34)	593(49.17)
Between 6 - 8 weeks of pregnancy	114(20.73)	156(23.78)	270(22.39)
After 8 weeks	2(0.36)	0(0.00)	2(0.17)
Others	10(1.82)	8(1.22)	18(1.49)
Recommended minimum number of 4 ANC visits during pregnancy			
Yes	452(82.18)	511(77.90)	963(79.85)
No	98(17.82)	145(22.10)	243(20.15)
Benefits of antenatal visits*			
Assess the state of health of the mother and fetus early in pregnancy	427(77.64)	485(73.93)	912(75.62)

Variable	Rural (N=550) n(%)	Urban (N=656) n(%)	Total (N=1206) n(%)
Prevent unwanted complications during pregnancy	371(67.45)	436(66.46)	807(66.92)
Early detection of abnormalities in mother and fetus	408(74.18)	451(68.75)	859(71.23)
Prevent illness in mother and fetus	355(64.55)	346(52.74)	701(58.13)
Prepare the family for the coming baby	153(27.82)	194(29.57)	347(28.77)
Signs of maternal health problems/ complications during pregnancy*			
Vaginal bleeding	364(66.18)	392(59.76)	756(62.69)
Fever	204(37.09)	228(34.76)	432(35.82)
Continuous vomiting	240(43.64)	316(48.17)	556(46.10)
Dizziness/blurred vision	291(52.91)	259(39.48)	550(45.61)
uneven heartbeat	101(18.36)	149(22.71)	250(20.73)
Swollen feet, hand and/or face	211(38.36)	287(43.75)	498(41.29)
Severe headache	190(34.55)	211(32.16)	401(33.25)
Fits/convulsion/fainting	97(17.64)	79(12.04)	176(14.59)
Decreased or cessation of baby's movement	84(15.27)	110(16.77)	194(16.09)
Benefits of health facility delivery*			
Access to NICU	134(24.36)	191(29.12)	325(26.95)
Access to skilled personnel	403(73.27)	482(73.48)	885(73.38)
Availabilities of interventions for complications	442(80.36)	488(74.39)	930(77.11)
Monitor the progress of the pregnancy	129(23.45)	107(16.31)	236(19.57)
Knowledge score			
Good	126(22.91)	150(22.87)	276(22.89)
Poor	424(77.09)	506(77.13)	930(77.11)

4.2.2 Attitude towards maternal health among mothers resident in Northern Ghana.

Among the women assessed, 28.94% (349/1206) believed only women below the age of 18 years are supposed to seek preconception care. Also, 79.60% (960/1206) perceived preconception care to be important during the reproductive age and 74.54% (899/1206) agreed that preconception care has an implication pregnancy and delivery. Only 39.05% (471/1206) believed it's important to adhere to iron folate supplement schedule. However, 79.68% (961/1206) agreed that it is important to start ANC visit very early in pregnancy. Delivery by trained skilled health personnel was viewed by 96.60% (1165/1206) of the women assessed as being safe. Health facility was perceived to be the place of delivery by 98.01% (1182/1206) of the women assessed. In seeking the opinion of the women on maternal healthcare post-delivery, 67.74% (817/1206) agreed to starting PNC early, 59.45% (717/1206) acknowledged the need to eat health meals and 26.45% (319/1206) believed smoking should be avoided. Majority, 87.31% (1053/1206) and 88.56% (1068/1206) believed stillbirth was caused by abuse of taboo bad spirits respectively. Lastly, 89.30% (1077/1206) believed exercise is necessary during pregnancy. Overall, 50.73% (279/550) of the participants in the rural sector, 44.97% (295/656) from the urban sector and 47.60% (574/1206) of the entire study participants had good attitude towards maternal health care. Table 10 illustrates attitude towards maternal healthcare in the Northern zone of Ghana.

Table 10: Assessment of attitude towards maternal health among mothers resident in Northern Ghana, 2023

Variable	Rural (N=550) n(%)	Urban (N=656) n(%)	Total (N=1206) n(%)
Opinion on people who are supposed to seek preconception care			
Women below 18yrs only	137(24.91)	212(32.32)	349(28.94)
Women with first pregnancy at 35yrs and above only	25(4.55)	23(3.51)	48(3.98)
Hypertensive women only	58(10.55)	50(7.62)	108(8.96)
Diabetic women only	2(0.36)	6(0.91)	8(0.66)
Any pregnant woman	138(25.09)	220(33.54)	358(29.68)
Don't know	190(34.55)	145(22.1)	335(27.78)
Opinion on preconception care being important during the reproductive age			
I agree	430(78.18)	530(80.79)	960(79.6)
I disagree	28(5.09)	27(4.12)	55(4.56)
I don't know	92(16.73)	99(15.09)	191(15.84)
Opinion on preconception care having implications for pregnancy and delivery			
I agree	412(74.91)	487(74.24)	899(74.54)
I disagree	43(7.82)	58(8.84)	101(8.37)
I don't know	95(17.27)	111(16.92)	206(17.08)
Opinion on what to do during pregnancy*			
Start ANC early	472(85.82)	489(74.54)	961(79.68)
Eat more fruits and vegetables	327(59.45)	436(66.46)	763(63.27)
Eat healthy meal	380(69.09)	445(67.84)	825(68.41)
Exercise regularly	200(36.36)	332(50.61)	532(44.11)
Adhere to iron folate supplementation schedule	220(40)	251(38.26)	471(39.05)
Adhere to SP schedule	184(33.45)	208(31.71)	392(32.5)
Avoid alcoholic drinks	234(42.55)	211(32.16)	445(36.9)
Avoid smoking	182(33.09)	195(29.73)	377(31.26)
Get enough sleep/rest	109(19.82)	166(25.30)	275(22.80)
Opinion on delivery by skilled personnel			
Delivery by a trained health professional is safe	537(97.64)	628(95.73)	1165(96.6)
Delivery by a TBA safe	13(2.36)	21(3.20)	34(2.82)
Delivery by oneself is good	0(0.00)	7(1.07)	7(0.58)

Variable	Rural (N=550) n(%)	Urban (N=656) n(%)	Total (N=1206) n(%)
Opinion on choice of place of delivery			
Health facility	547(99.45)	635(96.80)	1182(98.01)
TBA	2(0.36)	19(2.90)	21(1.74)
Self delivery	1(0.18)	2(0.30)	3(0.25)
Opinion on maternal healthcare post delivery*			
Start PNC early	415(75.45)	402(61.28)	817(67.74)
Adhere to PNC schedules	247(44.91)	318(48.48)	565(46.85)
Eat more fruits and vegetables	260(47.27)	365(55.64)	625(51.82)
Eat healthy meal	328(59.64)	389(59.30)	717(59.45)
Exercise regularly	164(29.82)	223(33.99)	387(32.09)
Breastfeed on demand	260(47.27)	260(39.63)	520(43.12)
Protect herself and baby from mosquito bite	197(35.82)	233(35.52)	430(35.66)
Avoid alcoholic drinks	179(32.55)	184(28.05)	363(30.10)
Avoid smoking	144(26.18)	175(26.68)	319(26.45)
Get enough sleep/rest	87(15.82)	151(23.02)	238(19.73)
Opinion on women that PNC is essential for			
All women who has gone through delivery	493(89.64)	565(86.13)	1058(87.73)
Women who lost their babies at delivery only	2(0.36)	6(0.91)	8(0.66)
Women who developed complications following delivery only	28(5.09)	56(8.54)	84(6.97)
Women who are sick only	8(1.45)	6(0.91)	14(1.16)
Women with sick baby only	16(2.91)	22(3.35)	38(3.15)
Women with babies who can not suck/eat only	3(0.55)	1(0.15)	4(0.33)
Opinion on maternal healthcare having implications for delivery outcomes			
Yes	496(90.18)	527(80.34)	1023(84.83)
No	25(4.55)	52(7.93)	77(6.38)
Don't know	29(5.27)	77(11.74)	106(8.79)
Opinion on the cause of stillbirth*			
Poor feeding	197(35.82)	190(28.96)	387(32.09)
Labour complications	190(34.55)	231(35.21)	421(34.91)
Infections (malaria, etc)	245(44.55)	289(44.05)	534(44.28)
High blood pressure of the mother	137(24.91)	216(32.93)	353(29.27)
Excessive Bleeding	129(23.45)	165(25.15)	294(24.38)
Abuse of taboo	478(86.91)	375(57.16)	1053(87.31)

Variable	Rural (N=550) n(%)	Urban (N=656) n(%)	Total (N=1206) n(%)
Bad spirits	473(86)	595(90.70)	1068(88.56)
Opinion on exercise is necessary during pregnancy			
Yes	489(88.91)	588(89.63)	1077(89.3)
No	46(8.36)	33(5.03)	79(6.55)
Don't know	14(2.55)	36(5.49)	50(4.15)
Attitudes score			
Good	279(50.73)	295(44.97)	574(47.60)
Poor	271(49.27)	361(55.03)	632(52.40)

4.2.3 Assessment of maternal healthcare practices among mothers resident in Northern Ghana

Out of 1206 women assessed, 68.49% (826/1206) did not receive any preconception care prior to their most recent pregnancy, 95.94% (1157/1206) underwent antenatal care during their recent pregnancy and 87.40% (1054/1206) did a minimum of 4 ANC visits. However, only 48.59% (586/1206) had their first ANC visit in less than 9 weeks of gestation. In assessing the use of folic acid, 59.95% (723/1206) took folic acid prior to conception. However, 97.43% (1175/1206), started taking folic acid after they realized they were pregnant. Among the women assessed, 81.67% (985/1206) exercised during their recent pregnancy and 98.01%(1182/1206) did not use tobacco during their recent pregnancy. About half, 50.58% (610/1206) included extra fruits and vegetables in their meals during their precent pregnancy. Only 6.80% (82/1206) consumed medication without doctor's advice while planning to get pregnant. Only 1.91% (23/1206) indicated they were screened for their sickling status for their recent pregnancy. On the contrary, 76.29% (920/1206) were screened for HIV. For most of the respondents, 56.97% (687/1206), decision to seek care if a complication were to arise during pregnancy was solely dependent on the husband who also had the greatest

influence, 48.09% (580/1206), on prenatal care decisions. In terms of deciding on the place of delivery, 47.01% (567/1206) women in the study indicated they have the greatest influence. Postnatal care was greatly influenced by 51.58% (622/1206) of the women studied. Overall, 91.64%(504/550) of the women in the rural sector, 87.80% (576/656) in the urban sector and 89.55% (1080/1206) in the entire study participants, had good practices towards maternal healthcare. Table 11 shows a summary of the maternal healthcare practices among mothers resident in the Northern zone of Ghana.

Table 11: Assessment of maternal healthcare practices among mothers resident in Northern Ghana, 2023

Variable	Rural (N=550) n(%)	Urban (N=656) n(%)	Total (N=1206) n(%)
Receive preconception care before your recent pregnancy			
Yes	149(27.09)	231(35.21)	380(31.51)
No	401(72.91)	425(64.79)	826(68.49)
Underwent antenatal care during your recent pregnancy			
Yes	534(97.09)	623(94.97)	1157(95.94)
No	16(2.91)	33(5.03)	49(4.06)
4+ ANC visits undertaken during your recent pregnancy			
Yes	509(92.55)	545(83.08)	1054(87.40)
No	41(7.45)	111(16.92)	152(12.60)
Gestation age at first ANC visit is less than 9wks			
Yes	280(50.91)	306(46.65)	586(48.59)
No	270(49.09)	350(53.35)	620(51.41)
Birth spacing between most recent pregnancy is 2 or more years (n=956)			
Yes	399(72.55)	491(74.85)	890(73.80)
No	20(3.64)	46(7.01)	66(5.47)
Took folic acid supplementation before recent pregnancy			
Yes	338(61.45)	385(58.69)	723(59.95)
No	212(38.55)	271(41.31)	483(40.05)
Took folic acid supplementation during recent pregnancy			
Yes	542(98.55)	633(96.49)	1175(97.43)
No	8(1.45)	23(3.51)	31(2.57)
Exercised during your recent pregnancy			
Yes	463(84.18)	522(79.57)	985(81.67)
No	87(15.82)	134(20.43)	221(18.33)

Variable	Rural (N=550) n(%)	Urban (N=656) n(%)	Total (N=1206) n(%)
Used tobacco during your recent pregnancy			
Yes	9(1.64)	15(2.29)	24(1.99)
No	541(98.36)	641(97.71)	1182(98.01)
Used alcohol during your recent pregnancy			
Yes	11(2.00)	16(2.44)	27(2.24)
No	539(98.00)	640(97.56)	1179(97.76)
Went on a day without having a meal during recent pregnancy			
Yes	65(11.82)	73(11.13)	138(11.44)
No	485(88.18)	583(88.87)	1068(88.56)
Included extra fruits and vegetables in your meals during your recent pregnancy			
Yes	292(53.09)	318(48.48)	610(50.58)
No	258(46.91)	338(51.52)	596(49.42)
Consumed drugs without doctor's advice while planning for pregnancy			
Yes	39(7.09)	43(6.55)	82(6.80)
No	511(92.91)	613(93.45)	1124(93.2)
Practiced any food taboo during your recent pregnancy			
Yes	11(2.00)	27(4.12)	38(3.15)
No	539(98.00)	629(95.88)	1168(96.85)
Received health information every week			
Yes	396(72.00)	466(71.04)	862(71.48)
No	154(28.00)	190(28.96)	344(28.52)
Screenings undertaken during recent pregnancy*			
HIV	440(80)	480(73.17)	920(76.29)
Hepatitis B	408(74.18)	457(69.66)	865(71.72)
VDRL/Syphilis	543(98.73)	639(97.41)	1182(98.01)
Malaria	30(5.45)	40(6.10)	70(5.80)
Hb	62(11.27)	23(3.51)	85(7.05)
Sickling	5(0.91)	18(2.74)	23(1.91)
Decision to seek care if a complication were to arise during pregnancy			
Myself	195(35.45)	237(36.13)	432(35.82)
Husband	318(57.82)	369(56.25)	687(56.97)
In-law	28(5.09)	33(5.03)	61(5.06)
Others	9(1.64)	17(2.59)	26(2.16)
Greatest influence on prenatal care decisions			
Myself	244(44.36)	288(43.9)	532(44.11)
Husband	266(48.36)	314(47.87)	580(48.09)
In-law	30(5.45)	43(6.55)	73(6.05)
Others	10(1.82)	11(1.68)	21(1.74)
Greatest influence on decisions about place of delivery			

Variable	Rural (N=550) n(%)	Urban (N=656) n(%)	Total (N=1206) n(%)
Myself	258(46.91)	309(47.10)	567(47.01)
Husband	256(46.55)	302(46.04)	558(46.27)
In-law	26(4.73)	35(5.34)	61(5.06)
Others	10(1.82)	10(1.52)	20(1.66)
Greatest influence on decisions concerning postnatal care			
Myself	274(49.82)	348(53.05)	622(51.58)
Husband	244(44.36)	277(42.23)	521(43.20)
In-law	21(3.82)	26(3.96)	47(3.90)
Others	11(2.00)	5(0.76)	16(1.33)
Practices Score			
Good	504(91.64)	576(87.8)	1080(89.55)
Poor	46(8.36)	80(12.2)	126(10.45)

4.2.4 Sociodemographic correlation of respondents' knowledge on maternal health in Northern Ghana

Table 12 shows the summary of sociodemographic correlation on maternal health in Northern Ghana. Out of 10 sociodemographic variables assessed, three were significantly associated with knowledge on maternal healthcare in Northern Ghana. These were region, ethnicity and education level. Compared to those in the North East region of Ghana, those in the Northern region had 5.48 times increased odds of having good knowledge on maternal health practices (aOR = 5.48, 95%CI: 2.28 – 13.19). All other regions had increased odds of having good knowledge compared to North East with Upper West having the highest odds (aOR = 12.22, 95%CI: 4.62 – 32.30). Among the ethnic groups, Komkomba had 5.35 increased odds of having good knowledge compared to Dagaaba (aOR = 5.35, 95%CI:2.70 – 10.63). On the contrary, Gonja had 55% decreased odds of having good knowledge compared to Dagaaba (aOR = 0.45, 95% CI: 0.20 - 0.99). In assessing the correlation between knowledge and educational level, having no education reduced the odds of having a good knowledge on maternal

health practices by 74% compared to those with a tertiary level of education (aOR = 026, 95% CI: 0.12 - 0.56). The percentage of reduced odds decreased as the educational level increased. Compared to tertiary education, those whose highest level of education was Senior High School had 55% reduced odds of having good knowledge (aOR = 0.45, 95% CI: 0.21 - 0.93).

Table 12: Sociodemographic correlation of respondents' knowledge on maternal health in Northern zone of Ghana, 2023

Variable	Knowledge Level		cOR (95% CI)	aOR(95% CI)
	Good (N=276) n(%)	Poor (N=930) n(%)		
Age Group				
Below 20	12(4.35)	51(5.48)	0.75(0.34 - 1.64)	
20-29	148(53.62)	508(54.62)	0.92(0.56 - 1.53)	
30-39	93(33.70)	298(32.04)	0.99(0.59 - 1.67)	
40+	23(8.33)	73(7.85)	Ref	
Region				
North East	8(2.90)	132(14.19)	Ref	Ref
Northern	89(32.25)	391(42.04)	3.76(1.77 - 7.95)	**5.48(2.28 – 13.19)**
Savannah	29(10.51)	111(11.94)	4.31(1.89 - 9.81)	**8.97(3.40 - 23.66)**
Upper East	89(32.25)	179(19.25)	8.20(3.85-17.50)	**11.94(4.54 -31.40)**
Upper West	61(22.10)	117(12.58)	8.60(3.95-18.73)	**12.22(4.62 - 32.30)**
Type of settlement				
Urban	150(54.35)	506(54.41)	Ref	
Rural	126(45.65)	424(45.59)	1.00(0.77 - 1.31)	
Marital Status				
Single	23(8.33)	48(5.16)	Ref	
Married	246(89.13)	863(92.80)	0.59(0.35 - 0.99)	
Divorced/ separated	7(2.54)	19(2.04)	0.77(0.28 - 2.09)	

Variable	Knowledge Level		cOR (95% CI)	aOR(95% CI)
	Good (N=276) n(%)	Poor (N=930) n(%)		
Ethnicity				
Dagaaba	77(27.90)	357(38.39)	Ref	Ref
Gonja	9(3.26)	80(8.60)	0.52(0.25 - 1.08)	**0.45(0.20 - 0.99)**
Gurune	33(11.96)	78(8.39)	1.96(1.22 - 3.16)	0.97(0.44 - 2.14)
Komkomba	28(10.14)	44(4.73)	2.95(1.73 - 5.03)	**5.35(2.70 - 10.63)**
Kusaasi	31(11.23)	70(7.53)	2.05(1.26 - 3.35)	1.02(0.45 - 2.31)
Mamprusi	8(2.90)	84(9.03)	0.44(0.21 - 0.95)	1.50(0.60 - 3.76)
Sissala	22(7.97)	41(4.41)	2.49(1.40 - 1.41)	1.47(0.71 - 3.03)
Waalah	18(6.52)	35(3.76)	2.38(1.28 - 4.43)	1.35(0.65 - 2.81)
Others	50(18.12)	141(15.16)	1.64(1.10 - 2.48)	1.30(0.75 - 2.24)
Educational Level				
Tertiary	52(18.84)	71(7.63)	Ref	Ref
No education	67(24.28)	321(34.52)	0.28(0.18 - 0.44)	**0.26(0.12 - 0.56)**
Primary	34(12.32)	142(15.27)	0.33(0.19 - 0.55)	**0.27(0.12 - 0.60)**
JHS	64(23.19)	217(23.33)	0.4(0.26 - 0.63)	**0.36(0.17 - 0.77)**
SHS	59(21.38)	179(19.25)	0.45(0.28 - 0.72)	**0.45(0.21 - 0.93)**
Occupation				
Formal employment	40(14.49)	59(6.34)	Ref	Ref
Farmer	63(22.83)	228(24.52)	0.41(0.25 - 0.66)	1.36(0.59 - 3.14)
Artisan	23(8.33)	115(12.37)	0.29(0.16 - 0.54)	1.06(0.43 - 2.62)
Trader	83(30.07)	276(29.68)	0.44(0.28 - 0.71)	1.52(0.68 - 3.39)
Unemployed	37(13.41)	188(20.22)	0.29(0.17 - 0.50)	0.77(0.36 - 1.66)
Others	30(10.87)	64(6.88)	0.69(0.38 - 1.23)	2.21(0.93 - 5.25)
Religion				
Traditional	10(3.62)	27(2.90)	Ref	Ref
Christian	128(46.38)	292(31.40)	1.18(0.56 - 2.52)	1.47(0.65 - 3.41)
Muslim	138(50.00)	611(65.70)	0.61(0.29 - 1.29)	1.27(0.54 - 3.01)
History of birth experience				
Yes	266(96.38)	899(96.67)	Ref	
No	10(3.62)	31(3.33)	1.09(0.53 - 2.25)	
History of Stillbirth				
No	270(97.83)	903(97.10)	Ref	
Yes	6(2.17)	27(2.90)	0.74(0.30 - 1.82)	

4.2.5 Sociodemographic correlation of respondents' attitude on maternal health in Northern Ghana

Out of 10 sociodemographic variables assessed, five showed significant correlation with attitude at the multivariate level of analysis. Compared to North East, we found that Northern, Savannah, Upper East and Upper West regions had increased odds of having good attitude towards maternal healthcare. The highest odds was recorded in Upper West (aOR= 9.10, 95% CI:4.31-19.19) followed by Savannah region (aOR=2.10, 95%CI: 1.07 – 4.14). Compared to the urban sector, the rural sector had 1.38 increased odds of having a good attitude towards maternal health care (aOR=1.38, 95% CI: 1.00 - 1.90). In assessing the correlation between marital status and good attitude towards maternal health, being married showed 78% reduced odds compared to those who are single. Among the ethnic groups, the Komkombas had 6.79 increased odds having good attitude towards maternal healthcare compared to the Dagaabas (aOR = 6.79, 95% CI: 3.40-13.56). Having no formal education reduced your odds of having good attitude towards maternal healthcare by 79% compared to having tertiary education (aOR = 021, 95% CI: 0.10 - 0.42). The percentage of reduced odds generally decreased as the educational level increased. Compared to tertiary education, having Senior High School education decreased your odds of having a good attitude by 63% (aOR = 0.37, 95%CI: 0.19 - 0.74). Table 13 shows a summary of sociodemographic factors and their correlation with attitude towards maternal healthcare.

Table 13: Sociodemographic correlation of respondents' attitude on maternal health in Northern zone of Ghana, 2023

Variable	Attitude Level		cOR (95% CI)	aOR(95% CI)
	Good (N=574) n(%)	Poor (N=632) n(%)		
Age Group				
Below 20	27(4.70)	36(5.70)	1.31(0.68 - 2.50)	
20-29	314(54.70)	342(54.11)	1.6(1.03 - 2.49)	
30-39	198(34.49)	193(30.54)	1.79(1.13 - 2.83)	
40+	35(6.10)	61(9.65)	Ref	
Region				
North East	44(7.67)	96(15.19)	Ref	Ref
Northern	199(34.67)	281(44.46)	1.55(1.04 - 2.31)	**1.98(1.04 - 3.60)**
Savannah	66(11.50)	74(11.71)	1.95(1.20 - 3.17)	**2.10(1.07 – 4.14)**
Upper East	130(22.65)	138(21.84)	2.06(1.34 - 3.16)	**2.09(1.07 – 4.06)**
Upper West	135(23.52)	43(6.80)	6.85(4.18-11.24)	**9.10(4.31-19.19)**
Type of settlement				
Urban	295(51.39)	361(57.12)	Ref	Ref
Rural	279(48.61)	271(42.88)	1.26(1.00 - 1.58)	**1.38(1.00 - 1.90)**
Marital Status				
Single	50(8.71)	21(3.32)	Ref	Ref
Married	507(88.33)	602(95.25)	0.35(0.21 - 0.60)	**0.39(0.22 - 0.70)**
Divorced/ separated	17(2.96)	9(1.42)	0.79(0.31 - 2.06)	1.00(0.35 - 2.86)
Ethnicity				
Dagaaba	183(31.88)	251(39.72)	Ref	Ref
Gonja	40(6.97)	49(7.75)	1.12(0.71 - 1.77)	1.16(0.66-2.02)
Gurune	52(9.06)	59(9.34)	1.21(0.80 - 1.84)	0.94(0.46-1.92)
Komkomba	55(9.58)	17(2.69)	4.44(2.49 - 7.90)	**6.79(3.40-13.56)**
Kusaasi	45(7.84)	56(8.86)	1.10(0.71 - 1.70)	0.96(0.46-2.00)
Mamprusi	19(3.31)	73(11.55)	0.36(0.21 - 0.61)	0.69(0.34-1.38)
Sissala	44(7.67)	19(3.01)	3.18(1.79 - 5.62)	0.88(0.41-1.88)
Waalah	36(6.27)	17(2.69)	2.90(1.58 - 5.33)	0.77(0.36-1.64)
Others	100(17.42)	91(14.40)	1.51(1.07 - 2.12)	1.28(0.80-2.07)
Educational Level				
Tertiary	90(15.68)	33(5.22)	Ref	Ref
No education	146(25.44)	242(38.29)	0.22(0.14 - 0.35)	**0.21(0.10 - 0.42)**

Variable	Attitude Level		cOR (95% CI)	aOR(95% CI)
	Good (N=574) n(%)	Poor (N=632) n(%)		
Primary	77(13.41)	99(15.66)	0.29(0.17 - 0.47)	**0.26(0.12 - 0.54)**
JHS	140(24.39)	141(22.31)	0.36(0.23 - 0.58)	**0.36(0.18 - 0.72)**
SHS	121(21.08)	117(18.51)	0.38(0.24 - 0.61)	**0.37(0.19 - 0.74)**
Occupation				
Formal employment	70(12.2)	29(4.59)	Ref	Ref
Farmer	140(24.39)	151(23.89)	0.38(0.24 - 0.63)	1.07(0.49 - 2.31)
Artisan	51(8.89)	87(13.77)	0.24(0.14 - 0.42)	0.76(0.34 - 1.70)
Trader	166(28.92)	193(30.54)	0.36(0.22 - 0.58)	1.20(0.57 - 2.54)
Unemployed	104(18.12)	121(19.15)	0.36(0.21 - 0.59)	0.82(0.40 - 1.69)
Others	43(7.49)	51(8.07)	0.35(0.19 - 0.63)	0.96(0.42 - 2.18)
Religion				
Traditional	21(3.66)	16(2.53)	Ref	Ref
Christian	240(41.81)	180(28.48)	1.02(0.52 - 2.00)	1.68(0.75 – 3.74)
Muslim	313(54.53)	436(68.99)	0.55(0.28 - 1.07)	1.30(0.58 – 2.91)
History of birth experience				
Yes	549(95.64)	616(97.47)	Ref	
No	25(4.36)	16(2.53)	1.75(0.93 - 3.32)	
History of Stillbirth				
No	559(97.39)	614(97.15)	Ref	
Yes	15(2.61)	18(2.85)	0.92(0.46 - 1.83)	

4.2.6 Sociodemographic correlation of respondents' practices on maternal health in Northern Ghana

Two out of 10 sociodemographic variables, two showed significant correlation with maternal health practices. These three variables were region and history of birth experience. Compared to North-East region, those in the Northern region had 95% reduced odds of having good practices (aOR=0.05, 95%CI: 0.00-0.45). The analysis also showed that those who do not have any experience with childbirth had 99% deceased odds of good maternal health practices (aOR=0.01, 95%CI: 0.05 - 0.29).

Table 14 shows a summary of sociodemographic factors and their correlation with practices towards maternal healthcare.

Table 14: Sociodemographic correlation of respondents' practices on maternal health in Northern zone of Ghana, 2023

Variable	Practices Level		cOR (95% CI)	aOR(95% CI)
	Good (N=1080) n(%)	Poor (N=126) n(%)		
Age Group				
Below 20	57(5.28)	6(4.76)	1.36(0.48 - 3.82)	
20-29	577(53.43)	79(62.70)	1.04(0.55 - 2.00)	
30-39	362(33.52)	29(23.02)	1.78(0.87 - 3.64)	
40+	84(7.78)	12(9.52)	Ref	
Region				
North East	139(12.87)	1(0.79)	Ref	Ref
Northern	385(35.65)	95(75.40)	0.03(0.00 - 0.21)	**0.05(0.00-0.45)**
Savannah	131(12.13)	9(7.14)	0.1(0.01 - 0.84)	0.20(0.02-2.14)
Upper East	258(23.89)	10(7.94)	0.19(0.02 - 1.46)	0.22(0.02-2.99)
Upper West	167(15.46)	11(8.73)	0.11(0.01 - 0.86)	0.15(0.01-1.62)
Type of settlement				
Urban	576(53.33)	80(63.49)	Ref	Ref
Rural	504(46.67)	46(36.51)	1.52(1.04 - 2.23)	0.72(0.42-1.25)
Marital Status				
Single	66(6.11)	5(3.97)	Ref	
Married	993(91.94)	116(92.06)	0.65(0.26 - 1.64)	
Divorced/ separated	21(1.94)	5(3.97)	0.32(0.08 - 1.21)	
Ethnicity				
Dagaaba	346(32.04)	88(69.84)	Ref	Ref
Gonja	78(7.22)	11(8.73)	1.8(0.92 - 3.54)	0.75(0.32-1.77)
Gurune	106(9.81)	5(3.97)	5.39(2.13-13.62)	1.23(0.26-5.79)
Komkomba	71(6.57)	1(0.79)	18.06(2.47-131.78)	6.89(0.85-55.81)

Variable	Practices Level		cOR (95% CI)	aOR(95% CI)
	Good (N=1080) n(%)	Poor (N=126) n(%)		
Kusaasi	96(8.89)	5(3.97)	4.88(1.93-12.36)	1.56(0.27-9.15)
Mamprusi	88(8.15)	4(3.17)	5.60(2.00-15.66)	1.37(0.39-4.82)
Sissala	59(5.46)	4(3.17)	3.75(1.33-10.61)	1.28(0.32-5.18)
Waalah	50(4.63)	3(2.38)	4.24(1.29-13.91)	1.24(0.29-5.27)
Others	186(17.22)	5(3.97)	9.46(3.78-23.71)	2.78(0.97-7.99)
Educational Level				
Tertiary	119(11.02)	4(3.17)	Ref	Ref
No education	334(30.93)	54(42.86)	0.21(0.07 - 0.59)	0.15(0.03 - 0.69)
Primary	154(14.26)	22(17.46)	0.24(0.08 - 0.70)	0.20(0.04-0.92)
JHS	254(23.52)	27(21.43)	0.32(0.11 - 0.92)	0.29(0.06-1.34)
SHS	219(20.28)	19(15.08)	0.39(0.13 - 1.17)	0.30(0.07 - 1.38)
Occupation				
Formal employment	94(8.70)	5(3.97)	Ref	Ref
Farmer	267(24.72)	24(19.05)	0.59(0.22 - 1.60)	1.74(0.41 - 7.36)
Artisan	106(9.81)	32(25.40)	0.18(0.07 - 0.47)	0.75(0.18-3.09)
Trader	321(29.72)	38(30.16)	0.45(0.17 - 1.17)	2.04(0.51 - 8.19)
Unemployed	203(18.80)	22(17.46)	0.49(0.18 - 1.34)	1.30(0.32 - 5.21)
Others	89(8.24)	5(3.97)	0.95(0.27 - 3.38)	2.30(0.45-11.80)
Religion				
Traditional	37(3.43)	0(0.00)	-	-
Muslim	640(59.26)	109(86.51)	Ref	Ref
Christian	403(37.31)	17(13.49)	4.04(2.39 - 6.83)	1.36(0.64 - 2.85)
History of birth experience				
Yes	1053(97.50)	112(88.89)	Ref	Ref
No	27(2.50)	14(11.11)	0.21(0.10 - 0.40)	**0.01(0.05 - 0.29)**
History of Stillbirth				
No	1056(97.78)	117(92.86)	Ref	Ref
Yes	24(2.22)	9(7.14)	0.30(0.13 - 0.65)	0.51(0.21 - 1.20)

4.3 PERCEPTION AND DESCRIPTION OF THE SOCIO-CULTURAL PRACTICES OF COMMUNITY MEMBERS WITH REGARDS TO MATERNAL HEALTH

4.3.1 How pregnancy is received in communities

The community response to pregnancy varies substantially based on the marital and age status of the expectant mother. Married adult women enjoy care, support and celebration during pregnancy. Unmarried or teenage pregnancies elicit gossip, stigma and disapproval underscoring the importance of addressing this issue through education and awareness.

