

Original Research Article

Antenatal Determinants and Birth Outcomes among First-Time Mothers in Tamale Metropolis

Abstract

Aim: Early Antenatal Care initiation among first-time mothers is crucial for the health of both the baby and mother. Unfavorable birth outcomes are mostly associated with late initiation of antenatal care that is designed to prevent complications associated with childbirth. This study examined the factors that influence antenatal care practices among first-time mothers within Tamale Metropolis. **Methods:** The study design was cross-sectional and the study approach was mixed method. A simple random sampling technique was used to select the health facilities. The data collection techniques were survey and interview and the tools were questionnaire and interview guide. Data were analyzed using Statistical Package for Social Sciences version 20, and thematic content analysis for quantitative and qualitative data respectively.

Results: Results showed that 80% of first-time mothers visited the centers for antenatal care services more than four times. Factors influencing antenatal care patronage include the distance from facilities, support from family, and the educational level of pregnant women. Again, the majority of first-time mothers who patronized antenatal care services throughout their respective pregnancy terms delivered full-term babies. The age of the respondents was significantly associated with antenatal care attendance, while the presence of a significant correlation between occupation and patronage of antenatal care services.

Conclusion: The study thus recommends that all stakeholders in health, including frontline health providers, should emphasize the effectiveness of adequate antenatal care attendance and the need for early initiation. Additionally, Ghana Health Service needs to develop programs to strengthen Focus antenatal care and counseling on birth preparedness.

Keywords: Antenatal, Determinants, Birth Outcomes, First-Time Mothers.

1. INTRODUCTION

Antenatal care (ANC) according to Tuncalp et al. [1] is care provided to women throughout their pregnancy by skilled healthcare professionals. It includes screening, prevention, and management of pregnancy-related complications, and health education and promotion. Thus, ANC is instituted for pregnant women to ensure that the pregnancy causes no harm to either the mother or the foetus [2-3]. Pregnancy as another stage in a woman's life demands enough caution, especially for first-time pregnancies. First-time mothers do not have any experience and are new in neonatal care practices. Hence Antenatal care that provides medical/health care screening and

prophylactic treatments given to a pregnant woman from conception to the birth of the child is very important, as it controls and manages some factors that might adversely affect a pregnancy outcome [4]. According to Asundep et al. [3], antenatal care is still one of the Safe Motherhood Interventions, and when administered properly, it can help reduce maternal and perinatal mortality.

Prenatal care is a public health service that ensures that any problems in the mother's pregnancy are discovered early [5]. As a result, women must give birth in the presence of competent birth attendants who can provide guidance and an enabling environment for both the mother and the infant to survive, especially in the case of a first-time mother. Women will therefore see no need for hospital birth if they receive optimal antenatal care, lowering the risk of pregnancy-related morbidity and mortality [6]. Every year, about 200 million conceptions occur, with roughly 40% of these resulting in pregnancy-related issues for women worldwide [7].

Recent studies show that a variety of unfavourable birth outcomes, including low birth weight and prematurity, have become a problem in most countries [4]. Research shows that women who attended ANC on fewer occasions had a 51% chance of having a low-birth-weight child compared to those who had enough appointments [3]. According to the Ghana Maternal Health Survey, Ghana had a Maternal Mortality Ratio of 310 for every 100,000 live births in 2017, which is unacceptably high when compared to the global objective of less than 70 per 100,000 live births by 2030. According to the Multi-Indicator Survey [8], the Northern region of Ghana has been the only region in the country to have recorded a lower percentage of pregnant women attending health facilities for prenatal care over the last five years.

According to the Ghana Demographic Health Survey [9] cited in Mahama [10], it is indicated that for the past five years in the Northern Region, 92% out of 480 women who had live births were recorded to have received antenatal care from skilled providers. Also, among 709 deliveries surveyed in Northern Ghana, only 36.4% were done by a skilled provider, and 35.4% in a health institution. The Northern Region had the lowest figure when these percentages were compared to all of Ghana's regions.

According to recent studies, a variety of negative birth outcomes among first-time mothers, such as low birth weight and prematurity, have become an issue in most countries [4]. In their study, Afaya et al. [6] indicated that 303 000 women and adolescent girls who obviously are first-time mothers die worldwide due to pregnancy and childbirth-related problems. The 2014 Ghana Demographic and Health Survey [9] revealed that for females who gave birth five years before the survey, 97% of them accessed ANC services at least once in their last childbirth, and nearly nine in ten women had four or more ANC visits.

There is a pool of literature on the determinants of ANC globally and specifically in Africa [e.g., 10,6]. Moreover, health outcomes among first-time mothers are heterogeneous across the country and among nations of the global north and the global south. Therefore, focused antenatal care can prepare the first-time mother to commence and continue good practices compared to poor or

absent Antenatal care during this period. Based on this premise, this study examines the determinants of ANC practices among first-time mothers in Northern Ghana (Tamale) such that need-driven policies can be formulated to ensure that ANC compliance is enhanced in the study area.

