

Available online at [www.mchandaids.org](http://www.mchandaids.org)INTERNATIONAL JOURNAL of  
MATERNAL and CHILD HEALTH and AIDS  
ISSN: 2161-864X (Online)  
ISSN: 2161-8674 (Print)  
DOI: 10.21106/ijma.639**ORIGINAL ARTICLE | WOMEN HEALTH****Influence of Sociodemographic Factors and Obstetric History on Choice of Place of Delivery: A Retrospective Study Among Post-Natal Women in Ghana****Abdul-Wahab Inusah, MPH<sup>1</sup>✉; Nana Asha Alhassan, MPH<sup>2</sup>; Ana Maria Simono Charadan, MD<sup>3</sup>; Roy Rillera Marzo, MD, MPH, FRSH<sup>4,5</sup>; Shamsu-Deen Ziblim, PhD<sup>6</sup>**

<sup>1</sup>Department of Global and International Health, School of Public Health, University for Development Studies, Box TLI 350 Tamale, Ghana; <sup>2</sup>Sagnarigu Health Center, Box 2544, Sagnarigu Municipal, Ghana; <sup>3</sup>Department of Obstetrics and Gynaecology, School of Medicine, Health, University for Development Studies, Box TL1350 Tamale, Ghana; <sup>4</sup>Department of Community Medicine, International Medical School, Management and Science University, Shah Alam, Selangor, Malaysia; <sup>5</sup>Global Public Health, Jeffrey Cheah School of Medicine and Health Sciences, Monash University Malaysia, Jalan Lagoon Selatan, 47500, Subang Jaya, Selangor, Malaysia; <sup>6</sup>Directorate of Academic Planning & Quality Assurance (DAPQA) University for Development Studies, Box TL 1350 Tamale, Ghana

✉ **Corresponding author email:** [abdulwahabinusah@gmail.com](mailto:abdulwahabinusah@gmail.com)**ABSTRACT**

**Background and Objectives:** Even though Ghana has recorded an appreciable level of facility delivery compared to other countries in sub-Saharan Africa, the country still has a lot of regional and community variations in facility delivery where professional maternal health care is guaranteed. This study assessed the main factors associated with facility delivery in the Sagnarigu Municipal Assembly of the Northern Region of Ghana.

**Methods:** Using a simple random sampling method, a retrospective community-based cross-sectional study was conducted from July 12, 2021 to October 17, 2021, among 306 postnatal women within 15 to 49 years who had delivered within the last six months. We conducted descriptive analyses, and the Pearson chi-square test of association between the sociodemographic factors and obstetrics history with the outcome variable, choice of place of birth. Lastly, significant variables in the chi-square test were entered into adjusted multivariate logistics regression to determine their association with the place of delivery. Data analysis was performed using the Statistical Package for Social Sciences version-25, with statistical significance set at a p-value of 0.05.

**Results:** The study reported a facility delivery rate of 82%, which is slightly higher than the national target (80%). We observed that age group [AOR 2.34 (1.07-5.14)], marital status [AOR 0.31 (0.12-0.81)], ethnicity [AOR 3.78 (1.18-12.13)], and couple's occupation [AOR 24.74 (2.51-243.91)] were the significant sociodemographic factors influencing facility delivery. The number of antenatal care (ANC) attendance [AOR 8.73 (3.41 – 22.2)] and previous pregnancy complications [AOR 2.4 (1.11 – 5.7)] were the significant obstetrics factors influencing facility delivery.

**Conclusion and Global Health Implications:** We found that specific sociodemographic and obstetric factors significantly influence the choice of place of delivery in the study area. To address this, the study recommends targeted interventions that focus on providing support and resources for women from different age groups, marital statuses, ethnicities, and occupational backgrounds to access facility delivery services. Additionally, improving ANC attendance and effectively managing pregnancy complications were highlighted as important measures to encourage facility-based deliveries.

**Keywords:** • Ghana • Institutional Delivery • Obstetric History • Pregnant Women • Post-Natal Mothers • Choice of Place Delivery

Copyright © 2023 Inusah et al. Published by Global Health and Education Projects, Inc. This is an open-access article distributed under the terms of the Creative Commons Attribution License **CC BY 4.0**.

## I. Introduction

Maternal health is a crucial concern both globally and within individual countries. The persistence of high maternal mortality rates and their effects on neonatal well-being makes this a crucial area of attention. Pregnant women are susceptible to fatal complications during delivery<sup>1</sup> and many deaths occur annually because of avoidable risk factors before, during, and after childbirth.<sup>2,4</sup> The United Nations (UN) Sustainable Development Goal 3 aims to ensure healthy lives and promote the well-being of all individuals. One of its goals is to decrease the global maternal mortality ratio to less than 70 per 100,000 live births by 2030. Unfortunately, there is a significant difference in maternal mortality ratios between low-and middle-income countries and that of developed countries. For example, the rate of maternal mortality in low- and middle-income countries is 240 per 100,000 live births compared with just 16 per 100,000 live births in developed countries.<sup>5</sup>

Between the years 2000 and 2020, maternal mortality decreased by 34% thus, from 342 deaths to 223 deaths per 100,000 live births. This translates into an average annual rate of decline of 2.1%.<sup>6</sup> In 2020, sub-Saharan Africa had 545 maternal deaths per 100,000 live births compared to 4 maternal deaths per 100,000 live births in Australia and New Zealand. In fact, sub-Saharan Africa alone accounted for 70% of global maternal deaths in 2020.<sup>6</sup>

In recent decades, there has been a gradual reduction in maternal mortality rates in Ghana. This positive trend can be attributed to various factors and the implementation of effective measures to ensure safe pregnancy and delivery. According to data gathered by the Ghana Health Service, there were 875 maternal deaths per 100,000 live births in 2018 and 838 per 100,000 live births in 2019.<sup>7</sup> Despite an increase in total deliveries, this number further decreased to 776 maternal deaths per 100,000 live births in 2020.<sup>7</sup> Additionally, in the face of the COVID-19 pandemic and its associated challenges, the institutional maternal mortality ratio decreased from 117 maternal deaths per 100,000 live births in 2019 to 106 maternal deaths per 100,000 live births in 2020.<sup>7</sup>

Maternal health and optimum child delivery outcomes (neonatal safety/health) are affected by better places of delivery, as well as prior antenatal care. Neonatal deaths are associated with the delivery of maternal health services adopted by expectant mothers.<sup>8</sup> The World Health Organization (WHO) recommended that a skilled birth attendant or midwife be present during childbirth to ameliorate maternal deaths due to complications and improve perinatal outcomes.<sup>9-11</sup> The World Health Organization has also put forward a communiqué that specified compulsory postpartum care for newly delivered mothers (scheduled at 6 hours, 6 days, 6 weeks, and 6 months after childbirth) and at least four (4) antenatal care attendance as best practices for maternal and neonatal health.<sup>12</sup> However, the services mentioned above are only provided in health facilities, and as such, pregnant women who deliver in the home setting have lower odds of accessing antenatal care (ANC) and postnatal care (PNC) services recommended by health authorities.<sup>11,12</sup>