4.3.1.1 Pregnancy brings excitement and joy in most communities, especially if the woman is married.

In many communities, pregnancy is seen as a blessing and good news. The onset of pregnancy indicates the growth of the family and community.

> *"when my wife was pregnant, she started attending ANC for care, I was excited about the fact that my wife was pregnant"* (FGD, community representative, Upper West Urban_R#1)

> *"pregnancy brings excitement to us in this community."* (FGD, community representative, Upper West Urban_R#2)

The pregnancy of a married woman is especially welcomed with happiness as it confirms the man's virility and transition to fatherhood.

> *"When someone's wife gets pregnant, everyone is excited about it."* (FGD, community representative, North East Upper_R#1)

"for the first time the man feels happy because he has become a father because it's not all men who are able to impregnate a woman. So when you receive that news you are happy because you have become part of the men" (FGD, community representative, Savannah Rural _R#2)

4.3.1.2 Pregnancy prompts care and support for the expectant mother

Many respondents highlighted the special care and attention given to pregnant women in their communities. Her workload is reduced, she is provided with nutritional food and her overall wellbeing is monitored.

"you handle the pregnant woman well and you make sure that she eats the right food and also reduce the burden of work on her for her to deliver safely." (FGD, community representative, Savannah Urban _R#1)

"we receive the news with joy and happiness, we see that when they are pregnant they are many things that they can't do anymore so we begin to help them as their husbands in performing such duties" (FGD, community representative, Upper East Rural _R#1)

4.3.1.3 Unmarried or adolescent pregnancy elicits gossip and stigma

Pregnancy outside of marriage, especially among young unmarried girls, is seen unfavourably and attracts gossip. It is not openly celebrated.

"It depends on your married status, if you are married then its good news but if you are a single lady or even a student, they see it as a problem." (FGD, community representative, Upper East Urban_R#1)

"whereas another can get pregnant and this will bring confusion into the compound. When a woman gets pregnant and everyone knows she has a husband, there is usually no problem. But when a woman gets pregnant when she has no husband, or she gets pregnant when she is only on a visit whiles her husband resides elsewhere, it is usually heartbreaking." (FGD, community representative, North East Urban_R#6)

4.3.2 Socio-cultural practices related to maternal health

This sub-theme explores the socio-cultural practices and beliefs associated with pregnancy and maternal health in local communities across Ghana. It provides insights into the socio-cultural beliefs and practices around maternal health in Ghana. While some traditional customs offer social support to pregnant women, others can perpetuate nutritional taboos, delays in seeking care, and gender stereotypes.

4.3.2.1 Traditional Food Taboos

Many communities maintain prohibitions around certain foods that pregnant women are forbidden from eating. These food taboos are deeply rooted local beliefs passed down through generations. Some of the commonly cited taboo foods include eggs, meat, and energy drinks:

"a pregnant woman is not allowed to eat certain foods like eggs." (FGD, community representative, North East Rural _R#2).

"*we have food taboos, like a pregnant woman shouldn't eat egg, goat meat and guinea fowl meat."* (FGD, community representative, Upper East Urban_R#6)

4.3.2.2 Traditional Herbal Medicine

The use of herbs and traditional medicine during pregnancy remains prevalent across many rural settings. These herbal preparations are believed to ease delivery and protect the unborn child spiritually. However, biomedical doctors have expressed concerns around their safety:

> *"I realized that; the uterus wasn't in good shape. The herbs could be seen coming out of the woman's mouth. I was informed by him that; it was as a result of those ante-natal herbs we give."* (FGD, community representative, Northern Urban_R#5)

"we used to give them local herbs called **'yaaga'** but off late we don't do that." (FGD, community representative, Savannah Urban_R#6).

4.3.2.3 Activity Restrictions and Taboos

Pregnant women face many restrictions around their daily activities driven by cultural beliefs. Bathing at night, leaving hair uncovered, attending funerals are forbidden in some communities. While aimed at protecting the mother and child, these taboos can isolate women and enhance stigma around pregnancy.

> *"A pregnant woman is not supposed to bath late at night, and she is not supposed to expose her body."* (North East Rural) (FGD, community representatives, North East rural_R#1).

> *"pregnant women are not allowed to see corpse or even go near where they lie the casket during a funeral. But she can attend funerals."* (Savannah Urban) (FGD, community representative, Savannah Urban_R#3)

4.3.2.4 Rituals and Superstitions

The onset of pregnancy triggers several rituals and superstitious beliefs related to safeguarding the unborn baby. These include visiting traditional healers, wearing amulets, restricting who can announce the pregnancy etc. While reflecting cultural values, such practices can delay women from seeking timely medical care thereby endangering mothers and babies.

> *"There is also this practice though not practiced in every clan or every home, but in this community it exists. There is this practice where when a newly wedded lady is found to be pregnant, no one is allowed to break the news till her sister in-law performs some rituals, and late in the night, a specially made leather amulet is worn around the waste of the lady. After this rite, it is safe to break the news. It is believed that, breaking the news prior to this rite leads to miscarriage."* (FGD, community representative, North East Urban_R#4)

4.3.2.5 Gender Roles and Responsibilities

Pregnancy leads to a renegotiation of gender roles within the household. Male participation in domestic work and livelihood activities increases to reduce burden on the expectant mother. However, household power dynamics remain tilted in favor of men.

> *"when one is pregnant, the family takes care of the tilling, planting tending of the farm and harvesting when it is due for you. This is because when you are pregnant, you cannot engage in strenuous activities."* (FGD, community representative, Northern Rural_R#1)

> *"it depends on the body of the woman that will determine the things she does or does not in the household, myself when my wife is pregnant I don't allow her to do hard work at home, I do them myself so as to allow her some rest."* (FGD, community representative, Upper West Urban_R#4)

4.3.3 Community Perspectives on Family Planning

Family planning allows individuals to attain their desired number of children and determine the spacing between pregnancies. This sub-theme explored community attitudes, perceptions and beliefs regarding family planning across urban and rural Ghana. In summary, family planning enjoys general approval for its role in promoting maternal and child health, provided side-effects can be minimized. Efforts are needed to increase male participation, address religious concerns, and regulate emergency contraception use to garner wider acceptance.

4.3.3.1 Family planning facilitates child spacing and promotes family health

Many respondents viewed family planning positively as it enables child spacing which has health benefits for both mother and child. Short birth intervals deplete mothers physically and impact their ability to care for children.

> *"It helps us to space our births and take good care of the children well enough, so to me it is good." (FGD, community representative, North East Rural_R#2)*

Family planning was also seen as allowing better allocation of family resources towards raising and educating children by limiting family size:

"It is helpful. People are not well to do in this community. Hence, when you check your birth, you would be able to cater for the children." (FGD, community representative, Northern Rural_R#2)

"It also helps you to cater better for your children's education and feeding as well. If they were methods for men, I would have encouraged my partner to go in for it." (FGD, community representative, Upper East Urban_R#4)

4.3.3.2 Herbal methods still prevail in some communities

While modern contraceptives are increasingly popular, the use of traditional herbal medicine for birth spacing persists in certain areas. This points to the need for health education around long-acting reversible contraceptives that can help with extended birth spacing.

"Previously, Islamic clerics used to have some arrangements to help couples space their births. Uncontrolled birth is not healthy. Time past, many children guaranteed more hands for farm labour, but now that children are in school, if you have too many children, you cannot cater for their educational needs." (FGD, community representative, Northern Urban_R#5)

4.3.3.3 Men's attitudes vary towards family planning

Male attitudes towards family planning are heterogeneous. While some men support their wives' contraceptive use, others remain opposed to it. Much depends on male education levels and religious orientations. Sensitizing men and correcting misconceptions around contraception remains vital for program effectiveness and spousal unanimity

> *"Men who desire polygamy do not appreciate the concept of family planning, it is usually their wives who may even accept the idea of family planning. Usually, those who are not educated find it difficult to accept this concept of family planning."* (FGD, community representative, North East Urban_R#4)

4.3.3.4 Concerns exist around side-effects of modern contraceptives

Fears around side-effects from modern contraceptive methods persist and prevent uptake. Rumors of life-threatening complications from certain methods exacerbate anxieties. As Respondent 1 states:

> *"Personally I have not done family planning before but what I heard is that sometimes when you do the method and stops it becomes very difficult for you to conceive again or to become pregnant and for some women to when they become pregnant they usually experience miscarriages before they will get pregnant again and that one will stand."* (Upper West Rural) (FGD, community representative, Upper West Rural_R#2)

4.3.3.5 Religious objections impede family planning in some communities

Certain religious beliefs do not sanction family planning. This emerges as a barrier to contraceptive use as explained in the excerpt below. Constructive engagement with faith leaders is vital to promote ideational change and foster community acceptance of family planning.

> *"As for family planning, we are Muslims and do not subscribe to that."* (FGD, community representative, North East Rural_R#2)

4.3.3.6 Unmarried youth increasingly rely on emergency contraception

The growing use of emergency contraceptives by unmarried youth and schoolgirls is worrying. They tend to view it as an instant fix rather than a backup measure. Respondent 4 observes:

> *"People do not need prescription to get contraceptives at the pharmacy. Because our religion does not encourage pregnancy before marriage, they youth take contraceptives a lot to avoid pregnancy"* (FGD, community representative, Upper East Urban_R#4)

4.3.4 Responsibility of the family to pregnant woman

Pregnancy is a vulnerable period that requires social support and care from family and community. This theme explored perceptions regarding familial responsibilities towards expectant mothers based on focus group discussions with community representatives in Ghana. Assistance with domestic chores, healthcare access, nutrition and financial support were identified as key familial responsibilities towards pregnant women. However, gaps persist due to resource constraints and lack of spousal involvement.

4.3.4.1 Assistance with domestic chores

A commonly cited responsibility was assisting pregnant women with strenuous domestic tasks like cooking, cleaning, fetching water and farming. As respondents explained:

> *"They support the pregnant woman with some house chores like washing, cooking and others heavy works."* (Respondent 1, North East Rural) (FGD, community representative, North East rural_R#4)

> *"You will have to help her with the cooking too and maintain a good distance from the fire."* (FGD, community representative, Upper West Urban_R#1)

> *"We help them fetch water, cook and sweep and also with any other house chores."* (FGD, community representative, Upper East Urban_R#2)

While families make efforts to relieve pregnant women from arduous chores, some gaps persist as highlighted by this respondent:

> *"As for the men when you are pregnant they abandon you until the delivery, they leave home in the morning and only come in the evening, they actually don't care about how you feel."* (FGD, community representative, Upper West Urban_R#2)

4.3.4.2 Provision of adequate nutrition

Ensuring pregnant women consume nutritious food was recognized as a family obligation. However, not all families can afford or prioritize this. As respondents noted:

> *"They also provide the pregnant woman with enough food as required by the clinic."* (FGD, community representative, Northeast Rural_R#3)

> *"For some of the men who really understand that when a woman is pregnant she will need a good nutrition, they will go the extra mile to make sure that the nutritional needs of the woman are available and constantly providing."* (FGD, community representative, Upper East Urban_R#1)

However, one respondent highlighted the lack of spousal support stating:

"She said after informing her husband, her husband told he didn't have money for that type of nutrition. Her husband advised her to better go for seek thick tree leaves and boil it and drink." (Respondent 4, North East Urban) (FGD, community representative, North East Urban_R#4)

4.3.4.3 Support for healthcare access

Families assist pregnant women in accessing antenatal services by arranging transport and financially contributing to care costs:

> *"They support the woman to attend ANC services and also buy some fruits that they said she should eat."* (FGD, community representative, North East Rural_R#2)

> *"The ones who will follow the women to the ANC, they get to hear from the caregiver what is being said so that when they come back some put them into practice, for instance encouraging your wife to sleep under the mosquito nets are advised by the caregiver."* (FGD, community representative, Upper East Urban_R#3)

4.3.4.4 Financial and material support

Families also provide financial and material assistance to meet pregnant women's needs as explained below:

> *"They support you financially especially when you are going to the clinic they give you money to take car and go."* (FGD, community representative, Upper West Rural_R#1)

> *"As a man when your wife is pregnant is pregnant, you will have to get your foodstuffs ready and your sheep ready for out dooring in preparations to when she will give birth."*(FGD, community representative, Savannah Urban_R#1)

However, lack of spousal financial support was noted as a gap:

> *"She said after informing her husband, her husband told he didn't have money for that type of nutrition."* (FGD, community representative, North East Urban_R#4)

4.3.4.5 Nutritional Support to pregnant women

The need to provide nutritional support to pregnant women was highlighted by this respondent:

> *"In instances like this, the pregnant woman is not allowed to engage in hard task. We also know pregnant women have a lot of cravings, they can even go as far as eating unripe mangoes...The family also endeavors to get certain delicacies and good meals to satisfy the pregnant woman's cravings."* (FGD, community representative, North East Urban_R#1)

4.3.5 Awareness of pregnancy danger signs during pregnancy

This sub-theme explored local knowledge and perspectives on identification of severe illness in pregnant women. Key findings on community knowledge of danger signs in pregnancy have been summarized here. In summary, analysis of community focus group discussion highlighted local knowledge of three main categories of danger signs in pregnancy that may indicate severe illness requiring urgent medical care. These

included knowledge of swelling, especially in the feet and legs, knowledge of problematic vaginal bleeding, and knowledge of more general or nonspecific signs of ill health like pallor, weakness or changes in appetite. This community knowledge forms an important foundation for identifying pregnancy complications and taking appropriate action.

4.3.5.1 Knowledge of Swelling Signs

Swelling, especially of the feet and legs, was one of the most universally recognized signs across community representatives that a pregnant woman may have a severe illness requiring urgent medical attention. As one rural respondent from North East explained:

> *"When she gets swollen feet then it means that it is serious."* (FGD, community representative, North East Rural_R#1)

Another community member from Northern region also identified swelling as a problematic sign warranting medical evaluation:

> *"If her feet swells, she would have to visit the hospital*." (FGD, community representative, Northern Urban_R#1)

The common mention of swelling suggests fairly widespread community knowledge of this as a potential indicator of severe disease in pregnancy.

4.3.5.2 Knowledge of Bleeding Signs

Vaginal bleeding during pregnancy, especially if excessive or unexplained, was another sign widely recognized across the regions as potentially serious and requiring healthcare. A representative from Savannah region stated:

> *"When the pregnant woman is bleeding."* (FGD, community representative, Savannah Urban_R#2)

A respondent from Upper East expressed similar understanding:

> *"Bleeding without knowing the cause of it."* FGD, community representative, Upper East Urban_R#1)

The consistent citing of bleeding signifies broad community awareness of this as a danger sign requiring urgent action.

4.3.5.3 Knowledge of General/Nonspecific Signs

In addition to swelling and bleeding, more nonspecific signs of ill health were also identified by many focus group participants as reasons for concern. A community member from North East region explained:

> *"When you notice she is pale. When you notice her eyes are pale, then you would realize she is pregnant."* (FGD, community representative, North East Urban_R#1).

Another North East respondent elaborated on general appearances that raise suspicion:

> *"When you see that the conjunctiva is pale or her skin is pale, you would suspect that the woman is seriously ill."* (FGD, community representative, Upper West Rural_R#1).

There was widespread recognition of these less precise signs that a pregnant woman may be unwell across the geographic regions.

4.3.6 How Communities Manage Severe Diseases among Pregnant Women

Pregnancy comes with many physiological changes that can sometimes manifest as concerning symptoms. This subthemes explored how different communities in Ghana manage such severe illnesses in pregnant women based on focus group discussions conducted with community representatives. Respondents reveal a multi-pronged approach to managing severe diseases in pregnant women. While hospital referrals are now prioritized, traditional remedies, dietary changes, rest, and reduced activity are also utilized as complementary strategies. The communities displayed a nuanced understanding of how to care for these vulnerable individuals and mobilize various resources to preserve the health of mother and baby. The quotes and themes uncovered in this report provide insight into prevailing attitudes and health behaviors in different regions of Ghana.

4.3.6.1 Hospital Referrals

One of the most common responses when asked about managing concerning symptoms was referring the woman to a hospital or clinic for medical evaluation and care. As one rural community representative from the North East region explained:

> *"We send them to the hospital where they do proper checkup and treat accordingly."* (FGD, community representative, North East Rural_R#1).

Urban representatives also emphasized taking the woman to a healthcare facility right away if she had any troubling signs or symptoms:

> *"We immediately alert her to go to the hospital for care and treatment."* (FGD, community representative, Upper West Urban_R#1).

> *"She has to go to the hospital."* (FGD, community representative, Upper West Urban_R#2)

These quotes highlight the role communities play in ensuring pregnant women access professional medical care when falling ill instead of relying solely on traditional or herbal remedies.

4.3.6.2 Advising rest and reduced activity

In addition to hospital referrals, community representatives discussed advising pregnant women with severe diseases to rest and limit strenuous activity. For example, one urban representative (Respondent 4) from Upper East region stated:

> *"Especially with the swollen legs we believe it's either hard work or travelling long journeys accounts for that so we usually don't allow them to work and nor travel long journeys but then we encourage them to have enough rest."* (FGD, community representative, Upper East Urban_R#4)

Restricting activity was seen as an important way to help manage symptoms and prevent further complications. Representatives also suggested measures to help reduce swelling specifically:

> *"We advise them to raise their feet when they are sitting down so that it helps prevent some these severe signs such as the edema."* (FGD, community representative, Upper East Urban_R#1)

4.3.6.3 Encouraging Traditional Remedies

While hospital referrals were emphasized, some community representatives mentioned traditional or herbal remedies being used as well. One rural representative from the Savannah region explained:

> *"We have the traditional birth attendants, when the woman shows these signs they normally invite her to come and inspect the woman if she is due for delivery or it is something else. So if she is not due for labor, they will look for the symptoms and see who can treat what either with the herbs or with the traditionalist."* (FGD, community representative, Savannah Rural_R#2)

Another representative from the same region simply stated:

> *"They normally take herbal treatment."* (FGD, community representative, Savannah Rural_R#1)

Urban communities also referenced herbs and traditional remedies:

> *"In some of the communities they prepare some concoctions for them to take to remedy some of these diseases. For example in cases like anemia, they prepare some herbs for them to drink to boost the blood production."* (FGD, community representative, Upper East Urban_R#6).

While traditional remedies are still used in some communities, representatives indicate that hospital care is now emphasized more compared to previously.

4.3.6.4 Dietary and Lifestyle Changes

In addition to herbal remedies, community representatives encouraged dietary and lifestyle changes to help manage concerning symptoms. For swelling specifically, reducing salt intake was suggested:

> *"We also advise them to reduce salt intake."* (FGD, community representative, Savannah Urban_R#2)

Eating iron-rich foods was also recommended for anemia:

> *"They should take foods that gives blood, especially foods like light soup."* (FGD, community representative, Savannah Urban_R#3)

Making dietary changes and altering activities were seen as practical ways pregnant women could actively improve their health.

4.3.7 Improvements needed for community management of severe diseases in pregnant women

This subthemes explored perspectives on improvements needed to better support pregnant women, based on focus groups conducted with community representatives across Ghana.

4.3.7.1 Reducing hospital referral barriers

A major issue that emerged was the need to reduce barriers that prevent pregnant women from accessing hospital care when severe issues emerge. As one rural representative from North East region shared:

> *“The hospital gives us a lot of things to buy before coming to buy and we sometimes finds it difficult buying all those things. So we will like*

them to reduce the things on the list" (FGD, community representative, North East Rural_R#1).

Another barrier noted was the costs now associated with antenatal care that previously was free:

> *"These days ANC services aren't free because they write drugs for us to go and buy and not all of us can afford it"* (FGD, community representative, North East Rural_R#1).

Making care more affordable was seen as vital to ensure pregnant women access needed services. As one urban representative (Respondent 1) from North East region explained:

> *"Even additionally, there may certain dishes that she should be eating that could improve her condition. So whatever nutrition or medication is prescribed, she would need to be assisted financially to procure them."* (FGD, community representative, North East Rural_R#1).

4.3.7.2 Enhancing Hospital Care Quality

In addition to accessibility, improving the quality of hospital care for pregnant women was emphasized. One rural representative from Savannah region voiced frustration with dismissal of concerns:

> *"You will go to the hospital with specific complain and they will tell you that it's normal without even checking you to see"* (FGD, community representative, Savannah Rural_R#1).

Conducting adequate evaluation and providing clear communication were seen as ways to improve care. As a rural representative (Respondent 1) from Upper West region stated:

> *"We expect that when we visit these health facilities, they should run lots of investigations on us before treatment. This is what we want them to improve upon, because mostly when you come they will just look at you and tell you to go buy medicines without running and investigations on you"* (FGD, community representative, Upper West Rural_R#1).

Another rural representative (Respondent 2) from the same region wanted more information after receiving a blood transfusion:

> *"When I delivered I was transfused with two pounds of blood but they didn't tell me if that was enough or not so I think next time they will tell us then it will be an improvement."* (FGD, community representative, Upper West Rural_R#1).

4.3.7.3 Enhancing Health Education and Sensitization

Multiple representatives emphasized the need for more health education and community sensitization around managing diseases in pregnancy. As one rural representative (Respondent 1) from Savannah region explained:

> *"I think if the community is educated on how to manage such conditions, they will become enlightened so that when it happens they will know the appropriate place to go for treatment."* (FGD, community representative, Savannah Rural_R#1).

An urban representative (Respondent 4) from North East region suggested organizing events to share information:

> *"The government can organize durbars to educate pregnant women and the general communities on the dangerous signs of pregnancies. This education will inform them about where to send these pregnant women should they see these signs."* (FGD, community representative, North East Rural_R#4).

Increasing awareness through active outreach was seen as vital for improving community care practices.

4.3.7.4 Discouraging traditional remedies

While traditional remedies are still used, some representatives advocated against their use due to potential risks. As one urban representative from Upper East region explained:

> *"With the herbs we need to discourage them from taking it since they will not know the exact quantity that is needed by the body and also they aren't even sure of the outcome of it."* (FGD, community representative, Upper East Urban_R#3).

Promoting Antenatal Care Engagement

Starting antenatal care early and maintaining engagement was highlighted as an area needing improvement. An urban representative (Respondent 1) from Upper West region stated:

> *"The moment you conceive you are supposed to start attending ANC till you give birth and you should go at the very early stages."* (FGD, community representative, Upper West Urban_R#1).

Another urban representative from Savannah region also emphasized regular antenatal care attendance. Engaging with antenatal care was seen as critical for monitoring maternal and foetal health.

4.3.7.5 Improving hygiene and sanitation in the community

Some representatives discussed the need for basic infrastructure improvements, especially regarding washrooms and toilet facilities. As one rural representative (Respondent 4) from Northern region explained:

> *"They should provide us with toilets. If there toilets designated for children, they wouldn't defecate indiscriminately."* (FGD, community representative, Northern Rural_R#4).

Enhancing sanitation was viewed as important for community health.

4.3.8 Community practices during pregnancy

Community practices during pregnancy revolved around community birth arrangements for safe delivery of pregnant women, support for pregnant women needing emergency care, perceptions of illnesses caused by evil spirits and perspectives on seeking traditional healers first for sick pregnant women.

4.3.8.1 Community Birth Arrangements for Safe Delivery of Pregnant Women

Ensuring a safe delivery is a major concern for pregnant women and their families. This report explores the various birth arrangements communities make to promote safe

delivery, based on focus groups with representatives. Their insights provide a window into the preparations deemed essential to support pregnant women.

4.3.8.1.1 Financial and Material Preparations

A key theme was the financial and material preparations families undertake. As one rural representative (Respondent 1) from North East region explained:

> *"Our husbands helps us buy the things needed for delivery, such as parazone, Dettol, soap, cotton, and others and get ready for labor when its sets in."* (FGD, community representative, North East Rural_R#1).

Urban representatives described similar provisions, like ensuring sanitary supplies:

> *"You will have to buy soaps and Dettol and some rags all ready for delivery when your time is due."* (FGD, community representative, Savannah Urban _R#2).

Another vital preparation was acquiring clothes and supplies for the baby, as an urban representative (Respondent 1) from Northern region stated:

> *"A woman may be the one to secure the clothes of the baby before it is born."* (FGD, community representative, Norther Urban _R#1).

These measures helped reduce the financial burden at the time of birth.

4.3.8.1.2 Food and Nutrition Preparations

In addition to materials, families focused on food and nutrition preparations to optimize the mother's health. As one rural representative from Savannah region explained:

> *"When it is getting to your time, they, make you eat food that will give you enough blood because at the time of your delivery you will be needing blood for yourself and for your baby. So you will be advised to eat some foods and also be told to buy some baby clothes and Dettol and soap and other things to prepare for delivery."* (FGD, community representative, Savannah Rural _R#2).

After birth, special foods are prepared as described by a rural representative from Upper West:

> *"As part of the preparations they take good care of us by giving us eggs and after a safe delivery they prepare us guinea fowl light soup to eat."* (FGD, community representative, Upper West Rural_R#2).

Nutrition was seen as key for managing blood loss and supporting recovery.

4.3.8.1.3 Transportation Arrangements

Arranging emergency transport to the hospital was also critical. As a rural representative (Respondent 1) from North East region shared:

> *"Yes, they help us to organize a motorbike or tricycle to take the pregnant woman to the clinic when she is in labor."* (FGD, community representative, North East Rural _R#1).

An urban representative from Upper East region also noted. Having reliable transportation reduced delays accessing care.

> *"We also do transportation preparations."* (FGD, community representative, Upper East Urban _R#3).

4.3.8.1.3 Social Support and Companionship

In addition to physical preparations, communities offered social support. A rural representative from Savannah region explained:

> *"At the community level when the pregnancy is advancing and the community thinks that she will be delivering around this time, they don't allow the woman to be alone, they are always with her so that when labor sets in they can support her to the delivery point."* (FGD, community representative, Savannah Rural _R#3).

Not leaving the woman alone provided reassurance and rapid assistance when labor began.

4.3.8.1.3 Engaging with Health Facility Guidance

Representatives emphasized following health facility recommendations to prepare. As a rural representative from Upper West region explained:

> *"In the past they will just tell you to buy some clothes towards your birth but now the facility will give you a list of items to buy so when we take the list to the house the family including the husband will come together and try to buy the items on the list."* (FGD, community representative, Upper West Rural _R#1).

This ensured they had guidance on supplies needed from knowledgeable healthcare providers.

4.3.8.1.4 Seeking Blood Donors

When complications were expected, communities arranged standby blood donors, as an urban representative from Upper East region shared: This could prove life-saving if haemorrhage or other bleeding occurred.

> *"We also get and prepare people to be on standby to donate blood in case the need arises."* (FGD, community representative, Upper East Urban_R#6).

4.3.8.2 Community Support for Pregnant Women Needing Emergency Care

Pregnancy complications often require emergency care at health facilities. This report explores how communities support pregnant women to reach care when referrals are needed urgently. Findings provide insight into community systems for emergency transport and social support.

4.3.8.2.1 Arranging Motorized Transportation

A major theme was arranging motorized transportation like ambulances, cars, motorbikes or tricycles. As a rural representative from North East region explained:

> *"When she is nearing her due date, we arrange with the ambulance to come and pick her up."* (FGD, community representative, North East Rural _R#2).

If ambulances were unavailable, other vehicles were organized as an urban representative (Respondent 1) from Northern region stated:

> *"In terms of emergencies, we are helpless unless we resort to the usage of motor bikes and tricycles to carry pregnant women when they are referred."* (FGD, community representative, Northern Urban _R#1).

Motorbikes were commonly used as shared by a rural representative from Savannah. Ensuring emergency transport reduced delays in urgent situations.

> *"We have people who have tricycle and motorbikes, so when labor sets in we get them to come and help us take the woman to the nearby health center."* (FGD, community representative, Savannah Rural _R#1).

4.3.8.2.2 Rallying Community Resources

In some areas, communities pulled resources to support costs. As an urban representative (Respondent 1) from Upper East region explained:

> *"We help contribute money for transportation for her."* (FGD, community representative, Upper East Urban _R#1).

A rural representative from the same region also noted:

> *"We help each other, you can send your wife to the hospital and they might be some costs you can't bore and you will be mandated to provide, so someone from the community will come to your aide." (*FGD, community representative, Upper East Rural_R#1).

4.3.8.2.3 Accompanying the Woman

In addition to arranging transport, representatives emphasized accompanying the woman to provide support. A rural representative from Northern region simply stated accompanying the woman shows support:

> *"What you can do to assist her, is to follow them to the hospital."(*FGD, community representative, Northern Rural_R#3)

Another representative from the same area elaborated:

> *"What you can do to assist her, is to take responsibility of her chores back home. Follow up to help her with hygiene at the hospital." (*FGD, community representative, Northern Rural_R#1)

This companionship and assistance addressed additional needs beyond transportation.

4.3.8.2.4 Seeking Urgent Care Closer to Home

When hospitals were farther away, representatives first sought care at local clinics. As an urban representative from Savannah region shared:

> *"There is a clinic close to me so in terms of emergency I rush there."* (FGD, community representative, Savannah Urban_R#2)

Another urban representative (Respondent 3) from the same area explained:

> *"When you see a pregnant woman in pains and can't control herself, you sit her down and rush to the clinic to bring the nurse to take care of her."* (FGD, community representative, Savannah Urban_R#3)

Getting urgent attention from local clinics helped stabilize women before onward referral.

4.3.8.2.5 Appealing for Better Ambulance Services

While motorized transport was arranged, communities desired more reliable ambulances. An urban representative from Northern region appealed:

> *"We will like to appeal to authorities to help us secure an ambulance, so that if there is the need for the referral of a woman ready for labour, we will be able to take care of it."* (FGD, community representative, Norther Urban_R#3)

Another representative reiterated this need:

> *"Without an ambulance, we will have no other option than to resort to the usage of the tricycles to convey pregnant women."* (FGD, community representative, Norther Urban_R#2)

4.3.9 Community Perceptions of Illnesses Caused by Evil Spirits

In some communities, certain illnesses are attributed to spiritual causes like evil spirits or witchcraft. This theme explored perceptions on illnesses deemed caused by evil spirits based on focus groups with community representative. Respondents revealed an interplay between traditional beliefs and medical experiences shape community perceptions that certain illnesses stem from evil spirits. Failed hospital treatment, unexplained symptoms and behaviors, and input from elders fed suspicions of supernatural causes. While beliefs vary between rural and urban areas, spirits remain an explanatory factor for some illnesses. Their views provide insight into traditional beliefs and rationales regarding spiritual illnesses.

4.3.9.1 Unsuccessful Hospital Treatment

A major theme was attributing an illness to evil spirits after unsuccessful treatment at hospitals. As one rural representative from North East region shared:

> *"You become sick and you will go to the hospital and they will do all the investigations and tell you that there is nothing wrong with you but still you feel sick, so at that point you get to know that it was caused by evil spirits."* (FGD, community representative, North East Rural_R#2).

An urban representative from North East region echoed failed hospital treatment, despite persisting symptoms, suggested a spiritual cause.

> *"Frequent visits to the health facility for treatment without any improvements is usually a signal that an illness is spiritual."* (FGD, community representative, North East Urban_R#3).

4.3.9.2 Normal investigations despite 1llness

Relatedly, normal medical investigations despite illness led to perceiving spiritual forces. A rural representative (Respondent 1) from Upper West region explained:

> *"When you go to the hospital and they do all the necessary investigations and can't find anything or given you medications but no improvements then you will know that it is an evil illness."* (FGD, community representative, Upper west Rural_R#4).

An urban representative from the same region shared a similar perspective:

> *"The hospital people confirms it by telling us that they have done all the labs but has seen nothing, these shows that it's spiritual."* (FGD, community representative, Upper west Urban_R#1).

4.3.9.3 Sudden Behavioural Changes

Some representatives said sudden inappropriate behaviours signalled spirit possession. An urban representative from Savannah region noted:

> *"Sometimes the action of the person changes, they start to do things there weren't doing before and that is when you will investigate to know if there is something spiritual about the person's behaviour?"* (Savannah Urban Community Representative) (FGD, community representative, Savannah Urban_R#2).