2. METHODOLOGY

2.1 Profile of Tamale Metropolitan Area

Tamale metropolis is located in the northern region of Ghana. Geographically, Tamale is located on latitude 9° '23'N and longitude 0° 50'W. It is the administrative capital of the Northern Region of Ghana. The Tamale metropolis shares a boundary with the SaveluguNanton municipality in the North, the East Gonja district in the South, Tolon District in the West, and the Yendi Municipality in the East. The Metropolis occupies approximately 750 sq. km, equivalent to 13% of the total land area of the Northern Region.

2.2 Study Design

The study employed a cross-sectional study design with a mixed-method approach. Using both qualitative and quantitative data. The cross-sectional design is the most appropriate approach when measuring the prevalence of a condition, knowledge, and attitude among patients and health professionals in validation studies [11].

2.3 Study Population

The participants in this study were first-time mothers (15-49 years old) and midwives within the Tamale Metropolis.

2.3.1 Inclusion criteria

First-time mothers and registered midwives from government health facilities.

2.3.2 Exclusion criteria

First-time mothers who are not within the Tamale Metropolis would be excluded from the study. Midwives in private health facilities would be excluded from the study. In addition, midwives without a license to operate would be excluded.

2.4 Sample Size Determination

The sample size was determined using *Yamane's formula*

$$n = \frac{N}{1 + N(e)^2}$$

Where;

n= Sample size

N= Total number of reproductive-age women in the Tamale Metropolis = 59,341

e= margin of error at 95% Confidence interval = 0.05 or 5%

$$n = \frac{59,341}{1 + 59,341 (0.05)^2}$$

$$n = 397.32 \sim 397$$

Using the 2010 Population and Housing Census District Analytical Report for Tamale Metropolis, the approximate sample size will be **397**.

2.5 Sampling Procedure

A simple random sampling technique was used to select four facilities: Reproductive and Child Health Centre, Tamale West Hospital, Nyohini Health Centre, and Tamale Central Hospital, from the 26 government health facilities in Tamale Metro.

Purposive sampling was used to select ten (10) midwives for in-depth interviews (qualitative), and simple random sampling was used to select 397 first-time mothers for the quantitative aspect of the study. Registers of various facilities were used as a sampling frame, and the 397 study participants were drawn from the registers randomly.

2.6 Data Collection

The qualitative aspect of the study employed an in-depth interview with some Community Health Nurses and Midwives. The quantitative aspect of the study employed an interviewer-administered questionnaire with semi-structured questions on antenatal care given to women who came for postnatal care services. The data was collected over three weeks, from 21st June 2021 to 9th July 2021. Adequate check for missing questions without answers on the field was undertaken and the data was properly sealed in a box before and after the data collection to ensure safe transport to and from the field.

2.7 Data Analysis

Statistical Package for Social Sciences version 20 was used to analyze the data. Frequencies and percentages were used to present categorical data. Means and standard deviations were used to display continuous data. Significant variables from the bivariate analysis were fitted in logistic regression models, and all confounders were accounted for; statistical significance was set at $p < 0.05$. The qualitative data were first of all transcribed verbatim from the recordings of the in-depth interviews. After the transcription, thematic analysis was used to organize the data into sections or themes by coding each interview answer by reading every sentence of the transcript and then identifying answers that are similar to each category or area. The individual responses were used in triangulation. The concepts extracted from the themes were then presented in narratives and used to support the quantitative results.

2.8 Ethical Consideration

Permission was obtained from the Tamale Metropolitan Health Directorate and the various facilities, and ethical approval was obtained from Kwame Nkrumah University of Science and Technology, a committee of Human Research, publication and Ethics ref: CHRPE/AP/266/21

3. RESULTS

3.1 Demographic characteristics

The total number of respondents in the study was 390 (**Table 1**). More than half (53.3%) of the respondents were from rural areas, and almost 60% were between the ages of 21 and 30. About

70% were Dagombas, and 76.7% were Muslims. Eight out of 10 respondents were married, and about 2% were cohabitating. One-third were employed in the public sector, and 42.9% were unemployed. The majority (38.5%), said they have schooled up to the tertiary level.

3.2 Practices of ANC

Almost all (98.7%) of the respondents reported that they had ever heard about ANC before, and close to 60% heard about it from health facilities. One out of every ten respondents heard about ANC from their parents. Over 90% (92.3%) of respondents reported that the people attending ANC are pregnant women. Details are shown in **Table 2**.

3.3 Issues discussed during ANC

Table 3 indicates the issues discussed during ANC. From the table, 48.5% of respondents said the importance of ANC was discussed at ANC. More than half of respondents (54.1%) also reported that the services available at ANC are also discussed at ANC sessions. About 50.5% of respondents said they also discussed issues relating to early initiation of ANC, and about 33.6% said they discussed issues pertaining to pregnancy-related complications. On the effectiveness of discussions, 67.9% rated the effectiveness of discussions to be average.