To improve maternal outcomes, the government of Ghana provides free maternal care (maternal health services women receive from the time of pregnancy to three months after delivery).<sup>13,14</sup> In addition, the Ghana National Health Insurance Scheme (NHIS) policy and user fee exemption policy have contributed significantly to reducing out-of-pocket expenditure for maternal health services received from public health facilities in Ghana.<sup>15,16</sup>

The Northern region of Ghana has experienced an inequitable distribution of health workers and other essential resources.<sup>17</sup> The harsh climatic and high levels of poverty in the region contribute to its disadvantaged status. The Southern region of Ghana in comparison, has a more highly developed infrastructure and accommodates the head offices of central Government ministries and businesses. Ghana Health Service 2021 Holistic Assessment report revealed, that more than 90% of pregnant mothers in the Northern region attended at least four ANC visits, however, only 75.8% and 72.1% received skilled delivery and postnatal care after delivery respectively.<sup>18</sup> This indicates that more than 20% of pregnant women are still delivered at home

or by unskilled persons such as the traditional birth attendant (TBA).

The region has 7.5% of the nation's population,<sup>19</sup> with a doctor-to-patient ratio of 1:9,926, a nurse-to-patient ratio of 1:636, and a midwife-to-women fertility age ratio of 1:494. The region recorded the worst number of midwives and nurses to patient ratio in 2021.<sup>18</sup> Successive governments have endeavored to provide incentives for the healthcare workforce to accept postings within the Northern region. These initiatives include the Deprived Area Incentive Scheme, which offers a remuneration package consisting of a 20-35% allowance in addition to the basic salary, as well as lodging accommodations, for those who accept a post in the region.<sup>20</sup>

Several interventions by government and non-governmental organizations, such as the USAID Resiliency in Northern Ghana Project, the USAID Accelerating Social and Behavior Change Activity, the World Food Program Nutrition Retails project, and the USAID Health Marketing Activities project, all aimed at, among other things, increasing access to maternal and child health services in the region. Previous studies show that a range of factors, including insufficient medical supplies, drugs, suboptimal referral procedures, and unreliable communication channels, have a detrimental impact on pregnant women's ability to obtain crucial maternal health services.<sup>21,22</sup> However, little is known about the factors influencing the choice of place of delivery among pregnant women in the Northern region of Ghana.

The study was conducted to explore the determinants of pregnant women's choices concerning places of delivery in the Sagnarigu Municipality of the Northern region of Ghana. The municipality has a total population of 341,711 with 171,512 (50.2%) of the population being females.<sup>19</sup> Despite this population size, the Municipality has only 23 functional health facilities, the majority of which are Community-Based Health Planning and Services (CHPs)<sup>23</sup> lowest ranked according to the Ghana Health Service standard<sup>24</sup> and noted for poor clinical attendance, including delay in seeking health care, reduced ANC and PNC attendance.<sup>25</sup>

We selected for the Municipal study because of its limited number of health facilities compared to the adjoining Tamale Metropolitan Assembly which has several health facilities, both private and public including the Regional Teaching Hospital. These findings provide useful information explaining why unskilled deliveries are recorded in the municipality and by extension, the Northern region. These findings also serve as a baseline for decision-making in addressing unskilled deliveries in other districts of the Northern region.

## 2. Methods

This research was cross-sectional with a retrospective assessment of antenatal and perinatal experiences of postpartum women conducted from July 12, 2021 to October 17, 2021 in the Sagnarigu Municipality of the Northern Region of Ghana. The Municipality has a land mass of approximately 200 km<sup>2</sup>, with 98 communities, and a shared boundary with the Tamale Metropolis. The predominant ethnic group in the Municipal is Dagomba, however, other major ethnic groups in Ghana such as the Gonja, Akans, and Gurunsi are also present. The municipality has 36 health facilities: 8 hospitals, 1 polyclinic, 5 Health Centers, 2 Clinics, 2 Maternity Homes, and 23 Demarcated CHPS, however, only 23 of these health facilities were functional at the time of this study.

### 2.1. Study Variables

*Dependent variable:* Choice of place of delivery was the outcome variable (home or health facility delivery) for the study. We measured this variable by asking participants where they delivered in the last six months. The outcome variable had binary outcomes whether facility delivery (skilled) delivery or home (unskilled) delivery.

*Independent variables:* The study has two groups of independent variables: sociodemographic characteristics and obstetrical factors. For sociodemographic characteristics, we collected data on the sociodemographic characteristics of the participants to examine how these variables influence pregnant women's choice of place of delivery. The variables under this section included mother's

age, ethnicity, religion, educational status, income level, parity, marital status, partner occupation, and household size). For obstetric factors, it was important to examine the obstetric history of mothers to see how they influence their choice of place of delivery. The obstetric variables included in the study were (the number of ANC attendance, birth order, labor complications, mode of delivery, and information on delivery practices).

### 2.1.1. Sample size and sampling procedures

The study involved women aged 15 to 49 years who delivered a child (still or live birth) in the last six (6) months. The sample size was computed using the single-proportion formula generated by Snedecor and Cochran.<sup>16</sup> The Z-score is the critical value corresponding to the 95% confidence level. Z-score = 1.96. Standard Deviation (StdDev) refers to the proportion of neonatal mortality attributable to home deliveries in developing countries.<sup>17</sup> StdDev = 56% margin of error with 5% acceptable error. Therefore, the minimum sample size was 379 eligible women.

$$n = \frac{[(Zscore)^2 \times StdDev \times (1 - StdDev)]}{(margin\ of\ error)^2}$$

The selection of the study participants was multi-staged. A list of all communities in the Sagnarigu Municipal was obtained from the Municipal Assembly. This list was numbered and the first five communities within a 500-point random number table were selected. Subsequently, simple random sampling was adopted to select eligible participants (women 15-49 years who have given birth within the last six months) from various communities using the postnatal attendance list provided by the Municipal Health Directorate. After exhausting the list provided, successive participants were found using the guiding question, "Whom do you know delivered at home whose child is either (dead or alive) within the last six months in this community?" This was necessary to help identify mothers who had not visited any health facility in the municipality after delivery. The number of mothers interviewed in each community was proportional to the number of mothers who

have attended PNC in the community as provided Municipal Health Directorate.