Likewise, another urban representative (Respondent 4) from the same region gave an example:

> *"The way the person dresses, she will sometimes not even wear sandals and all these are signs of evil attacks."* (FGD, community representative, Savannah Urban_R#4).

Aberrant behaviours deviating from norms were seen as resulting from malicious spiritual influence.

4.3.9.4 Unexplained Pain Episodes

Some representatives perceived unexplained pain episodes as caused by evil spirits, especially at night. An urban representative from Upper East region shared:

> *"Some of the pregnant women complains of severe pain at night and when they go to the hospital too they are being told everything is fine hence the suspicion of a spiritual attack on them."* (FGD, community representative, Upper East Urban_R#5).

With no medical explanation, night pains were attributed to supernatural forces.

4.3.9.5 Certain Conditions Deemed Spiritual

Additionally, some specific conditions were categorized as spiritual illnesses. A rural representative from Northern region gave examples:

> *"If suffer a broken leg, you are to go to a traditional healer for care. When your leg is broken, that one, it is not hospital disease, so you will take it to a spiritualist."* (FGD, community representative, Northern Rural_R#2).

Another representative from the same region added:

> *"Illnesses that do not require to be taken to the hospital are two. Boils and illnesses caused by jinn."* (FGD, community representative, Northern Rural_R#3).

Thus, certain conditions were predefined as requiring traditional healing, not hospital treatment.

4.3.9.6 Perceived Spirit Interference

Some representatives recounted direct spiritual interference with treatment. An urban representative from North East region shared an incident:

> *"It was found out from camera images that, whenever the patient was to take in a drug, a particular unknown hand always stretched out to deny the drug from getting into the mouth of the patient. That is when it was found out that the illness was spiritual."* (FGD, community representative, North East Urban _R#4).

Visible spirit obstruction confirmed the illness had a supernatural source.

4.3.9.7 Elder Suspicions of Spiritual Causes

Additionally, suspicions of evil spirits from community elders influenced perceptions. A rural representative (Respondent 2) from North East region noted:

> *"Sometimes when you are sick and suffering, some elders in the house will be able to see and tell you that your sickness is caused by evil spirits and will advise you to go and see the traditionalist for herbs."* (FGD, community representative, North East Rural_R#2).

Elders' discernment carried weight in discerning spiritual illnesses.

4.3.10 Perspectives on Seeking Traditional Healers First for Sick Pregnant Women

This subtheme summarizes perspectives from focus group discussions regarding factors that motivate community members to send sick pregnant women to traditional healers first, before formal healthcare. Primary motivators for seeking traditional healer care first for sick pregnant women appear to be convenience and proximity, positive experiences with traditional medicine, dissatisfaction with formal healthcare, perceptions of spiritual illnesses, and an entrenched cultural tradition of using local remedies during pregnancy.

4.3.10.1 Proximity and Convenience

One of the most frequently cited motivators was proximity and convenience of access. As one rural community representative explained,

> *"I think it's because of proximity, they are there living with them so once they are near to them so they will just go to them"*. (FGD, community representative, Norther Rural_R#2).

Since traditional healers live within the communities, it is quicker and easier to reach them, especially when urgent care is needed.

Along the same lines, another participant from a rural area in the Northeast region stated:

> *"Sometimes there is no money to go to the hospital as it may be far from where you stay and when they see that the woman is suffering they*

think they should first send her there and see if she can be attended to". (FGD, community representative, North East Rural_R#1).

The long distances and high costs of transportation to hospitals motivate seeking more convenient local traditional treatment first.

4.3.10.2 Positive Personal Experiences

Some respondents indicated that community members choose traditional healers first because of positive personal experiences with them for either themselves or others they know. As one rural participant from the Upper West explained;

> *"The herbal medicine makes me feel better, I delivered twice at the hospital and both were stillbirth but I went to the herbalist and I got my baby".* (FGD, community representative, Upper West Rural_R#1).

Such perceived efficacy of traditional medicine encourages first use.

Similarly, an urban community representative stated:

> *"Some of us have never had any negative experience with the herbal medicines so we keep using them since it always gives us the desired satisfaction".* (FGD, community representative, Savannah Urban_R#3).

Having repeatedly found traditional medicine effective, community members are motivated to seek it first when falling ill.

4.3.10.3 Dissatisfaction with Hospitals

In some cases, dissatisfaction with hospitals and clinics was cited as a driver of consulting traditional healers first. Perceived ineffectiveness of clinical treatment leads some to traditional options instead.

> *"Sometimes the clinic medicines don't give the required satisfaction so they seek to try also from the local medicine too"* (FGD, community representative, Savannah Urban_R#2).

An urban community representative from the Upper West region specifically called out negative experiences with nurses during prolonged labor. To avoid such mistreatment, pregnant women may seek traditional birth assistants first.

> *"The nurse don't handle us well especially when your labor is prolonged, they talk any how to us so we all want to get there and just deliver to avoid their rudeness"*. (FGD, community representative, Upper West Urban_R#4).

4.3.10.4 Spiritual Causes Perceived

In some instances, there is a perception that illnesses during pregnancy have spiritual roots. As one urban representative explained,

> *"It depends on what happens at the time of the sickness, for instance in a sudden collapse, people mistaken it for a spiritual attack so they quickly send the person to the herbalist, so I think it's the mentality"* (FGD, community representative, Upper East Urban_R#5).

Therefore, consulting traditional healers is seen as more appropriate for spiritually-caused conditions.

4.3.10.5 Entrenched Cultural Tradition

Some respondents cited cultural tradition as a driver, explaining that use of traditional medicine during pregnancy is a longstanding local practice. A rural community member stated that previously

> *"When the woman gets pregnant and is about to give birth, you are able to mobilize some local medicine to support the woman but because of the presence of clinics now, that practice has being stopped"* (FGD, community representative, Savannah Rural_R#4).

While clinics are reducing the tradition, the strong legacy of using traditional medicine during pregnancy persists.

4.3.11 The Role of Men in Caring for Pregnancies

This subtheme shares perspective how men are involved in caring for pregnancies in their communities. Men are viewed as having important responsibilities related to finances, antenatal care attendance, domestic assistance, and intimacy during their partner's pregnancy. However, poverty and cultural norms sometimes limit men's ability or willingness to fulfill these roles. More work is needed to understand how to increase positive male engagement in maternal health. Insights from the focus group provide an understanding of men's perceived responsibilities and actual involvement in supporting their pregnant partners.

4.3.11.1 Providing Financial Support

One of the most frequently mentioned roles was providing financial support to pregnant women. As a female respondent from the Northeast region explained,

"They support us to go for ANC visits by giving us money for transport" (FGD, community representative, North East Rural_R#1).

Men were seen as responsible for covering the costs associated with antenatal care like transportation. This was reiterated by a male participant from the Northern region:

> *"He may also cater for bills that may accrue during the sessions. Even if he is not there, he may tell you to go on your own, and he will come over later"* (FGD, community representative, Northern Rural_R#1).

However, some women noted that support was inconsistent, with a female respondent stating:

> *"You would at times inform your husband that you are going to the hospital, and he would not have the finances to take you there"*. (FGD, community representative, Northern Rural_R#2).

4.3.11.2 Accompanying for Antenatal Care

In addition to financial assistance, men were expected to accompany their pregnant partners for antenatal clinic visits. A male respondent from the Upper East region shared:

> *"We usually go with them for ANC visits and even when they go alone the midwives pick our phone numbers and call us to come over"* (Respondent 1, Upper East Rural). (FGD, community representative, Upper East Rural_R#1).

However, excuses like lack of funds or emergencies sometimes prevented men from participating.

When asked why men agree to accompany pregnant women, a male participant explained:

> *"We see it as our responsibility so we do it. It allows us to take part in the woman's struggle and it promotes our bond as a family"* (FGD, community representative, Upper East Rural_R#1). So men recognize their role in providing support during pregnancy.

4.3.11.3 Domestic Support

Men also discussed providing support with household chores to decrease the workload on pregnant women.

> *"I don't allow my wife to do strenuous work like farming and fetching of water when she is pregnant and I also provide whatever she craves for" shared one rural male participant"*. (FGD, community representative, Savannah Rural_R#1).

Urban men also assisted pregnant wives by *"supporting them with the house chores"* (FGD, community representative, Upper West Urban_R#3).

However, some gender norms persist, with a female representative noting:

> *"It depends on the body of the woman that will determine the things she does or does not do in the household"* (FGD, community representative, Upper West Urban_R#1) suggesting women are still primarily responsible for domestic duties.

4.3.11.4 Intimate Relations

A couple respondents mentioned men being advised to have intercourse with pregnant wives to facilitate smooth delivery. As one urban male participant stated:

> *"They are advised to have sex with the pregnant woman to enable her give birth safely"* (FGD, community representative, Upper West Urban_R#1).

This demonstrates a cultural belief in men's role in ensuring safe childbirth through intimacy.

4.3.11.5 Barriers to Male Involvement

While men's involvement was seen as important by both men and women, some cited barriers like lack of finances limiting men's ability to provide support. A female respondent explained: *"Some help, some do not help"* (FGD, community representative, Northern Rural_R#1) indicating inconsistency.

4.3.12 DHMT Collaboration for Maternal Health

This subtheme summarizes findings regarding how communities work with the District Health Management Team (DHMT) to implement maternal health interventions. The focus groups provided insights into existing engagement strategies and opportunities for enhanced collaboration. While communities generally recognized the value of partnering with DHMTs on maternal health promotion, collaboration was often basic. Many opportunities exist to enhance community-district health team engagement through co-development of locally tailored interventions, knowledge sharing, resource mobilization and integrated action on socioeconomic

determinants. Investing further in the community-DHMT interface will be instrumental for improving maternal health outcomes.

4.3.12.1 Community Health Education

One of the main forms of collaboration mentioned was the DHMT providing community health education to promote maternal wellbeing. As one rural participant explained;

> *"They come over to engage us. They offer medication and vaccination when they visit. Their presence also gets us to go things as expected. They offer us education on how to ensure our health and that of our children"* (FGD, community representative, Northern Rural_R#1)

Urban representatives described similar health education activities:

> *"When they call for durbars we do our possibly best to attend and give them our support"* (FGD, community representative, Northern Urban_R#1)

Durbars are festivals or social gatherings where health promotion can occur.

4.3.12.2 Use of Community Volunteers

Some respondents discussed the DHMT's use of community volunteers to bridge the gap between the health system and community members. According to one rural participant,

> *"We have community health volunteers that serve as the middlemen between the community and the district health management team"* (FGD, community representative, Northern Rural_R#1)

Another rural representative explained community volunteers assist in service delivery and social mobilization.

> *"They nominate people from the community to help the nurses in the clinic especially during our weighing days"* (FGD, community representative, Upper East Rural_R#1)

4.3.12.3 Community Meetings with DHMT

In some areas, direct meetings between community leaders and DHMT representatives were held to discuss maternal health issues and solutions. As one rural participant noted having open channels for sharing concerns and ideas helps align priorities,

> *"We usually meet to discuss matters on how to improve our wellbeing".* (FGD, community representative, Northern Rural_R#2).

4.3.12.4 Supporting DHMT Activities

Communities also collaborate by actively participating in DHMT-led initiatives. For example, a rural representative stated community involvement is key for successful implementation.

> *"When they organize health programs we come out to support them by attending and participating and also doing as they want us to do in order to achieve whatever policies they bring because we know that they are there to help us"* (FGD, community representative, North East Rural_R#1)

4.3.12.5 Barriers to Collaboration

While examples of cooperation emerged, barriers were also evident. Some rural areas reported minimal interaction with DHMT representatives. An urban participant said simply;

> *"When they call for durbars we do our possibly best to attend and give them our support"* (Respondent 1, Upper West Urban) (FGD, community representative, Upper West Urban_R#1), suggesting passive rather than active engagement.

More regular exchanges are needed in some areas to foster ongoing collaborative relationships between communities and district health teams. This will require leadership from both sides to initiate and strengthen partnerships.

4.3.12.6 Potential Areas for Enhanced Collaboration

- Jointly developing educational materials and campaigns adapted to community needs and norms

- Training more community volunteers to expand local resources and linkages

- Building DHMT capacity to effectively partner with communities

- Increasing opportunities for community representatives to provide input into district health planning processes

- Collaborating on comprehensive interventions addressing social and economic maternal health determinants

4.4 DESCRIPTION OF MATERNAL HEALTH CARE OF MOTHERS WHO HAVE BEEN AFFECTED BY STILLBIRTH

This theme explored maternal healthcare of stillbirth mother's in both rural and urban settings across Northern Ghana. The aim was to understand their knowledge, attitudes and practices around maternal health and their pregnancies which resulted in stillbirth. The FGDs focused on topics including but not limited to community reactions to pregnancy announcements, responsibilities towards pregnant women, and cultural practices or taboos related to pregnancy.

The findings presented highlight the complex sociocultural dynamics around their pregnancy. Though modern medical practices are increasingly available, traditional beliefs still hold significance for many communities.

4.4.1 Community Reactions to Pregnancy Announcements

Their pregnancy announcements within the community were widely received positively, with happiness and celebration regardless of whether it was one's own family or a neighbour. As one respondent from a rural village in the Savannah region explained:

> *"For my pregnancy it was seen as a blessing. The community rejoiced over it because someone is coming to join us as a family."* (FGD, Stillbirth mothers, Upper West Urban_R#1)

Another respondent from North-East region also expressed the same views and echoed this:

> *"When the people from my household and the neighbours heard I was pregnant, it was all joy"* (FGD, Stillbirth mothers, North-East Urban_R#1).

The anticipation and excitement that comes with a pregnancy was commonly mentioned across focus groups. It represents hope and new life. Only a few exceptions to this general enthusiasm were noted, mainly in situations where pregnancies occurred out of wedlock, particularly among young unmarried girls. Such pregnancies were seen as an embarrassment.

4.4.2 Family Responsibilities towards Pregnant Women

In addition to the excitement that came with the pregnancy announcements, participants emphasized the responsibilities and support they got from families. This was seen as essential to promoting their health and wellbeing as well as that of the baby.

Husbands were most commonly mentioned as taking up the duty to provide financially and practically. As one rural community representative from the Savannah region explained:

> *"When I got pregnant, I got support from the family, either my husband or my mother-in-law. I was not allowed to do everything by myself and also supported us financially."* (FGD, Stillbirth mothers, Savannah Rural_R#2)

Helping pregnant women avoid strenuous work and meeting their nutritional needs were frequently raised as key responsibilities by most respondents in both rural and urban settings

4.4.3 Cultural Practices and Taboos Related to Pregnancy

The discussions revealed a number of traditional beliefs and customs associated with pregnancy persisting in communities alongside modern medical practices. These reflect the syncretism between traditional African and modern Western approaches to maternal health.

One prevalent theme was taboos around diet during pregnancy. In both rural and urban areas across regions, participants mentioned restrictions on pregnant women consuming certain foods like eggs, meats, fish and mangoes.

In addition to food taboos, many participants emphasized traditional practices by herbalists and spiritualists to protect mother and baby during pregnancy. Special herbs, tonics, rituals and amulets are still commonly used, especially in rural areas. As one stillbirth mother from urban Northern region explained:

> *"My husband never left me when I was pregnant. Upon noticing I was pregnant, herbal medicine was prepared for me to take. As the months wore on, special herbs were prepared for me till I delivered."* (FGD, Stillbirth mothers, Norther Urban_R#1)

An urban respondent from North East region described a traditional ritual requiring:

> *"When I got pregnant, no one was allowed to break the news till my sister in-law performed some rituals, and late in the night, a specially made leather amulet was worn around my waste. After this ritual, it was safe to break the news."* (FGD, Stillbirth mothers, North East Urban_R#1)

These types of cultural practices around pregnancy remain deeply ingrained in many communities. The data also demonstrates the syncretic nature of maternal health behaviours, as both traditional and modern practices operate side by side. Cultural taboos persist around diet, activities, and rituals for pregnant women, carried out to promote safety and health according to local customs. But modern medicine is also increasingly valued and normalized.

4.4.4 Community awareness of pregnancy danger signs

This theme reports on findings from focus group discussions conducted with women with experience of stillbirths regarding their knowledge of pregnancy complications and how to identify when pregnant women are severely ill. The aim was to elucidate the level of awareness at community level about risks and danger signs in pregnancy. Such insights can shape maternal health promotion efforts to improve early recognition of complications and prompt care-seeking.

4.4.4.1 Knowledge of Danger Signs in Pregnancy

Across the focus groups, the most commonly cited danger signs participants associated with problematic pregnancies were vomiting, bleeding, swollen body parts, headaches, dizziness, and malaria or fever. As explained by one participant:

> *"Some do vomit, some too spit a lot and some too present with swollen feet, some too can't eat. For my only lost appetite which is also normal with pregnancy"* (FGD, Stillbirth mothers, Upper East Rural_R#1)

And a woman from Northern region noted:

> *"The severe signs they will see in pregnant women and know that they are sick is that, some are vomiting severely, some bleed, some malaria*

and when you see them, they would be weak." (FGD, Stillbirth mothers, Northern Urban_R#2)

Vaginal bleeding during pregnancy elicited particular concern across groups as a sign of potential complications. As a community member from North-East region explained:

> *"When she bled from her private part it was a major concern and she was rushed to the clinic."* (FGD, Stillbirth mothers, North East Urban_R#2)

And an urban stillbirth mother stated:

> *"When the woman is bleeding without taking any meds, she is to be rushed to the hospital too."* (FGD, Stillbirth mothers, Savannah Urban_R#3)

Swelling of body parts, especially legs and feet, was also frequently mentioned:

> *"I was feeling dizzy and it's a bad sign. I also had swollen feet."* (FGD, Stillbirth mothers, Savannah Urban_R#1)

However, findings indicate limited knowledge overall about the full range of potential danger signs in pregnancy and their implications. Only a few participants cited symptoms such as blurred vision, breathing difficulties, seizures or loss of consciousness. And awareness was low regarding the underlying conditions that different symptoms might signify, like pre-eclampsia, infections etc. This gap in knowledge likely delays recognition and appropriate care-seeking.

4.4.4.2 Perspectives on Care-Seeking for Pregnancy Complications

In discussing management of pregnancy danger signs, participants overwhelmingly cited the importance of biomedical healthcare. Most of them mentioned they sought medical care at the clinic when they had worrying symptoms. As explained by one community leader:

> *"I was advised to to go to the hospital and not the herbalist even though I sometimes prefer the herbalist."* (FGD, Stillbirth mothers, North East Rural_R#2)

And an urban mother echoed:

> *"It's not good for a pregnant woman to go to the drugstore and buy medicines which were not prescribed, so I didn't take over the counter medications. I went to the hospital."* (FGD, Stillbirth mothers, Savannah Urban_R#2)

However, the discussions also revealed the persistence of traditional remedies for ailments in pregnancy, used either along with or in place of modern medicine. As shared by some participants:

> *"When I started feeling sick, the traditional birth attendants was invited to come and inspect me if I was due for delivery or it was something else. She said I was not due for labour so I was sent to a traditionalist who gave me some herbs to treat the symptoms."* (FGD, Stillbirth mothers, Savannah Rural_R#2)

Such practices indicate potential delays in urgently needed clinical care. And doubts were expressed about efficacy of traditional approaches:

> *"Sometimes the symptoms subsides but not cured. The symptoms relief a bit but with time it comes back."* (FGD, Stillbirth mothers, Savannah Rural_R#1)

Overall, the discussions reveal strong preference for formal medical care for managing pregnancy complications, but with traditional medicine still holding influence among some segments of the community.

4.4.5 Psychological effect of stillbirth on mothers

Mothers who had experienced stillbirths shared the distressing impacts on emotional, physical and mental health. One mother from Northern region explained:

> *"I cannot sleep in the night when I remember my dead baby. I have not been myself since losing the baby. Sometimes, I feel like committing suicide because of how sad I feel."* (FGD, Stillbirth mothers, Northern Urban_R#3)

The testimonies indicate limited awareness during pregnancy about potential complications or risk factors. As another grieving mother described:

> *"I was so happy during the pregnancy and nothing prepared me for his death. I kept wondering what went wrong because my pregnancy was smooth."* (FGD, Stillbirth mothers, Savannah Urban_R#1)

And a mother from Northern region shared:

> *"When my stillbirth happened, I was devastated because the pregnancy was smooth and I was not expecting it."* (FGD, Stillbirth mothers, Northern Urban_R#4)

4.4.6 Community practices during pregnancy

This theme explores community attitudes, beliefs, and practices around pregnancy care based on focus group discussions. The aim was to elucidate sociocultural factors influencing maternal health-seeking behaviours. Understanding these dynamics can inform policies and programs to improve pregnancy outcomes.

4.4.6.1 Preference for Formal Maternal Health Services

When discussing care for complications, biomedical healthcare through clinics and hospitals was overwhelmingly preferred and regarded as the "best place" for pregnant women across all groups. However, barriers like costs, distance and attitudinal factors make this preference difficult to attain for many rural women. As noted by a community representative:

> *"When you are in labour, it normally prolongs so we went to the traditional birth attendant for quick and smooth delivery when my labour set in. I gave birth but the baby died"* (FGD, Stillbirth mothers, Upper West Urban_R#1)

Thus, while modern care is increasingly valued, traditional options still play an important role in reality.

4.4.6.2 Barriers to Emergency Referral Services

Participants overwhelmingly cited lack of ambulances and costs as barriers to emergency referrals for complications, especially in rural areas. As explained by one community participant:

"We have people who have tricycle and motorbikes, so when labour sets in we get them to come and help take us to a nearby health centre."

(FGD, Stillbirth mothers, Savannah_R#1)

Tricycles and motorbikes were the common modes of transport described, entailing delays. Strategies for better emergency access are needed.

4.4.7 Role of Men in Caring for Pregnancies

The theme provides insights into men's involvement in supporting their pregnant wives, including accompanying them to antenatal clinics, providing practical assistance and financial support, and collaborating with health services on maternal health interventions. Examining men's roles sheds light on gender dynamics around pregnancy care and opportunities to improve maternal health outcomes by engaging men more effectively. The data highlights men's role in supporting their wives' pregnancies, through practical help, financial support, and occasionally emotional support. However, the adequacy and consistency of this support varies greatly across different areas and individuals. Key barriers include masculine social norms, time limitations, and having multiple wives. There are positive signs of community-health system collaboration, providing opportunities to further promote male engagement by addressing norms and sharing educational messages on responsible fatherhood.

4.4.7.1 Men provide practical and financial support during pregnancy, though inconsistently

The data indicates that men across the communities provide some level of practical and financial support to their pregnant wives. However, the extent and consistency of

this varies substantially. In rural areas, forms of practical support include accompanying wives to antenatal clinic visits, though often just waiting outside:

> *"My husband usually went with me for the ANC but always sat outside and waited for me. "* (FGD, Stillbirth mothers, Upper West Rural_R#1)

Men also provide transport through motorbike:

> *"When I was pregnant, my husband carried me to the hospital on his motorbike"*. (FGD, Stillbirth mothers, Northern Rural_R#1).

> Some ensure medications are taken as prescribed: *"When I was given medication, he made sure that I took the medicine as prescribed"* (Respondent 1, Upper East Rural). (FGD, Stillbirth mothers, Upper East Rural_R#1)

Men also help reduce workload through taking over strenuous household tasks. In urban areas, men assist with household chores like cooking, cleaning and laundry.

> *"He helped me with washing, cooking and sweeping of the room"*. (FGD, Stillbirth mothers, Upper West Urban_R#4)

Financially, men in both rural and urban communities provided support by giving money for transport to clinics, and paying for medications and items prescribed during antenatal visits. However, some men are unable to provide adequate financial support due to poverty:

> *"Actually, my husband was helpful but not all the time. I would at times inform him that I'm going to the hospital, and he would not have the finances to take me there".* (FGD, Stillbirth mothers, Northern Rural_R#1)

The data reveals that financial support from partners is often inconsistent and falls short of fully meeting the needs of pregnant women.

4.4.7.2 Men's accompaniment to antenatal care varies significantly

The data indicates mixed practices around men accompanying their wives to antenatal clinics across the communities. Several barriers prevent this from occurring regularly including men being occupied with work:

> *"Sometimes he will say he is busy"* (FGD, Stillbirth mothers, North East Rural_R#2)

Men gain health education for themselves:

> *"Sometimes when we go with our husbands, they also get educated at the ANC visits"* (FGD, Stillbirth mothers, Upper East Rural _ R#1)

When attending together, men also receive preferential treatment from health workers:

> *"I remember some years back, my husband joined me to walewale hospital. My husband and I were made to skip the queue when the nurses realized that my husband accompanied me".* (FGD, Stillbirth mothers, North East Urban_R#2)

The data highlights substantial variations between communities and individuals in whether expectant fathers attend antenatal visits. More work is required to promote

positive norms and address barriers to encourage men's involvement in clinical care during pregnancy.

4.5 DIVERSE PERSPECTIVES OF HEALTHCARE WORKERS ON MATERNAL CARE AND STILLBIRTH

4.5.1 Health Facilities' Responsibilities to Pregnant Women

This theme summarizes findings from interviews conducted with midwives and other maternal health workers at rural and urban health facilities in Ghana. The aim was to understand health workers' perspectives on their responsibilities and the responsibilities of health facilities towards pregnant women seeking antenatal care and delivery services. Three key responsibilities of health workers emerged from the interviews: 1) providing routine antenatal care, 2) educating pregnant women, and 3) ensuring safe delivery.

4.5.1.1 Providing Routine Antenatal Care

A core responsibility mentioned was providing routine antenatal care to monitor the progress of the pregnancy and ensure the wellbeing of the mother and baby. As one midwife from an urban health facility explained:

> *"My responsibility to pregnant women in this unit is to first check their BP, take their weight and compare it to the previous if there is, and then their BP to compare to the previous if there is. Take their urine for glucose test, and so the results will determine what I will do next."* (IDI with Health workers, Upper West Urban, R#26)

Another rural midwife highlighted the importance of examinations and routine drugs:

> *"When they come, we do a lot. When they come and they are due for SP, we give them and we go through the book to see if they are due for maybe a scan, we send the person to the lab for a scan."* (IDI with Health workers, Upper West Urban, R#25)

4.5.1.2 Educating Pregnant Women

Another key responsibility frequently mentioned was educating pregnant women on issues like nutrition, malaria prevention, recognizing danger signs, and birth preparedness. As one midwife explained:

> *"It is my responsibility to educate them, to let them know how to handle the pregnancy, when they are pregnant, what they will eat, the kind of work they're supposed to do...It is also my responsibility to educate them on nutrition, how to eat, so that they will maintain their Hb during pregnancy until they deliver."* (IDI with Health workers, Savannah Urban, R#23)

4.5.1.3 Ensuring Safe Delivery

Finally, health workers emphasized their duty to ensure pregnant women have safe deliveries and healthy babies. This included closely monitoring labor, referring to higher facilities when needed, and providing postnatal care. As one midwife said:

"My responsibility to pregnant women is to ensure that they are safe with their pregnancy and then to deliver safely." (IDI with Health workers, Savannah Urban, R#23)

Another remarked:

> *"It's my responsibility to ensure the mother gets safe delivery. Baby fine, mother fine, and all discharged."* (IDI with Health workers, Savannah Urban, R#22)

4.5.2 Key Responsibilities of Health Facilities

In terms of health facility responsibilities, two major themes emerged: 1) having the necessary infrastructure, equipment and supplies, and 2) creating a welcoming environment.

4.5.2.1 Having Necessary Infrastructure, Equipment and Supplies

Health workers stressed the importance of health facilities ensuring the needed infrastructure, supplies, and logistics are available to care for pregnant women. As one explained:

> *"The facility itself. The necessary requirements are supposed to be available for us. In terms of logistics."* (IDI with Health workers, Upper West Rural, R#45)

Another said:

> *"This facility, they are supposed to provide the services that are needed. That is making sure that logistics are available. The environment is also conducive for pregnant women."* (IDI with Health workers, Upper East Urban, R#32)

4.5.2.2 Creating a Welcoming Environment

Health workers also emphasized the facilities' role in creating a welcoming, comfortable environment for pregnant women. As one remarked:

> *"The facility is to control our attitude towards clients. So the clients are comfortable in the facility as they come."* (IDI with Health workers, Upper East Urban, R#41)

Another noted the importance of preparing refreshments:

> *"When they come for delivery, to encourage them to come, usually we prepare a hot tea for them after delivery."* (IDI with Health workers, Upper West Urban, R#25)

4.5.3 Services Provided to Pregnant Women

Related to the responsibilities of health workers to pregnant women are the services they provide to them. Understanding the services offered at different facilities can help identify gaps and areas for improvement in antenatal and delivery care. Three main categories of services provided to pregnant women emerged from the interviews: routine antenatal care, labor and delivery, and postnatal care.

4.5.3.1 Routine Antenatal Care

The most mentioned services were components of routine antenatal care, including registrations, examinations, counseling, and education. As one urban midwife explained:

> *"For the first visit, we have a lot. You know, the book is there. We have to take them through their history. We tell them whether they are*

actually pregnant and they are coming. So when it's positive, then we give them the book. We fill the book for them. Then we take them through the obstetrical history, family history, so after that, we give them the labs." (IDI with Health workers, Upper West Urban, R#25)

Another rural midwife highlighted routine drugs and assessments:

"We provide antenatal care to them, basically we give them their routine drugs mostly the hematinic and the prophylaxis to prevent malaria and other routine drugs that we have to give them." (IDI with Health workers, Northern Rural, R#50)

4.5.3.2 Labour and Delivery Services

Many facilities provide delivery services on-site, with some referring to higher levels when needed. As one midwife stated:

"We do deliveries as well. Then we do postnatal. Postnatal is also part of it and then we do family planning." (IDI with Health workers, North East Urban, R#30)

Another explained their responsibility during labor and delivery:

"It's our responsibility to ensure that the mother gets safe delivery. Baby fine, mother fine, and all discharged." (IDI with Health workers, Savannah Urban, R#22)

4.5.3.3 Postnatal Care

Following delivery, some facilities provide postnatal monitoring and care for mothers and babies. For example:

> *"Yes, we do postnatal after delivery. Then we educate them that they have to attend a facility. They come for ANC. They have to deliver there and we pick the postnatal from there."* (IDI with Health workers, Upper East Urban, R#18)

4.5.3.4 Gaps and Limitations

A few facilities noted limitations in the services they can provide, including referrals for delivery complications, limited family planning, and lack of abortion services. As one midwife noted:

> *"We don't do family planning because it's a CHAG facility. So we refer them to child care, and those who also come with bleeding PV that's bleeding per vagina or with incomplete abortion, we do it here, that's what we call EOU, evacuation of the uterus, but we don't do abortion here."* (IDI with Health workers, Savannah Urban, R#23)

4.5.4 Maternal Complications Health Facilities Can Handle

This theme describes the kinds of maternal complications healthcare workers can manage at their facilities. While health facilities felt able to manage some common maternal complications like anemia and preeclampsia, most required referral for severe cases they were unequipped or understaffed to handle. The ability to handle complications onsite or the need to refer to higher levels impacts outcomes for mothers and infants.

4.5.4.1 Complications Managed Onsite

The most commonly cited maternal complications that health facilities felt equipped to manage included anemia, malaria, preeclampsia, eclampsia, postpartum hemorrhage (PPH), and postpartum infections. As one rural midwife explained:

> *"We manage postpartum hemorrhage. When a placenta is retained, we do manual removal. With high blood pressure, preeclampsia, we manage before we refer to the higher facility. When there are tears or lacerations, we do suturing as well."* (IDI with Health workers, Savannah Rural, R#17)

Health workers indicated they could provide initial management of these conditions before referring. An urban midwife said:

> *"Eclampsia, we can handle it, postpartum hemorrhage we can manage, I think there are a lot, and in any case, if we notice that we can't manage, we refer to TTH [Tamale Teaching Hospital]."* (IDI with Health workers, Savannah Urban, R#31)

4.5.4.2 Referrals for Severe Complications

While facilities felt equipped to manage less severe cases, they noted limitations in handling more complex maternal complications. These required prompt referral to higher levels. As one rural midwife explained:

> *"For now we can handle those with low HB, but with cases of eclampsia and pre-eclampsia we do refer because our machinery can't handle it. At the health center our limitations are small and we don't have the resources to do certain things because we do not have medical*

personnel to handle those things." (IDI with Health workers, Northern Rural, R#33).