3.4 Prevalence of antenatal care (ANC) attendance and services provided by health workers

Out of the total population of 390 respondents, 79.5% said they gave birth through vaginal delivery, while the remaining 20.5 delivered through Caesarian Section(**Table 4**). Approximately 87% of respondents delivered a full-term baby with 12.8% being pre-term. A good number (73.8%) of the respondents initiated ANC during the first three months of pregnancy, while the other percentage initiated it in their second and third trimesters. About 13% of the respondents said they had to go through cultural rights before going to the hospital and that prevented them from initiating ANC during the first trimester or first three months. About 98% of respondents said their blood sample was taken, and they were given injections in their upper arm and SP tablets to take.

On the services available during ANC, the majority of the respondents (98.7%) and (97.7%) had their urine and blood samples taken, respectively, and 87.4% of them attested that they were given the injection more than once. About 62% of them were given SP tablets thrice. For those who said they 'weren't given the tablets, about 3.3% of them said that they were not available at the facilities they went to for their ANC services, and 2.8% were allergic to the drug. An enormous number of respondents (92.1%) gave birth in either a hospital, Health Centre, or Community-Based Health and Planning Service (CHPs) compound assisted by either a Midwife or a Community Health Nurse, while 7.9% of them gave birth at home.

3.5 Bivariate analysis of factors associated with ANC attendance

In trying to establish an association between the age of respondents and then ANC attendance, there was a significant association ($P=0.043$). A significant association was also observed between occupation and then ANC attendance ($P=0.002$).

There was no association observed between the categories of people who go for ANC and then ANC attendance, and there was no significant association ($P=0.061$). Most of the significance of issues discussed at ANC were insignificant; however, marginal significance was observed between issues being discussed at ANC and ANC attendance, as the p-value was almost approaching insignificance ($P=0.047$). In addition, a significant association was observed between the effectiveness of issues discussed at ANC and then ANC attendance ($P=0.032$). A significant association was observed between the first pregnancy and then ANC attendance with a p-value of 0.028, but no statistical significance was observed between the mode of delivery and then ANC attendance ($P=0.897$). (**Table 5**)

The analysis revealed a significant association between ANC initiation in the last pregnancy and ANC attendance ($P < 0.001$). Place of delivery was also significantly associated with ANC attendance with $p < 0.001$. Similarly, a significant association was observed between the person who assisted in the delivery and the ANC attendance with a p-value less than 0.001. In trying to establish an association between the sustainability of children due to the money that is earned monthly and then ANC attendance, there was no significant association ($P=0.105$). The analysis revealed no association between the reason for attending ANC and then ANC attendance ($P=0.0471$). In addition, no significant association was established between the place of ANC attendance and then ANC attendance ($P=0.441$). On the contrary, a significant association was revealed between birth outcome and then ANC attendance ($P < 0.001$). The study observed no association between any cultural belief that prevents pregnant women from attending ANC and then ANC attendance, as the p-value was greater than the threshold for significance ($P=0.422$).

3.6 Predictors of ANC Attendance

Table 6 presents the multivariate analysis of factors that predict ANC attendance. From the table, factors that were significant in the bivariate analysis were used for further analysis in a logistic regression model. The R square value of the model was 18.9% and factors such as first pregnancy, birth outcomes, and place of delivery were still significantly associated with ANC attendance. Respondents who said it was their first pregnancy were 64% less likely to go for ANC attendance [A.O.R= 0.36, C.I (0.18-0.75), $P=0.006$] compared to those who had been pregnant before. Respondents who were previously delivered full-term birth babies were 70% less likely to go for ANC attendance [A.O.R=0.30, C.I (0.15-0.63), $P=0.001$] compared to those with a previous history of preterm delivery. Women who had previously been delivered at health facilities were 72% less likely to go for ANC attendance compared to their counterparts who were delivered at home [A.O.R=0.28, C.I (0.12-0.65), $P=0.003$].

3.7 Qualitative Aspect of ANC

A number of demographic and social factors influence antenatal practices among first-time mothers in the study area. Respondents mentioned factors such as facilities not being available, long distances, the performance of cultural rites before women could visit health

facilities for ANC, lack of knowledge of ANC, and financial problems. Some other respondents mentioned negative attitudes of staff towards clients. During the interviews, one of them said

"Well, in this facility, we take care of people from some of the remote communities like Fushegu, Bilahabila, KambongNaaYili, and Guunayiliamong others. The distance to this facility is far, unless someone whose husband has a motorbike to bring the person.