### 2.1.2. Data collection methods and tools

The data collection tool was a closed-ended paper-based questionnaire that was designed by the researchers after a careful review of similar studies.<sup>26-28</sup> The tool was revised by two senior lecturers at the Department of Maternal and Child Health at the University for Development Studies to see how well it measures the study objectives. The tool was pretested among 25 post-natal women at Nyohini, a community in the Tamale Metropolitan Assembly. This community shared a boundary with the study area, and they are virtually the same ethnic group with the same cultural practices but demarcated for administrative convenience. The research team analyzed the pretest data to determine the accuracy of the tool to ensure that the tool was able to accurately collect the right information needed for this study. Revisions were made to the tool based on the feedback from the pretest. Five resident community health nurses were recruited and trained for two days. This was to ensure they understood the data collection tool, sampling strategies, and the communities selected for the study. The in-person interview method was employed using the widely spoken local language (Dagbani) in the Sagnarigu Municipal Assembly. Before the day of data collection, a consensus was reached on the English-to-Dagbani translation of the data-collection tool.

### 2.2. Data Analysis

The data collected were entered into SPSS version 25<sup>29</sup> cleaned, and coded for analysis. Mean and standard deviation were calculated for continuous variables such as age, household size, number of ANC attendance, gestation period before first ANC attendance, and the birth order of the most recent child. Frequency tables were used for categorical variables such as marital status, ethnicity, educational level, occupation, and place of delivery (outcome variable). A Chi-square test of association between the outcome variable (place of birth) and each of the two covariates: sociodemographic characteristics variables (9 questions), and obstetric history (9 questions) was performed using a

$p < 0.05$  as the level significance. Using an adjusted multivariate logistic regression model, we calculated the impact of the covariates on the outcome variables by including variables that were significant from the Chi-square analysis. The first model was sociodemographic variables thus: age group, marital status, ethnicity, and occupation were regressed with place of delivery (outcome). The second regression model was between two obstetric variables thus: the number of ANC attendance and history of pregnancy complications were regressed with place of birth, with the statistical significance set at  $p < 0.05$ .

### 2.3. Ethical Approval

Ethical clearance and approval (UDS/RB/013/21) for this study were obtained from the Research Ethical Review Board of the University for Development Studies (UDS) Tamale, located in the Northern region of Ghana. The study protocol was reviewed by two Maternal and Child Health lecturers from the UDS. The Sagnarigu Municipal Health Directorate in the Sagnarigu Municipal Assembly of Ghana and the traditional authorities within each sampled community approved the study. In addition, participants were educated on the purpose and scope of the study before their written or verbal consent was sought to participate in the research. Participation was voluntary and all participants consented to participate before being interviewed.

## 3. Results

### 3.1. Sociodemographic Characteristics of Study Respondents

The study included 306 respondents. Respondents' ages ranged from 18 to 40 years, with an overall mean age of  $29.5 \pm 4.89$ . A high proportion (60%) of the respondents were between the ages of 21-30 years. More than half (54%) of the respondents were Muslims. A majority (65%) of respondents were married, and 34% cohabited. About (32%) of the mothers had no education, whilst trading/vending was the main occupation of the majority (53%) of the respondents. Health facility delivery was 82% as shown in Table 1.

#### 3.1.1. Choice of place of delivery (outcome) among postnatal mothers.

The study found that 251 (82%) mothers delivered at a health facility (skilled delivery) whilst 55 (18%) mothers delivered at home (unskilled delivery) in their most recent childbirth.

#### 3.1.2. Place of delivery and sociodemographic characteristics of postnatal mothers

In this study, a bivariate analysis was conducted using nine sociodemographic characteristics. Of the nine variables, six were found to be statistically significant for the mothers' choice of place of delivery. From the analysis, 87% of those who delivered at a health facility were between the ages of 21 and 30 years, with only 18% of those aged 20 years and below delivering at home. From the study, age group was significantly associated with place of delivery ( $\chi^2 = 9.13$ ,  $df = 2$ ,  $p = 0.010$ ).

In the study, 90% of those who were cohabiting delivered at a health facility, which was higher than married mothers (73%) delivering at the health facility. Marital status was significantly associated with place of delivery ( $\chi^2 = 15.76$ ,  $df = 2$ ,  $p < 0.001$ ). In terms of ethnicity, all Akan ethnic groups were delivered at a health facility. 81% of the Dagomba ethnic group delivered at a health facility, with only 19% of the Gonjas delivering at home. There was also a significant association between ethnicity and the place of delivery ( $\chi^2 = 16.67$ ,  $df = 5$ ,  $p = 0.005$ ). Regarding occupation, 79% of mothers who were traders delivered at a health facility compared to 76% of mothers who were civil servants delivered at the facility. All mothers who were artisans delivered at health facilities and this was significantly associated with place of delivery ( $\chi^2 = 10.028$ ,  $df = 4$ ,  $p = 0.040$ ). Again, 86% of mothers whose partners had tertiary education delivered at a health facility. There was a statistically significant association between spousal educational level and mothers' place of delivery ( $\chi^2 = 18.96$ ,  $df = 4$ ,  $p < 0.001$ ). Husbands who were civil servants and traders had their wives delivering at health facilities compared to those who were farmers ( $\chi^2 = 10$ ,  $df = 3$ ,  $p = 0.017$ ). There was no statistically significant association between mothers' religious affiliation, educational level, household sizes, and the choice of place of delivery (Table 2).

**Table 1: Sociodemographic characteristics of respondents (n=306), 2021**

Variable	Category	Frequency	Percentage
Age group	20 years and below	11	3.6
	21-30 years	187	61.1
	31-40	108	35.3
	Total	306	100.0
Religious affiliation	Traditional	4	1.3
	Christianity	137	44.8
	Islam	165	53.9
	Total	306	100.0
Marital status	Married	198	64.7
	Divorce	5	1.6
	Cohabiting	103	33.7
	Total	306	100.0
Ethnicity	Akan	50	16.3
	Dagomba	162	52.9
	Gonja	21	6.9
	Mamprusi	28	9.2
	Hausa	16	5.2
	Others	29	9.5
	Total	306	100.0
Level of education	None	94	30.7
	Primary	28	9.2
	Middle/JHS	49	16.0
	SHS	78	25.5
	Tertiary	57	18.6
	Total	306	100.0
Your main occupation	Trade/vendor	163	53.3
	Farmer	14	4.6
	Civil servant	58	19.0
	Artisan	7	2.3
	Housewife only	64	20.9
	Total	306	100.0
Spouse's level of education	None	136	44.4
	Primary	3	1.0
	Middle/JHS	19	6.2
	SHS	12	3.9
	Tertiary	136	44.4
	Total	306	100.0
Spouse main occupation	Trade/vendor	80	26.1
	Farmer	72	23.5
	Civil servant	140	45.8
	Artisan	14	4.6
	Total	306	100.0
Household size	5 and below	147	48.0
	Above 5	159	52.0
	Total	306	100.0
Where did you deliver your most recent pregnancy? **	Home	55	18.0
	Health facility	251	82.0
	Total	306	100.0