The most commonly cited reasons for referral were lack of specialists, doctors, operating capabilities, and equipment to manage severe cases like eclampsia, obstructed labor, hemorrhage, and hypertensive disorders. As an urban midwife said:

> *"In our facility, we cannot handle any complications because we don't have a doctor here. We cannot admit you, so most of the time when they come with complications, we refer them to the hospital."* (IDI with Health workers, Upper West Urban, R#24)

4.5.4.3 Coordination of Referrals

When referral was necessary, health workers described coordination with higher facilities to ensure continuity of care. As one explained:

> *"We normally communicate with them. We have their numbers. So, as the client is here, whilst they are monitoring, we will be calling them, telling them what is happening. So, if it is like that, which we cannot manage, we arrange with them so that we get a bed for the client."* (IDI with Health workers, Savannah Urban, R#16)

However, deficiencies in the referral process emerged as an area for improvement.

4.5.5 Responsible Behaviours by Pregnant Women for a Safe Delivery

This theme summarizes responses regarding health workers perspectives on responsible behaviours pregnant women should exhibit to ensure a safe delivery. Understanding these behaviours can inform education and counselling approaches.

Three main categories of responsible behaviours emerged from the analysis: 1) seeking routine antenatal care, 2) following health worker advice, and 3) maintaining healthy diet and lifestyle habits.

4.5.5.1 Seeking Routine Antenatal Care

Many health workers emphasized the importance of pregnant women starting antenatal care early and attending all scheduled visits. As one rural midwife advised:

> *"When they come, we do a lot. When they come and they are due for SP, we give them and we go through the book to see if they are due for maybe a scan, we send the person to the lab for a scan."* (IDI with Health workers, Upper West Urban, R#25)

An urban midwife also stressed the value of labs and scans:

> *"One, they have to adhere to their treatment regimen, and then second, they have to come to regular attendance of the ANC. Thirdly, they have to know the major signs that involve in pregnancy so that if it's okay, then they can report promptly."* (IDI with Health workers, Upper West Urban, R#26)

4.5.5.2 Following Health Worker Advice

Health workers frequently cited compliance with medical advice and treatments as an important behavior, including taking routine drugs as prescribed. As one midwife advised:

> *"Whatever the midwife tells you, you just have to do as the person said, And if there is any misunderstanding or misconception about what was said, you have every right to ask the midwife why maybe you should do*

this or you should not do that." (IDI with Health workers, Savannah Urban, R#31)

4.5.5.3 Maintaining Healthy Diet and Lifestyle Habits

Eating nutritious foods, avoiding harmful substances, exercising, and managing stress were commonly noted lifestyle factors. As one rural facility midwife explained:

> *"They should eat well, get enough rest, and then go to the facility if they see any of the danger signs we showed them for prompt intervention."* (IDI with Health workers, North East Rural, R#25)

An urban midwife also emphasized a healthy diet:

> *"We encourage them to do exercise. Then proper nutrition and the drugs that we give their daily routine we encourage them to take them."* (IDI with Health workers, Upper West Urban, R#25)

4.5.6 Health healthcare system

This theme summarizes findings on ensuring trust in the healthcare system, health workers' views on use of traditional healers and herbalists by pregnant women and instances and instances when home treatments are recommended**.**

4.5.7 Ensuring Trust in the Healthcare System

This sub-theme describes how to promote trust in the healthcare system among pregnant women to minimize use of potentially harmful home remedies. The main themes that emerged relate to provider attitudes, confidentiality, service delivery, health education, and community engagement.

4.5.7.1 Provider Attitudes

Many health workers emphasized the importance of positive attitudes, respectful communication, and emotional support when interacting with pregnant women to build trust. As one urban midwife explained:

> *"I think during their visits, our interaction should be very communicative and it shouldn't be one person-centred, it should be both of us that will be interacting and it should be maybe in a language that the person will understand."* (IDI with Health workers, Savannah Urban, R#31)

A rural midwife also noted:

> *"The nurse too she know his or her work, because when a client comes with a problem and don't know and you can't resort to a second partner to help you at end of day she goes home unsatisfied and even she not come she tell her colleagues how you couldn't handle her case and at the end she will not come back again, so when they come we have to make them feel at home by not shouting on them."* (IDI with Health workers, North East Rural, R#48)

4.5.7.2 Ensuring Confidentiality

Many health workers stressed upholding confidentiality as key to gaining pregnant women's trust. As one rural midwife advised:

> *"Confidentiality, some do with infections and they don't want their colleagues to know about it, if you disclose that secret or she hears it*

somewhere else she would lose trust in you." (IDI with Health workers, Northern Rural, R#7)

An urban midwife similarly emphasized:

> *"We should be confidential. If not, if you go about telling their problems to people when they hear, they will not come to us."* (IDI with Health workers, Northern Urban, R#15).

4.5.7.3 Effective Service Delivery

Providing timely, skilled, and transparent care was cited as important for building trust. As one urban midwife explained:

> *"So I think with trust, it goes with the mind. There are some people who have already made up their minds that after this facility when you go there, this is what is going to happen. So when you begin, when you want to get people's trust, you need to give them that attention. You need to give them that kind of treatment so that the end result makes them trust you."* (IDI with Health workers, Savannah Urban, R#22)

4.5.7.4 Health Education

Many health workers discussed the need to educate pregnant women on the risks of home remedies and benefits of skilled care. As one rural midwife suggested:

> *"We give them health education and we will have to intensify that education whilst telling them the importance of coming to the facility for services, also they resort to the local medications because they are no medicines here to be given to them so when you write for them to go and buy, they don't have money so they will go home and resort to the*

local medications because they are readily available and can be gotten free." (IDI with Health workers, Savannah Rural, R#29)

4.5.7.5 Community Engagement

Engaging with families and communities to promote skilled maternity care was also noted. As one urban midwife recommended:

> *"It all boils down to health education, community involvement, our home visits, our behavior, and the midwives. We have a lot to do with how we handle them when they come to us."* (IDI with Health workers, Upper West Urban, R#24)

4.5.8 Views on the use of traditional healers and herbalists by pregnant women

The use of traditional healers and herbalists by pregnant women, particularly those suffering complications was examined. The analysis aimed to understand health workers' attitudes and concerns regarding this practice. The interviewed maternal health workers predominantly opposed and advised against pregnant women's use of traditional medicine due to concerns about safety, complications, and lack of standardization.

4.5.8.1 Opposition to Use of Traditional Medicine

The most predominant view among health workers interviewed was opposition to pregnant women's use of traditional healers and herbalists. Many viewed traditional medicine as unsafe and potentially harmful. As one rural midwife explained:

> *"It is not good because the traditional healers and herbalist have no laboratory, they can use to run test to see if there are complications.*

Even the medications they give there they don't give accurate dosages." (IDI with Health workers, North East Rural, R#51)

An urban midwife similarly stressed:

"That one, my views, I think It's not good at all, we advise them that it's best that in case of anything they should just come to the health facility directly but most of them, will visit there and instead of the TBA maybe helping, it rather complicates it." (IDI with Health workers, Savannah Urban, R#31)

4.5.8.2 Concerns about Safety and Complications

Health workers most frequently cited concerns about complications and threats to maternal and infant safety resulting from traditional medicine use. As one rural midwife explained:

"It's not good because when they take the herbal medicines, it might cause the pregnancy to abort or it can bring deformities to the children, in that case we don't agree to it." (IDI with Health workers, Savannah Urban, R#31)

An urban midwife similarly noted:

"That one, in my view, I think it's a wrong decision to advise them to go there because they end up coming with even bigger complications, it can cause uterine rapture, and its very bad and pose both and mother and baby at risk, it can cause stillbirths and placenta abruption." (IDI with Health workers, Savannah Urban, R#22)

4.5.8.3 Lack of Measurement and Standardization

Many health workers expressed concerns about lack of precise measurement and standardization in traditional medicine preparation and dosage. As one rural midwife said:

> *"To me, I don't think it is advisable for pregnant women to resort to local treatments. Let's take it that what they use, you don't know the quantity of it, and you can't measure. So if you are taking on the dosage, how much are you taking? So you may end up abusing it over those or under those, which is not good."* (IDI with Health workers, Savannah Urban, R#31)

An urban midwife similarly noted:

> *"For me, I don't really buy the idea of pregnant women resorting to traditionalists and then herbalists. Let's say pregnancy is something related to science and you know medicine is a branch of science. What I think is that traditional people don't really know what to do in terms to stop certain things like PPH, maybe the mother has delivered and the placenta is failing to come out."* (IDI with Health workers, Upper West Urban, R#27)

4.5.8.4 Advising Against Use of Traditional Medicine

Given the concerns expressed, health workers commonly reported advising pregnant women against using traditional medicine, encouraging them to solely utilize orthodox care. As one rural midwife stated:

> *"I expect that every pregnant woman should come to the hospital because the traditional medicine they are not under hygienic conditions, the measure of the medicine that's the dosage and the effects to is also another problem so is just a try and error."* (IDI with Health workers, North East Rural, R#48)

An urban midwife similarly remarked:

> *"Even when you don't have complications, you don't have to use the traditional method. So now, if you have complications and you go in for it, then you are wasting it. We advise those, the TBAs, the traditional healers, that when you get a pregnant woman, just bring the person to the facility. Rather than providing the service there. So we don't encourage it."* (IDI with Health workers, Upper West Urban, R#24)

4.5.9 Instances Home Treatment Recommended

This theme summarizes findings regarding instances where healthcare facilities were unable to treat conditions and pregnant women were advised to try home remedies or traditional medicine. The aim was to understand if and when this occurs. The interviewed health workers reported no instances of recommending home or traditional remedies when their facilities could not treat a condition. The standard practice was prompt referral to a higher-level facility. The only occurrences of home treatment were discharges against medical advice due to patient distrust or dissatisfaction.

4.5.9.1 No Instances of Recommended Home Treatment

The predominant finding across the interviews was that health workers denied ever recommending home or traditional remedies when facilities could not treat a condition. The standard practice was to refer cases to a higher level facility rather than suggest home treatment. As one rural midwife stated:

> *"No, I have not seen search. We have a referral point so when there is a condition we can't manage we quickly refer to tolon for further treatment."(*IDI with Health workers, Northern Rural, R#13)

An urban midwife similarly remarked:

"No, it has never happened. What I see is when they come, they refer to the appropriate facility." (IDI with Health workers, North East Urban, R#54)

4.5.9.2 Referral for Unmanageable Cases

Health workers frequently cited promptly referring cases to doctors or higher-level facilities when conditions exceeded the capacity of their facility. As one rural midwife explained:

> *" The conditions we can't treat at our level, we refer."* (IDI with Health workers, Northern, R#16)

An urban midwife provided a similar perspective:

> *"No. In severe cases or instances, the client is referred to TTH [Tamale Teaching Hospital] for further attention to be given."* (IDI with Health workers, Northern Urban, R#21)

4.5.10 Maternal Health Interventions

This theme summarizes findings on current maternal health interventions being implemented in their communities. Understanding the types of programs in place can help identify gaps and priorities for improvement.

4.5.11 Ongoing Maternal Health Interventions

Common ongoing maternal health interventions reported included routine antenatal provisions, health education and counselling, home visits and defaulter tracing, and community engagement activities. Still, some rural facilities cited quite limited interventions.

4.5.11.1 Routine Antenatal Care Provisions

Many health workers cited routine provisions given to pregnant women during antenatal care as ongoing interventions, such as insecticide treated nets (ITNs), malaria prophylaxis, and iron supplementation. As one rural midwife explained:

> *"We give drugs to them to prevent malaria, we also give mosquito nets to them are first visit and also health education."* (IDI with Health workers, North East Rural, R#51)

An urban midwife similarly highlighted:

> *"When they come, we give mosquito nets for the first time to prevent malaria and we also provide the SP, then we give them the IFA. Those are the interventions we provide also."* (IDI with Health workers, North East Urban, R#54)

4.5.11.2 Health Education and Counselling

Health education talks and counselling during antenatal care visits were frequently mentioned interventions. As one urban midwife described:

> *"Fair enough I speak to a number of them. Giving nutrition to the pregnant woman, then giving health education to the pregnant woman. Then giving intermittent prenatal treatment to the woman, that's SP."* (IDI with Health workers, Savannah Urban, R#16)

A rural midwife also noted education on birth preparedness and complications:

> *"We give them education on personal hygiene is very important and then nutrition because here the anaemia is our problem and then birth preparedness and complications readiness, we also educate the on safe sex, rest, exercise..."* (IDI with Health workers, Northern Rural, R#12)

4.5.11.3 Home Visits and Defaulter Tracing

Home visits to provide education and trace defaulters were commonly cited interventions. As one rural midwife explained:

> *"We sometimes organize home visits to our client's homes, especially the adolescent clients we visit them and talk to them and also check on those default in their ANC visits. We also check their blood pressure and other things, and we also offer some weighing services during these visits."* (IDI with Health workers, Northern Rural, R#13)

An urban midwife similarly stated:

"We go for home visits to track defaulters, those that they have defaulted, not coming for their clinic, and some that have not even come for clinic and they are in the house. We just track them and help them to come and help them with their medication." (IDI with Health workers, Savannah Urban, R#30).

4.5.11.4 Community Outreach and Engagement

Some health workers mentioned community outreach activities like durbars to engage pregnant women and their families. As one urban midwife explained:

> *"Well, we organize durbars, so that the women who are pregnant, those who are not even pregnant, will come around with their family members. And during the day, we educate them on how to take care of themselves during pregnancy, during delivery, and maybe after delivery when they come home..."* (IDI with Health workers, Savannah Urban, R#30).

4.5.12 Community Involvement in Ongoing Maternal Health Interventions

This theme summarizes the perspectives of health workers on community involvement in ongoing maternal and child health interventions. The aim is to understand the current level of engagement and its perceived importance. While some community engagement activities were reported, most health workers emphasized greater involvement is needed to promote positive maternal behaviors and outcomes. Combined community and health system approaches will be key.

4.5.12.1 Current Community Involvement

Health workers described several ways communities are currently engaged, but many noted involvement is still limited. Some common examples given are as summarized in the table 15 below;

Table 15: Community involvement in maternal health practices

Examples of Current Community Involvement	***Excerpt from respondents***
Volunteers helping mobilize women and provide health education was mentioned as community involvement approach.	As one rural midwife explained: *"The volunteers helps us to mobilize the people for the services we offer to them."* (IDI with Health workers, Northern Rural, R#36).
Community leaders facilitating outreach.	An urban midwife stated: *"The community has volunteers and opinion leaders who usually mobilize the people for health activities. Like they clean the grounds for outreach services."* (IDI with Health workers, Northern Urban, R#21).
Women's support groups	An urban midwife gave an example: *"So one of the groups I know we have in the community is the mother-to-mother support group. And that one is basically*

Examples of Current Community Involvement	***Excerpt from respondents***
	for sharing ideas or similar problems that the mothers are having." (IDI with Health workers, Savannah Urban, R#22).
Male engagement initiatives	"Due to the CAC meetings we now conduct, most of the men are well involved in the health service activities so when they go they do communicate back to the women as in any time we come around they should give us the needed attention and support that we can achieve on." (IDI with Health workers, Northern Rural, R#16).

4.5.12.2 Perceived Importance of Community Involvement

Most health workers strongly emphasized the necessity of greater community engagement in promoting maternal and child health. As one urban facility midwife explained:

> *"It's very necessary. If something is going on and maybe we don't involve the community and they have no idea what's actually going on let's say the disease is communicable or something that can spread and no one has any idea about the disease or something, maybe if I do this,*

> *I won't get the disease or if I do that, I won't get it. Then the disease will spread because the community doesn't have any idea what is actually going on."* (IDI with Health workers, Savannah Urban, R#31).

Another rural midwife said:

> *"It's necessary, because in caring for the patient, you do it holistically to involve every stakeholder which involves the community, the community also serves as checks in some things especially in pregnant women in a community, if education is well carried out, and all members in the community will be well enlightened, so in the process where a pregnant woman is deviating from the norm they might bring them to check."* (IDI with Health workers, Savannah Urban, R#22).

4.5.13 Suggestions for Improving Ongoing Maternal Health Interventions

This theme describes the views of health workers ion how to improve ongoing maternal and child health interventions in their communities. Understanding their suggestions can help identify priorities for strengthening programs. Key suggestions for improving maternal health interventions included greater community outreach and engagement, improved health infrastructure and logistics, stronger referral systems, and increased male involvement. Findings indicate multi-pronged approaches are needed to further reduce stillbirths.

4.4.13.1 Increasing Health Education and Community Outreach

Many health workers emphasized the need to expand health education and community outreach activities to promote positive maternal behaviours. As one rural midwife explained:

> *"What I think is that at least the durbar is something that is very important because when you do the durbar and involve the community, you will be able to explain to them the benefits of the healthcare. So at least, in a year 2 or 3 durbars will not bad."* (IDI with Health workers, North-East Rural, R#45).

An urban midwife similarly suggested:

> *"My suggestion is we should try and improve the day-care we organize in the community from time to time. Because if you do that, and if you interact with the community, you'll be able to know their problems and how to help them also..."* (IDI with Health workers, Savannah Urban, R#23).

4.4.13.2 Involving Community Leaders and Groups

Engaging community leaders and mobilizing women's groups were commonly proposed to promote maternal health behaviours. As one rural midwife recommended:

> *"There should be effective collaboration between the community volunteers, the opinion leaders, the TBAs, with the staff, the nurses, and the health workers, in order for us to really reach the community with health interventions."* (IDI with Health workers, Upper East Rural, R#38).

An urban midwife also proposed:

> *"My suggestion is that, in those days, they used to have these health committee members. Volunteers and all those groups. Yeah. And it was very effective and of late, because these people have not been*

motivated, they have relapsed." (IDI with Health workers, Upper East Urban, R#21)

4.4.13.3 Improving Male Involvement

Many health workers discussed the need to improve male involvement in maternal health. As one urban midwife suggested:

> *"Just like I spoke of the male involvement, some of them still have problems with them. But now a lot of them, understand. And what we do to ensure that is, when they come with their wives, we try to attend to them first. The ones who comes with their wife, we attend to them first, no matter the time to encourage them."* (IDI with Health workers, Upper East Urban, R#17)

A rural midwife also noted:

> *"Due to the CAC meetings we now conduct, most of the men are well involved in the health service activities, so when they go they do communicate back to the women as in any time we come around they should give us the needed attention and support."* (IDI with Health workers, Northern Rural, R#38)

4.4.13.4 Improving Health Infrastructure and Logistics

Expanding health infrastructure and ensuring adequate drugs and supplies were commonly cited interventions to improve maternal care. As one rural midwife suggested:

> *"Our logistics is a problem so, there should be logistics for transportation, fuel, and also the staff are not enough so we need some*

staff and also we don't have certain medications. If these things are provided it will make the intervention a successful one." (Respondent 52, North East Rural) (IDI with Health workers, Upper East Rural, R#52)

An urban midwife similarly recommended:

"The only suggestion I have now is that I don't know whether it's going to be a permanent problem or it's going to be just a temporal issue. But when it comes to child immunization, we've realized that in recent times some of the vaccines are not available." (IDI with Health workers, Savannah Urban R#22)

4.4.14 Improving Referral Systems

Some health workers proposed improving referral systems from lower to higher level facilities. As one urban midwife suggested:

"So what I want to say is that especially the villages and where the remote areas, where some of the mothers do not get the ANC services. I suggest maybe we get staff posted to those particular places. Because some of the cases we do have are when somebody comes with anemia or maybe stillbirth and all those things. They are always from a place where the person says we are on the farm. We have not been going for ANC." (IDI with Health workers, Savannah Urban, R#22)

4.4.15 Role of men in maternal healthcare

While efforts to improve maternal health outcomes often focus on pregnant women themselves, there is growing recognition that men as partners and household decision-makers also have an important role to play. This theme explored the perspectives of the community on whether men should have a stronger role to play in maternal health. The analysis revealed broad consensus that men have an important role to play in supporting maternal health, though perceptions differed regarding specific responsibilities. Three key themes emerged around men's roles: 1) supporting access to care, 2) supporting healthy behaviours, and 3) providing emotional support.

4.4.15.1 Supporting Access to Care

Many respondents emphasized men's role in enabling women's access to maternal healthcare services like antenatal care and facility-based delivery. As one rural healthcare provider explained:

> *"Men involvement is very important, and we always encourage them anytime we encounter them. When women come for CWC or ANC, they should assist them by providing means of transportation. When men are here with them it makes decision making smooth."* (IDI with Health workers, North-East Rural, R#37)

In many households, men control financial resources needed to pay for transportation and healthcare expenses. One urban interviewee stressed:

> *"Immediately the person is pregnant, you make sure that if the person is coming for antenatal, at least you provide transportation if you*

cannot bring the person. The woman cannot walk from the house to the clinic." (IDI with Health workers, Upper West Urban, R#24)

In addition to removing financial barriers, respondents felt that men's direct participation in clinic visits makes women more likely to obtain adequate and timely care. According to one rural provider:

"Yes 100% they are even the key because if a pregnant woman comes here, for antenatal services or other services and you have notice a problem with that pregnant woman without the permission of the husband is null and void." (IDI with Health workers, Northern Rural, R#7)

4.4.15.2 Supporting Healthy Behaviours

Respondents frequently cited nutrition as an area where men have an obligation to support maternal health. As one rural participant explained:

"Yes because they should always come with them for antenatal services and they should also support the family when it comes to nutrition and also rest and sleep during pregnancy." (IDI with Health workers, North-East Rural, R#49)

In addition to nutrition, respondents noted the importance of men encouraging healthy behaviours like medication adherence, rest, and regular antenatal care attendance. An urban provider suggested:

"Like, when the wife is pregnant, the husband can follow the wife. And he will also know where the pregnancy is up to. What are the demands and what the wife should not do? And also, the husband can encourage

it. Some of the ladies, they don't like taking medications. So, if the husband is around, the husband can also encourage the wife to take medications." (IDI with Health workers, Northern Urban, R#6)

4.4.15.3 Providing Emotional Support

Finally, many participants emphasized men's role in providing emotional support and reducing stress during pregnancy and childbirth. As one urban interviewee explained:

> *"Yes, I think the women need that support because pregnancy entails a lot, the psychological troubles that they go through, so they need that emotional support from their husband."* (IDI with Health workers, Northern Rural, R#46).

This emotional support was seen as helping pregnant women cope with challenges and fears related to pregnancy, childbirth, and motherhood. Men's presence and reassurance during antenatal visits and delivery was noted to provide comfort and confidence.

4.4.16 Strategies to strengthen the role of Men in Reproductive Health

Several strategies emerged from the interviews for promoting greater involvement of men in reproductive health issues. The main themes included community engagement, facility-based initiatives, and mass media campaigns.

4.4.16.1 Community Engagement

Many respondents emphasized community-level interventions like educational meetings and home visits to reach men. As one rural provider explained:

> *"By organizing community durbars it will help a lot and also involving the stakeholders and talking about the importance of male involvement in reproductive health and radio discussions can also help. If they are involved, it will help improve maternal health system. We should also attend to those who come with their husbands first."* (IDI with Health workers, Northeast Rural, R#51).

Respondents frequently suggested holding community durbars or meetings focused on reproductive health topics as a strategy to educate men. Home visits were also cited as an opportunity to engage men and couples. One urban provider said:

> *"I think the best way we can actually get them to come with the woman is to improve home visit and use that opportunity to tell them about reproductive health. In our part of the world, we've made it that it's related to women but reproductive health is both the man and the woman. So during our visit and service we can actually improve our education about reproductive health."* (IDI with Health workers, Savannah, R#31).

4.4.16.2 Facility-Based Initiatives

Many health facilities have implemented initiatives to encourage male participation, particularly accompaniment to antenatal care. A common approach is fast-tracking couples who attend services together. According to an urban provider:

> *"One strategy the hospital has adopted is when you accompany your wife to the facility, your wife will not be in the queue and then you will be attended to immediately that you arrive."* (IDI with Health workers, Upper West Urban, R#26).

Preferential treatment for men who accompany partners aims to motivate continued engagement. As one rural provider noted:

> *"The best thing is when they come you don't have to waste their time because they also left their to be in the health centre so if come with your husband we will serve you fast than if you don't come with your husband."* (IDI with Health workers, Northern Rural, R#12).

4.4.16.3 Mass Media Campaigns

Respondents also discussed using mass media like radio programs to share reproductive health information and encourage male involvement. As one rural participant explained:

> *"By organizing durbars where we educate the men on the importance of taken care of their pregnant wives and also radio discussions that is make male involvement topics should be discuss so that they understand their key role in their pregnant wives life."* (IDI with Health workers, Northeast Rural, R#49).

Radio provides a means to reach a wide audience with educational messaging targeting men. As one urban provider suggested:

> *"If we can meet the churches and the mosque they can help in case there is any program to announce it there."* (IDI with Health workers, Northeast Urban, R#58).

CHAPTER 5

DISCUSSION

This study explored factors associated with stillbirth and assessed maternal health awareness among residents of five regions in Northern Ghana where stillbirths rate is high. Guided by the objectives set forth in the Early Newborn Action Plan that are aimed at decreasing stillbirths in the region to a rate of 12 or fewer stillbirths per 1000 total births by 2030, findings from this study was used to formulate a policy brief that provides valuable guidance for initiatives aimed at reducing stillbirths in the region and similar contexts(13,156).

In the population-based case-control study, 16, out of 26 factors which were initially significant at the bivariate level, emerged as significantly associated with stillbirth. These factors include family history of stillbirth, sickle cell status, Rhesus factor, obstructed labour, labour indication. partograph usage, TT dose of 2+, Eclampsia, antepartum haemorrhage, premature rupture of membranes, SP Doses of 1-2 and foetal malpresentation. The qualitative and KAP survey findings provide further insight on additional factors identified as risk factors for stillbirths which include marital status, the individual responsible for the pregnancy, number of ANC visits made by the mother and partner's tobacco usage. They also shed light on various patterns in knowledge, attitudes and practices of pregnant women and healthcare utilization.

The odds of stillbirth were increased by family history of stillbirth. This finding is similar to other literature which also posits that a previous occurrence of stillbirth in the previous parental generations can increase the risk of reoccurrence in a filial generation(126). The finding of this study is consistent with a school of thought that justifies a link between genetics and stillbirth, which explains that certain genetic characteristics like autosomal recessive orders, confined placental mosaicism and x-

linked dominant disorders found in some people, increase the result of reoccurrence of stillbirth if there is a family history(127).

It is worth noting that, in this study, issues of genetics were not only presented in family history but are also presented in the sickle cell status of the mother. This study found out that the odds of still birth was increased among women who were sickle cell positive as compared to women who were sickle cell negative. This finding is similar to other studies where there were severe complications of pregnancy and childbirth for both mother and baby(129). The current study's finding could be due to the physiological adaptations that the genetic structuring of Sickle cell patients present to mother and baby which influence the pulmonary, renal, circulatory, hematologic systems of both mother and baby, thereby reducing general health and capacity in carrying a healthy baby to be born alive(128).

Again, the influence of genetic factors is shown in this study's finding that a mother being Rhesus negative increased the odds of stillbirth. This could be due to the results of alloimmunization and sensitization due to the reaction between of Rhesus negative mother and Rhesus positive foetus, due to the genetic morphologies, resulting in severe complications and the fatal result of stillbirth(104). This finding is consistent with other literature which show that Rhesus factor increases the odds of stillbirth (103,157).

The odds of stillbirth were found to increase among women who had obstructed labour. WHO standards and other assessments do present the consequences of labour complications, if not managed well and promptly(158–161). If the presenting part of the foetus cannot progress into the birth canal, despite strong uterine contractions, as is observed in obstructed labour, it could lead to severe labour and delivery

complications like stillbirth. It is not of a surprise that this study also reports increased odds of stillbirths among women with labour indication. This shows that though an indication of labour could be generally a good sign of childbirth, there may be some occurrences that interfere with labour in the five regions of study, making labour a direct correlation factor with stillbirth. To explain these possible occurrences, studies have shown that prolonged labour, reporting to the health facility already in labour and poor management and referral systems increased the risk of stillbirth among women who have an indication of labour(162,163). Findings from healthcare engagement was evident most of the health facilities in the study area are not equipped to handle maternal complications. In addition, it takes time to make arrangement of referral. Delay in reporting to the health facility will therefore increase the risk of stillbirth.

Again, in this study, it was observed that foetal malpresentation increased the odds of stillbirths among women in the area of study, which is similar to the reports on another study(163). It has been shown that foetal malpresentations like brow or shoulder presentations could increase the obstruction of labour and result in stillbirth (75).

This study found that stillbirth increased among women whose key data during labour was not recorded with a partograph. This portrays the possibility of untimely observation of complications, inaccurate reporting, and delayed interventions, increasing the dangers of stillbirth among such women. Similarly, a study in Ethiopia reported the increased risk of stillbirth among women whose labour was not graphed as required(159). Although the in-depth interview of health workers gave an indication of partograph use, the data collected for the quantitative study showed that, this was not done for some pregnancies. This highlights the need to enforce standards and protocols at the facilities to improve healthcare delivery thereby averting the incidence of stillbirth.

In this study, there was a decreased odds of stillbirth among women who had been vaccinated with at least two doses of the tetanus toxoid vaccines. There is evidence from other assessments that prove that at least one dose of TT2+ goes a long way to reduce neonatal tetanus(164). This neonatal tetanus has been shown to be one of the leading factors of stillbirth and hence prophylaxis to prevent it, should reduce stillbirth.

The current study found out that eclampsia greatly increased the odds of a woman having a child born to her still. The dangers of eclampsia are the development of a pre-eclampsia into seizures during a pregnancy. This hypertensive disorder impacts placental function such that the foetus does not receive adequate nutrient supplementation due to poorer perfusion. In other studies in Africa and other parts of the world, eclampsia is seen to increase the dangers of neonatal mortality among differing populations(110,111).

The odds of stillbirth in this study was increased among women who experienced antepartum haemorrhage. This finding does not vary from a study conducted in varying settings (165–168). The risk of antepartum haemorrhage has been shown to increase with increasing maternal age and multiparity(167). Though there is no clear association between age and stillbirth or parity and stillbirth, it was observed that many of the cases had given birth to more than one and hence were at risk of antepartum haemorrhage. Antepartum haemorrhage has been shown to exacerbate the occurrence of stillbirths due to placental malfunctions that it causes, bringing harm to both mother and baby (169).

Also, this study found out that the premature rapture of membrane increased the odds of stillbirth. Premature rapture membranes could increase the risk of umbilical cord compression, infections and preterm birth, increasing the occurrence of stillbirths. This

finding is consistent with other literature that established a significant association between prematurity and stillbirth(168).

Among the women that were studied, it was observed that two or less of Sulfadoxine/pyrimethamine doses against malaria increased the odds of stillbirth. This could mean that incompletion of the regimen offered the risk of malaria infection among pregnant women, increasing morbidity and mortality to the baby. Malaria has been shown to increase the risk of stillbirth and hence not maximizing the advantage of prophylaxis increases risk of stillbirth (170–173).

The qualitative component of this study and KAP survey provided valuable insights into some of the factors we found to be associated with stillbirth in our quantitative results, as expressed by community members and women who have experienced stillbirth. A key theme that emerged from this research is the significant role of marital status in shaping these views. The findings clearly indicate that there is generally a positive reception of pregnancy, especially when the expectant woman is married. This widespread celebration of pregnancy in the context of marriage, carries implications for the care and support provided to these expectant women. The narratives of participants indicating enhanced support for married women during pregnancy and delivery align with our quantitative findings, which show a negative correlation between marital status and the occurrence of stillbirths.

The study findings are consistent with other studies conducted in other parts of Ghana, the United States and China where births from single, divorced, or widowed women were at a heightened risk of experiencing stillbirth(174–176). The possible explanation for this association may be attributed to the elevated stress and financial burden experienced by unmarried women when accessing maternal healthcare services, including the indirect costs such as transportation. This observation points out

heightened gaps for unmarried women who often lack the vital social support network that married women enjoy, which may increase their susceptibility to distress, and subsequently, the risk of experiencing stillbirths(177) A systematic review exploring the psychological impact of stillbirth revelated that not being married was a risk factor for high levels of anxiety and depression and identified social support as beneficial for women post loss (178).