Another problem is we have a tradition they normally do in these communities and there is this culture errmm, they call it in the local dialect 'that's Dagbani as 'pirigibu.' So once a woman has been married and 'she's pregnant, she has no right or nobody has the right, it is taboo for anyone to call her a pregnant woman until her sister-in-law tells her or they perform that ritual on her. (Respondent #1)

Some of the respondents mentioned that good birth outcomes or prognoses were associated with ANC attendance. They opined that ANC attendance could lead to healthy deliveries without complications and early detection of abnormalities.

"Pregnancy outcome is not predictable at all, especially in first-time mothers but attending the antenatal clinic helps in detecting any risk or future problems during childbirth. (Respondent #6)

Challenges encountered by respondents during ANC performance of cultural rites and beliefs and inadequate education or ignorance about ANC. Another group mentioned staff's poor attitude towards clients and pregnant women spending long hours in queues. Responses of some respondents have been shown below:

"Mmmm, they have some religious beliefs that errmm, a first-time or a mother in her first trimester will have to do these their cultural practices before she can attend ANC. Then errmm they 'don't have much knowledge in ANC so they 'don't know the importance of coming to ANC during the first trim". (Respondent # 1)

There were some experiences shared by respondents on ways to improve ANC service. Some of these include a positive attitude towards work and a good client and nurse relationship, which will help improve services at ANC. Other areas include accessible and affordable for more patronage. On recommendations for first-time mothers on ANC practices, so many varied opinions were gathered from the respondents. Some of them mentioned that pregnant women should do well in patronizing these ANC services since it will help them and their foetuses. They spoke about the fact that pregnant women should adhere to the advice given by midwives. One of the health workers was noted to have said;

"Mmmm, ANC practice is safe and effective when correctly attended, will help both the foetus and the mother hence the need for pregnant women to patronize these ANC services".(Respondent 3)

4. DISCUSSION

4.1 Adoption Intensity of ANC Practices

ANC is an essential part of safe childbirth and as a result, should be commenced at an early stage of pregnancy. According to a report [12], pregnant women need to seek ANC in the first trimester of pregnancy, especially in developing countries. Results from this study on the Prevalence of ANC Practices in the Northern Region revealed that most respondents attended ANC for consultation during pregnancy. About 80% attended ANC for consultation more than 4 times. These findings are in line with the findings of the GDHS 2014 [13], and Afaya et al. [6] where knowledge and its associated factors regarding optimum utilization of antenatal care in rural Ghana were high (86%), even though only 62% were able to attend up to four globally. And even with this percentage, sub-Saharan Africa and South Asia have reported a lower ANC attendance rate. However, in the case of the participating health centres reported a majority of first-time mothers were frequent in their visits to healthcare facilities for checkups and other pregnancy-related activities. A similar study in the Northern region of Ghana concluded that approximately 81% of the respondents had ≥ 4 ANC visits during pregnancy, and coverage was over 99% [14]. Sadique [15] also conducted a cross-sectional design with a simple random sampling technique study that sought to examine the factors associated with the timing of antenatal care service initiation in two health facilities in the Tamale Metropolis which revealed that the majority of the respondents for the study (69.9%) initiated ANC service late (95%; CI: 64-76) while the remaining (30.1%) initiated ANC services early (95%; CI: 23.9-36.9).

4.2 Demographic and socio-economic factors that Influence ANC Attendance

Results from this study indicated that factors that influenced the patronage of ANC were: distance from facilities, support from family, and the educational level of pregnant women also influenced the increased patronage of ANC attendance. This was supported by Andrew et al. [16] in their study that revealed that although the understanding of the procedures involved in ANC was limited, several factors were identified to influence ANC attendance. These factors, according to the authors, are categorized into accessibility, attitudes to ANC, and interpersonal issues. Respondents mentioned cost and distance under the accessibility factors. Under attitudes to ANC, respondents mentioned the quality of care, waiting times, and perceptions of preventive care and medical interventions during pregnancy. Some of the interpersonal factors mentioned include a relationship with healthcare providers, family conflict, distance to health facility and transportation problems, financial constraints, difficulties in crossing big rivers during the rainy season to go to seek healthcare, shame to visit the clinic with torn clothes or tight dresses, shame for having too many pregnancies or being over 40 years old and pregnant. Service-related reasons also mentioned included negative attitudes of service providers, long hours of waiting, and poor quality of care. Abrahams et al. [17] also stated in their study that harassment by healthcare providers, cost of medical care, and long-distance travel are all barriers to seeking healthcare.