\*\*Outcome variable for the study

**Table 2:A bivariate analysis of place of delivery and sociodemographic characteristics (n=306), 2021**

Demographics variables	Categories	Place of delivery		p-value ( $\chi^2$ , df)
		Home	Health facility	
Age group				p=0.010 (9.13,2)*
	<=20	2 (18.2)	9 (81.8)	
	21-30 years	24 (12.8)	163 (87.2)	
	31-40 years	29 (26.9)	79 (73.1)	
Religion				p=0.84 (0.34, 2)
	Traditional	1 (25)	3 (75)	
	Christianity	23 (16.8)	114 (82.2)	
	Islam	31 (18.8)	134 (81.2)	
Marital status				p<0.001 (15.76, 2)***
	Married	40 (26.8)	109 (73.2)	
	Divorce	0	4 (100)	
	Cohabiting	15 (9.8)	138 (90.2)	
Ethnicity				p=0.01 (16.67, 5)**
	Akan	0	50 (100)	
	Dagomba	30 (18.5)	132 (81.5)	
	Gonja	4 (19)	17 (81)	
	Mamprusi	8 (28.6)	20 (71.4)	
	Hausa	5 (31.3)	11 (68.8)	
	Others	8 (27.6)	21 (72.4)	
Level of education				p=0.129 (7.14, 4)
	None	18 (19.1)	76 (80.9)	
	Primary	2 (7.1)	26 (92.9)	
	JHS	8 (16.3)	41 (83.7)	
	SHS	11 (14.1)	67 (85.9)	
	Tertiary	16 (28.1)	41 (71.9)	
Main occupation				p=0.040 (10.03, 4)*
	Trade/vendor	34 (20.9)	129 (79.1)	
	Farmer	3 (21.4)	11 (78.6)	
	Civil servant	14 (24.1)	44 (75.9)	
	Artisan	0	7 (100)	
	Housewife only	4 (6.3)	60 (93.8)	
Spouse's level of education				p<0.001 (18.96,4)***
	None	29 (21.1)	107 (78.7)	
	Primary	3 (100)	0	
	Middle/JHS	4 (21.1)	15 (78.9)	
	SHS	0	12 (100)	
	Tertiary	19 (14)	117 (86)	
Spouse main occupation				p=0.017 (10.22, 3)*
	Trade/vendor	16 (20)	64 (80)	
	Farmer	16 (22.2)	56 (77.8)	
	Civil servant	17 (12.1)	123 (87.9)	
	Artisan	6 (42.9)	8 (57.1)	
Household size				p=0.308 (1.040, 1)
	5 & below	23 (15.6)	124 (84.4)	
	More than 5	32 (20.1)	127 (79.9)	

Strength of statistical association \*p<0.05, \*\*p<0.01, \*\*\*p<0.001  $\chi^2$ (Chi-square), df (degree of freedom)

### 3.1.3. Sociodemographic characteristics and place of delivery

Table 3 shows a multivariate logistic regression analysis, only five sociodemographic factors predicted the choice of place of delivery. Mothers who were between the ages of 31 years to 49 years were 2.3 times more likely to deliver at the health facility compared to those who were 20 years and below [AOR=2.3; 95% CI (1.07- 5.14),  $p=0.034$ ]. Divorce mothers were less likely to deliver at the health facility compared to married mothers [AOR=0.31; 95% CI (0.12- 0.81),  $p=0.016$ ]. Mothers who belong to the Gonja ethnic group were four times more likely to deliver at a health facility compared to the Akan group [AOR=3.78; 95% CI (1.18- 12.13),  $p=0.025$ ]. Also, mothers whose main occupation was farming, civil service, and artisans respectively, were less likely to deliver at a health facility compared to traders/vendors. Mothers whose husbands were artisans were 25 times more likely to deliver at the health facility compared to husbands who were traders [AOR=24.7; 95% CI (2.51- 243.91),  $p=0.006$ ].

**Table 3: Socio-demographic characteristics that predict the place of delivery among mothers (n=306) 2021**

Exposure variable	Variables	(COR) [95% CI]
Age group	<=20	Ref <sup>*</sup>
	21-30 years	5.50 (0.88-34.15)
	31-40 years	2.34 (1.07-5.14)*
Marital status	Married	Ref <sup>*</sup>
	Divorce	0.31 (0.12-0.81)**
	Cohabiting	0.99 (0.32-9.02)
Ethnicity	Dagomba	Ref <sup>*</sup>
	Akan	1.16 (0.03-065)
	Gonja	3.78 (1.18-12.13)*
	Mamprusi	2.97 (0.52-17.14)
	Hausa	1.54 (0.40-5.92)
	Others	0.42 (0.84-2.11)
Main Occupation	Trade/vendor	Ref <sup>*</sup>
	Farmer	0.09 (0.023-0.34)***
	Civil servant	0.10 (0.014-0.69)**
	Artisan	0.017 (0.003-0.01)***
	Housewife only	0.014 (0.12-3.99)
Spousal occupation	Trade/vendor	Ref <sup>*</sup>
	Farmer	2.17 (0.41-11.53)
	Civil servant	3.48 (0.67-18.14)
	Artisan	24.74 (2.51-243.91)**

The number Asterisks (\*) indicate strength of statistical significance and Ref<sup>\*</sup> indicates reference group.

### 3.1.4. Obstetric history among postnatal mothers

The mean ANC attendance was  $7 \pm 2.7$ , and 67% of mothers had attended ANC 6-11 times during their last pregnancy. The study reported the duration of pregnancy before mothers first visit ANC, with 85% reporting 1-4 months whilst the remaining patients attended ANC within the 5-9 months of their pregnancy. Mothers were asked whether they had experienced stillbirth or miscarriage in their lifetime, and 27% said yes. In the study, 30% of the study participants experienced complications at the point of delivery. Almost all (84%) mothers delivered their recent children through normal delivery, compared to 26% delivered by cesarean section. When mothers were asked whether they had experienced excessive bleeding during childbirth, 75% said no. The study also reported that 20% of respondents had problems with conceiving/pregnancy complications. Regarding the birth order of the mothers, most (31%) were on their 3<sup>rd</sup> birth, while 23% had their 5<sup>th</sup> birth (Table 4).