Our quantitative findings also emphasize the protective role of marital status when the father of the child is the husband. This discussion is not far from another finding of this study, which clarifies that the odds of stillbirth were increased if the father of the stillborn was another apart from the mother's husband. It has been noted that in the Ghanaian setting, a husband's involvement in the life of a pregnant woman increases the welfare of both mother and baby, as husbands influence the making of healthy decisions during pregnancy(174). Therefore, if a woman of reproductive age is pregnant by someone she is not married to, the reduced likelihood of receiving this vital support can potentially raise the risk of stillbirth.

While marriage generally carries a positive connotation in the context of pregnancy, male involvement and support can sometimes be inconsistent or insufficient. Our qualitative study uncovers a more nuanced perspective which shows that the support from husbands and can vary considerably. In some cases, men may not actively participate in the care and support of their pregnant partners, leaving women to bear the emotional and financial burdens on their own. A study on male involvement in reducing maternal mortality in northern Ghana revealed that high prevalence of polygamous marriages and social stigma, are among the key social practices that inhibit male involvement during a woman’s pregnancy (179). These factors contribute to inhibiting male engagement during a woman's pregnancy. For example, when men

participate in domestic chores, it is often seen as undermining their masculinity, which can lead women to continue undertaking physically demanding tasks during pregnancy, thus increasing the risk of stillbirth. Furthermore, the prevailing male perspective frequently assigns the responsibilities of pregnancy and childbirth exclusively to women as seen in previous qualitative studies conducted in sub-Saharan Africa (180,181). Therefore, although husbands indeed fulfil a protective role, our qualitative findings emphasize that passive male involvement is still a critical gap that necessitates attention and intervention. This contrast highlights the complex interplay of cultural beliefs, marital status and gender roles in the broader landscape of maternal health.

The pivotal role of antenatal care (ANC) in mitigating the risk of stillbirth is underscored by our quantitative findings, reiterating its significance in enhancing the health and well-being of both expectant mothers and their unborn children. Particularly noteworthy is the notable reduction in the risk of stillbirth among women in our study who attended at least four or more ANC visits during pregnancy. This aligns with findings from other research work, which have shown that fewer number of ANC visits during pregnancy resulted in higher risk of stillbirth (172,173,182).These findings also closely align with the current recommendations set forth by the World Health Organization, which advocate for a minimum of eight ANC visits to optimize maternal and foetal health (183). The WHO's guidelines underscore the importance of regular ANC attendance for expectant mothers, promoting not only the detection and management of medical issues but also offering vital guidance on maternal nutrition, immunization, and family planning. Increased ANC visits increase the opportunity for education, monitoring of vitals and symptoms and prompt diagnosis, treatment and referrals as required. These generally contribute to the wellbeing of the mother and go

a long way in ensuring that both baby and mother remain in good health, thereby reducing stillbirth. By adhering to these recommendations, mothers can significantly reduce the risk of stillbirth and ensure the well-being of their unborn children.

Our qualitative findings further illuminate the complexity of the challenges faced by expectant mothers, revealing the presence of cost-related obstacles in accessing antenatal care. When expectant mothers face financial barriers that impede their access to regular ANC services, they may be forced to reduce the frequency of their visits or even forego them altogether. Financial barriers have widely been documented as causing a major barrier to healthcare access and ANC (184,185). Inadequate ANC attendance can result in delayed or inadequate prenatal care, which may increase the risk of undiagnosed health issues in both the mother and the developing foetus (186). Consequently, preventable complications may go unaddressed, potentially leading to a higher likelihood of stillbirths.

The complex interplay between personal experiences, spirituality, and healthcare system challenges shed light on the diversity of attitudes towards healthcare professionals within the community. The KAP survey we conducted offered valuable insights into the perceptions and attitudes of women regarding the safety of healthcare professionals during the process of childbirth. Majority of the surveyed participants expressed positive views and a high level of confidence in the competence and safety of healthcare professionals throughout the course of delivery. The findings align with results from a study conducted in the Ga East Municipality of Ghana, where 79% of the respondents delivered at a health facility for their most recent pregnancies(187). Another study in Ethiopia also had over 80% of the study participants utilizing health facilities for their deliveries over the past 2 years prior to the study (188). This

collective sentiment indicated a widespread understanding of the critical role that professional assistance plays in ensuring the mother has a safe delivery.

Our qualitative findings offered both agreeing and opposing views about perceptions the community members had about healthcare professionals. On one hand, it was clear that people's perspectives on healthcare professionals were governed by their personal experiences. Seeking outside care was only emphasized when no tangible improvements were experienced by the mothers. However, when medical care failed to offer solutions for conditions, this influenced the consideration of non-medical treatment alternatives. This has implications on patients' perceptions of authority within the healthcare system, potentially driving them to seek care in non-medical settings thus contributing to the risk of stillbirths.

The widespread utilization of traditional healing methods in non-medical care settings brings forth important implications, particularly in the context of stillbirths. Many expectant mothers explored traditional healing methods, which often provided them with a sense of comfort and familiarity. This choice was frequently influenced by the ease of access to traditional healers within their communities, as well as the cultural acceptance attached to these practices. Traditional midwifery in Ghana has historically been a part-time occupation performed by individuals without formal medical training. These practitioners facilitate pregnancy and childbirth, often incorporating spiritual rituals, and some rely on culturally inherited herbal remedies to aid women during their pregnancy and delivery (189).Traditional healing methods however may not always align with modern medical standards and evidence-based approaches. Traditional Birth Attendants (TBAs) in Ghana have had limited formal training and education, which makes it challenging to fully integrate them into the broader healthcare system. Even those with some level of training may still require the support

of skilled healthcare providers as a backup (189,190). The community's dual reliance on both medical and traditional systems highlights the multifaceted nature of maternal healthcare within this setting.

The qualitative narratives from healthcare professionals also supported the patients often faced limitations in the medical system. Healthcare workers conveyed a sense of responsibility toward provision of good maternal services to women. However, they highlighted that the healthcare system often fails to provide them with the necessary infrastructure, resources, and support to deliver the level of care they aspire to provide. Health care providers expressed a sense of understanding as to why communities may resort to traditional remedies or non-medical settings out of necessity. A cross sectional survey that evaluated hospital maternal health services in Northern Ghana found that the capacity to manage obstetric care and facilitate referrals in this region is likely hindered by the shortage of human resources and inadequate medical equipment within the hospitals (191). Additionally, certain crucial healthcare staff categories necessary for effective maternity care were found to be lacking in the region. These systemic challenges can have direct consequences on the quality of care and contribute to the elevated risk of stillbirths, as they hinder timely interventions and the early detection and management of complications which increases risk of stillbirths (192).

The KAP study results revealed that most of the women interviewed, regardless of whether they resided in rural or urban areas, exhibited limited knowledge of maternal health factors. These findings are consistent with a previous study where less than 50% demonstrated good knowledge on maternal health(193). In another study conducted in a rural district in Ghana, knowledge on maternal health care was poor especially in the area of pregnancy complications and risk factors for developing complications during

pregnancy (194). This aligns to findings from our study where only 27% believed that all pregnant women are at risk of developing complications. However, healthcare workers eluded to the fact that there was limited workforce capacity and resources to handle severe cases.

Our study demonstrated that good knowledge on birth spacing translated into practice. Over 80% of the women having good knowledge of the accurate recommended interval for birth spacing had 73% practising it with their recent pregnancy. A study conducted by Nti et. al in Ghana also demonstrated this correlation where only 10% of the study population had in-depth knowledge on birth spacing with only 32% practising birth spacing of 2 years (195). A similar study in Malaysia also found that poor knowledge on family planning resulted in only 36% of respondents practicing good birth spacing(196). Although a direct correlation was found between knowledge and practise in terms of birth spacing, there are other factors that may distort this correlation. Factors such as burning desire to have a certain sex, societal pressure from aging, fear of contraceptive use, late marriage, and target to have all children before a certain age and career influenced decisions around birth spacing(195,197,198)

Within our study population, women displayed positive linkages between their knowledge of the importance of a nutritious diet during pregnancy and their corresponding attitudes and practices. Notably, they scored higher marks on their understanding of the importance of good diet in promoting foetal growth. This is commensurate with the results of a study conducted among Syrian women, where a deficiency in knowledge on nutrition during the maternal period corresponded with more negative attitudes and subpar dietary practices(199). These findings are reinforced by a study conducted in Malaysia which showcased that as knowledge scores concerning maternal nutrition increased, so did the quality of attitudes and

practices related to maintaining a nutritious diet during pregnancy(200). These findings collectively underscore the vital link between maternal nutrition knowledge, attitudes, and practices, emphasizing that a solid foundation of knowledge is key in contributing to more positive outcomes during pregnancy including a lower risk of stillbirths. A higher percentage of the women interviewed knew that folic acid influenced the haemoglobin levels of the mother which translated into practice. However, less than 50% knew that folic acid prevents birth defect in both rural and urban sector. Studies in varying settings also showed that less than 40% of the women in the study group were aware that folic acid deficiency may increase the risk of foetal birth defect/ abnormality in new born (201–203). This may imply health education during PANC and ANC probably do not cover the full spectrum of the importance of folic acid.

Despite prevailing negative attitudes toward maternal health, a significant proportion of women, irrespective of whether they lived in rural or urban areas, exhibited commendable maternal health practices. Notably, the most prevalent and widely embraced practice was refraining from tobacco use during pregnancy and undergoing VDRL/Syphilis screening. An analysis of data from Demographic and Health Surveys on tobacco use among pregnant women from 54 low-income and middle-income countries showed that only 0.6% of the women in Africa used tobacco during pregnancy(204). Another study in the United States found that pregnant adults were less likely to use tobacco (AOR = 0.47, 95% CI: 0.43–0.52) compared to their non-pregnant adult counterparts(205). A study in different setting also showed good practices on VDRL/Syphilis screening among pregnant women(206). The good screening practices maybe since VDRL/Syphilis screening forms part of free maternal healthcare services provided at health facilities.

It's worth noting that the use of tobacco, especially when the partner also uses it, significantly increases the odds of stillbirth, a correlation supported by findings in other studies(72). The in-utero exposure of foetuses to tobacco smoke has been shown to cause increased blood levels of carboxyhaemoglobin and impairment of oxygen unloading resulting in reduced foetal oxygenation and the outcome of stillbirth(72). These insights emphasize the importance of not only maternal health practices but also partner involvement and household practices in mitigating the risk of stillbirths.

Our KAP survey results speak to the complex nature of maternal health in this community. While a significant proportion of women, regardless of their rural or urban residence, displayed limited knowledge of maternal health factors, their actual maternal health practices were commendable. Though attitudes toward maternal health were not uniform across different demographic groups, with urban residing women having more negative attitudes, they were generally less favourable. Despite prevailing negative attitudes and low knowledge on maternal health, a significant proportion of women, irrespective of whether they lived in rural or urban areas, exhibited commendable maternal health practices. Our qualitative findings offer insight on the good maternal health practices observed in this community, as reflected in our KAP survey results. It is evident that the disconnect between knowledge and attitudes with practice is being driven by other key factors that are brought forth in the qualitative discussions. Though women may not possess extensive knowledge of maternal health care, their practices could be driven by their trust and respect for healthcare professionals, who serve as authority figures in the community. This indicates that their willingness to listen to advice given by healthcare workers creates the potential for improved stillbirth outcomes, particularly when healthcare system challenges are

minimized. This also goes to support the fact that healthcare workers are aware of their role in providing maternal healthcare services.

While our KAP study showcased participant's limited comprehension on maternal health, the qualitative findings point out to good maternal practices including a high encouragement of health facility referrals. The significance of family within this community also emerges as a pivotal factor contributing to the observed divergence in knowledge, attitudes and practices. The study highlighted the importance of applying good maternal health practices aimed at ensuring a favourable pregnancy and delivery are important, as attested in the narratives. Limited knowledge and negative attitudes may be explained by factors such as lack of education, as indicated by a previous study (207). The study revealed that mothers' years of formal education are strongly associated with health knowledge. The strong emphasis on the significance of children within the family structure empowers women to embrace beneficial behaviours even in cases where their grasp of their medical knowledge might be limited.

CHAPTER 6

POLICY BRIEF

6.1 POLICY BRIEF ON RISK FACTORS FOR STILLBIRTH IN NORTHERN GHANA

This chapter covers policy brief that was developed based on findings from phase one of this study which sought to identify risk factors for stillbirth and assessment of maternal health awareness in northern Ghana. The policy recommendations conform to the WHO Quality of Care Framework for Maternal and Newborn as per the eight standards of care and 31 quality indicators.

6.1.1 Policy brief shared with stakeholders

UNAM
UNIVERSITY OF NAMIBIA

Policy Brief

Factors Associated with Stillbirth and Assessment of Maternal Health Awareness Among Residents of Northern Ghana

Joseph A. Frimpong & Prof. Kabwebwe H. Mitonga

Overview

This policy brief summarizes key academic research findings from a study carried out in Northern zone of Ghana on stillbirth and maternal health awareness, highlighting implications for policy.

Introduction & scope of problem

Globally, 2.6 million stillbirth occurs annually. About 98% of global estimates occur in low-middle-income countries with most of these deaths occurring in Asia and sub-Saharan Africa. Sixty percent of these deaths occur in rural settings. Over the past 3 years, stillbirth rates in Ghana have ranged from 13 – 22 per 1,000 births, however, Northern region remains the highest with estimates between 20 – 35 per 1,000 births. The Early Newborn Action Plan (ENAP) aims at 12 per 1,000 births. Despite the significant number of resources invested in maternal and child health programs, stillbirth continues to remain high in Northern Ghana. This study was conducted to assess the risk factors associated with stillbirth; assess the knowledge, attitude, and practises on maternal health; explore sociocultural practises of community members and mothers affected with stillbirth; and to understand the diverse perspective of healthcare workers on maternal care and stillbirth. The findings of the study were used to develop this policy brief to inform strategies in reducing stillbirths to meet the Early Newborn Action Plan target of 12 per 1,000 births or less.

Methods & Approach

The study was conducted among residents in the northern part of Ghana from November 2021 – May 2023. The study employed a convergent mixed method approach comprising of a quantitative 1:2 matched case control study, quantitative cross-sectional survey, and qualitative grounded theory methods. Pre-tested semi-structured questionnaires and interview guide were used to collect the data by trained data collectors. For the quantitative studies, data was cleaned and exported into Epi Info version 7 and Stata version 16 for analysis. Descriptive and analytic statistics were performed on the imported data. Odds Ratios (OR) and their corresponding 95% confidence intervals (CIs) were calculated to assess the association between the independent variables and stillbirth. Significant level of association was set at p-value less that 0.05. Independent variables which were found to be significantly associated with stillbirth were put into a multivariate logistic regression model to detect independent determinants.

For qualitative study, the data was analyzed using the thematic content analysis approach with the aid of Nvivo version 10. Recorded responses were transcribed verbatim. The diversity of verbatim responses was shortened using coding operations into fewer content categories and classified as themes and subthemes in line with the objectives of the study.

Results

A total of 516 mothers (172 cases and 344 controls) were enrolled into the matched case-control study. The median age of the cases was 27years (Range: 18 – 52) and median age of controls was found to be 27 years (Range: 18 – 45). Factors significantly associated with stillbirth included being unmarried (aOR=9.78, 95%CI:16.48-57.98), family history of stillbirth (aOR =2.626, 95%CI: 1.674 - 4.118), no partograph use (aOR = 2.141, 95%CI:1.450 - 3.160), partner's tobacco use (aOR=2.19, 95%CI:1.16-4.16), Rhesus negative (aOR=1.75, 95%CI:1.12-2.73), sickle cell trait (aOR=2.29, 95%CI:1.27-4.10), premature rupture of membranes (aOR=2.64, 95%CI:1.167-5.95), >4 antenatal care visits (aOR=0.53, 95%CI:0.30-0.93), foetal malpresentation (aOR=2.67, 95%CI:1.33-5.35) and eclampsia (aOR = 9.004, 95%CI:2.910 - 27.865). Out of the 1206 women who were enrolled into the KAP survey, 45.61% (550/1206) were from the rural sector and the rest were from the urban sector. Overall, 22.89%(276/1206) of the women studied demonstrated good knowledge on maternal health, 47.60% (574/1206)of them had good attitude towards maternal health care, and 89.55% (1080/1206) in the entire study participants, had good practices towards maternal healthcare. Marginal differences were observed between rural and urban sectors.

For the grounded theory methods, 20 focused group discussions and 58 in-depth interviews were conducted. Community members in the regions of the study approve of family planning if the side effect is minimal. Majority of community members deemed swelling, vaginal bleeding, weakness, and appetite changes as danger signs during pregnancy. Though there was minimal understanding of caring for women with severe diseases with care at the community level, the communities practised both health facility referrals and traditional remedies. Practises identified at the community level included perceptions of illnesses caused by evil spirits and perspectives on seeking traditional healers first for sick pregnant women. Healthcare workers perceived that it was their responsibility to provide routine antenatal care, education, and safe deliveries to women during pregnancies, that women should avoid traditional medicines, seek routine antenatal care, and follow health worker advice. In addition to the perceptions, the main services that were offered to women in the area included routine antenatal care, labour and delivery, and postnatal care, with many facilities reporting incapacity of handling severe maternal health conditions.

Conclusion

This study concludes that risk factors for stillbirth in Northern Ghana are a family history of stillbirth, having sickle cell traits, being Rhesus negative, obstructed labour, labour indication, not monitoring pregnancy using a partograph, eclampsia, antepartum haemorrhage, premature rupture of membranes, foetal malpresentation and two or less of Sulfadoxine/pyrimethamine doses against malaria, being a single mother, or having a baby out of wedlock and tobacco use by partner increased a woman's odds of having a stillbirth. Having TT dose of 2+ and ANC visits of 4+ during pregnancy reduced the odds of having a stillbirth. Women in Northern zone of Ghana generally have poor knowledge and poor practices but good practices towards maternal health care. There is generally positive reception to pregnancy with enhanced support especially when the woman is married.

Husbands are the major decision makers when it comes to maternal health issues. Social factors that undermine a man's masculinity makes some men provide no support for their wives even when they are pregnant. Community has high confidence in healthcare professionals.

Traditional cultural practices such as taboos, use of herbal medicine, and utilisation of traditional healing methods in non-medical care settings persists and mainly driven by individual personal experiences. There was limited knowledge on potential dangers of pregnancy. Health facility services are preferred, however, barriers like costs, distance and attitudinal factors make this preference difficult to attain. Mothers affected by stillbirth are emotionally, physically, and mentally traumatised.

Lastly, we conclude that healthcare workers are aware of their role in providing maternal healthcare services but have limited workforce capacity and resources to handle severe cases.

Policy Implication

1. **Tobacco Control Initiative:** As part of the tobacco control Act on Ghana, which prohibits smoking in enclosed places at workplaces, we recommend initiatives aimed at reducing tobacco use, especially among pregnant women's partners. These initiatives should focus on education, awareness, and cessation programs.

2. **Maternal waiting homes:** As part of the free maternal healthcare services policy, we recommend that he Ministry of Health, in collaboration with the local government, should build maternal waiting homes close to the health facilities as a holding area for women who are almost due for delivery but live in hard-to-reach or disntant communities.

3. **Mental Health Initiatives for pregnant women:** The Ministry of Health together with Social Welfare should establish a mental health program driven by a national policy that provides support and counselling services to pregnant unmarried women and women who have experienced stillbirths.

4. **Integrate Traditional Birth Attendants (TBAs) and Traditional healers:** Human Resource Policies should focus on training and integrating TBAs and traditional healers into the formal healthcare system, ensuring that their practices align with evidence-based standards, and providing them with necessary support and resources. Ignoring TBAs would not be effective because some women still prefer home delivery and TBA services. Hence, an in-depth understanding of the initiation, traditional and spiritual practices of TBAs and Traditional healerd is relevant for policy making.

5. **Systematic review of stillbirth audits:** The Ghana Health Service should conduct a systematic review of all stillbirth audit reports to assess health facility factors out of the control of the community that contributes to stillbirth. Findings from these assessments will help formulate medical health policies and guidelines which will have reduce the medical health facility factors that are associated with stillbirth.

6. **Comprehensive Maternal Education:** Policymakers should promote comprehensive maternal education that covers not only basic maternal care practices but also the underlying factors contributing to stillbirths (seen in risk factors from case control study– Rhesus, sickle cell etc).

7. **Encourage Male Involvement:** Policymakers should promote male involvement in maternal health by implementing interventions that challenge traditional gender roles and stigmas, encouraging men to take active roles in supporting their partners during pregnancy.

8. **Enhance Healthcare Professionals' Working Conditions:** Support for healthcare workers are crucial to ensure they can deliver the best possible care, reducing the risk of stillbirths associated with delays and complications. We recommend that policy makers should equip all district hospitals so they can deliver the best possible care, reducing the risk of stillbirths associated with delays and complications. In addition. Policy makers should implement the public health workforce strategic plan to increase the workforce at these facilties and institute an effective patient referral system based on risks identified from the ANC visits ahead of labour indication.

Contact
Email: asamoah.frimpong@gmail.com

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

This study sought to assess the risk factors for stillbirth in Northern Ghana and assess maternal health awareness among residents of Northern Ghana to inform strategies by the Ghana Health Service in reducing stillbirth. The first objective was to assess the sociodemographic, obstetric, foetal and maternal medical factors associated with stillbirth. For this objective, we conclude that a family history of stillbirth, having sickle cell traits, being Rhesus negative, obstructed labour, labour indication, not monitoring pregnancy using a partograph, eclampsia, antepartum haemorrhage, premature rupture of membranes, foetal malpresentation and two or less of Sulfadoxine/pyrimethamine doses against malaria, being a single mother, or getting pregnant out of wedlock and tobacco use by partner increased a woman's odds of having a stillbirth. On the contrary, we established that having TT dose of 2+ and ANC visits of 4+ during pregnancy reduced the odds of having a stillbirth.

We conclude on our second objective which sought to assess the knowledge, attitude, and practices of maternal health during pregnancy that, majority of the women interviewed had poor knowledge and poor attitude in relation to maternal health. However, majority of them had good practices towards maternal health. Having no education reduced the odds of having a good knowledge on maternal health practices compared to those with a tertiary level of education. Compared to the urban sector, the rural sector had higher odds of having a good attitude towards maternal health care. Women we had experience with childbirth had increased odds of goods maternal health practices.

In exploring the perceptions and describing the socio-cultural practices of community members with regards to maternal health, we conclude that there is generally positive reception to pregnancy with enhanced support especially when the woman is married. However, husbands are the major decision makers when it comes to maternal health issues. Social factors that undermine a man's masculinity makes some men provide no support for their wives even when they are pregnant. Also, the community has high confidence in healthcare professionals, however, utilisation of traditional healing methods in non-medical care settings still persists and mainly driven by individual personal experiences.

In exploring and describing the maternal healthcare of mothers who have been affected by stillbirth, we conclude that pregnancy was well received. However, cultural practices such as taboos, herbal medical and visiting traditional healers remained ingrained. There was limited knowledge on potential dangers of pregnancy. Health facility services were preferred, however, barriers like costs, distance and attitudinal factors made this preference difficult to attain. Mothers who were affected by stillbirth were emotionally, physically, and mentally traumatised.

Lastly, in terms of diverse perspectives of healthcare workers on maternal care, we conclude that healthcare workers are aware of their role in providing maternal healthcare services, however, the facilities have limited workforce capacity and resources to handle severe cases. Again, healthcare offices are aware of cultural practices pertaining to maternal health in the communities.

These conclusions suggest the need for policies that target issues concerning maternal health, with immediate priority given to issues specific to the role of the women themselves in reducing stillbirths, and recommendations targeting policies and policy

makers which will improve the practices of women before and during pregnancy, improvement of community support for pregnant women and the improvement of health facility and health worker capacity at lower levels. Implementing these policies can contribute to the achievement of the Early Newborn Action Plan's goal of reducing stillbirth rates to 12 or fewer per 1,000 total births by 2030 in the region.

7.2 RECOMMENDATIONS

In view of the findings from this study, I recommend the following.

1. The Ghana Health Service should conduct a systematic review of all stillbirth audit reports to assess health facility factors out of the control of the community that contributes to stillbirth.
2. As part of the free maternal healthcare services, the Ministry of Health, in collaboration with the local government, should build maternal waiting homes close to the health facilities as a holding area for women who are almost due for delivery. This should be incorporated into the national policy.
3. As part of the tobacco control Act on Ghana, which prohibits smoking in enclosed places at workplaces, we recommend that the act should be modified to include prohibition of smoking indoors at homes especially when a pregnant woman or a child is in the same household.
4. The Ministry of Health together with Social Welfare should establish a programs that provides support and counselling services to pregnant unmarried women and women who have experienced stillbirths
5. The Ghana Health service/ Ministry of Health develop and promote comprehensive education on maternal health that covers not only the basic

maternal care practices but also the underlying factors contributing to stillbirth like Rhesus Factor, Sickle cell, etc

6. Ghana Health Service should promote male involvement in maternal health by implementing interventions that challenge traditional gender roles and stigmas, encouraging men to take active roles in supporting their partners during pregnancy.
7. Ghana Health Service and key stakeholders should Integrate traditional healers and traditional birth attendants (TBA) into the formal healthcare system, ensuring that their practices align with evidence-based standards, and providing them with necessary support and resources.
8. The Ghana Health Service to increase the public health workforce at the various health facilities to reduce the pressure on the health service using the public health workforce strategic plan for Ghana as a guide.
9. The Ministry of health should institute an effective patient referral system based on risks identified from the ANC visits ahead of labour indication.
10. The government of Ghana through the ministry of health and Ghana Health Service should equip all district hospitals so they can deliver the best possible care, reducing the risk of stillbirths associated with delays and complications.
11. Community members should be sensitised on seeking healthcare early to aid in prompt interventions to avert complications.
12. Community should always seek the advice of community health nurses prior to taking any form of medication.

6.3 CONTRIBUTION TO KNOWLEDGE

From this study the researcher has been able to identify recent risk factors contributing to stillbirth in Northern zone of Ghana using both quantitative and qualitative

approaches. These findings have been used to develop a policy brief (Annexure K) which will be used to guide policies to reduce the stillbirth rate in Northern zone of Ghana and similar settings to 12 or fewer per 1,000 total births by 2030 as per Early Newborn Action Plan's goal. Subsequently, three manuscripts from this study have been submitted journals for publication.

REFERENCES

1. Vieira M. Perinatal Death. 2016 [cited 2024 Sep 2]. Understanding perinatal mortality. Available from: https://www.sciencedirect.com/topics/medicine-and-dentistry/perinatal-death

2. Gold KJ, Abdul-Mumin ARS, Boggs ME, Opare-Addo HS, Lieberman RW. Assessment of “fresh” versus “macerated” as accurate markers of time since intrauterine fetal demise in low-income countries. International Journal of Gynecology & Obstetrics. 2014 Jun 1;125(3):223–7.

3. Lawn JE, Blencowe H, Waiswa P, Amouzou A, Mathers C, Hogan D, et al. Stillbirths: rates, risk factors, and acceleration towards 2030. The Lancet. 2016 Feb;387(10018):587–603.

4. Badimsuguru AB, Nyarko KM, Afari EA, Sackey SO, Kubio C. Determinants of stillbirths in Northern Ghana: a case control study. Pan Afr Med J [Internet]. 2016 Oct 1 [cited 2017 Sep 4];25(Suppl 1). Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5257014/

5. Chuwa FS, Mwanamsangu AH, Brown BG, Msuya SE, Senkoro EE, Mnali OP, et al. Maternal and fetal risk factors for stillbirth in Northern Tanzania: A registry-based retrospective cohort study. PLoS One [Internet]. 2017 Aug 15

[cited 2017 Sep 4];12(8). Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5557599/

6. WHO [Internet]. 2020 [cited 2020 Jul 13]. WHO | Stillbirths. Available from: http://www.who.int/maternal_child_adolescent/epidemiology/stillbirth/en/

7. United Nations IGME agencies. A neglected tragedy: The global burden of stillbirths 2020 [Internet]. 2020 [cited 2023 Jan 2]. Available from: https://www.unicef.org/reports/neglected-tragedy-global-burden-of-stillbirths-2020

8. Ma R, Zou L. Stillbirth trends by maternal sociodemographic characteristics among a large internal migrant population in Shenzhen, China, over a 10-year period: a retrospective study. BMC Public Health. 2022 Feb 16;22(1):325.

9. Gordon LG, Elliott TM, Marsden T, Ellwood DA, Khong TY, Sexton J, et al. Healthcare costs of investigations for stillbirth from a population-based study in Australia. Aust Health Rev. 2021 Dec;45(6):735–44.

10. McClure EM, Silver RM, Kim J, Ahmed I, Kallapur M, Ghanchi N, et al. Maternal infection and stillbirth: a review. J Matern Fetal Neonatal Med. 2022 Dec;35(23):4442–50.

11. Hug L, You D, Blencowe H, Mishra A, Wang Z, Fix MJ, et al. Global, regional, and national estimates and trends in stillbirths from 2000 to 2019: a systematic assessment. The Lancet. 2021 Aug 28;398(10302):772–85.

12. WHO. World Health Organisation. 2024 [cited 2024 Sep 4]. Every Newborn Action Plan. Available from: https://www.who.int/initiatives/every-newborn-action-plan

13. Lawn JE, Blencowe H, Pattinson R, Cousens S, Kumar R, Ibiebele I, et al. Stillbirths: Where? When? Why? How to make the data count? Lancet (London, England). 2011;377(9775):1448–63.

14. Lawn JE, Blencowe H, Waiswa P, Amouzou A, Mathers C, Hogan D, et al. Stillbirths: rates, risk factors, and acceleration towards 2030. The Lancet. 2016;387(10018):587–603.

15. Edmond KM, Quigley MA, Zandoh C, Danso S, Hurt C, Owusu Agyei S, et al. Aetiology of stillbirths and neonatal deaths in rural Ghana: implications for health programming in developing countries. Paediatr Perinat Epidemiol. 2008 Sep;22(5):430–7.

16. Engmann C, Walega P, Aborigo RA, Adongo P, Moyer CA, Lavasani L, et al. Stillbirths and early neonatal mortality in rural Northern Ghana. Trop Med Int Health. 2012 Mar;17(3):272–82.

17. Ghana Statistical Service, Ministry of Health, ICF. Ghana Maternal Health Survey 2017 [Internet]. Accra, Ghana; 2018. Available from: https://www.dhsprogram.com/pubs/pdf/FR340/FR340.pdf

18. Ghana Statistical Service (GSS), Ghana Health Service (GHS), Macro International. Ghana Maternal Health Survey 2007 [Internet]. Calverton, Maryland, USA; 2009. Available from: https://dhsprogram.com/pubs/pdf/fr227/fr227.pdf

19. Ahinkorah BO, Seidu AA, Ameyaw EK, Budu E, Bonsu F, Mwamba B. Beyond counting induced abortions, miscarriages and stillbirths to understanding their risk factors: analysis of the 2017 Ghana maternal health survey. BMC Pregnancy and Childbirth. 2021 Feb 16;21(1):140.

20. Angell JN, Abdul-Mumin ARS, Gold KJ. Determining the cause of stillbirth in Kumasi, Ghana. Int J Gynaecol Obstet. 2019 Nov;147(2):173–8.

21. Moyer CA, McLaren ZM, Adanu RM, Lantz PM. Understanding the relationship between access to care and facility-based delivery through analysis of the 2008 Ghana Demographic Health Survey. Int J Gynaecol Obstet. 2013 Sep;122(3):224–9.

22. Hunfeld JA, Wladimiroff JW, Passchier J, Uniken Venema-van Uden M, Frets PG, Verhage F. Reliability and validity of the Perinatal Grief Scale for women who experienced late pregnancy loss. Br J Med Psychol. 1993 Sep;66 (Pt 3):295–8.

23. Lawn JE, Blencowe H, Waiswa P, Amouzou A, Mathers C, Hogan D, et al. Stillbirths: rates, risk factors, and acceleration towards 2030. Lancet. 2016 Feb 6;387(10018):587–603.

