Knowledge of Maternal Mortality and Its Determinants Among Pregnant Women at Tamale Teaching Hospital in Northern Ghana: A Descriptive Cross-Sectional Study

Hajara Yakubu[1], Mudasir Mohammed Ibrahim[1], Patience Dogbe[1], Nafisatu Issah[1], Kate Abosi[1], Adisah Osman[1], Francisca Abangbila[1], Abdul-Malik Abdulai[1]

[1] *Nurses and Midwives Training College, Tamale, Ghana*
Corresponding author: mudassiribrahim30@gmail.com

ABSTRACT

Background: Maternal mortality remains a significant public health challenge in Ghana. Understanding the level of knowledge among pregnant women regarding maternal mortality is crucial for designing effective interventions.

Purpose: To evaluate the knowledge of maternal mortality and its determinants among pregnant women at Tamale Teaching Hospital in the Northern Region of Ghana.

Methods: An institution-based quantitative cross-sectional study was conducted at Tamale Teaching Hospital in the Northern Region of Ghana. A systematic random sampling technique was used to select 240 pregnant women attending ANC services at the facility. The data were analyzed using John's Macintosh Project (JMP) Statistical Software version 17.1.

Results: The response rate in this study was 97.5%. The majority of pregnant women (52.6%) had good knowledge of maternal mortality, while 47.4% had poor knowledge. Significant determinants of knowledge of maternal mortality were educational level (OR=3.69, p=0.002), occupational status (OR=4.00, p=0.001), monthly income (OR=3.67, p=0.001), age at first pregnancy (OR=2.84, p=0.021), number of weeks in the current pregnancy (OR=0.41, p=0.041), previous history of intrauterine fetal distress (IUFD) (OR=5.01, p=0.021), presence of chronic illness (OR=7.93, p=0.001), and obstetric labor complications readiness (OR=8.93, p<0.001).

Conclusion: Although the majority of pregnant women had good knowledge of maternal mortality, special attention should be given to women in the second trimester and those with previous histories of IUFD or chronic illnesses to address gaps in knowledge and ultimately reduce maternal mortality rates.

Keywords: *Maternal Mortality; Pregnant Women; Obstetric Labor Complications; Knowledge*

BACKGROUND

Maternal mortality has garnered global attention due to its profound impact on populations, particularly the health of women and children (Asogwa et al., 2022). The term refers to the death of mothers resulting from complications related to pregnancy and childbirth, as defined by (Faduyile et al., 2017) and (Ogu & Ephraim-Emmanuel, 2018). This includes deaths during pregnancy or within 42 days of termination, regardless of gestational age or pregnancy site. Maternal mortality is often linked to how pregnancy is handled (Okeke et al., 2021).

The World Health Organization (WHO) highlights maternal morbidity and mortality as major concerns in developing and resource-limited countries. WHO estimates reports that out of 8 million women facing pregnancy-related complications annually, approximately half a million dies (Acquaye et al., 2021). Developing countries constitute about 99% (284,000) of these global maternal deaths, and more than half (162,000) occur in Sub-Saharan Africa (Berhe et al., 2019; Gebre et al., 2015) . In 2010, developing countries experienced an average maternal mortality rate of 240 per 100,000 births, while developed countries had only 16 per 100,000. Sub-Saharan Africa had the highest rate at 500 maternal deaths per 100,000 live births. A few countries, including India, Nigeria, Pakistan, Afghanistan, Ethiopia, and the Democratic Republic of the Congo, contributed to over 50% of all maternal mortality in 2008. Guinea, in particular, reported a high rate of 550 deaths per 100,000 live births (Asfaha et al., 2022; Balde et al., 2021).

Mental health conditions during pregnancy contribute to maternal mortality, with increased risk for women who have had two or more children. The frequency of antenatal visits inversely correlates with the likelihood of maternal mortality, emphasizing the importance of regular check-ups (Amoo & Ajayi, 2019). Obstetric complications stand as the primary causes of maternal death, with an estimated 830 women worldwide succumbing daily to preventable causes during pregnancy and childbirth (Asefa, A., Getachew, B., Belete, A. M., & Molla, 2022; Takahashi & Chuemchit, 2016).