### 3.1.5. Place of delivery and obstetric history

From the analysis, 82% of mothers who attended ANC delivered at a health facility compared to 19% of those who attended ANC delivered at home. Most (84%) of mothers whose pregnancy was 6-11 months when they first attended ANC delivered at a health facility. A majority of mothers (52.3%) who attended ANC 5-9 times in their most recent pregnancy delivered at a health facility. Thus, the number of ANC visits was significantly associated with place of delivery ( $\chi^2= 29.55$ ,  $df=1$ ,  $p<0.001$ ). In the study, only 18% of mothers who had experienced stillbirth or miscarriage delivered at home. However, there was no association between the choice of place of delivery and a history of miscarriage. More than half of the mothers (79%) experienced a complication or problem giving birth at a health facility. There was a significant association between the mode of delivery and the choice of place of delivery. All those who delivered at home were delivered through normal delivery. In all, 100% of all cesarean section deliveries were conducted at health facilities. Mode of delivery was significantly associated with place of delivery ( $\chi^2= 7.29$ ,  $df=1$ ,  $p=0.007$ ). The study

**Table 4: Obstetric history of the study participants (n=306) 2021**

Variable	Response	Frequency	Percentage
Did you attend your first antenatal session during your last pregnancy?	No	19	6.2
	Yes	287	93.8
	Total	306	100
If yes, how many times did you attend ANC during your pregnancy?	1-5	96	33.6
	6-11	191	66.6
	Total	287	100
When you first attended ANC in your most recent pregnancy, how old was the pregnancy at the time (MONTHS)?	1-4	243	84.7
	5-9	44	15.3
	Total	287	100
In all your days as a mother, have you ever experienced stillbirth or miscarriage?	No	223	72.9
	Yes	83	27.1
	Total	306	100
Have you ever experienced a complication or a problem giving birth when it was time for you to give birth?	No	214	69.9
	Yes	92	30.1
	Total	306	100
In your most recent delivery, what was the mode of delivery?	Normal	257	84
	Cesarean	49	16
	Total	306	100
Have you ever experienced excessive bleeding during childbirth?	No	228	74.5
	Yes	78	25.5
	Total	306	100
Have you ever had a problem conceiving a child? In your last pregnancy, before delivery were you given some form of health education on child delivery practices?	No	246	80.4
	Yes	60	19.6
	Total	306	100
	No	18	5.1
	Yes	288	94.1
If yes, what was your source of information?	Total	306	100
	Health worker	249	86.5
	media	10	3.5
	CHV	29	10.0
	Total	288	100
What is the birth order of your most recent child?	1 <sup>st</sup>	47	15.4
	2 <sup>nd</sup>	96	31.4
	3 <sup>rd</sup>	51	16.7
	4 <sup>th</sup>	41	13.4
	5 <sup>th</sup>	71	23.2
	Total	306	100

also found significant associations between having problems conceiving a child, the birth order of the most recent child, and the mother's choice of place of delivery ( $\chi^2= 5.43$ ,  $df=1$ ,  $p=0.02$ ) and ( $\chi^2= 10.5$ ,  $df=4$ ,  $p=0.033$ ), respectively (Table 5).

### 3.1.6. Obstetric factors predicting place of delivery

Only two significant variables were finally entered into a multivariable logistic regression analysis. Mothers

who attended antenatal care (ANC) between 5-9 times were nine times more likely to deliver at a health facility compared to those who had attended 1-4 ANC visits [(AOR 8.73, CI:3.41-22.17),  $p<0.001$ ]. Additionally, mothers who had experienced difficulty conceiving a child were twice as likely to deliver at a health facility compared to those who had not experienced such difficulty [(AOR 2.40, CI:1.11-5.67),  $p=0.026$ ] (Table 6).

**Table 5: Bivariate analysis of obstetric history and mothers' choice of place of delivery (n=306) 2021**

Demographics variables	Categories	Place of delivery		p ( $\chi^2$ , df)
		Home	Health facility	
Did you attend your first antenatal session during your last pregnancy?	No	2 (10.5)	17 (85.5)	p=0.38 (0.76, 1)
	Yes	53 (18.5)	234 (81.5)	
When you first attended the ANC in your most recent pregnancy how old was the pregnancy in month/s?	1-5	23 (24.0)	73 (76.0)	p=0.089 (2.29, 1)
	6-11	30 (15.7)	161 (84.3)	
If yes, how many times did you attend ANC in your last pregnancy?	1-4	32 (13.2)	211 (86.8)	p<0.001 (29.55, 1)***
	5-9	21 (47.7)	23 (52.3)	
In all your days as a mother, have you ever experienced stillbirth or miscarriage?	No	40 (17.9)	183 (82.1)	p=0.98 (0.001, 1)
	Yes	15 (18.1)	68 (81.9)	
Have you ever experienced a complication or a problem giving birth when it was time for you to give birth?	No	36 (16.8)	178 (83.2)	p=0.04 (0.64, 1)*
	Yes	19 (20.7)	73 (79.3)	
In your most recent delivery, what was the mode of delivery?	Normal	55 (19.9)	221 (80.1)	p<0.007 (7.29, 1)***
	Cesarean	0	30 (100)	
Have you experienced excessive bleeding during childbirth?	No	39 (17.1)	189 (82.9)	p=0.50 (0.45, 1)
	Yes	16 (20.5)	62 (79.5)	
Have you ever had problem conceiving a child?	No	38 (15.4)	208 (84.6)	p=0.02 (5.43, 1)*
	Yes	17 (28.3)	43 (71.7)	
What is the birth order of your most recent child	1 <sup>st</sup>	16 (34)	31 (66)	p=0.03 (10.50, 4)*
	2 <sup>nd</sup>	13 (13.5)	83 (86.5)	
	3 <sup>rd</sup>	9 (17.6)	42 (82.4)	
	4 <sup>th</sup>	5 (12.2)	36 (87.8)	
	5 <sup>th</sup> &over	12 (16.9)	59 (83.1)	

Strength of statistical association \*p≤0.05, \*\*p≤0.01, \*\*\*p≤0.001,  $\chi^2$ (Chi-square), df (degree of freedom)

**Table 6: Obstetric factors predicting mothers' choice of place of delivery (n=306), 2021**

Predicting variables	Variables	(AOR) [95% CI]
If yes, how many times did you attend ANC in your last pregnancy?	1-4	Ref*
	5-9	8.73 (3.41 – 22.2)***
Have you ever had a problem conceiving a child?	No	Ref*
	Yes	2.4 (1.11 – 5.7)*

The number Asterisks (\*) indicate strength of statistical significance and Ref\* indicates reference group.