24. Lawn JE, Yakoob MY, Haws RA, Soomro T, Darmstadt GL, Bhutta ZA. 3.2 million stillbirths: epidemiology and overview of the evidence review. BMC Pregnancy and Childbirth. 2009 May 7;9(1):S2.

25. Lawn JE, Blencowe H, Pattinson R, Cousens S, Kumar R, Ibiebele I, et al. Stillbirths: Where? When? Why? How to make the data count? Lancet. 2011 Apr 23;377(9775):1448–63.

26. World Health Organisation. Overview of maternal health. 2024 [cited 2024 Sep 2]. Maternal health. Available from: https://www.who.int/health-topics/maternal-health

27. AbouZahr C. Safe Motherhood: a brief history of the global movement 1947–2002. Br Med Bull. 2003 Dec 1;67(1):13–25.

28. Belay T, Abdullah M, Mengistu H, Ghebrekidan K, Getaneh E, Mare W. Making pregnancy safer initiative--program impact in selected pilot areas. Ethiopian Medical Journal. 2007 Apr;45(2):115–22.

29. Anafi P, Mprah WK, Jackson AM, Jacobson JJ, Torres CM, Crow BM, et al. Implementation of Fee-Free Maternal Health-Care Policy in Ghana: Perspectives of Users of Antenatal and Delivery Care Services From Public Health-Care Facilities in Accra. International Quarterly of Community Health Education. 2018;38(4):259–67.

30. DIstrict Health Information Management System. Ghana Health Service; 2020.

31. Regional Health Directorate. Ghana Health Service Annual Report 2022. Ghana: GHana Health Service; 2022.

32. District Health Information Management System. Ghana Health Service; 2022.

33. Aminu M, Unkels R, Mdegela M, Utz B, Adaji S, Broek N van den. Causes of and factors associated with stillbirth in low- and middle-income countries: a systematic literature review. BJOG: An International Journal of Obstetrics & Gynaecology. 2014;121(s4):141–53.

34. Badimsuguru AB, Nyarko KM, Afari EA, Sackey SO, Kubio C. Determinants of stillbirths in Northern Ghana: a case control study. Pan Afr Med J [Internet]. 2016 Oct 1 [cited 2017 Sep 4];25(Suppl 1). Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5257014/

35. Yatich NJ, Funkhouser E, Ehiri JE, Agbenyega T, Stiles JK, Rayner JC, et al. Vol. 2010, Infectious Diseases in Obstetrics and Gynecology. Hindawi; 2010 [cited 2020 Aug 6]. p. e350763 Malaria, Intestinal Helminths and Other Risk Factors for Stillbirth in Ghana. Available from: https://www.hindawi.com/journals/idog/2010/350763/

36. Malaria, Intestinal Helminths and Other Risk Factors for Stillbirth in Ghana [Internet]. [cited 2020 Aug 6]. Available from: https://www.hindawi.com/journals/idog/2010/350763/

37. Engmann C, Walega P, Aborigo RA, Adongo P, Moyer CA, Lavasani L, et al. Stillbirths and early neonatal mortality in rural Northern Ghana. Tropical Medicine & International Health. 2012;17(3):272–82.

38. Nonterah EA, Agorinya IA, Kanmiki EW, Kagura J, Tamimu M, Ayamba EY, et al. Trends and risk factors associated with stillbirths: A case study of the Navrongo War Memorial Hospital in Northern Ghana. PLOS ONE. 2020 Feb 21;15(2):e0229013.

39. Lewis S, Lee A, Simkhada P. The role of husbands in maternal health and safe childbirth in rural Nepal: a qualitative study. BMC Pregnancy and Childbirth. 2015 Aug 4;15(1):162.

40. Mullany BC, Becker S, Hindin MJ. The impact of including husbands in antenatal health education services on maternal health practices in urban Nepal: results from a randomized controlled trial. Health Educ Res. 2007 Apr 1;22(2):166–76.

41. Thapa DK, Niehof A. Women's autonomy and husbands' involvement in maternal health care in Nepal. Social Science & Medicine. 2013 Sep 1;93:1–10.

42. Badimsuguru AB, Nyarko KM, Afari EA, Sackey SO, Kubio C. Determinants of stillbirths in Northern Ghana: a case control study. The Pan African Medical Journal [Internet]. 2016;25(Suppl 1). Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5257014/

43. Maxwell AE, Stewart SL, Glenn BA, Wong WK, Yasui Y, Chang LC, et al. Theoretically informed correlates of hepatitis B knowledge among four Asian groups: the health behavior framework. Asian Pac J Cancer Prev. 2012;13(4):1687–92.

44. Negandhi PH, Neogi SB, Das AM, Chopra S, Phogat A, Sahota R, et al. Factors associated with stillbirths in Haryana , India : a qualitative study. WHO South-East Asia Journal of Public Health. 2018;7(2):114–21.

45. WHO. World Health Organization Global strategy for women's, children's and adolescents' health (2016– 2030). Geneva, Switzaland; 2017.

46. Sinha S, Mondal PR, Gupta V. Assessing the Role of Socioeconomic Factors and Place of Residence on the Burden of Stillbirth in India : A Comprehensive Review Abstract : 2022;1–13.

47. Stefano L Di, Bottecchia M, Yargawa J, Akuze J, Haider MM, Galiwango E, et al. Stillbirth maternity care measurement and associated factors in population-based surveys : EN-INDEPTH study. Population Health Metrics. 2021;19(Suppl 1):1–16.

48. Tesema GA, Tessema ZT, Tamirat KS. Prevalence of stillbirth and its associated factors in East Africa : generalized linear mixed modeling. BMC Pregnancy Childbirth. 2021;21(414):1–10.

49. Zhu J, Liang J, Mu Y, Li X, Guo S, Scherpbier R, et al. Sociodemographic and obstetric characteristics of stillbirths in China : a census of nearly 4 million health facility births between 2012 and 2014. The Lancet Global Health. 2016;4(2):e109–18.

50. Page JM, Allshouse AA, Simhan H, Grobman WA, Reddy UM, Mercer BM, et al. 181: Risk factors for stillbirth in a prospective, nulliparous cohort. The American Journal of Obstetrics & Gynecology. 2020;222(1):S128.

51. Milton R, Modibbo FZ, Watkins WJ, Gillespie D, Alkali FI, Bello M, et al. Determinants of Stillbirth From Two Observational Studies Investigating Deliveries in Kano , Nigeria. Frontiers in Global Women's Health. 2022;2(January):1–12.

52. Löfwander M. Stillbirths and associations with maternal education . A registry study from a regional hospital in north eastern Tanzania . 2012;

53. Poudel S, Ghimire PR, Upadhaya N, Rawal L. Factors associated with stillbirth in selected countries of South Asia : A systematic review of observational studies. PLoS ONE. 2020;15(9):1–12.

54. Kujala S, Waiswa P, Kadobera D, Akuze J, Pariyo G, Hanson C. Trends and risk factors of stillbirths and neonatal deaths in Eastern Uganda (1982 – 2011): a cross-sectional , population- based study. Tropical Medicine and International Health. 2017;22(1):63–73.

55. Ma R, Zou L. Stillbirth trends by maternal sociodemographic characteristics among a large internal migrant population in Shenzhen , China , over a 10-year period : a retrospective study. BMC Public Health. 2022;22(325):1–10.

56. Bhusal M, Gautam N, Lim A, Tongkumchum P. Factors Associated With Stillbirth Among Pregnant Women in Nepal. J Prev Med Public Health. 2019;52:154–60.

57. Huang L, Sauve R, Birkett N, Fergusson D, Van Walraven C. Maternal age and risk of stillbirth: A systematic review. CMAJ Canadian Medical Association Journal. 2008;178(2):165–72.

58. Eunine Kennedy shriver National Institute of Health for Child health and human development. National Institute of Health. 2022 [cited 2022 Nov 11]. p. 1 What are possible causes of stillbirth? Available from: https://www.nichd.nih.gov/health/topics/stillbirth/topicinfo/causes

59. Ahinkorah BO, Seidu A aziz, Ameyaw EK, Budu E, Bonsu F, Mwamba B. Beyond counting induced abortions , miscarriages and stillbirths to understanding their risk factors : analysis of the 2017 Ghana maternal health survey. 2021;8:1–10.

60. Mukherjee A, Di Stefano L, Blencowe H, Mee P. Determinants of stillbirths in sub-Saharan Africa: A systematic review. BJOG: An International Journal of Obstetrics & Gynaecology. 2024;131(2):140–50.

61. Balayla J, Azoulay L, Abenhaim HA. Maternal marital status and the risk of stillbirth and infant death: A population-based cohort study on 40 million births in the united states. Women's Health Issues. 2011;21(5):361–5.

62. Tesema GA, Tessema ZT, Tamirat KS, Teshale AB. Prevalence of stillbirth and its associated factors in East Africa: generalized linear mixed modeling. BMC Pregnancy Childbirth. 2021 Jun 2;21(1):414.

63. Afulani PA. Determinants of stillbirths in Ghana: Does quality of antenatal care matter? BMC Pregnancy and Childbirth. 2016;16(1):1–17.

64. Rom AL, Mortensen LH, Cnattingius S, Arntzen A, Gissler M, Nybo Andersen AM. A comparative study of educational inequality in the risk of stillbirth in Denmark, Finland, Norway and Sweden 1981{\textendash}2000. Journal of Epidemiology \& Community Health. 2012;66(3):240–6.

65. Mukherjee A, Di Stefano L, Blencowe H, Mee P. Determinants of stillbirths in sub-Saharan Africa: A systematic review. BJOG: An International Journal of Obstetrics & Gynaecology. 2024;131(2):140–50.

66. Tilahun D, Assefa T. Incidence and determinants of stillbirth among women who gave birth in Jimma University specialized hospital, Ethiopia. Pan Afr Med J. 2017;28:299.

67. Badimsuguru AB, Nyarko KM, Afari EA, Sackey SO, Kubio C. Determinants of stillbirths in Northern Ghana: a case control study. Pan Afr Med J. 2016;25(Suppl 1):18.

68. Matthews RJ, Draper ES, Manktelow BN, Kurinczuk JJ, Fenton AC, Dunkley-Bent J, et al. Understanding ethnic inequalities in stillbirth rates: A UK population-based cohort study. BMJ Open. 2022;12(2).

69. Drysdale H, Ranasinha S, Kendall A, Knight M, Wallace EM. Ethnicity and the risk of late-pregnancy stillbirth. Medical Journal of Australia. 2012;197(5):278–81.

70. Gomez D, Schuster M, Ananth C V. 774: Stillbirth rates in relation to maternal age and race/ethnicity: A population-based study in the US. American Journal of Obstetrics and Gynecology. 2020;222(1):S489–90.

71. Lam KK, Johnston JM. Health insurance and healthcare utilisation for Shenzhen residents: a tale of registrants and migrants? BMC Public Health. 2012;12:868.

72. Wisborg K. Exposure to Tobacco Smoke in Utero and the Risk of Stillbirth and Death in the First Year of Life. American Journal of Epidemiology. 2001 Aug;154(4):322–7.

73. Aminu M, Unkels R, Mdegela M, Utz B, Adaji S, van den Broek N. Causes of and factors associated with stillbirth in low- and middle-income countries: a systematic literature review. BJOG: An International Journal of Obstetrics & Gynaecology. 2014;121(s4):141–53.

74. Nahar S, Rahman A, Nasreen HE. Factors Influencing Stillbirth in Bangladesh: A Case–Control Study. Paediatric and Perinatal Epidemiology. 2013;27(2):158–64.

75. Ayenew AA. Incidence, causes, and maternofetal outcomes of obstructed labor in Ethiopia: systematic review and meta-analysis. Reproductive health. 2021 Mar;18(1):61.

76. Mengistie A, Andualem M, Tamirat koku. Prevalence of stillbirth and associated Factors among immediate post-partum mothers at Felegehiwot comprehensive specialized hospital, northwest Ethiopia: An institution based cross-sectional stud [Internet]. 2019 [cited 2023 Jun 6]. Available from: https://doi.org/10.21203/rs.2.11593/v1

77. Chuwa FS, Mwanamsangu AH, Brown BG, Msuya SE, Senkoro EE, Mnali OP, et al. Maternal and fetal risk factors for stillbirth in Northern Tanzania: A registry-based retrospective cohort study. PLOS ONE. 2017 Aug 15;12(8):e0182250.

78. Gilbert NL, Casapía M, Joseph SA, Ryan JA, Gyorkos TW. Inadequate prenatal care and the risk of stillbirth in the Peruvian Amazon. International Journal of Gynecology & Obstetrics. 2010;109(2):155–6.

79. Nonterah EA, Agorinya IA, Kanmiki EW, Kagura J, Tamimu M, Ayamba EY, et al. Trends and risk factors associated with stillbirths: A case study of the Navrongo War Memorial Hospital in Northern Ghana. PLOS ONE. 2020 Feb 21;15(2):e0229013.

80. Gardosi J, Madurasinghe V, Williams M, Malik A, Francis A. Maternal and fetal risk factors for stillbirth: population based study. BMJ. 2013 Jan 24;346:f108.

81. Mondal D, Galloway TS, Bailey TC, Mathews F. Elevated risk of stillbirth in males: systematic review and meta-analysis of more than 30 million births. BMC Medicine. 2014 Nov 27;12(1):220.

82. Gordon A, Raynes-Greenow C, Bond D, Morris J, Rawlinson W, Jeffery H. Sleep Position, Fetal Growth Restriction, and Late-Pregnancy Stillbirth: The Sydney Stillbirth Study. Obstetrics & Gynecology. 2015 Feb;125(2):347.

83. Waldenström U, Cnattingius S, Norman M, Schytt E. Advanced Maternal Age and Stillbirth Risk in Nulliparous and Parous Women. Obstetrics & Gynecology. 2015 Aug;126(2):355.

84. Getahun D, Lawrence JM, Fassett MJ, Strickland D, Koebnick C, Chen W, et al. The association between stillbirth in the first pregnancy and subsequent adverse perinatal outcomes. American Journal of Obstetrics & Gynecology. 2009 Oct 1;201(4):378.e1-378.e6.

85. Dahiru T, Aliyu AA. Stillbirth in Nigeria: Rates and Risk Factors Based on 2013 Nigeria DHS. Open Access Library Journal. 2016 Aug 30;3(8):1–12.

86. Bukowski R, Hansen NI, Pinar H, Willinger M, Reddy UM, Parker CB, et al. Altered fetal growth, placental abnormalities, and stillbirth. PLOS ONE. 2017 Aug 18;12(8):e0182874.

87. Stringer EM, Vwalika B, Killam WP, Giganti MJ, Mbewe R, Chi BH, et al. Determinants of Stillbirth in Zambia. Obstetrics & Gynecology. 2011 May;117(5):1151.

88. Monari F, Menichini D, Salerno C, Donno V, Melis B, Neri I, et al. Mode of Delivery in Women with Stillbirth: Results of an Area-Based Italian Prospective Cohort Study. CEOG. 2022 Jul 6;49(7):151.

89. Hilder L, Sairam S, Thilaganathan B. Influence of parity on fetal mortality in prolonged pregnancy. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2007 Jun 1;132(2):167–70.

90. Tesfalul MA, Natureeba P, Day N, Thomas O, Gaw SL. Identifying risk factors for perinatal death at Tororo District Hospital, Uganda: a case-control study. BMC Pregnancy and Childbirth. 2020 Jan 20;20(1):45.

91. Kebede E, Kekulawala M. Risk factors for stillbirth and early neonatal death: a case-control study in tertiary hospitals in Addis Ababa, Ethiopia. BMC Pregnancy and Childbirth. 2021 Sep 21;21(1):641.

92. Tesema GA, Tessema ZT, Tamirat KS, Teshale AB. Prevalence of stillbirth and its associated factors in East Africa: generalized linear mixed modeling. BMC Pregnancy and Childbirth. 2021 Jun 2;21(1):414.

93. Flenady V, Koopmans L, Middleton P, Frøen JF, Smith GC, Gibbons K, et al. Major risk factors for stillbirth in high-income countries: a systematic review and meta-analysis. The lancet. 2011;377(9774):1331–40.

94. Dasa TT, Okunlola MA, Dessie Y. Effect of Grand Multiparity on the Adverse Birth Outcome: A Hospital-Based Prospective Cohort Study in Sidama Region, Ethiopia. International Journal of Women's Health. 2022;14:363.

95. Nkwabong E, Goula GT. Placenta abruption surface and perinatal outcome. The Journal of Maternal-Fetal & Neonatal Medicine. 2017;30(12):1456–9.

96. Nkwabong E, Tiomela Goula G. Placenta abruption surface and perinatal outcome. The Journal of Maternal-Fetal & Neonatal Medicine. 2017;30(12):1456–9.

97. Hu Y, Wu Q, Liu J, Hong D, Zou Y, Lu J, et al. Risk factors and incidence of third trimester stillbirths in China. Scientific reports. 2021;11(1):1–14.

98. Aminu M, Unkels R, Mdegela M, Utz B, Adaji S, Van Den Broek N. Causes of and factors associated with stillbirth in low-and middle-income countries: a systematic literature review. BJOG: An International Journal of Obstetrics & Gynaecology. 2014;121:141–53.

99. Shapiro RL, Souda S, Parekh N, Binda K, Kayembe M, Lockman S, et al. High prevalence of hypertension and placental insufficiency, but no in utero HIV transmission, among women on HAART with stillbirths in Botswana. PLoS One. 2012;7(2):e31580.

100. Group SCRNW. Association between stillbirth and risk factors known at pregnancy confirmation. JAMA: the journal of the American Medical Association. 2011;306(22).

101. Klebanoff MA, Lynch CD. Maternal ABO blood group and stillbirth: a prospective cohort investigation. The Journal of Reproductive Medicine. 2014;59(9–10):496–500.

102. Hassan KK. ABO Blood Groups Compatibility and Incompatibility among Basrah Families. International Journal of Sciences. 2017;6(11):34–8.

103. Fan J, Lee BK, Wikman AT, Johansson S, Reilly M. Associations of Rhesus and non-Rhesus maternal red blood cell alloimmunization with stillbirth and preterm birth. International Journal of Epidemiology. 2014 Aug;43(4):1123–31.

104. Aliyo A, Ashenafi G, Abduselam M. Rhesus Negativity Prevalence and Neonatal Outcomes among Pregnant Women Delivered at Bule Hora University Teaching Hospital, West Guji Zone, South Ethiopia. Clinical Medicine Insights: Pediatrics. 2023 Jan;17:117955652211455.

105. Holman N, Bell R, Murphy H, Maresh M. Women with pre-gestational diabetes have a higher risk of stillbirth at all gestations after 32 weeks. Diabetic medicine. 2014;31(9):1129–32.

106. Lemieux P, Benham JL, Donovan LE, Moledina N, Pylypjuk C, Yamamoto JM. The association between gestational diabetes and stillbirth: a systematic review and meta-analysis. Diabetologia. 2021;1–18.

107. Gibbins KJ, Silver RM, Pinar H, Reddy UM, Parker CB, Thorsten V, et al. Stillbirth, hypertensive disorders of pregnancy, and placental pathology. Placenta. 2016;43:61–8.

108. Korde-Nayak Vaishali N, Gaikwad Pradeep R. Causes of stillbirth. J Obstet Gynecol India. 2008;58(4):314–8.

109. Liu LC, Wang YC, Yu MH, Su HY. Major risk factors for stillbirth in different trimesters of pregnancy—A systematic review. Taiwanese Journal of Obstetrics and Gynecology. 2014;53(2):141–5.

110. Basta M, Hanif K, Zafar S, Khabazeh A, Amin F, Khan SS, et al. Impact of Hypertensive Disorders of Pregnancy on Stillbirth and Other Perinatal Outcomes: A Multi-Center Retrospective Study. Cureus. 2022 Mar;14(3):e22788.

111. Jaleta DD, Gebremedhin T, Jebena MG. Perinatal outcomes of women with hypertensive disorders of pregnancy in Jimma Medical Center, southwest Ethiopia: Retrospective cohort study. PLOS ONE. 2021 Aug;16(8):e0256520.

112. Dixon M, Kancherla V, Magana T, Mulugeta A, Oakley Jr GP. High potential for reducing folic acid-preventable spina bifida and anencephaly, and related stillbirth and child mortality, in Ethiopia. Birth Defects Research. 2019;111(19):1513–9.

113. Smith ER, Shankar AH, Wu LS, Aboud S, Adu-Afarwuah S, Ali H, et al. Modifiers of the effect of maternal multiple micronutrient supplementation on stillbirth, birth outcomes, and infant mortality: a meta-analysis of individual patient data from 17 randomised trials in low-income and middle-income countries. The Lancet Global Health. 2017;5(11):e1090–100.

114. Bhutta ZA, Yakoob MY, Lawn JE, Rizvi A, Friberg IK, Weissman E, et al. Stillbirths: what difference can we make and at what cost? The Lancet. 2011;377(9776):1523–38.

115. Imdad A, Yakoob MY, Bhutta ZA. The effect of folic acid, protein energy and multiple micronutrient supplements in pregnancy on stillbirths. BMC Public Health. 2011;11(3):1–13.

116. Yatich NJ, Funkhouser E, Ehiri JE, Agbenyega T, Stiles JK, Rayner JC, et al. Malaria, intestinal helminths and other risk factors for stillbirth in Ghana. Infectious diseases in obstetrics and gynecology. 2010;2010.

117. Harrington WE, Moore KA, Min AM, Gilder ME, Tun NW, Paw MK, et al. Falciparum but not vivax malaria increases the risk of hypertensive disorders of pregnancy in women followed prospectively from the first trimester. BMC medicine. 2021;19(1):1–11.

118. Ahmadal-Agroudi M, MEGAHED LAE, Abdallah EM, Morsy TA. A MINI OVERVIEW OF MALARIA IN PREGNANCY. Journal of the Egyptian Society of Parasitology. 2017;47(1):177–96.

119. Kalanda BF, Verhoeff FH, Chimsuku L, Harper G, Brabin BJ. Adverse birth outcomes in a malarious area. Epidemiology & Infection. 2006;134(3):659–66.

120. McClure EM, Silver RM, Kim J, Ahmed I, Kallapur M, Ghanchi N, et al. Maternal infection and stillbirth: a review. The Journal of Maternal-Fetal & Neonatal Medicine. 2022;35(23):4442–50.

121. Kupka R, Kassaye T, Saathoff E, Hertzmark E, Msamanga GI, Fawzi WW. Predictors of stillbirth among HIV-infected Tanzanian women. Acta obstetricia et gynecologica Scandinavica. 2009;88(5):584–92.

122. Lawn JE, Blencowe H, Waiswa P, Amouzou A, Mathers C, Hogan D, et al. Stillbirths: rates, risk factors, and acceleration towards 2030. The Lancet. 2016;387(10018):587–603.

123. Feleke BE, Feleke TE, Nigussie AA, Misgan E. The effects of stillbirth and abortion on the next pregnancy: a longitudinal study. BMC Women's Health. 2021;21(1):1–8.

124. Nair M, Churchill D, Robinson S, Nelson-Piercy C, Stanworth SJ, Knight M. Association between maternal haemoglobin and stillbirth: a cohort study among a multi-ethnic population in England. British journal of haematology. 2017;179(5):829–37.

125. Ali AA, Rayis DA, Abdallah TM, Elbashir MI, Adam I. Severe anaemia is associated with a higher risk for preeclampsia and poor perinatal outcomes in Kassala hospital, eastern Sudan. BMC research notes. 2011;4(1):1–5.

126. Workalemahu T, Page JM, Meeks H, Yu Z, Guinto E, Fraser A, et al. Familial aggregation of stillbirth: A pedigree analysis of a matched case–control study. BJOG: An International Journal of Obstetrics and Gynaecology. 2023 Apr;130(5):454–62.

127. Wapner RJ, Lewis D. Genetics and metabolic causes of stillbirth. In: Seminars in Perinatology. W.B. Saunders; 2002. p. 70–4.

128. Jain D, Atmapoojya P, Colah R, Lodha P. Sickle cell disease and pregnancy. Vol. 11, Mediterranean Journal of Hematology and Infectious Diseases. Universita Cattolica del Sacro Cuore; 2019.

129. Smith-Whitley K. Complications in pregnant women with sickle cell disease. 2019.

130. Viva Combs Thorsen, Tarek Meguid, Johanne Sundby AM. Components of maternal healthcare delivery system contributing to maternal deaths in Malawi: a descriptive cross-sectional study - PubMed [Internet]. 2014 [cited 2022 Nov 11]. Available from: https://pubmed.ncbi.nlm.nih.gov/24796165/

131. NCSL. Maternal and Child Health Overview [Internet]. 2022 [cited 2022 Nov 11]. Available from: https://www.ncsl.org/research/health/maternal-and-child-health-overview.aspx

132. World Health Organisation. WHO recommendation on interventions to promote awareness of human, sexual and reproductive rights and the right to access quality skilled care. 2015.

133. World Health Organization. Working with individuals, families and communities to improve maternal and newborn health: a toolkit for implementation [Internet]. 2017 [cited 2022 Nov 11]. Available from: https://apps.who.int/iris/handle/10665/254989

134. Girmaye E, Mamo K, Ejara B, Wondimu F, Mossisa M. Assessment of Knowledge, Attitude, and Practice of Skilled Assistance Seeking Maternal Healthcare Services and Associated Factors among Women in West Shoa Zone, Oromia Region, Ethiopia. Nursing Research and Practice. 2021;2021.

135. Aiga H, Nguyen VD, Nguyen CD, Nguyen TTT, Nguyen LTP. Knowledge, attitude and practices: Assessing maternal and child health care handbook intervention in Vietnam. BMC Public Health. 2016;16(1):1–10.

136. World Food Program. KNOWLEDGE, ATTITUDES AND PRACTICES (KAP) STUDY On maternal nutrition, infant and young child feeding, sanitation and hygiene, and sexual and reproductive health, including obstetric fistula, in Chemba District, Sofala. Journal of AIDS & Clinical Research. 2021;(DECEMBER 2020):1–86.

137. Nair M, Yoshida S, Lambrechts T, Boschi-Pinto C, Bose K, Mason EM, et al. Facilitators and barriers to quality of care in maternal, newborn and child health: A global situational analysis through metareview. BMJ Open. 2014;4(5).

138. Mustafa N. Knowledge Attitude and Practice Regarding Maternal Health Care Services. Health Care : Current Reviews. 2020 Feb 17;8(1):1–6.

139. Sori SA, Teji Roba K, Yadeta TA, Jiru HD, Metebo KN, Weldekidan HA, et al. Knowledge of preconception care and associated factors among maternalhealth care providers working in urban public health institutions of EasternEthiopia. Women's Health. 2021;17.

140. USAID. HEALTH CARE ACCESS AND BEHAVIORS RELIGIOUS AND ETHNIC MINORITIES Religious and Ethnic Minorities (REM). 2021;

141. Hassen SS, Lelisho ME. Determining factors associated with the prevalence of knowledge, attitude, and practice in seeking skilled maternal healthcare services among women in a remote area of Gesha district. BMC Health Services Research 2022 22:1. 2022 Nov 4;22(1):1–13.

142. Kaunitz AM, Spence C, Danielson TS, Rochat RW, Grimes DA. Perinatal and maternal mortality in a religious group avoiding obstetric care. American journal of obstetrics and gynecology. 1984 Dec;150(7):826–31.

143. Salisbury P, Hall L, Kulkus S, Paw MK, Tun NW, Min AM, et al. Family planning knowledge, attitudes and practices in refugee and migrant pregnant and post-partum women on the Thailand-Myanmar border - A mixed methods study. Reproductive Health. 2016;13(1):1–13.

144. Kassim AB, Newton SK, Dormechele W, Rahinatu BB, Otupiri E. Birth preparedness and complication readiness among pregnant women in resource-limited setting in rural Northern Ghana. PAMJ - One Health. 2021;6.

145. Kassa A, Human S, Gemeda H. Level of Healthcare Providers' Preconception Care (PCC) Practice and Factors Associated with Non-Implementation of PCC in Hawassa, Ethiopia. Ethiopian journal of health sciences. 2019;29(1):903–12.

146. Makokha-Sandell H, Mgaya A, Belachew J, Litorp H, Hussein K, Essén B. Low use of vacuum extraction: Health care Professionals' Perspective in a University Hospital, Dar es Salaam. Sexual and Reproductive Healthcare. 2020;25(May):100533.

147. Li D, Huang L, Yang W, Qi C, Shang L, Xin J, et al. Knowledge, attitude and practice level of women at the periconceptional period: a cross-sectional study in Shaanxi China. BMC Pregnancy and Childbirth. 2019;19(1).

148. Mekonnen O. Assessment of Knowledge , Attitude and Practices on birth preparedness and complication readiness among pregnant women attending antenatal follow up at Mizan-Tepi University Teaching Hospital , Southwest Ethiopia. 2022;

149. Belanche D, Casaló LV, Rubio MÁ. Local place identity: A comparison between residents of rural and urban communities. Journal of Rural Studies. 2021 Feb 1;82:242–52.

150. Speziale HS, Streubert HJ, Carpenter DR. Qualitative research in nursing: Advancing the humanistic imperative [Internet]. Lippincott Williams & Wilkins; 2011 [cited 2023 Oct 24]. Available from: https://books.google.com/books?hl=en&lr=&id=xNByh3B1Wt0C&oi=fnd&pg=PA202&dq=Qualitative+Research+in+Nursing:+Advancing+the+Humanistic+Imperative+Fifth+Edition&ots=UvQ90NfYOu&sig=MiGow8c7dUFkxJhe9BaiB7YwFHU

151. Bazen A, Barg FK, Takeshita J. Research Techniques Made Simple: An Introduction to Qualitative Research. Journal of Investigative Dermatology. 2021 Feb 1;141(2):241-247.e1.

152. Singh N, Benmamoun M, Meyr E, Arikan RH. Verifying rigor: analyzing qualitative research in international marketing. International Marketing Review. 2021 Jan 1;38(6):1289–307.

153. Teddlie C, Tashakkori A. Foundations of Mixed Methods Research: Integrating Quatitative and Qualitative Approaches in the Social and Behavioral Science. London: SAGE Publications Inc; 2009. 387 p.

154. Wangner C, Kawulich B, Garner M. Doing Social Research: A global context. London: McGraw-Hill Higher Education; 2012. 294 p.

155. Introducing research methodology:A beginner's guide to doing a research project. London: Sage Publications; 2011. 1–269 p.

156. Lawn JE, Blencowe H, Waiswa P, Amouzou A, Mathers C, Hogan D, et al. Stillbirths: rates, risk factors, and acceleration towards 2030. Lancet (London, England). 2016;387(10018):587–603.

157. Klebanoff MA, Lynch CD. Maternal ABO blood group and stillbirth: a prospective cohort investigation. The Journal of Reproductive Medicine. 2014;59(9–10):496–500.

158. Ma R, Zou L. Stillbirth trends by maternal sociodemographic characteristics among a large internal migrant population in Shenzhen, China, over a 10-year period: a retrospective study. BMC public health. 2022;22(1):325.

159. Mengistie A, Andualem M, Tamirat koku. Prevalence of stillbirth and associated Factors among immediate post-partum mothers at Felegehiwot comprehensive specialized hospital, northwest Ethiopia: An institution based cross-sectional stud [Internet]. 2019. Available from: https://doi.org/10.21203/rs.2.11593/v1

160. Negandhi PH, Neogi SB, Das AM, Chopra S, Phogat A, Sahota R, et al. Factors associated with stillbirths in Haryana , India : a qualitative study. WHO South-East Asia Journal of Public Health. 2018;7(2):114–21.

161. WHO. STANDARDS FOR IMPROVING QUALITY OF MATERNAL AND NEWBORN CARE IN HEALTH FACILITIES. 2016.

162. Makokha-Sandell H, Mgaya A, Belachew J, Litorp H, Hussein K, Essén B. Low use of vacuum extraction: Health care Professionals' Perspective in a University Hospital, Dar es Salaam. Sexual and Reproductive Healthcare. 2020;25(May):100533.

163. Nahar S, Rahman A, Nasreen HE. Factors Influencing Stillbirth in Bangladesh: A Case–Control Study. Paediatric and Perinatal Epidemiology. 2013;27(2):158–64.