Direct obstetric complications, such as hemorrhage, sepsis, hypertensive disorders, obstructed labor, and unsafe abortion, account for about 75% of maternal deaths. Recognizing danger signs and providing skilled institutional care can prevent these fatalities (Asferie & Goshu, 2022). In addition, multiple factors such as nutritional status, anemia, medical history, age, antenatal care, delivery method, late referral, occupational status, and pregnancy complications, contribute to higher risks of maternal mortality (Diana et al., 2020). Thaddeus and Maine also identified three delays affecting obstetric services: (a) delay in deciding to seek care, (b) delay in reaching a facility, and (c) delay in receiving care (Kamineni et al., 2017; Saaka & Alhassan, 2021). Antenatal clinics play a crucial role in preventing and promptly addressing adverse pregnancy outcomes (APO) (Alharbi et al., 2018).

In Ghana, the documented Maternal Mortality Ratio (MMR) for 2012 was 350 per 100,000 live births, with maternal mortality remaining a significant cause of death among women aged 15-49 (Ogu & Ephraim-Emmanuel, 2018). Despite progress, Ghana's MMR in 2017 was still 308 per 100,000 live births, indicating the need for further improvement to meet Millennium Development Goal 5 (Takahashi & Chuemchit, 2016). The country lags behind others like Djibouti, Sudan, Zambia, and Angola in MMR, according to 2017 figures (Agambire et al., 2022). Maternal deaths in Ghana follow patterns seen in developing countries, with hemorrhage, hypertensive disorders, abortion-related complications, and septicemia as leading causes.

Furthermore, in the Northern Region of Ghana, the maternal mortality rate at Tamale Teaching Hospital (TTH) has increased significantly in 2023/2024 compared to the previous years, with a rise from 719 to 1210 maternal deaths per 100,000 live births (Gadafi, 2024; Getachew et al., 2017). To develop effective interventions, it is crucial to understand the knowledge and awareness of direct obstetric causes of maternal mortality and prevention strategies among pregnant women. Unfortunately, there is a lack of research on this topic, particularly in Ghana and the Northern region, including Tamale (Purwati et al., 2022; Suglo et al., 2017). Knowledge of maternal mortality is essential for reducing maternal mortality and achieving sustainable development goals, as it supports actions and fosters self-confidence, attitudes, and behaviors. Knowledge is a significant factor influencing healthcare-seeking behavior (Toe et al., 2021). Therefore, the purpose of this study was to evaluate the knowledge of maternal mortality and its determinants among pregnant women at Tamale Teaching Hospital in the Northern Region of Ghana.

METHODS

Study design

A descriptive cross-sectional design was adopted for this study.

Study setting

The study was conducted at Tamale Teaching Hospital (TTH), a healthcare facility located in Tamale, in the Northern Region of Ghana. The hospital was commissioned in the year 1974 as a regional hospital and then converted to a teaching hospital in the year 2005. TTH is the only tertiary hospital in Northern Ghana 2km southeast of town. It is the third oldest and largest teaching hospital in Ghana after the Korle Bu Teaching Hospital and Komfo Anokye Teaching Hospital. It serves as a referral hospital for the five Northern Regions of Ghana. TTH provides specialized services in various medical fields.

Population and sample

The study consisted of all pregnant women seeking antenatal care (ANC) services at the Tamale Teaching Hospital in the Northern Region of Ghana. Those who provided consent to be part of the study were included. However, pregnant women who were seriously ill and unable to participate were excluded from the study. The estimated population size (N) was 600, and a precision level (e) of 0.05 was used. Using the Taro Yamane (1967) formula $n = \frac{N}{1+N(e)^2}$, the calculated sample size was approximately 240 respondents, as shown below:

$$n = \frac{600}{1+600(0.05)^2} = \frac{600}{1+600(0.0025)} = \frac{600}{1+1.5} = \frac{600}{2.5} = 240.$$

Sampling technique

A systematic random sampling technique was utilized to ensure a representative sample of pregnant women attending the ANC clinic. The sampling interval (k) was determined by dividing the total number of pregnant women by the desired sample size (600/240 = *Approximately* 3). A random starting point was selected within the first k women attending the clinic on the initial day of data collection. Every 3rd woman on the list,

starting from the random starting point, was invited to participate in the study. If a selected woman declined to participate, the next eligible woman was chosen.