#### 4. Discussion

The choice of place of facility delivery is intricately linked to the physical presence of the health facility and the quality of the services provided. The current study shows that 82% of mothers delivered in a health facility during their most recent childbirth. This result is slightly higher than the national target of 80% facility delivery.<sup>30</sup> This is consistent with an earlier study conducted in Eritrea<sup>26</sup> but differs from similar studies conducted in Ethiopia (73.2%),<sup>31</sup> Nigeria (41%),<sup>32</sup> Tanzania (64.5%),<sup>33</sup> and

Kenya (55.2%).<sup>27</sup> In contrast, earlier literature indicates that 59% of home deliveries occur in rural communities in Ghana.<sup>34</sup> In addition, a report from the 2017 Ghana Maternal Health Survey (GMHS) indicated that twice as many women (nearly 50%) in rural areas of the Northern and Volta regions of Ghana still deliver at home compared to the national average (21%).<sup>35</sup> Although this figure is greater than the current study's home delivery prevalence rate, the result indicates progress toward a reduction in home delivery in Ghana. According to Moyer,<sup>36</sup> diverse health promotion campaigns have been conducted in the Northern Regions of Ghana by the Ghana Health Service, Civil Society Organizations (CSOs), and school-based outreaches culminating in a progressive shift in social norms in favor of facility deliveries in the hands of skilled birth attendants. Notwithstanding, a considerable number of pregnant women still deliver at home as a result of the non-existence of health facilities in their communities, lack of transportation services, or lack of funds,<sup>37</sup> Optimum facility delivery and

outright extinction of home delivery are the basis for the WHO recommendation that every delivery be supervised by skilled birth attendants.<sup>12</sup> This endorsement of facility delivery was not selfish; most incidences of maternal deaths, obstetric complications, and increased risk of infections are attributable to home deliveries and, for that matter, child deliveries are presided over by the TBAs.<sup>27,38</sup> According to Lawn,<sup>39</sup> approximately 50% of neonatal mortalities in developing countries are attributable to home deliveries and the absence of a skilled health professional to manage potential obstetric complications. Therefore, the elevated rate of facility delivery observed in this study is good progress and may be attributable to dedicated health education activities, the free maternal health policy in Ghana, the NHIS, and other unforeseen interventions.

In this study, older mothers were more likely to deliver at health facilities. This finding is consistent with that of a similar study conducted in Nigeria, in which an increase in age was associated with institutional delivery.<sup>40</sup> A possible explanation for this finding is that older mothers tend to be more aware of the benefits of facility delivery. Again, some of them might have faced pregnancy complications, and with such experiences, they might have opted for facility delivery. In contrast, a demographic and health survey conducted in 28 sub-Saharan Africa revealed that the tendency to deliver at a health facility decreases with the age of the mothers.<sup>41</sup> This position was also supported by another study conducted in Jos, Nigeria, in which older women delivered at home compared with younger women.<sup>38</sup> This indicates that younger women tend to fear labor complications and prefer to deliver at a health facility to receive professional health care. On the other hand, older women with less fear of labor complications tend to deliver at home unassisted or assisted by a Traditional Birth Attendant.<sup>42</sup>

In our study, the prevalence of facility delivery was lower in divorced women than in married women. This supports the fact that married women stand the chance of being influenced by their partners to deliver at a health facility, especially in a male-dominated area, such as the study site. Kifle et al. found that in rural communities in Eritrea,

the choice of place of delivery was influenced by a joint decision between husband and wife,<sup>43</sup> which supports our current findings. The odds of facility delivery were higher among the Gonja Ethnic group than the Dagomba ethnic group, which is in agreement with an earlier study in which a significant statistical association was found between ethnicity and place of birth.<sup>44</sup> Further research is needed to explore the influence of ethnicity on the choice of delivery location. There is a need to understand why the Gonja ethnic group prefers facility delivery in the Dagomba-dominated area.

Maternal and paternal occupation may impact the partner's income status, and with an increase in income, pregnant women will be able to bear the costs associated with facility delivery and are more likely to deliver at a health facility compared to the lower-income group.<sup>41</sup> In this study, partner occupation was associated with institutional delivery. Mothers who were farmers, artisans, and civil servants were less likely to deliver at a health facility than mothers who were traders/vendors, which is consistent with an earlier study conducted in Nigeria, in which farmers, low-income mothers, and hawkers were less likely to deliver at a health facility.<sup>38,45</sup> These findings provide insights into the importance of women's empowerment through trade and other income-generating activities to improve their socioeconomic well-being.

ANC attendance plays a crucial role in pregnancy outcomes, and an increase in ANC attendance leads to better maternal outcomes.<sup>44</sup> The importance of ANC attendance to the health of both pregnant women and unborn children led to the revision of the WHO 1990s ANC guidelines into the new WHO 2016 guideline on ANC attendance.<sup>12,46</sup> According to the current WHO ANC guidelines, the number of ANC visits has increased from six to eight before delivery.<sup>12</sup> In this study, ANC attendance was 94%, with 67% of mothers visiting ANC six-eleven times before delivery. Our study found a significant association between ANC attendance and choice of place of birth. A similar study conducted in Akordet town, Eritrea, reported that mothers who had ANC visits four to six times were more likely to deliver at health facilities than those who had fewer visits or

none.<sup>46</sup> This was expected, as an ANC visit provides the healthcare provider with the opportunity to educate pregnant women on the importance of facility delivery and other maternal and child health information. This could influence the decision of pregnant women to deliver at health facilities. Additionally, with frequent ANC visits, mothers become comfortable discussing pregnancy-related issues with the healthcare provider and may choose to deliver at a health facility.

Experience with pregnancy complications or problems with pregnancy conception may trigger the desire for a pregnant woman to deliver at a health facility to avoid her loss of pregnancy after struggling to conceive compared to women who have no pregnancy conception or experience any pregnancy complications.<sup>47,48</sup> In our study, women who had pregnancy complications were 2.4 times more likely to deliver at a health facility than those who had few or no complications. Our findings were consistent with previous studies in Eritrea and Uganda in which knowledge of pregnancy complications and previous pregnancy complications were associated with facility delivery.<sup>43,46,49</sup>

The study has some limitations. Being a retrospective cross-sectional study, we could not infer a cause-and-effect relationship between the variables. A respondent rate of 81.4% was achieved. We could not also rule out a few issues of recall biases since it was a retrospective study. Sociodemographic variables such as occupation and ethnicity were coded into five and six categories respectively and this could introduce a large standard error. Utilizing both quantitative and qualitative methodologies in future research could yield comprehensive insights into the potential underlying factors that contributed to our findings.

## 5. Conclusion and Global Health Implications

This study found that, while the rate of facility delivery was higher than the national average, a significant proportion of women still delivered at home. Sociodemographic factors such as increased age, ethnicity, marital status, and couple's occupation, as well as obstetric factors such as antenatal care visits and experiences with pregnancy complications, were associated with facility delivery. Policymakers should

adopt stringent measures to scale up facility delivery. The authors recommend empowering women through economic activities such as trade to support maternal and child health costs. Partner involvement in maternal decision-making processes can increase facility delivery, especially in male-dominated societies. These recommendations have the potential to improve maternal and newborn health.

**Data availability statement:** The raw data supporting the conclusions of this article will be made available by the authors, without any reservation.