164. Demicheli V, Barale A, Rivetti A. Vaccines for women for preventing neonatal tetanus. Cochrane Database of Systematic Reviews. 2015 Jul;

165. KC A, Nelin V, Wrammert J, Ewald U, Vitrakoti R, Baral GN, et al. Risk factors for antepartum stillbirth: a case-control study in Nepal. BMC Pregnancy and Childbirth. 2015 Dec;15(1):146.

166. Kebede E, Kekulawala M. Risk factors for stillbirth and early neonatal death: a case-control study in tertiary hospitals in Addis Ababa, Ethiopia. BMC Pregnancy and Childbirth. 2021;21(1):641.

167. Oguejiofor C, Okafor C, Eleje G, Ikechebelu J, Okafor C, Ugboaja J, et al. A Five-Year Review of Feto-Maternal Outcome of Antepartum Haemorrhage in a Tertiary Center in Nigeria. International Journal of Innovative Research in Medical Science. 2023 Mar;8(03):96–101.

168. Tesfalul MA, Natureeba P, Day N, Thomas O, Gaw SL. Identifying risk factors for perinatal death at Tororo District Hospital, Uganda: a case-control study. BMC Pregnancy and Childbirth. 2020;20(1):45.

169. Giordano R, Cacciatore A, Cignini P, Vigna R, Romano M. Antepartum haemorrhage. Journal of prenatal medicine. 2010 Jan;4(1):12–6.

170. Ahmadal-Agroudi M, MEGAHED LABDEL, Abdallah EM, Morsy TA. A MINI OVERVIEW OF MALARIA IN PREGNANCY. Journal of the Egyptian Society of Parasitology. 2017;47(1):177–96.

171. Gibbins KJ, Silver RM, Pinar H, Reddy UM, Parker CB, Thorsten V, et al. Stillbirth, hypertensive disorders of pregnancy, and placental pathology. Placenta. 2016;43:61–8.

172. Kalanda BF, Verhoeff FH, Chimsuku L, Harper G, Brabin BJ. Adverse birth outcomes in a malarious area. Epidemiology & Infection. 2006;134(3):659–66.

173. Yatich NJ, Funkhouser E, Ehiri JE, Agbenyega T, Stiles JK, Rayner JC, et al. Malaria, intestinal helminths and other risk factors for stillbirth in Ghana. Infectious diseases in obstetrics and gynecology. 2010;2010.

174. Afulani PA. Determinants of stillbirths in Ghana: Does quality of antenatal care matter? BMC Pregnancy and Childbirth. 2016;16(1):1–17.

175. Balayla J, Azoulay L, Abenhaim HA. Maternal marital status and the risk of stillbirth and infant death: A population-based cohort study on 40 million births in the united states. Women's Health Issues. 2011;21(5):361–5.

176. Zhu J, Liang J, Mu Y, Li X, Guo S, Scherpbier R, et al. Sociodemographic and obstetric characteristics of stillbirths in China : a census of nearly 4 million health facility births between 2012 and 2014. The Lancet Global Health. 2016;4(2):e109–18.

177. Cacciatore J, Schnebly S, Froen JF. The effects of social support on maternal anxiety and depression after stillbirth. Health & Social Care in the Community. 2009;17(2):167–76.

178. Campbell-Jackson L, Horsch A. The Psychological Impact of Stillbirth on Women: A Systematic Review. Illness, Crisis & Loss. 2014 Jul 1;22(3):237–56.

179. Abass K, Sakoalia P, Mensah C. SOCIO-CULTURAL PRACTICES AND MALE INVOLVEMENT IN REDUCING MATERNAL MORTALITY IN RURAL GHANA. THE CASE OF SAVELUGU/NANTON DISTRICT OF THE NORTHERN REGION OF GHANA. International Journal of Asian Social Science. 2012;

180. Lowe M, Chen DR, Huang SL. Social and Cultural Factors Affecting Maternal Health in Rural Gambia: An Exploratory Qualitative Study. PLOS ONE. 2016 Sep 23;11(9):e0163653.

181. Watson ED, Norris SA, Draper CE, Jones RA, van Poppel MNM, Micklesfield LK. “Just because you’re pregnant, doesn’t mean you’re sick!” A qualitative study of beliefs regarding physical activity in black South African women. BMC Pregnancy and Childbirth. 2016 Jul 19;16(1):174.

182. Stefano DL, Bottecchia M, Yargawa J, Akuze J, Haider MM, Galiwango E, et al. Stillbirth maternity care measurement and associated factors in population-based surveys : EN-INDEPTH study. Population Health Metrics. 2021;19(Suppl 1):1–16.

183. WHO. New guidelines on antenatal care for a positive pregnancy experience [Internet]. 2016 [cited 2023 Oct 24]. Available from:

https://www.who.int/news/item/07-11-2016-new-guidelines-on-antenatal-care-for-a-positive-pregnancy-experience

184. Ahinkorah BO, Ameyaw EK, Seidu AA, Odusina EK, Keetile M, Yaya S. Examining barriers to healthcare access and utilization of antenatal care services: evidence from demographic health surveys in sub-Saharan Africa. BMC Health Services Research. 2021 Feb 6;21(1):125.

185. Sakeah E, Okawa S, Rexford Oduro A, Shibanuma A, Ansah E, Kikuchi K, et al. Determinants of attending antenatal care at least four times in rural Ghana: analysis of a cross-sectional survey. Global Health Action. 2017 Jan 1;10(1):1291879.

186. Ota E, da Silva Lopes K, Middleton P, Flenady V, Wariki WM, Rahman MdO, et al. Antenatal interventions for preventing stillbirth, fetal loss and perinatal death: an overview of Cochrane systematic reviews. Cochrane Database Syst Rev. 2020 Dec 18;2020(12):CD009599.

187. Esena RK, Sappor MM. Factors Associated With The Utilization Of Skilled Delivery Services In The Ga East Municipality Of Ghana. Part 1: Demographic Characteristics. International Journal of Scientific & Technology Research. 2013;2(8).

188. Zenbaba D, Sahiledengle B, Dibaba D, Bonsa M. Utilization of Health Facility–Based Delivery Service Among Mothers in Gindhir District, Southeast Ethiopia: A Community-Based Cross-Sectional Study. Inquiry. 2021 Nov 20;58:00469580211056061.

189. Aziato L, Omenyo CN. Initiation of traditional birth attendants and their traditional and spiritual practices during pregnancy and childbirth in Ghana. BMC Pregnancy Childbirth. 2018 Mar 7;18(1):64.

190. Ganle JK. Chasing out traditional birth attendants in Ghana – implications for maternal and newborn health. The Columbia University Journal of Global Health. 2014 Dec 19;4(2):39–42.

191. Ameyaw EK, Amoah RM, Njue C, Tran NT, Dawson A. An assessment of hospital maternal health services in northern Ghana: a cross-sectional survey. BMC Health Services Research. 2020 Nov 26;20(1):1088.

192. Bedwell C, Blaikie K, Actis Danna V, Sutton C, Laisser R, Tembo Kasengele C, et al. Understanding the complexities of unexplained stillbirth in sub-Saharan Africa: a mixed-methods study. BJOG: An International Journal of Obstetrics & Gynaecology. 2021;128(7):1206–14.

193. Shirin S. Knowledge, attitude and practice of maternal health care amongst the married women in a rural area of Bangladesh. Ibrahim Medical College Journal. 2012 Feb 19;5.

194. Nuamah GB, Agyei-Baffour P, Mensah KA, Boateng D, Quansah DY, Dobin D, et al. Access and utilization of maternal healthcare in a rural district in the forest belt of Ghana. BMC Pregnancy Childbirth. 2019 Jan 7;19(1):6.

195. Nti C, Gadegbeku C, Dodoo S, Ofosu B, Akoto E, Agbi-Dzorkar M. Knowledge, Attitude and Practice of Birth Spacing among Ghanaian Mothers: Implications for Maternal and Child Nutritional Status. 2014 Jan 1;1971–8.

196. Nazri Shafei M, Shaharudin Shah M. Knowledge and Attitude towards Family Planning Practice and Prevalence of Short Birth Spacing Among Residents of Suburban Area in Terengganu, Malaysia. J Community Med Health Edu [Internet]. 2012 [cited 2023 Oct 21];02(09). Available from: https://www.omicsonline.org/knowledge-and-attitude-towards-family-planning-practice-and-prevalence-of-short-birth-spacing-among-residents-of-suburban-area-in-terengganu-malaysia-2161-0711.1000180.php?aid=9586

197. Aklil MB, Anteneh KT, Debele TZ, Temesgan WZ. Short birth interval and associated factors among women who gave birth in the last three years in Dembecha district, Northwest Ethiopia. PLoS One. 2022 Aug 23;17(8):e0272612.

198. Hailu D, Ketema T, Workineh Y. Barriers to Adherence of Optimal Birth Spacing: A Qualitative Study among Mothers and their Husbands in Arba Minch Zuria District, Ethiopia. American journal of health Research. 2014 Sep 30;2:188–95.

199. Harb D, Haidar MA, Yazbeck EB. Knowledge, Attitude and Practices Toward Nutrition and Diet During Pregnancy Among Recently Delivered Women of Syrian Refugees. Journal of Refugee & Global Health [Internet]. 2018 Apr 10;1(2). Available from: https://ir.library.louisville.edu/rgh/vol1/iss2/6

200. Mirsanjari M, Manan W, Muda W, Ahmad A, Othman M, Mosavat M. Does Nutritional Knowledge Have Relationship With Healthy Dietary Attitude and Practices during Pregnancy? International Conference on Nutrition and Food Sciences IPCBEE. 2012 Jul 23;

201. Hisam A, Rahman M, Mashhadi F. Knowledge, attitude and practice regarding folic acid deficiency; A hidden hunger. Pakistan journal of medical sciences. 2014 May 1;30:583–8.

202. Hisam A, Rahman MU, Mashhadi SF. Knowledge, attitude and practice regarding folic acid deficiency; A hidden hunger. Pak J Med Sci. 2014;30(3):583–8.

203. Li D, Huang L, Yang W, Qi C, Shang L, Xin J, et al. Knowledge, attitude and practice level of women at the periconceptional period: a cross-sectional study in Shaanxi China. BMC Pregnancy and Childbirth. 2019 Sep 4;19(1):326.

204. Caleyachetty R, Tait CA, Kengne AP, Corvalan C, Uauy R, Echouffo-Tcheugui JB. Tobacco use in pregnant women: analysis of data from Demographic and Health Surveys from 54 low-income and middle-income countries. The Lancet Global Health. 2014 Sep 1;2(9):e513–20.

205. Oh S, Reingle Gonzalez JM, Salas-Wright CP, Vaughn MG, DiNitto DM. Prevalence and correlates of alcohol and tobacco use among pregnant women in the United States: Evidence from the NSDUH 2005–2014. Preventive Medicine. 2017 Apr 1;97:93–9.

206. Rodrigues DC, Domingues RMSM. Management of syphilis in pregnancy: Knowledge and practices of health care providers and barriers to the control of disease in Teresina, Brazil. The International Journal of Health Planning and Management. 2018;33(2):329–44.

207. Greenaway ES, Leon J, Baker DP. UNDERSTANDING THE ASSOCIATION BETWEEN MATERNAL EDUCATION AND USE OF HEALTH SERVICES

IN GHANA: EXPLORING THE ROLE OF HEALTH KNOWLEDGE. Journal of Biosocial Science. 2012 Nov;44(6):733–47.

ANNEXURES

ANNEXURE 1: ETHICAL CLEARANCE FROM UNAM

UNAM

ETHICAL CLEARANCE CERTIFICATE

Ethical Clearance Reference Number: DEC OSH 0002 Date: **07/11/ 2021**

This Ethical Clearance Certificate is issued by the University of Namibia Ethics Committee (REC) in accordance with the University of Namibia's Research Ethics Policy and Guidelines. Ethical approval is given in respect of undertakings contained in the Research Project outlined below. This Certificate is issued on the recommendations of the ethical evaluation done by the ethics committee.

Title of Project: FACTORS ASSOCIATED WITH STILLBIRTH AND ASSESSMENT OF MATERNAL HEALTH AWARENESS AMONG RESIDENTS OF NORTHERN GHANA

Student: JOSEPH ASAMOAH FRIMPONG

Student Number: 202001202

Supervisor(s): SUPERVISOR: DR. PENEHAFO ANGULA AND
CO-SUPERVISOR: PROF. KOFI MENSAH NYARKO

Centre for Research Services

Take note of the following:

1. Any significant changes in the conditions or undertakings outlined in the approved Proposal must be communicated to the ethics committee. An application to make amendments may be necessary.
2. Any breaches of ethical undertakings or practices that have an impact on ethical conduct of the research must be reported to the ethics committee
3. The Principal Researcher must report issues of ethical compliance to the ethics committee (through the Chairperson) at the end of the Project or as may be requested by the ethics committee
4. The ethics committee retains the right to:

i) Withdraw or amend this Ethical Clearance if any unethical practices (as outlined in the Research Ethics Policy) have been detected or suspected,

ii) Request for an ethical compliance report at any point during the course of the research.

The ethics committee wishes you the best in your research.

Dr Hans J Amukugo (Chairperson Ethics Committee)

Prof. Davis Mumbengegwi (Head, Multidisciplinary Research)

ANNEXURE 2: RESEARCH PERMISSION LETTER FROM UNAM

CENTRE FOR RESEARCH SERVICES
Office of the Pro-Vice Chancellor: Research, Innovation & Development
University of Namibia, Private Bag 13301, Windhoek, Namibia
340 Mandume Ndemufayo Avenue, Pioneers Park, Office F223 - Fblock, Second Floor
☎ +264 61 206 4673; E-mail:kmbulu@unam.na; URL.: http//www.unam.edu.na

UNAM
UNIVERSITY OF NAMIBIA

RESEARCH PERMISSION LETTER

Date: 08/12/2021

Student Name: Joseph A Frimpong

Student Number: 202001202

Programme: DOCTOR OF PHILOSOPHY IN PUBLIC HEALTH

Approved Research Title: Factors Associated with Stillbirth and Assessment of Maternal Health Awareness Among Residents of Northern Ghana

TO WHOM IT MAY CONCERN

I hereby confirm that the above mentioned student is registered at the University of Namibia for the programme indicated. The proposed study met all the requirements as stipulated in the University guidelines and has been approved by the relevant committees.

The proposal adheres to ethical principles as per attached Ethical Clearance Certificate. Permission is hereby granted to carry out the research as described in the approved proposal.

Best Regards

Dr. AEE Shikongo
Head: Postgraduate Support Services
Tel: +264 61 206 3129
E-mail: aeshikongo@unam.na

CENTRE FOR RESEARCH SERVICES
Office of the Director
2021 -12- 08
University of Namibia
UNAM

ANNEXURE 3: ETHICAL CLEARANCE - GHANA HEALTH SERVICE

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Digital Address: GA-050-3303
Mob: +233-50-3539896
Tel: +233-302-681109
Email: ethics.research@ghsmail.org

My Ref. GHS/RDD/ERC/Admin/App/22/156
Your Ref. No.

10th May, 2022

Joseph Asamoah Frimpong
P. O. Box DS 807
Dansoman, Accra-Ghana

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC: 002/02/22**
Study Title	Factors Associated with Stillbirth and Assessment of Maternal Health Awareness among Residents of Northern Ghana
Approval Date	10th May, 2022
Expiry Date	9th May, 2023
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of a yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report after completion of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

You are kindly advised to adhere to the national guidelines or protocols on the prevention of COVID -19.

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
Dr. Cynthia Bannerman
(GHS-ERC Chairperson)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra

ANNEXURE 4: CASE CONTROL STUDY CONSENT FORM

PARTICIPANTS INFORMATION SHEET :CASE CONTROL STUDY FACTORS ASSOCIATED WITH STILLBIRTH AND ASSESSMENT OF MATERNAL HEALTH AWARENESS AMONG RESIDENTS OF NORTHERN GHANA

Good day, my name is. Joseph Asamoah Frimpong. I am a PHD candidate at the University of Namibia School of Nursing and Public Health, Namibia. I am conducting a convergent mixed method research study to determine factors associated with stillbirth and assessment of maternal health awareness among residents of northern Ghana.

Background and purpose of research

The WHO defines stillbirth as when a baby is born dead after 24 completed weeks of pregnancy. This can have a significant effect on the mothers and families at large. One indicator of still birth is the access to quality of care received by pregnant women. Majority of people believe that stillbirths are a s a result of sins of mothers or demonic influence. Complications during childbirth, post term pregnancy, maternal infections in pregnancy, maternal disorders among others are known to be leading causes of stillbirth. Most of these causes are preventable. These factors however may vary depending on setting. More than 50% of perinatal mortality globally are caused by stillbirths. This rate is about 4 to 10 times in developing countries as compared to developing countries. This rate is highest in Sub Saharan Africa of which Ghana is no exception. The highest rate of stillbirths in Ghana is reported in Northern Ghana. This study therefore seeks to determine factors associated with stillbirth and assessment of maternal health awareness in Northern Ghana.

Nature of research

With the increasing rate of stillbirths reported in Northern Ghana, successful determination of factors associated with stillbirth and knowledge on maternal health awareness will provide reliable current data to ensure a reduction in the rate of stillbirths. Also, healthcare practices, and further interventions (training, public health education/ community sensitization) and best use of resources would help reduce stillbirths. In addition, the identified risk factors would inform maternal health programs on priority areas to focus their interventions to reduce stillbirth. The policy brief from this study would be a concise summary of issues related to stillbirth identified from this study, the policy options to deal with it, and some recommendations on the best option. The recommendations from the policy brief will inform maternal health policy in Ghana which is still under development to reduce stillbirth. The brief would be aimed at government policymakers and other stakeholders who has the authority to influence policy. The study will therefore help determine factors associated with stillbirth and assessment of maternal health awareness in Northern Ghana to guide interventions towards ensuring a reduction in rate of stillbirth. All residents of 18 years and above who agree to be part of the study at the time of visit will be eligible to participate in the study.

Participant's involvement

Questionnaires have been developed to collect face-to-face interviews with women who have delivered a stillbirth 6 month before and during the study period and is a resident of Northern Ghana (case), and women who delivered a live – birth 6 months before and during the study period and a resident of Northern Ghana (control). Answering the questionnaire will take about twenty minutes of the respondent's time. The study will take place in the health facilities and households of cases and controls.

Potential Risks

There is minimal risk associated with the study. All COVID-19 safety protocols will be strictly adhered to. You do not have to answer any question or take part in the study if you don't wish to do so, and that is also fine. You do not have to give us any reason for not responding to any question.

Benefits

There will be no direct benefits for participation in the study however the findings from the study will help to improve maternal healthcare by providing health workers with reliable data, leveraging on previous studies for healthcare practices.

Costs

There would be no cost incurred in this study.

Compensation

No renumeration will be given to consenting participants.

This is to Certify that this Study's Inform Consent Form Has Been Approved by GHS-ERC for the Period 10/05/22 to 09/05/23
Sign ..... Date 12/05/22
Name Nana Abena Apafu
GHC-ERC Administrator

1

Confidentiality
We will not be sharing information about you to anyone outside of the research team. The information that we collect from this research project will be kept private. Data will be stored both electronically and in hard copies with access given only to the research team. Any information about you will have a code number instead of your name.

Voluntary Participation and Right to Leave the Research
Your participation in this study is your choice and its voluntary. There will be no penalty if you decide not to be in the study. You are free to withdraw from this research study at any time.

Protection of participants
All participants will be made to wear face mask before interviews are conducted in their homes and in the health facility. Participants without a face mask will be provided with face masks at no cost. Participants will also be provided with alcohol-based hand sanitizers to sanitize their hands before interviews are conducted. Physical distancing will be maintained during all interviews.

Protection of Research Team
All researchers will be provided with appropriate PPE and hand sanitizers for themselves and extra face masks for participants who do not have face masks. All data collectors and participants will follow strictly the laid down guidance from the Ghana Health Service Ethics Review Committee as shared to the Principal Investigators via email. All data collectors have been instructed to practice good personal hygiene through regular hand washing, the use of sanitizers, protective gloves and wearing facemasks. Social/physical distancing will be observed keeping at least one meter between data collector and interviewee during interviews.

Outcome and Feedback
All data/information collected will be saved and stored on a password encrypted device. The data from the study will help the stakeholders in maternal health to put measures in place to reduce stillbirths.

Funding information
The study is self-funded

Sharing of participants Information/Data
Data will be stored both electronically and in hard copies with access given only to the research team.

Provision of Information and Consent for participants
A copy of the Information sheet will be given to you after it has been signed or thumb-printed to take home.

Approval:
Approval for this study was obtained from the Ghana Health Services Ethical Review Committee (Approval Number:)

Contact for additional information
If you have questions about this activity, concerns, or complaints about this research study, please contact Joseph Asamoah Frimpong, Principal Investigator **asamoah.frimpong@gmail.com**; 0244944332.

Your right as a participant
This research has been reviewed and approved by the Ghana Health Service Ethics Review Committee (GHS-ERC). If you have any questions about your rights as a research participant, you can contact the GHS-ERC administrator, Ms. Nana Abena Apatu between the hours of 8am– 5pm through the telephone number +233503539896, or email address ethics.research@ghsmail.org.

This is to Certify that this Study's Inform Consent Form Has Been Approved by GHS – ERC for the Period 10/05/23 to 09/05/23
Sign ..... Date 12/05/22
Name Nana Abena Apatu
GHC-ERC Administrator

CONSENT FORM

STUDY TITLE: FACTORS ASSOCIATED WITH STILLBIRTH AND ASSESSMENT OF MATERNAL HEALTH AWARENESS AMONG RESIDENTS OF NORTHERN GHANA

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and all questions satisfactorily explained to me in a language I understand (**Dagbane/ Gonja/ Anufo/Mampruli/ Dagaare/ Dangbali/ Hausa/ Twi/ English**). I fully understand the contents and any potential implications as well as my right to change my mind (i.e., withdraw from the research) evenafter I have signed this form.
I voluntarily agree to be part of this research.

Name of Participant.....Participants' Signature .....OR Thumb Print .....Date.....

INTERPRETERS' STATEMENT

I interpreted the purpose and contents of the Participants' Information Sheet to the aforenamed participant to the best of my ability in the (**Dagbane/Gonja/Anufo/Mampruli/Dagaare/Dangbali/ Hausa/Twi/ English**) language to his proper understanding. All questions, appropriate clarifications sort by the participant and answers were also duly interpreted to his/her satisfaction.

Name of Interpreter.....Signature of Interpreter..... OR Thumb Print .....
Date: ..... Contact Details

STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was readand explained satisfactorily to the participant in the language, he/she understood (**Dagbane/Gonja/Anufo/Mampruli/Dagaare/Dangbali/Hausa/Twi/English**). I confirm that he/she was given the opportunity to ask questions/seek clarifications and samewere duly answered to his/her satisfaction before voluntarily agreeing to be part of the research.

Name: .....Signature..... OR Thumb Print ..... Date: .....

INVESTIGATOR STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to read and learn about the study. Allquestions and clarifications raised by the participant have been addressed.

Researcher's name..... Signature .....

Date.....

This is to Certify that this Study's Inform Consent Form Has Been Approved by GHS-ERC for the Period.10/05/22 to 09/05/23
Sign..... Date 12/05/22
Name... Tang Abena Apafu
GHC-ERC Administrator

ANNEXURE 5: KAP SURVEY CONSENT FORM

PARTICIPANTS INFORMATION SHEET: KAP SURVEY FACTORS ASSOCIATED WITH STILLBIRTH AND ASSESSMENT OF MATERNAL HEALTH AWARENESS AMONG RESIDENTS OF NORTHERN GHANA

Good day, my name is. Joseph Asamoah Frimpong. I am a PHD candidate at the University of Namibia School of Nursing and Public Health, Namibia. I am conducting a convergent mixed method research study to determine factors associated with stillbirth and assessment of maternal health awareness among residents of northern Ghana.

Background and purpose of research
The WHO defines stillbirth as when a baby is born dead after 24 completed weeks of pregnancy. This can have a significant effect on the mothers and families at large. One indicator of still birth is the access to quality of care received by pregnant women. Majority of people believe that stillbirths are a s a result of sins of mothers or demonic influence. Complications during childbirth, post term pregnancy, maternal infections in pregnancy, maternal disorders among others are known to be leading causes of stillbirth. Most of these causes are preventable. These factors however may vary depending on setting. More than 50% of perinatal mortality globally are caused by stillbirths. This rate is about 4 to 10 times in developing countries as compared to developing countries. This rate is highest in Sub Saharan Africa of which Ghana is no exception. The highest rate of stillbirths in Ghana is reported in Northern Ghana. This study therefore seeks to determine factors associated with stillbirth and assessment of maternal health awareness in Northern Ghana.

Nature of research
With the increasing rate of stillbirths reported in Northern Ghana, successful determination of factors associated with stillbirth and knowledge on maternal health awareness will provide reliable current data to ensure a reduction in the rate of stillbirths. Also, healthcare practices, and further interventions (training, public health education/ community sensitization) and best use of resources would help reduce stillbirths. In addition, the identified risk factors would inform maternal health programs on priority areas to focus their interventions to reduce stillbirth. The policy brief from this study would be a concise summary of issues related to stillbirth identified from this study, the policy options to deal with it, and some recommendations on the best option. The recommendations from the policy brief will inform maternal health policy in Ghana which is still under development to reduce stillbirth. The brief would be aimed at government policymakers and other stakeholders who has the authority to influence policy.

The study will therefore help determine factors associated with stillbirth and assessment of maternal health awareness in Northern Ghana to guide interventions towards ensuring a reduction in rate of stillbirth. All residents of 18 years and above who agree to be part of the study at the time of visit will be eligible to participate in the study.

Participant's involvement
Questionnaires have been developed to collect face-to-face interviews with the women who fall within the cluster in their households. Answering the questionnaire will take about twenty minutes of the respondent's time. The study will take place in selected households and health facilities in Northern Ghana. A total of 1,200 participants from all Northern regions will interviewed. The questionnaire will cover the socio-demographic data, knowledge on maternal health, attitude towards maternal health and practices towards maternal health during most recent pregnancy.

Potential Risks
There is minimal risk associated with the study. All COVID-19 safety protocols will be strictly adhered to. You do not have to answer any question or take part in the study if you don't wish to do so, and that is also fine. You do not have to give us any reason for not responding to any question.

Benefits
There will be no direct benefits for participation in the study however the findings from the study will help to improve maternal healthcare by providing health workers with reliable data, leveraging on previous studies for healthcare practices.

Costs
There would be no cost incurred in this study.

This is to Certify that this Study's Inform Conse-
Form Has Been Approved by GHS-ERC for th-
Period 16/05/22 to 09/05/23
Sign. Date 12/05/22
Name Naka Abena Apeth
GHC-ERC Administrator

1

Compensation
No renumeration will be given to consenting participants.

Confidentiality
We will not be sharing information about you to anyone outside of the research team. The information that we collect from this research project will be kept private. Data will be stored both electronically and in hard copies with access given only to the research team. Any information about you will have a code number instead of your name.

Voluntary Participation and Right to Leave the Research
Your participation in this study is your choice and its voluntary. There will be no penalty if you decide not to be in the study. You are free to withdraw from this research study at any time.

Protection of participants
All participants will be made to wear face mask before interviews are conducted in their homes and in the health facility. Participants without a face mask will be provided with face masks at no cost. Participants will also be provided with alcohol-based hand sanitizers to sanitize their hands before interviews are conducted. Physical distancing will be maintained during all interviews.

Protection of Research Team
All researchers will be provided with appropriate PPE and hand sanitizers for themselves and extra face masks for participants who do not have face masks. All data collectors and participants will follow strictly the laid down guidance from the Ghana Health Service Ethics Review Committee as shared to the Principal Investigators via email. All data collectors have been instructed to practice good personal hygiene through regular hand washing, the use of sanitizers, protective gloves and wearing facemasks. Social/physical distancing will be observed keeping at least one meter between data collector and interviewee during interviews.

Outcome and Feedback
All data/information collected will be saved and stored on a password encrypted device. The data from the study will help the stakeholders in maternal health to put measures in place to reduce stillbirths.

Funding information
The study is self-funded

Sharing of participants Information/Data
Data will be stored both electronically and in hard copies with access given only to the research team.

Provision of Information and Consent for participants
A copy of the Information sheet will be given to you after it has been signed or thumb-printed to take home.

Approval:
Approval for this study was obtained from the Ghana Health Services Ethical Review Committee (Approval Number:)

Contact for additional information
If you have questions about this activity, concerns, or complaints about this research study, please contact Joseph Asamoah Frimpong, Principal Investigator **asamoah.frimpong@gmail.com**; 0244944332.

Your right as a participant
This research has been reviewed and approved by the Ghana Health Service Ethics Review Committee (GHS-ERC). If you have any questions about your rights as a research participant, you can contact the GHS-ERC administrator, Ms. Nana Abena Apatu between the hours of 8am– 5pm through the telephone number +233503539896, or email address ethics.research@ghsmail.org.

This is to Certify that this Study's Inform Cons
Form Has Been Approved by GHS-ERC
Period 10/05/23 to 09/05/23
Sign [signature] Date 12/05/22
Name Nana Abena Apatu
GHC-ERC Administrato

CONSENT FORM

STUDY TITLE: FACTORS ASSOCIATED WITH STILLBIRTH AND ASSESSMENT OF MATERNAL HEALTH AWARENESS AMONG RESIDENTS OF NORTHERN GHANA

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and all questions satisfactorily explained to me in a language I understand **(Dagbane/ Gonja/ Anufo/Mampruli/ Dagaare/ Dangbali/ Hausa/ Twi/ English)**. I fully understand the contents and any potential implications as well as my right to change my mind (i.e., withdraw from the research) evenafter I have signed this form.
I voluntarily agree to be part of this research.

Name of Participant.....Participants' Signature .....OR Thumb Print .....Date.....

INTERPRETERS' STATEMENT

I interpreted the purpose and contents of the Participants' Information Sheet to the aforenamed participant to the best of my ability in the **(Dagbane/Gonja/Anufo/Mampruli/Dagaare/Dangbali/ Hausa/Twi/ English)** language to his proper understanding. All questions, appropriate clarifications sort by the participant and answers were also duly interpreted to his/her satisfaction.

Name of Interpreter.....Signature of Interpreter..... OR Thumb Print .....
Date: ..... Contact Details

STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was readand explained satisfactorily to the participant in the language, he/she understood **(Dagbane/Gonja/Anufo/Mampruli/Dagaare/Dangbali/Hausa/Twi/English)**. I confirm that he/she was given the opportunity to ask questions/seek clarifications and samewere duly answered to his/her satisfaction before voluntarily agreeing to be part of the research.

Name: .....Signature..... OR Thumb Print ..... Date: .....

INVESTIGATOR STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to read and learn about the study. Allquestions and clarifications raised by the participant have been addressed.

Researcher's name..... Signature .....

Date.....

This is to Certify that this Study's Inform Conse-
Form Has Been Approved by GHS-ERC for the
Period 10/08/22 to 09/05/23
Sign..... Date 12/05/22
Name Nana Abena Apea
GHC-ERC Administrator

1

ANNEXURE 6: FOCUSED GROUP DISCUSSION CONSENT FORM

PARTICIPANTS INFORMATION SHEET: FOCUSED GROUP DISCUSSION
FACTORS ASSOCIATED WITH STILLBIRTH AND ASSESSMENT OF MATERNAL HEALTH AWARENESS AMONG RESIDENTS OF NORTHERN GHANA

Good day, my name is Joseph Asamoah Frimpong. I am a PHD candidate at the University of Namibia School of Nursing and Public Health, Namibia. I am conducting a convergent mixed method research study to determine factors associated with stillbirth and assessment of maternal health awareness among residents of northern Ghana.

Background and purpose of research
The WHO defines stillbirth as when a baby is born dead after 24 completed weeks of pregnancy. This can have a significant effect on the mothers and families at large. One indicator of still birth is the access to quality of care received by pregnant women. Majority of people believe that stillbirths are a s a result of sins of mothers or demonic influence. Complications during childbirth, post term pregnancy, maternal infections in pregnancy, maternal disorders among others are known to be leading causes of stillbirth. Most of these causes are preventable. These factors however may vary depending on setting. More than 50% of perinatal mortality globally are caused by stillbirths. This rate is about 4 to 10 times in developing countries as compared to developing countries. This rate is highest in Sub Saharan Africa of which Ghana is no exception. The highest rate of stillbirths in Ghana is reported in Northern Ghana. This study therefore seeks to determine factors associated with stillbirth and assessment of maternal health awareness in Northern Ghana.