4.3 Association between ANC and birth outcomes

Antenatal care-seeking among first-time mothers is an important component of childbirth; many authorities have asserted that the negative birth outcomes can be attributed to the low patronage of ANC services. From this study, most first-time mothers who patronized ANC services throughout their respective pregnancy terms delivered full-term babies. From the analysis, the age of the respondent was significantly associated with ANC attendance. There was another significant association between occupation and then ANC attendance. Logistic regression was performed, and factors such as first pregnancy, birth outcomes, and place of delivery were still significantly associated with ANC attendance. Adane et al. [4] and Ganle et al. [18] argue that the variety of unwanted birth outcomes is attributed to low ANC attendance, with effects such as low birth weight and premature being more prevalent in some countries. Beeckman et al. [19] studied the relationship between antenatal care and preterm birth: the importance of the content of care in Brussels, Belgium. The findings of the study show that caring for a woman during pregnancy is associated with preterm birth. The results found that pregnant women who started care or ANC before the 14th week of gestation had a very low risk for preterm birth, compared to women who received less care. Chen et al. [20] conducted a study on Teenage pregnancy and adverse birth outcomes: a large population-based retrospective cohort study in California. Results of the study indicated that married women who received good prenatal care were educated, 'didn't smoke nor take alcohol were not at high risks of any adverse birth outcome. Kuhnt and Vollmer [21] also studied antenatal care services and their implications for children's vital and health outcomes, which revealed that, for at least one ANC visit, there is a 1.04% and 1.07% of the reduced chance of neonatal mortality and lower probability of infant mortality respectively.

4.4 Challenges of Adopting ANC Practices

Antenatal care, a component of reproductive health, remains one of the Safe Motherhood Interventions. When ANC is practiced properly, it will help reduce maternal and perinatal deaths. Which will in turn help the country meet the Sustainable Development goal agenda 2030. That is Ending Preventable Maternal Mortality (EPMM) by 2030, according to the Maternal Health Task Force report. From the study, the prevalent challenges that were identified in adopting ANC practices include; cultural rites, homes far from the facility, the attitude of staff, financial problems, and lack of education on ANC. Afaya et al. [6] assert that women and adolescent girls die worldwide as a result of pregnancy and childbirth-related problems. They stated that the majority of maternal deaths occur in low-resource settings and that while the number of deaths decreased from 1990 to 2013, some regions in West Africa continue to have high maternal mortality rates, with a Maternal Mortality Ratio (MMR) of 679 deaths per 100,000 live births in 2015. The Multi-Indicator Survey [8], indicates that over the past 5 years, the northern region of Ghana has been the only region that has recorded a lower percentage of less than 50% of pregnant women attending health facilities for antenatal care. And this is a result of the attitudes of health professionals, financial problems, distance, including others.

5. Conclusion

This study was conducted to examine the factors that influence ANC practices among pregnant women in Northern Ghana (Tamale). The study indicated an increase in patronage of ANC services in the study area due to the region's increased awareness through the realization that commitment to ANC attendance schedules helps control and manage some factors that might adversely affect the outcomes of pregnancy. This is further attributed to several other factors such as the demographic and social factors that influenced patronage of ANC: distance from facilities, support from family and the educational level of pregnant women also influenced the increased patronage of ANC attendance. Moreover, the majority of first-time mothers who were dedicated and were able to complete the prescribed ANC schedules during the trimesters of the pregnancies delivered full-term babies although the major challenges of patronage across the study area remained, cultural rites, location of patients, and the distance from the facility, while others indicated that the attitude of the staff as well as the financial problems and lack of education on ANC, were also factors that mitigated against the patronage of ANC services. The overall significance of this study is to contribute to the existing literature and assist in allocating resources to benefit respondents based on socio-cultural demographic settings.

6. Strengths and Limitations of the study

The study was a mixed method of data collection to maximize the validity and reliability of the data collected. The findings of this study will enable the formulation and implementation of interventions by reproductive health service planners, to sustain the utilization of ANC services by reducing the problem of the high prevalence rate of maternal mortality in the Tamale Metropolis, since it is a major threat to health and the socio-economic development of the area, the nation and the world at large.

The weakness however is that the focus was on only women of reproductive age to the detriment of other women. The study design is cross-sectional; hence, it is challenging to establish a causal relationship among the variables assessed. The findings of this study can only be generalized to women of reproductive age in Ghana.

Ethical Approval & Consent

Permission was obtained from the Tamale Metropolitan Health Directorate and the various facilities, and ethical approval was obtained from Kwame Nkrumah University of Science and Technology, a committee of Human Research, publication, and Ethics ref: CHRPE/AP/266/21. All methods in the study were carried out in accordance with the relevant regulations and guidelines of the Ethical Review Committee. All the participants provided Informed consent to participate before the survey questions were sent to them. The survey questions did not capture the personal identities of the participants.

Acknowledgment

We acknowledge the participation of all study participants who took part in the study. Also, special acknowledgments go to the Ethical Review Committee of the Kwame Nkrumah University of Science and Technology for their review comments.