### Compliance with Ethical Standards

**Conflict of interest:** The authors have no conflicts of interest to declare. **Financial Disclosure:** Nothing to declare. **Funding:** None. **Ethics Approval:** Ethical clearance and approval (UDS/IRB/013/21) for this study were obtained from the Research Ethical Review Board of the University for Development Studies (UDS) Tamale, located in the Northern region of Ghana. **Acknowledgments:** None. **Disclaimer:** None.

### Key Messages

- ▶ The facility delivery rate in the Sangnari Municipal Assembly is higher than the national average.
- ▶ Sociodemographic factors such as age, marital status, ethnicity, and a couple's occupation are associated with facility delivery.
- ▶ Obstetrics factors such as the number of ANC attendance and previous pregnancy complications are also associated with facility delivery.
- ▶ The government should provide women with information on the importance of facility delivery through the Ghana Health Service and civil society.
- ▶ Women's empowerment through income-generating activities is crucial to increase the rate of facility delivery.
- ▶ Providing a platform for joint couple decision-making on maternal and child health topics can empower men to support their partners in assisted facility delivery.

### References

1. Boah M, Adampah T, Jin B, et al. "I couldn't buy the items so I didn't go to deliver at the health facility" Home delivery among rural women in northern Ghana: A mixed-method

- analysis. *PLoS One*. 2020;15(3):e0230341. doi: 10.1371/journal.pone.0230341
2. Bhandari TR, Kutty VR, Sarma PS, Dangal G. Safe delivery care practices in western Nepal: does women's autonomy influence the utilization of skilled care at birth? *PLoS One*. 2017;12(8):e0182485.
  3. Alkema L, Chou D, Hogan D, et al. Global, regional, and national levels and trends in maternal mortality between 1990 and 2015, with scenario-based projections to 2030: a systematic analysis by the UN Maternal Mortality Estimation Inter-Agency Group. *Lancet*. 2016;387(10017):462–74.
  4. Atuahene M, Mensah D, Adjui M. A cross-sectional study of determinants of birth weight of neonates in the Greater Accra region of Ghana. *Matern Heal Neonatol Perinatol*. 2015;1(1):1–8. doi: 10.1186/s40748-015-0023-4
  5. Shakiba M, Navaee M, Hassanzai Y. The effect of motivational interviewing on attitude and practice about type of delivery in primigravid women requesting elective cesarean section referring to comprehensive health services centers. *J Educ Health Promot*. 2020;9:37. doi: 10.4103/jehp.jehp\_503\_19
  6. United Nations Children's Fund (UNICEF). Maternal mortality rates and statistics - UNICEF DATA. Published 2020. Accessed June 29, 2021. <https://data.unicef.org/topic/maternal-health/maternal-mortality/>
  7. World Health Organization (WHO). Ghana holds Conference on Maternal, Child Health and Nutrition | WHO | Regional Office for Africa. <https://www.afro.who.int/news/ghana-holds-conference-maternal-child-health-and-nutrition>
  8. Kuhnt J, Vollmer S. Antenatal care services and its implications for vital and health outcomes of children: evidence from 193 surveys in 69 low-income and middle-income countries. *BMJ Open*. 2017;7(11):e017122.
  9. World Health Organization (WHO). Trends in maternal mortality: 1990 to 2015. WHO. Published 2020. Accessed June 29, 2021. <http://www.who.int/reproductivehealth/publications/monitoring/maternal-mortality-2015/en>
  10. Alibhai KM, Ziegler BR, Meddings L, Batung E, Luginaah I. Factors impacting antenatal care utilization: a systematic review of 37 fragile and conflict-affected situations. *Confl Health*. 2022;16(1):1–16.
  11. Larkins-Pettigrew MD, Villalobos VE, Pettigrew GL, Wilds CL. Disturbing maternal and Child Health Outcomes Among Vulnerable Populations. In: *A Population Health Approach to Health Disparities for Nurses*. Springer; 2022: 411–434.
  12. World Health Organization. WHO Recommendation on Antenatal Care for a Positive Pregnancy Experience: Summary. *Lancet*. 2018;387(10017):1–10.
  13. Dalinjong PA, Wang AY, Homer CSE. Has the free maternal health policy eliminated out of pocket payments for maternal health services? Views of women, health providers and insurance managers in Northern Ghana. *PLoS One*. 2018;13(2):e0184830. doi: 10.1371/journal.pone.0184830
  14. Ganle JK, Parker M, Fitzpatrick R, Otupiri E. A qualitative study of health system barriers to accessibility and utilization of maternal and newborn healthcare services in Ghana after user-fee abolition. *BMC Pregnancy Childbirth*. 2014;14:425. doi: 10.1186/s12884-014-0425-8
  15. Kanmiki EW, Bawah AA, Phillips JF, et al. Out-of-pocket payment for primary healthcare in the era of national health insurance: evidence from northern Ghana. *PLoS One*. 2019;14(8):e0221146. doi: 10.1371/journal.pone.0221146
  16. Ekholuenetale M, Barrow A. Inequalities in out-of-pocket health expenditure among women of reproductive age: after-effects of national health insurance scheme initiation in Ghana. *J Egypt Public Health Assoc*. 2021;96:6. doi: 10.1186/s42506-020-00064-9
  17. Oteng-Ababio M, Mariwah S, Kusi L. Is the underdevelopment of northern Ghana a case of environmental determinism or governance crisis? *Ghana J Geogr*. 2017;9(2):5–39.
  18. Ministry of Health (MoH). 2021 Holistic Assessment Report. Ministry of Health. Published April 2022. Accessed June 29, 2022. [https://www.moh.gov.gh/wp-content/uploads/2022/09/2021-Holistic-Assessment-Report\\_v1.7.3.pdf](https://www.moh.gov.gh/wp-content/uploads/2022/09/2021-Holistic-Assessment-Report_v1.7.3.pdf)
  19. Ghana Statistical Service (GSS). Ghana 2021 Population and Housing Census. Report. 2021;6:128.
  20. Ministry of Health. *Review POW 2004 Ministry of Health GHANA Report of the External Review Team*. Ghana Ministry of Health. 2005:1–82.
  21. 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 Serv Res*. 2020;20(1):1088. <https://doi.org/10.1186/s12913-020-05937-5>
  22. Dalinjong PA, Wang AY, Homer CSE. Are health facilities well equipped to provide basic quality childbirth services under the free maternal health policy? Findings from rural northern Ghana. *BMC Health Serv Res*. 2018;18(1):959. doi: 10.1186/s12913-018-3787-1
  23. Local Government Ministry. *Ghana Districts: A repository of all Local Assemblies in Ghana*. Accessed August 1, 2022. <https://www.ghanadistricts.com/Home/District/142>
  24. Ghana Health Service. *CHPS Policy Document*. Ghana Health Service. 2005: 63. Accessed August 1, 2022. <https://www.moh.gov.gh/wp-content/uploads/2016/02/CHPS-Operational-Policy-2005.pdf>
  25. Bassoumah B, Adam AM, Adokiya MN. Challenges to the utilization of Community-based Health Planning and Services: the views of stakeholders in Yendi Municipality, Ghana. *BMC Health Serv Res*. 2021;21(1):1223. <https://doi.org/10.1186/s12913-021-07249-8>
  26. Kifle MM, Kesete HF, Gaim HT, Angosom GS, Araya MB. Health facility or home delivery? Factors influencing the