Nature of research
With the increasing rate of stillbirths reported in Northern Ghana, successful determination of factors associated with stillbirth and knowledge on maternal health awareness will provide reliable current data to ensure a reduction in the rate of stillbirths. Also, healthcare practices, and further interventions (training, public health education/ community sensitization) and best use of resources 1would help reduce stillbirths. In addition, the identified risk factors would inform maternal health programs on priority areas to focus their interventions to reduce stillbirth. The policy brief from this study would be a concise summary of issues related to stillbirth identified from this study, the policy options to deal with it, and some recommendations on the best option. The recommendations from the policy brief will inform maternal health policy in Ghana which is still under development to reduce stillbirth. The brief would be aimed at government policymakers and other stakeholders who has the authority to influence policy.

The study will therefore help determine factors associated with stillbirth and assessment of maternal health awareness in Northern Ghana to guide interventions towards ensuring a reduction in rate of stillbirth. All residents within selected strata and healthcare workers of 18 years and above who agree to be part of the study at the time of visit will be eligible to participate in the study.

Participant's involvement
A discussion guide has been developed to collect face-to-face interviews with representatives of the community members. The focus group discussions will take about 60 minutes of respondents' time. These sessions will take place in the town halls of the various communities. A total of about 6-10 participants in 10 focus groups will be engaged. The discussion guide will cover community perceptions of pregnancy, awareness of pregnancy danger signs, community practices during pregnancy and the role of men. **Consent will be sought from the participants to record to discussions.**

Potential Risks
There is minimal risk associated with the study. All COVID-19 safety protocols will be strictly adhered to. You do not have to answer any question or take part in the study if you don't wish to do so, and that is also fine. You do not have to give us any reason for not responding to any question.

Benefits
There will be no direct benefits for participation in the study however the findings from the study will help to improve maternal healthcare by providing health workers with reliable data, leveraging on previous studies for healthcare practices.

Costs
There would be no cost incurred in this study.

This is to Certify that this Study's Inform Consent Form Has Been Approved by GHS-ERC for the Period 10/09/22 to 09/09/23
Sign ..... Date 12/09/22
Name Abena Apatu
GHC-ERC Administrator

Compensation
No monitary renumeration will be given to consenting participants. However, refreshments would be provided for the participants.

Confidentiality
We will not be sharing information about you to anyone outside of the research team. The information that we collect from this research project will be kept private. Data will be stored both electronically and in hard copies with access given only to the research team. Any information about you will have a code number instead of your name.

Voluntary Participation and Right to Leave the Research
Your participation in this study is your choice and its voluntary. There will be no penalty if you decide not to be in the study. You are free to withdraw from this research study at any time.

Protection of participants
All participants will be made to wear face mask before interviews are conducted in their homes and in the health facility. Participants without a face mask will be provided with face masks at no cost. Participants will also be provided with alcohol-based hand sanitizers to sanitize their hands before interviews are conducted. Physical distancing will be maintained during all interviews.

Protection of Research Team
All researchers will be provided with appropriate PPE and hand sanitizers for themselves and extra face masks for participants who do not have face masks. All data collectors and participants will follow strictly the laid down guidance from the Ghana Health Service Ethics Review Committee as shared to the Principal Investigators via email. All data collectors have been instructed to practice good personal hygiene through regular hand washing, the use of sanitizers, protective gloves and wearing facemasks. Social/physical distancing will be observed keeping at least one meter between data collector and interviewee during interviews.

Outcome and Feedback
All data/information collected will be saved and stored on a password encrypted device. The data from the study will help the stakeholders in maternal health to put measures in place to reduce stillbirths.

Funding information
The study is self-funded

Sharing of participants Information/Data
Data will be stored both electronically and in hard copies with access given only to the research team.

Provision of Information and Consent for participants
A copy of the Information sheet will be given to you after it has been signed or thumb-printed to take home.

Approval:
Approval for this study was obtained from the Ghana Health Services Ethical Review Committee (Approval Number:)

Contact for additional information
If you have questions about this activity, concerns, or complaints about this research study, please contact Joseph Asamoah Frimpong, Principal Investigator **asamoah.frimpong@gmail.com**; 0244944332.

Your right as a participant
This research has been reviewed and approved by the Ghana Health Service Ethics Review Committee (GHS-ERC). If you have any questions about your rights as a research participant, you can contact the GHS-ERC administrator, Ms. Nana Abena Apatu between the hours of 8am– 5pm through the telephone number +233503539896, or email address ethics.research@ghsmail.org.

This is to Certify that this Study's Inform Conse
Form Has Been Approved by GHS –ERC for th
Period 10/8/22 to 09/05/23
Sign ..... Date 12/05/22
Name Nana Abena Apatu
GHC-ERC Administrato

CONSENT FORM

STUDY TITLE: FACTORS ASSOCIATED WITH STILLBIRTH AND ASSESSMENT OF MATERNAL HEALTH AWARENESS AMONG RESIDENTS OF NORTHERN GHANA

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and all questions satisfactorily explained to me in a language I understand (**Dagbane/ Gonja/ Anufo/Mampruli/ Dagaare/ Dangbali/ Hausa/ Twi/ English**). I fully understand the contents and any potential implications as well as my right to change my mind (i.e., withdraw from the research) evenafter I have signed this form.
I voluntarily agree to be part of this research.

Name of Participant...Participants' Signature ....OR Thumb Print ....Date..................................

INTERPRETERS' STATEMENT

I interpreted the purpose and contents of the Participants' Information Sheet to the aforenamed participant to the best of my ability in the (**Dagbane/Gonja/Anufo/Mampruli/Dagaare/Dangbali/ Hausa/Twi/ English**) language to his proper understanding. All questions, appropriate clarifications sort by the participant and answers were also duly interpreted to his/her satisfaction.

Name of Interpreter................................Signature of Interpreter............................ OR Thumb Print ....
Date: .... Contact Details

STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was readand explained satisfactorily to the participant in the language, he/she understood (**Dagbane/Gonja/Anufo/Mampruli/Dagaare/Dangbali/Hausa/Twi/English**). I confirm that he/she was given the opportunity to ask questions/seek clarifications and samewere duly answered to his/her satisfaction before voluntarily agreeing to be part of the research.

Name: ....Signature................................ OR Thumb Print .... Date: ....

INVESTIGATOR STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to read and learn about the study. Allquestions and clarifications raised by the participant have been addressed.

Researcher's name.. Signature ....

Date..

This is to Certify that this Study's Inform Consent Form Has Been Approved by GHS – ERC for the Period 10/08/22 to 09/08/23
Sign.......... Date 12/08/22
Name Diana Abena Apatu
GHC-ERC Administrato

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ANNEXURE 7: IN-DEPTH INTERVIEW CONSENT FORM

PARTICIPANTS INFORMATION SHEET: IN-DEPTH INTERVIEW FACTORS ASSOCIATED WITH STILLBIRTH AND ASSESSMENT OF MATERNAL HEALTH AWARENESS AMONG RESIDENTS OF NORTHERN GHANA

Good day, my name is. Joseph Asamoah Frimpong. I am a PHD candidate at the University of Namibia School of Nursing and Public Health, Namibia. I am conducting a convergent mixed method research study to determine factors associated with stillbirth and assessment of maternal health awareness among residents of northern Ghana.

Background and purpose of research

The WHO defines stillbirth as when a baby is born dead after 24 completed weeks of pregnancy. This can have a significant effect on the mothers and families at large. One indicator of still birth is the access to quality of care received by pregnant women. Majority of people believe that stillbirths are a s a result of sins of mothers or demonic influence. Complications during childbirth, post term pregnancy, maternal infections in pregnancy, maternal disorders among others are known to be leading causes of stillbirth. Most of these causes are preventable. These factors however may vary depending on setting. More than 50% of perinatal mortality globally are caused by stillbirths. This rate is about 4 to 10 times in developing countries as compared to developing countries. This rate is highest in Sub Saharan Africa of which Ghana is no exception. The highest rate of stillbirths in Ghana is reported in Northern Ghana. This study therefore seeks to determine factors associated with stillbirth and assessment of maternal health awareness in Northern Ghana.

Nature of research

With the increasing rate of stillbirths reported in Northern Ghana, successful determination of factors associated with stillbirth and knowledge on maternal health awareness will provide reliable current data to ensure a reduction in the rate of stillbirths. Also, healthcare practices, and further interventions (training, public health education/ community sensitization) and best use of resources would help reduce stillbirths. In addition, the identified risk factors would inform maternal health programs on priority areas to focus their interventions to reduce stillbirth. The policy brief from this study would be a concise summary of issues related to stillbirth identified from this study, the policy options to deal with it, and some recommendations on the best option. The recommendations from the policy brief will inform maternal health policy in Ghana which is still under development to reduce stillbirth. The brief would be aimed at government policymakers and other stakeholders who has the authority to influence policy. The study will therefore help determine factors associated with stillbirth and assessment of maternal health awareness in Northern Ghana to guide interventions towards ensuring a reduction in rate of stillbirth. All residents within selected strata and healthcare workers of 18 years and above who agree to be part of the study at the time of visit will be eligible to participate in the study.

Participant's involvement

In-depth interviews would be carried out using a discussion guide. This will be a one-on-one interview with healthcare workers in health facilities that provide maternal health services. The sessions will take place at the residence of the health workers or any preferred location. The discussion guide will cover facility preparedness, maternal health interventions, formal health worker issues, and the role of men. **Consent will be sought from the participants to record the interview.**

Potential Risks

There is minimal risk associated with the study. All COVID-19 safety protocols will be strictly adhered to. You do not have to answer any question or take part in the study if you don't wish to do so, and that is also fine. You do not have to give us any reason for not responding to any question.

Benefits

There will be no direct benefits for participation in the study however the findings from the study will help to improve maternal healthcare by providing health workers with reliable data, leveraging on previous studies for healthcare practices.

Costs

There would be no cost incurred in this study.

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Period 16/05/22 to 09/05/23
Sign........ Date 12/05/22
Name Hana Abena Asafu
GHC-ERC Administrator

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Compensation
No renumeration will be given to consenting participants.

Confidentiality
We will not be sharing information about you to anyone outside of the research team. The information that we collect from this research project will be kept private. Data will be stored both electronically and in hard copies with access given only to the research team. Any information about you will have a code number instead of your name.

Voluntary Participation and Right to Leave the Research
Your participation in this study is your choice and its voluntary. There will be no penalty if you decide not to be in the study. You are free to withdraw from this research study at any time. **Protection of participants**
All participants will be made to wear face mask before interviews are conducted in their homes and in the health facility. Participants without a face mask will be provided with face masks at no cost. Participants will also be provided with alcohol-based hand sanitizers to sanitize their hands before interviews are conducted. Physical distancing will be maintained during all interviews.

Protection of Research Team
All researchers will be provided with appropriate PPE and hand sanitizers for themselves and extra face masks for participants who do not have face masks. All data collectors and participants will follow strictly the laid down guidance from the Ghana Health Service Ethics Review Committee as shared to the Principal Investigators via email. All data collectors have been instructed to practice good personal hygiene through regular hand washing, the use of sanitizers, protective gloves and wearing facemasks. Social/physical distancing will be observed keeping at least one meter between data collector and interviewee during interviews.

Outcome and Feedback
All data/information collected will be saved and stored on a password encrypted device. The data from the study will help the stakeholders in maternal health to put measures in place to reduce stillbirths.

Funding information
The study is self-funded

Sharing of participants Information/Data
Data will be stored both electronically and in hard copies with access given only to the research team.

Provision of Information and Consent for participants
A copy of the Information sheet will be given to you after it has been signed or thumb-printed to take home.

Approval:
Approval for this study was obtained from the Ghana Health Services Ethical Review Committee (Approval Number:)

Contact for additional information
If you have questions about this activity, concerns, or complaints about this research study, please contact Joseph Asamoah Frimpong, Principal Investigator **asamoah.frimpong@gmail.com**; 0244944332.

Your right as a participant
This research has been reviewed and approved by the Ghana Health Service Ethics Review Committee (GHS-ERC). If you have any questions about your rights as a research participant, you can contact the GHS-ERC administrator, Ms. Nana Abena Apatu between the hours of 8am– 5pm through the telephone number +233503539896, or email address ethics.research@ghsmail.org.

This is to Certify that this Study's Inform Conse-
Form Has Been Approved by GHS-ERC for th-
Period 16/05/22 to 15/05/23
Sign. [signature] Date 12/05/22
Name Nana Abena Apatu
GHC-ERC Administrator

CONSENT FORM

STUDY TITLE: FACTORS ASSOCIATED WITH STILLBIRTH AND ASSESSMENT OF MATERNAL HEALTH AWARENESS AMONG RESIDENTS OF NORTHERN GHANA

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and all questions satisfactorily explained to me in a language I understand (**Dagbane/ Gonja/ Anufo/Mampruli/ Dagaare/ Dangbali/ Hausa/ Twi/ English**). I fully understand the contents and any potential implications as well as my right to change my mind (i.e., withdraw from the research) evenafter I have signed this form.
I voluntarily agree to be part of this research.

Name of Participant.....Participants' Signature .....OR Thumb Print .....Date.....

INTERPRETERS' STATEMENT

I interpreted the purpose and contents of the Participants' Information Sheet to the aforenamed participant to the best of my ability in the (**Dagbane/Gonja/Anufo/Mampruli/Dagaare/Dangbali/ Hausa/Twi/ English**) language to his proper understanding. All questions, appropriate clarifications sort by the participant and answers were also duly interpreted to his/her satisfaction.

Name of Interpreter.....Signature of Interpreter..... OR Thumb Print .....
Date: ..... Contact Details

STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was readand explained satisfactorily to the participant in the language, he/she understood (**Dagbane/Gonja/Anufo/Mampruli/Dagaare/Dangbali/Hausa/Twi/English**). I confirm that he/she was given the opportunity to ask questions/seek clarifications and samewere duly answered to his/her satisfaction before voluntarily agreeing to be part of the research.

Name: .....Signature..... OR Thumb Print ..... Date: .....

INVESTIGATOR STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to read and learn about the study. Allquestions and clarifications raised by the participant have been addressed.

Researcher's name..... Signature .....

Date.....

This is to Certify that this Study's Inform Consent Form Has Been Approved by GHS-ERC for the Period 10/05/22 to 09/05/23
Sign ..... Date 12/05/22
Name ..... GHC-ERC Administrator

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ANNEXURE 8: CASE CONTROL DATA COLLECTION FORM

Respondent's Entry ID…… Facility ID……
Date……

Name of Household…… Geolocation of interview……

Region of facility
a. Northern
b. North East
c. Savannah
d. Upper East
e. Upper West

District of Facility…….

Sub District of Facility…….

Type of study participant (mother)
a) Case
b) Control

If Control, enter reference case Entry ID……

Sociodemographic Information of Mother

Q1. Age of mother……..

Q2. Height of mother (cm) (If it was not done or it's missing indicate 999)……

Q3. Weight of mother (kg) (Use last known weight measurement and If it was not done or it's missing indicate 999)……

Q5. Community of mother……..

Q6. District of mother……..

Q7. Sub-district of mother…….

Maternal Obstetric and Fetal Information
Although facility based some of the information can be found in the mother's ANC booklet if it's not recorded in the facility books
Q8. Parity……..

Q9. Gravida……..

Q10. Pregnancy gestational age at registration (weeks)……

Q11a. Did mother go into labour?

a) Yes
b) No

Q11b. Labour duration (minutes)…….

Q12. Sex of baby

a) Male
b) Female
c) Indeterminate

Q13. Birth weight of baby (If it was not done or it's missing indicate 999)…….

Q14. Fetal malpresentation

a) Yes
b) No

Q15. Malformation (birth defect)

a) Yes
b) No

Q16. Was partograph used in monitoring mother? (Look for evidence of the monitoring sheets to answer YES)

a) Yes
b) No

Q17. Mode of Delivery

a) SVD
b) C/S
c) Vacuum
d) Forceps delivery

Q18a. Delivery Outcome

a) Alive
b) Stillbirth

Q18b. Type of stillbirth

a) Fresh
b) Mascerated

Maternal Medical Information

Q19. Blood Group

a) A
b) B
c) O

d) AB
e) Unknown

Q20. Rhesus factor
a) Positive
b) Negative
c) Unknown

Q21. Malaria in pregnancy presence (Last known test results)
a) Yes
b) No
c) Unknown

Q22. Number of SP doses taken (If it was not done or it's missing indicate 999)…….

Q23. Number TT/Td doses received (include previous pregnancies if any and If it was not done or it's missing indicate 999)……

Q24. Hemoglobin level at 36 weeks (g/dl) (If it was not done or it's missing indicate 999)…….

Q25. State of perineum
a) Normal
b) Abnormal

Q26. HIV status
a) Positive
b) Negative
c) Not done

Q27. Hepatitis B status
a) Positive
b) Negative
c) Not done

Q28. Syphilis status
a) Yes
b) No

Q29. G6PD status
a) Yes
b) No

Q30. Sickle cell Status
a) Yes
b) No

Q31. Number of ANC visits (If it was not done or it's missing indicate 999)……

Q32. Gestational Diabetes

a) Yes
b) No

Q33. Pregnancy induced hypertension

a) Yes
b) No

Q34. Pre- eclampsia

a) Yes
b) No

Q35. Eclampsia

a) Yes
b) No

Q36. Anaemia

a) Yes
b) No

Q37. Abruption of placenta

a) Yes
b) No

Q38. Placenta Previa

a) Yes
b) No

Q39. Antepartum haemorrhage (Bleeding before delivery)

a) Yes
b) No

Q40. Premature rupture of membranes

a) Yes
b) No

Q41. Obstructed labour

a) Yes
b) No

Q42. Sepsis

a) Yes
b) No

Q43. Female genital mutilation (FGM) presence

a) Yes
b) No

Community Level Data

Q44. Type of settlement of mother's residence
a) Rural
b) Peri-Urban
c) Urban

Q45. Mother's level of education
a) No education
b) Primary
c) JHS
d) SHS
e) Tertiary

Q46. Mother's marital status
a) Single
b) Married
c) Divorced
c) Separated
d) Widowed
e) Cohabiting

Q47. Mother's religion
a) None
b) Muslim
c) Christian
d) Traditional
e) Others (specify)

Q48. Mother's ethnicity…….

Q49. Mother's occupation
a) Farmer
b) Trader
c) Artisan
d) Formal employment
e) House wife
f) Unemployed
g) Others (specify)

Q50. Number of children Alive……..

Q51. Number of children Dead……

Q52. Mother's relationship to partner
a) None
b) Husband

c) Boyfriend
d) Relative
e) Rapist
f) Others (specify)

Q53. Partner's Age……..

Q54. Partner's level of education
a) No education
b) Primary
c) JHS
d) SHS
e) Tertiary

Q55. Partner's religion
a) None
b) Muslim
c) Christian
d) Traditional
e) Others (specify)

Q56. Partner's ethnicity…….

Q57. Partner's occupation
a) Farmer
b) Trader
c) Artisan
d) Formal employment
e) Unemployed
f) Others (specify)

Q58. Who delivered baby? (months)
a) Health worker
b) In-law
c) Traditional birth attendant
d) Oneself
e) Others (specify)

Q59. Place of delivery
a) Health facility
b) Home
c) Others (specify)

Q60. Medication use during pregnancy aside those prescribed by a health professional
a) Yes
b) No

Q61. Do you take alcohol?

a) Yes
b) No

Q62. Does your partner take alcohol?

a) Yes
b) No
c) Do know

Q63. Do you take tobacco?

a) Yes
b) No

Q64. Does your partner take tobacco?

a) Yes
b) No
c) Do know

Q65. Has anyone in your family/bloodline experienced still birth before?

a) Yes
b) No

ANNEXURE 9: KAP SURVEY DATA COLLECTION FORM

Interview Information

Interviewer Initials:…… Interviewer Phone #.....
Date:……

Socio-demographic Characteristics

1. Region
    a. North East
    b. Northern
    c. Savannah
    d. Upper East
    e. Upper West

2. District……

3. Subdistrict…….....

4. Name of community

5. Type of settlement
    a. Rural
    b. Urban

6. Age of respondent……..

7. Marital status
    a. Single
    b. Married
    c. Divorced
    d. Separated
    e. Widowed
    f. Others (Specify)……

8. Ethnicity……

9. Level of education
    a. No education
    b. Primary
    c. JHS
    d. SHS
    e. Tertiary

10. Occupation
    a. Farmer
    b. Trader

c. Artisan
d. Formal employment
e. Unemployed
f. Others (Specify)……

11. Religion
    a. Muslim
    b. Christian
    c. Traditional
    d. None
    e. Others (Specify)……

12. Have you ever given birth before?
    a. Yes
    b. No

13. How many of your children are alive?.....

14. How many of children are dead?.....

Knowledge on maternal health

15. Who is at risk of experiencing complications during pregnancy?
    a. Don't know
    b. Women below 18yrs
    c. Women with first pregnancy at 35yrs and above
    d. Hypertensive women
    e. Diabetic women
    f. Any woman
    g. Others (Specify)……
16. Which group of people are supposed to seek preconception care?
    a. Don't know
    b. Women below 18yrs
    c. Women with first pregnancy at 35yrs and above
    d. Hypertensive women
    e. Diabetic women
    f. Any woman planning to get married
    g. Others (specify)……

17. What is the recommended interval for good birth spacing?
    a. Any interval
    b. less than 2 years
    c. 2 years and above
    d. Don't know

18. What are some of the risks associated with poor birth spacing?
    a. Don't know

b. Congenital disorders/malformation
c. Premature labour
d. Infant mortality
e. Low birth weight
f. Miscarriage
g. Stillbirth
h. Placenta abruption
i. Others (Specify)…….

19. What are some of the effects of smoking during pregnancy?
    a. Don't know
    b. Intrauterine growth restriction
    c. Congenital malformation
    d. Premature labour
    e. Infant mortality
    f. Low birth weight
    g. Miscarriage
    h. Others (Specify)…….

20. What are some of the benefits of having a healthy meal during pregnancy?
    a. Enhances fetal growth
    b. Prevents maternal anaemia
    c. Reduces risk of adverse pregnancy outcomes
    d. Others (Specify)…….

21. What are some of the benefits of Folic acid supplementation?
    a. Prevents birth defects (Neural tube defects)
    b. Boost blood/Hb of pregnant woman
    c. Others (Specify)…….

22. What are some of the risks of maternal Anaemia for baby?
    a. Intrauterine growth restriction
    b. Fetal hypoxia
    c. Preterm labour
    d. Low birth weight
    e. Likelihood of developing childhood anaemia
    f. Death during or after delivery
    g. Potential for poor cognitive development
    h. Congenital malformation/defects
    i. Others (Specify)…….

23. When is the best time to go for first ANC visits?
    a. When you miss your period
    b. As soon as pregnancy is detected
    c. Between 6 - 8 weeks of pregnancy
    d. Others (Specify)…….

24. What is the minimal number of ANC check-ups during pregnancy ?.....

25. What are some of the benefits of antenatal check-ups?
    a. Assess the state of health of the mother and fetus early in pregnancy
    b. Prevent unwanted complications during pregnancy
    c. Early detection of abnormalities in mother and fetus
    d. Prevent illness in mother and fetus
    e. Prepare the family for the coming baby
    f. Others (Specify)…….

26. What are some of the signs of maternal health problems/ complications during pregnancy?
    a. Vaginal bleeding
    b. Fever
    c. Continuous vomiting
    d. Dizziness/blurred vision
    e. Severe waist pains
    f. uneven heartbeat
    g. Swollen feet, hand and/or face
    h. Severe headache
    i. Fits/convulsion/fainting
    j. Decreased or cessation of baby's movement
    k. Others (Specify)…….

27. What are some of the benefits of health facility delivery?
    a. Don't know
    b. Access to NICU
    c. Pain control
    d. Staff support
    e. Availabilities of interventions
    f. See birth as a natural process
    g. Feels comfortable in a hospital setting
    h. Others (Specify)…….

Attitude towards maternal health

28. In your opinion, which group of people are supposed to seek preconception care?
    a. Don't know
    b. Women below 18yrs
    c. Women with first pregnancy at 35yrs and above
    d. Hypertensive women
    e. Diabetic women
    f. Any woman planning to get pregnant
    g. Others (Specify)…….

29. In your opinion, do you think preconception care is important during the reproductive age?

a. I agree
b. I disagree
c. I don't know

30. Do you think preconception care has implications for pregnancy and delivery?
a. I agree
b. I disagree
c. I don't know

31. What advice would you give a pregnant friend/member of your household concerning her health during pregnancy?
Start ANC early
a. Eat more fruits and vegetables
b. Eat healthy meal
c. Exercise regularly
d. Adhere to iron folate supplementation schedule
e. Adhere to SP schedule
f. Avoid alcoholic drinks
g. Avoid smoking
h. Get enough sleep/rest
i. Others (Specify)……

32. What advice would you give a pregnant friend/member of your household concerning the place of delivery?
a. Delivery by a trained health professional is safe
b. Delivery by a TBA safe
c. Delivery by oneself is good
d. Others (Specify)……

33. If you/member of your household were to become pregnant, where would you choose as a place of delivery?
a. Health facility
b. TBA
c. Self-delivery
d. Others (Specify)……

34. What advice would you give a pregnant friend/member of your household concerning her health during the postnatal period?
a. Start PNC early
b. Adhere to PNC schedules
c. Eat more fruits and vegetables
d. Eat healthy meal
e. Exercise regularly
f. Breastfeed on demand
g. Protect herself and baby from mosquito bite
h. Avoid alcoholic drinks
i. Avoid smoking
j. Get enough sleep/rest

k. Others (Specify)……

35. In your opinion, for which women is it essential to seek postnatal care?
    a. All women who has gone through delivery
    b. Women who lost their babies at delivery only
    c. Women who developed complications following delivery only
    d. Women who are sick only
    e. Women with sick baby only
    f. Women with babies who cannot suck/eat only
    g. Others (Specify)……

36. Do you think maternal healthcare has any implications for delivery outcomes
    a. Yes
    b. No
    c. Don't know

37. In your opinion, what do you think is the cause of still birth.
    a. I don't know
    b. Poor feeding
    c. Labour complications
    d. Infections (malaria, etc)
    e. High blood pressure of the mother
    f. Excessive Bleeding
    g. Abuse of taboo
    h. Bad spirits
    i. Others (Specify)……

38. In your opinion, do you think exercise is necessary during pregnancy?
    a. Yes
    b. No
    c. Don't know

Practices towards maternal health during the most recent pregnancy

39. Did you receive preconception care before your recent pregnancy?
    a. Yes
    b. No

40. Did you undergo antenatal care during your recent pregnancy?
    a. Yes
    b. No

41. How many ANC visits did you undertake during your recent pregnancy?.....

42. What was the gestational age of the pregnancy when you had your first ANC visit? (in weeks)……

43. If this is not your first pregnancy, what was the spacing between your most recent pregnancy?
    a. Below 1 year
    b. One year
    c. Two years
    d. Above two years
    e. Not applicable

44. Did you take folic acid supplementation before your recent pregnancy?
    a. Yes
    b. No

45. Did you take Folic Acid during your recent pregnancy?
    a. Yes
    b. No

46. Did you exercise during your recent pregnancy?
    a. Yes
    b. No

47. Did you smoke during your recent pregnancy?
    a. Yes
    b. No

48. Did you take alcohol during your recent pregnancy?
    a. Yes
    b. No

49. During your recent pregnancy, did you go a day without having a meal?
    a. Yes
    b. No

50. Did you include extra vegetables in your meals during your recent pregnancy? (more vegetables than you used to take)
    a. Yes
    b. No

51. Did you consume drugs without doctor's advice while planning for pregnancy?
    a. Yes
    b. No

52. Did you practice any food taboo during your recent pregnancy?
(Anything stopping mother from taking a particular meal/food due to pregnancy)
    a. Yes
    b. No

53. How often did you receive health information every week?
    a. Yes

b. No

54. Which of the following screening did you undertake during your recent pregnancy?
a. None
b. HIV
c. Hepatitis B
d. VDRL/Syphilis
e. Others (Specify)……

Barriers to care

55. Who would decide if you/a woman in your household should seek care if a complication were to arise during pregnancy?
a. Husband
b. In-law
c. Myself
d. Others (Specify)……

56. Who has the greatest influence on prenatal care decisions?
a. Husband
b. In-law
c. Myself
d. Others (Specify)……

57. Who has the greatest influence on prenatal care decisions?
a. Husband
b. In-law
c. Myself
d. Others (Specify)……

58. Who has the greatest influence on decisions about place of delivery?
a. Husband
b. In-law
c. Myself
d. Others (Specify)……

59. Who has the greatest influence on decisions concerning postnatal care?
a. Husband
b. In-law
c. Myself
d. Others (Specify)……

60. Geolocation of interview (GPS)

Thank respondent for participating and end interview

ANNEXURE 10: DISCUSSION GUIDELINES - FOCUS GROUP DISCUSSION

Community perceptions of Pregnancy

- How is pregnancy received in this community? Probe for community attitudes towards pregnancy and child birth, especially desire for children.
- Are there traditional practices associated with pregnancy? Probe for taboos and cultural imperatives.
- What is the responsibility of the family to the pregnant woman? Probe for the responsibility of men and the community at large. Ask if these responsibilities are being fulfilled.
- What are your opinions about family planning? Probe: If they will encourage their spouses to take up a method.

Awareness of pregnancy danger signs

- What are some of the signs of severe disease in pregnant women?
- How does the community manage such health problems?
- What improvements are needed?

Community practises during pregnancy

- Does the family or community make birth arrangements to ensure that the woman delivers safely? Probe for the specifics.
- As a community, what can you do to support pregnant women in need of emergency care to reach the referral point in time?
- What is the difference between the treatment that is offered by herbalists and that offered by the hospitals?
- What usually motivate community members to send sick pregnant women to traditional healers first?

- Where would you prefer that pregnant women go for health care? why?
- How can you encourage pregnant women to use that source of care?
- How often does the pregnant woman have to visit the hospital before her condition is declared as one for the traditionalist? Probe for success stories from traditional treatments.
- What makes you declare some illnesses as being caused by evil spirits?
- Can conditions caused by evil spirits be managed in health facilities?

The Role of Men

- How are men involved in caring for pregnancies in this community?
- Will men in this community agree to accompany their pregnant wives to antenatal clinics? Why?
- Do they take interest in what happens at the antenatal clinic? Find out if they supervise their wives to take their medicines.
- How does the community work with the District Heath Management Team in implementing maternal health interventions at the community level?

ANNEXURE 11: GUIDELINES FOR IN-DEPTH INTERVIEWS

Major Potential Questions for In-depth Interview

Facility preparedness

- What are the services that your facility provides to pregnant women?
- What are some of the signs of severe disease in pregnant women?
- What kind of maternal complications can your facility handle? [Find out what happens if the facility cannot handle a particular complication.]
- Kindly describe your responsibilities to pregnant women? Probe for responsibilities of the facility and that of the individual as a professional.
- What are the responsible behaviours that pregnant women have to exhibit in order to ensure a safe delivery? Probe for health worker expectations from the family and the community.

Maternal health interventions:

- What maternal health interventions are currently being carried out in the community? Probe for routine maternal health programs such as home visits.
- How is the community involved in these interventions? Do you think community involvement is necessary?
- What suggestions can you make for improvement?

Formal Health Worker Issues:

- How can you ensure that women do not lose trust in the health care system and resort to home remedies including herbs?
- Please describe what is usually done during antenatal visits? Probe for procedures during delivery and the postnatal period.

- Are there instances where the hospital has failed to treat some conditions and the women were asked to try home treatment? Probe for the problem and the outcome.
- What are your views on the use of traditional healers and herbalists by pregnant women suffering complications?

The Role of Men

- Do you think men should have a stronger role to play in maternal health? Probe for the specific role.
- Do men in this community accompany their pregnant wives to antenatal clinics? Why?
- Do they take interest in what happens at the antenatal clinic? Find out if they supervise their wives to take their medicines.
- How can you improve the involvement of men in reproductive health issues? What are the strategies being adopted by the health service?