Competing interest

The authors have declared that no competing interests exist

REFERENCES

1. Tunçalp Ö, Pena-Rosas JP, Lawrie T, Bucagu M, Oladapo OT, Portela A, et al. (2017) WHO recommendations on antenatal care for a positive pregnancy experience—going beyond survival. *BJOG*. 124:860–62. doi: 10.1111/1471-0528.14599
2. Andegiorgish AK, Elhoumed M, Qi Q, Zhonghai Z, & Lingxia Z, (2022) Determinants of antenatal care use in nine sub-Saharan African countries: a statistical analysis of cross-sectional data from Demographic and Health Surveys *BMJ Open* 2022; 1212:e051675. doi:10.1136/bmjopen-2021-051675
3. Asundep, N. N., Jolly, P. E., Carson, A., Turpin, C. A., Zhang, K., & Tameru, B. (2013). *Antenatal Care Attendance, a Surrogate for Pregnancy Outcome? The Case of Kumasi, Ghana. Maternal and Child Health Journal*, 18(5), 1085–1094.
4. Adane, A. A., Ayele, T. A., Ararsa, L. G., Bitew, B. D., & Zeleke, B. M. (2014). Adverse birth outcomes among deliveries at Gondar University Hospital, Northwes Ethiopia. *BMC pregnancy and childbirth*, 14(1), 1-8.
5. Manyeh, A. K., Amu, A., Williams, J., & Gyapong, M. (2020). Factors associated with the timing of antenatal clinic attendance among first-time mothers in rural southern Ghana. *BMC pregnancy and childbirth*, 20(1), 1-7.
6. Afaya, A., Azongo, T. B., Dzomeku, V. M., Afaya, R. A., Salia, S. M., Adatar, P., ... & Amogre Ayanore, M. (2020). 'Women's knowledge and its associated factors regarding optimum utilization of antenatal care in rural Ghana: A cross-sectional study. *Plos one*, 15(7), e0234575.
7. Dankwah, E., Zeng, W., Feng, C., Kirychuk, S., & Farag, M. (2019). The social determinants of health facility delivery in Ghana. *Reproductive health*, 16(1), 1-10
8. Ghana Statistical Service (2018) Ghana Multiple Indicator Cluster Survey with an Enhanced Malaria Module and Biomarker, Final report. Accra, Ghana.
9. Ghana Demographic and Health Survey (2022). Key Indicators Report, The DHS Program ICF Rockville, Maryland.
10. Mahama, B. I. (2019). *Factors That Influence Place of Delivery Choice Among Expectant Mothers in Ghana* (Doctoral dissertation, Walden University).
11. Kesmodel, U. S. (2018). Cross-sectional studies—what are they good for?. *Acta obstetrica et gynecologica Scandinavica*, 97(4), 388-393.
12. World Health Organization (2015) *Trends in Maternal Mortality: 1990 to 2015*. Geneva, Switzerland.

13. Ghana Statistical Service (GSS), Ghana Health Service (GHS), and ICF, (2017) *Ghana maternal health survey 2017: key findings*.
14. Abubakari, A., Agbozo, F., & Abiuro, G. A. (2018). Factors associated with optimal antenatal care use in Northern region, Ghana. *Women & Health*, 58(8), 942-954.
15. Sadique, Z. (2018). *Factors Associated With the Timing of Antenatal Care Service Initiation in Two Health Facilities in the Tamale Metropolis* (Doctoral dissertation, University of Ghana).
16. Alibhai, K.M., Ziegler, B.R., Meddings, L., Batung E., & Luginaah, I. (2022) Factors impacting antenatal care utilization: a systematic review of 37 fragile and conflict-affected situations. *Confl Health* 16, 33. <https://doi.org/10.1186/s13031-022-00459-9>
17. Heri, R, Mselle L.T., Malqvist M. (2023) Qualitative Exploration Study of Perceptions of Women and Nurse-Midwives on Antenatal Care Information and Communication in Tanzania. *Int J Womens Health*. 2023;15:927-941 <https://doi.org/10.2147/IJWH.S398710>
18. Ganle, J. K., Mahama, M. S., Maya, E., Manu, A., Torpey, K., & Adanu, R. (2019). Understanding factors influencing home delivery in the context of user-fee abolition in Northern Ghana: Evidence from 2014 DHS. *The International Journal of Health Planning and Management*, 34(2), 727-743.
19. Pervin J, Rahman SM, Rahman M, Aktar S, & Rahman A. (2020) Association between antenatal care visit and preterm birth: a cohort study in rural Bangladesh *BMJ Open*;10:e036699. doi: 10.1136/bmjopen-2019-036699
20. Chen, X.K., Wen, S.W., Fleming, N., Demissie, K., Rhoads, G. G., & Walker, M. (2007). Teenage pregnancy and adverse birth outcomes: a large population-based retrospective cohort study. *International Journal of Epidemiology*, 36(2), 368-373.
21. Kuhut, J., & Vollmer, S. (2017). Antenatal care services and their implications for vital and health outcomes of children: evidence from 193 surveys in 69 low-income and middle-income countries. *BMJ open*, 7, e017122.