- choice of delivery place among mothers living in rural communities of Eritrea. *J Health Popul Nutr.* 2018;37(1):22. doi: 10.1186/s41043-018-0153-1.
27. Gitonga E, Muiruri F. Determinants of health facility delivery among women in Tharaka Nithi county, Kenya. *Pan Afr Med J.* 2016;25(Suppl 2):9. doi: 10.11604/pamj.supp.2016.25.2.10273.
  28. Envuladu E, Agbo H, Lassa S, Kigbu J, Zoakah A. Factors determining the choice of a place of delivery among pregnant women in Russia village of Jos North, Nigeria: achieving the MDGs 4 and 5. *Int J Med Biomed Res.* 2013;2(1):23–7.
  29. IBM Corp. IBM Statistical Package for the Social Sciences (SPSS) Statistics for Windows. Armonk, NY: IBM Corp; 2017. <https://hadoop.apache.org>
  30. Sory E. Ghana Health Service Annual Report. 2017:61.
  31. Kelebore WG, Asefa A, Tunje A, et al. Assessment of factors affecting institutional delivery service utilization among mother who gave birth in last two years, Arbaminch Town, Gamo Gofa Zone, Snnpr, Ethiopia. *Sci J Public Heal.* 2016;4(6):458. doi: 10.11648/j.sjph.20160406.17
  32. Bolarinwa OA, Fortune E, Aboagye RG, et al. Health facility delivery among women of reproductive age in Nigeria: Does age at first birth matter? *PLoS One.* 2021;16(11):e0259250. doi: 10.1371/journal.pone.025925033
  33. Muhunzi S, Ngocho JS, Mwanamsangu A, et al. Prevalence, predictors and reasons for home delivery amongst women of childbearing age in Dodoma Municipality in central Tanzania. *Afr Health Sci.* 2020;20(4):1933-1942. doi: 10.4314/ahs.v20i4.5234
  34. Ganle JK, Mahama MS, Maya E, Manu A, Torpey K, Adanu R. Understanding factors influencing home delivery in the context of user-fee abolition in Northern Ghana: Evidence from 2014 DHS. *Int J Health Plann Manage.* 2019;34(2):727–43.
  35. Ghana Statistical Service (GSS), Ghana Health Service (GHS) and I. 2017 Ghana Maternal Health Survey (GMHS) Research Policy Briefs. GSS, GHS, ICF. 2019. Accessed August 1, 2022. <https://statsghana.gov.gh/gssmain/fileUpload/pressrelease/PB14.pdf>
  36. Moyer CA, Adongo PB, Aborigo RA, Hodgson A, Engmann CM, DeVries R. “It’s up to the woman’s people”: how social factors influence facility-based delivery in Rural Northern Ghana. *Matern Child Health J.* 2014;18(1):109–19.
  37. Puthuchira Ravi R, Athimulam Kulasekaran R. Does Socio-demographic factors influence women’s choice of place of delivery in rural areas of Tamilnadu State in India. *Am J Public Heal Res.* 2014;2(3):75–80.
  38. Abebe F, Berhane Y, Girma B. Factors associated with home delivery in Bahirdar, Ethiopia: a case control study. *BMC Res Notes.* 2012;5:653.
  39. Lawn JE, Cousens S, Zupan J, Team LNSS. 4 million neonatal deaths: when? Where? Why? *Lancet.* 2005;365(9462):891–900.
  40. Shehu CE, Ibrahim MTO, Oche MO, Nwobodo EI. Determinants of place of delivery: a comparison between an urban and a rural community in Nigeria. *J Public Health Epidemiol.* 2016;8(6):91-101. Doi: 10.5897/JPHPE2016.0817
  41. Adde KS, Dickson KS, Amu H. Prevalence and determinants of the place of delivery among reproductive age women in sub-Saharan Africa. *PLoS One.* 2020;15(12):e0244875. doi: 10.1371/journal.pone
  42. MLAN, K FM, Dramaix-Wilmet M, Donnen P. Determinants of maternal health services utilization in urban settings of the Democratic Republic of Congo—a case study of Lubumbashi City. *BMC Pregnancy Childbirth.* 2012;12:66. doi: 10.1186/1471-2393-12-66
  43. Kifle MM, Kesete HF, Gaim HT, Angosom GS, Araya MB. Health facility or home delivery? Factors influencing the choice of delivery place among mothers living in rural communities of Eritrea. *J Health Popul Nutr.* 2018;37(1):22. doi: 10.1186/s41043-018-0153-1
  44. Hunter M, Pairman S, Benn C, et al. Do low risk women actually birth in their planned place of birth and does ethnicity influence women’s choices of birthplace? *New Zeal Coll Midwives J.* 2011;(44).
  45. Ijaiya MA, Saka MJ, Aderibigbe SA, Raji HO, Adeniran AS, Ijaiya ZB, et al. Determinants of choice of facility-based delivery among mothers in Kwara State, Nigeria. *West Afr J Med.* 2023;40(6):594–600.
  46. Gebregziabher NK, Zeray AY, Abtey YT, Kinfe TD, Abrha DT. Factors determining choice of place of delivery: analytical cross-sectional study of mothers in Akordet town, Eritrea. *BMC Public Health.* 2019;19(1):924. doi: 10.1186/s12889-019-7253-8
  47. Gage AJ. Barriers to the utilization of maternal health care in rural Mali. *Soc Sci Med.* 2007;65(8):1666–82. doi: 10.1016/j.socscimed.2007.06.001
  48. Gabrysch S, Zanger P, Seneviratne HR, Mbewe R, Campbell OMR. Tracking progress towards safe motherhood: Meeting the benchmark yet missing the goal? An appeal for better use of health-system output indicators with evidence from Zambia and Sri Lanka. *Trop Med Int Heal.* 2011;16(5):627–39. doi: 10.1111/j.1365-3156.2011.02741.x
  49. Anyait A, Mukanga D, Oundo GB, Nuwaha F. Predictors for health facility delivery in Busia district of Uganda: a cross sectional study. *BMC Pregnancy Childbirth.* 2012;12:132. doi: 10.1186/1471-2393-12-132