TABLES OF RESULTS

Table 1. Demographic characteristics of Respondents

Residence	Frequency	Percent
Rural	208	53.3
Urban	182	46.7
Age of respondents		
10-20	53	13.6
21-30	230	59.0
31-40	98	25.1
40+	9	2.3
Religion		
Ethnicity		
Dagomba	270	69.2
Mampurli	76	19.5
Gonja	16	4.1
Others	30	7.3
Religion		
Ethnicity		
Muslim	299	76.7
Christian	86	22.1
Traditional	5	1.3
Marital status		
Single	56	14.4
Married	312	80.0
Widow	14	3.6
Cohabiting	8	2.1
Employment status		
Unemployed	168	42.9
Employed formal sector	129	33.2
Employed informal sector	93	23.9
What is the level of your education?		
Basic	81	20.8
Secondary	125	32.1
Tertiary	150	38.5
Non	34	8.7

Table 2. Practices of ANC

Have you heard of ANC before?	Frequency	Percent
Yes	386	99
No	4	1
If yes, from which source?		
Friends	58	14.9
Parents	39	10.0
School	38	9.7
Health facility	230	59.0
Media	25	6.4
Which categories of people go for ANC?		
Women	31	7.9
Pregnant women	359	92.1

Table 3. Issues discussed during ANC

Importance of ANC	Frequency	Percent
Yes	189	48.5
No	201	51.5
Nutrition		
Yes	307	78.7
No	83	21.3
Services available		
Yes	211	54.1
No	179	45.9
Need for early ANC initiation		
Yes	197	50.5
No	193	49.5
Management of pregnancy-related complications		
Yes	131	33.6
No	259	66.4
Importance of postnatal care		
Yes	90	23.1
No	300	76.9
How effective are issues discussed?		
Below average	49	12.6
Average	264	67.7
Above average	77	19.7

Table 4. Prevalence of antenatal care (ANC) attendance and services provided by health workers

Mode of delivery	Frequency	Percent
Caesarian Section	80	20.5
Vaginal delivery	310	79.5
What was the birth outcome?		
Delivered a full-term healthy baby	340	87.2
Delivered a pre-term baby	50	12.8
Did you attend ANC during your pregnancy?		
Yes	386	99.0
No	4	1.0
How many times did you attend ANC in your last pregnancy?		
1-3	72	18.5
4+	314	80.5
None	4	1.0
When did you initiate ANC during your last pregnancy?		
First three months of the pregnancy	288	73.8
Second three months of the pregnancy	81	20.8
Third three months of the pregnancy	17	4.4
None	4	1.0
What prevented you from initiating ANC during the first three months?		
	288	73.8
Health facility far from home	28	7.2
Unfriendly health staff	4	1.0
The cumbersome process to go through at the health facility	9	2.3
Had to undergo cultural rituals	49	12.6
Others	12	3.1
Was your urine sample taken?		
Yes	385	98.7
No	4	1.0
Don't know	1	.3
Was your blood sample taken?		
Yes	381	97.7
No	6	1.5
Don't know	3	.8
Were you given an injection on your upper arm?		
Yes	381	97.7
No	6	1.5
Don't know	3	.8

How many times were you given the injection?			
Once	24	6.2	
Twice or more	341	87.4	
Don't know	17	4.4	
None	8	2.1	
Were you given SP tablets to take?			
Yes	369	94.6	
No	20	5.1	
Don't know	1	.3	
How many times were you given the tablet?			
Once	25	6.4	
Twice	100	25.6	
Thrice	241	61.8	
Don't know	7	1.8	
None	17	4.4	
Why were you not given?		Frequency	Percent
I was given		364	93.3
Allergic to drug		11	2.8
Drug unavailable		13	3.3
I don't know why		2	.6
Where did you deliver your baby?			
Home		31	7.9
Community-Based Health Planning and Service/Health Centre/Hospital		359	92.1
Who assisted in the delivery?			
Traditional Birth Attendant		32	8.2
Dr. /Nurse/Midwife/Community Health Nurse		358	91.8

Table 5. Bivariate analysis of factors associated with ANC attendance

Variables	ANC Attendance		
Age of Respondent	Sub-Optimal (ANC < 4) N (%)	Optimal (ANC ≥ 4) N (%)	Test Statistic/P- value
10-20	17 (32.1)	36 (67.9)	
21-30	41 (17.8)	189(82.2)	X²=7.737,
31-40	15(15.3)	83 (84.7)	P=0.043
40+	3(33.3)	6 (66.7)	
Marital Status			
Single	13(23.2)	43(76.8)	X²=2.119,
Married	61(19.6)	251(80.5)	P=0.544
Widow	2(14.3)	12(85.7)	
Cohabiting	0(0.0)	8 (100)	
Religion			
Muslim	62(20.7)	237(79.3)	
Christian	14 (16.3)	72 (83.7)	X²=1.373,
Traditional	0(0.0)	5 (100.0)	P=0.517
Occupation			
Unemployed	45 (26.8)	123(73.2)	X²=12.985
Employed formal sector	13(10.1)	116(89.9)	P=0.002
Employed informal sector	18(19.4)	75(19.2)	
Which categories of people go for ANC?	Sub-Optimal (ANC < 4) N (%)	Optimal (ANC ≥ 4) N (%)	Test Statistic/P- value
Women	10(32.3)	21(67.7)	X²=3.501
Pregnant women	66 (18.4)	293 (81.6)	P=0.061
What issues are discussed during ANC?_			
Importance of ANC			
Yes	32(16.9)	245(83.1)	X²=1.527
No	44(21.9)	157 (78.1)	P=0.217
What issues are discussed during ANC?			
_Nutrition			
Yes	61(19.9)	246(60.1)	X²=0.135,
No	15 (18.3)	68(82)	P=0.714
What issues are discussed during ANC?			
_Services available			
Yes	47(22.3)	164(77.7)	X²=2.277,

No	29(16.2)	150(83.8)	P=0.131
What issues are discussed during ANC?			
_Need for early initiation			
Yes	42(21.3)	155(78.7)	X²=0.852
No	34 (17.6)	159 (82.4)	P=0.356
What issues are discussed during ANC?			
_Management of pregnancy-related complications			
Yes	26(19.8)	105(80.2)	X²=0.16
No	50(19.3)	209(80.7)	P=0.898
What issues are discussed during ANC?			
_The Importance of postnatal care			
Yes	11(12.2)	79(87.8)	X²=3.936
No	65(21.7)	235(78.3)	P=0.047
How effective are issues discussed?			
Below average	15(30.6)	34(69.4)	X²=6.858
Average	52(19.7)	212(80.3)	P=0.032
Above average	9(11.7)	68(88.3)	
No	8(29.6)	19(70.4)	
Is this your first pregnancy (Gravidity)?			
Yes	61(17.8)	281(82.2)	X²=4.827
No	15(31.2)	33(68.8)	P=0.028
Mode of delivery			
CS	16(20.0)	64(80.0)	X²=0.017
Vaginal Delivery	60(19.4)	250(80.6)	P=0.897
Did you attend ANC during your pregnancy?			
	Sub-Optimal (ANC < 4) N (%)	Optimal (ANC ≥ 4) N (%)	Test Statistic/P- value
Yes	72(18.7)	314(81.3)	
No	4(100.0)	0(0.0)	P=0.001
When did you initiate ANC during your last pregnancy?			
First three months of the pregnancy	21(7.3)	267(92.7)	X²=99.597
Second three months of the pregnancy	45(55.6)	36(44.4)	P< 0.001
Third three months of the pregnancy	6(35.3)	11(64.7)	
None	4(100.0)	0(0.0)	
Where did you deliver your baby?			

Home	16(51.6)	15(48.4)	X²=22.153
CHPs compound/Health Centre/Hospital	60(16.7)	299(83.3)	P< 0.001
Who assisted in the Delivery?			
Traditional Birth Attendant	16(50.0)	16(50.0)	X²=20.686
Dr./Nurse/Midwife/Community Nurse	Health 60(16.8)	298(83.2)	P< 0.001
Where did you attend ANC during your last pregnancy?			
CHPs Compound	9(30.0)	21(70.0)	X²=5.864
Health Centre	26(24.8)	79(75.2)	P=0.053
Hospital	41(16.1)	214(83.9)	
What was the birth outcome?			
Delivered a full-term healthy baby	56(16.5)	284(83.5)	X²=15.381
Delivered a pre-term baby	20(40.0)	30(60.0)	P< 0.001

Table 6. Multivariate analysis of factors that predict ANC attendance

Variables	P-value	Adjusted Odds Ratio (A.O.R)	95% A.O.R	C.I.for
			Lower	Upper
Occupation (Reference= Informal sector)	Employed .041			
Unemployed	.533	.810	.418	1.570
Employed in the government sector	.089	2.019	.899	4.532
Issues discussed (Importance of ANC) (Reference=Yes)	.722	.901	.508	1.599
Effectiveness of issues discussed at ANC (Reference= Above average)	.298			
Below average	.125	.453	.165	1.247
Average	.228	.610	.273	1.363
First pregnancy(Reference= Yes)	.006	.363	.176	.748
Where did you attend ANC (Reference= Hospital)	.243			
CHPs compound	.164	.513	.201	1.313
Health center	.211	.679	.370	1.246
Birth outcome (Reference= Full term)	.001	.303	.146	.630
Place of delivery (Reference= Health facility)	.003	.281	.122	.647
Constant	.000	12.436		
Constant	.000	12.436		

UNDER PEER REVIEW