Research instrument

The instrument used for data collection in this study was developed following a comprehensive review of the literature on maternal health knowledge (Getachew et al., 2017; Igberase et al., 2019). The review focused on identifying key aspects of direct obstetric causes and the prevention of maternal mortality. Based on the findings from the literature, a 45-item questionnaire was constructed to gather information on the sociodemographic characteristics and obstetric history of the respondents, their knowledge of maternal mortality, and their readiness for obstetric complications. Respondents were asked to provide information about their sociodemographic characteristics using seven (7) items with multiple options to choose from (age, educational level, marital status, etc.). Additionally, respondents were asked about their obstetric history through a set of six (6) items, providing them with multiple options to choose from. For example, they were asked about their previous experiences, such as "Do you have a previous history of intrauterine fetal distress (IUFD)?" Moreover, there were two (2) components to the assessment of maternal mortality knowledge. First, sixteen (16) questions were used to assess the respondents' knowledge of the direct obstetric causes of maternal mortality (for example, "Excessive loss of blood during pregnancy can lead to maternal mortality"). Second, eight (8) questions were utilized to assess respondents' knowledge about maternal mortality preventive measures (e.g., "Adequate nutrition before pregnancy can help prevent the death of pregnant mothers"). There were three possible answers for respondents to choose from for each question: "Yes," "No," and "I don't know." Lastly, the respondents' readiness for obstetric labor complications was evaluated based on seven specific items. They were given the opportunity to indicate whether they had made preparations since their pregnancy by selecting either "Yes" or "No" (e.g., "Identify place to deliver").

Validity and reliability

To ensure the validity and reliability of the questionnaire developed for this study on maternal health knowledge, a multi-step process was followed, involving peer review, a pilot study, and reliability testing. The initial version of the 45-item questionnaire was subjected to peer review by a panel of six experts in the fields of maternal health and epidemiology. Each expert independently evaluated the questionnaire for content validity, ensuring that the items comprehensively covered the key aspects of maternal health knowledge, direct obstetric causes of maternal mortality, and preventive measures. A pilot study was conducted with a sample of twenty (20) respondents who were similar to the target population but not included in the main study. The questionnaire was thoroughly reviewed, and no issues were identified; thus, no revisions were necessary. The internal consistency of the instrument was evaluated using Cronbach's alpha (0.81), indicating good reliability.

Variables and measurements

Knowledge of maternal mortality was the dependent variable, while the independent variables were sociodemographic characteristics (age, educational level, marital status, occupation status, monthly income, residence, and religious affiliation), obstetric history information (number of pregnancies "gravida", age at first pregnancy, a previous history of intrauterine fetal distress (IUFD), had ever had an abortion before, had a chronic illness, and number of weeks of current pregnancy), and obstetric labor complications

readiness. Knowledge of maternal mortality was assessed by assigning a score of "1" to correct answers and "0" to incorrect answers. The scores were then totaled (range: 6-24), and individuals scoring 20 and above were categorized as having "Good Knowledge," while those scoring less than 20 were categorized as having "Poor Knowledge." For obstetric labor complications readiness, respondents who identified seven of the items were classified to be "Fully Prepared", while those who identified fewer than seven items were considered to be "Not Fully Prepared".

Data collection

The researchers sought full permission to conduct the study in the facility. After gaining approval, respondents were approached at the ANC clinic individually at a time convenient to them. Respondents were provided with detailed information about the study, including its purpose, procedures, risks, and benefits. Written informed consent was obtained from each respondent before any data was collected. Five of the researchers administered the questionnaires to the respondents in a designated restroom within the ANC clinic. The data collection period was between January 2024 to February 2024 at the ANC clinic.

Data analysis

Data were coded, cleaned, and analyzed using JMP version 17.1 (SAS Institute Inc., Cary, North Carolina, USA). The results were presented in frequency tables and bar charts, followed by a narrative explanation of respondents' sociodemographic characteristics, obstetric history, and their knowledge of direct obstetric causes and preventive measures of maternal mortality. A multivariable binary logistic regression was performed to investigate the determinants of knowledge of maternal mortality among the respondents. A P-value < 0.05 was considered statistically significant, with a 95% confidence interval.

Ethical consideration

An introductory letter was obtained from the affiliated college and used to seek for permission from the Tamale Teaching Hospital Department of Research and Development (ref: TTH/R&D/SR/331). Following approval, permission was sought from respondents verbally by explaining the essence of the study to them in order to gain their full cooperation. The questionnaires were then distributed to those who responded voluntarily and without being forced. The confidentiality and anonymity of the respondents were ensured as no identifiable feature of the respondents was obtained.

RESULTS

Table 1: Sociodemographic characteristics of pregnant women (N = 234)

Variable	n	%
Age (in years)		
18-20	32	13.7
21-23	36	15.4
24-26	43	18.4
27-30	72	30.8
>30	51	21.8
Educational level		
not educated	32	13.7

Variable	n	%
Basic	42	17.9
Secondary	57	24.4
Tertiary	103	44.0
Marital status		
Single	59	25.2
Married	151	64.5
Divorced	20	8.5
Widowed	4	1.7
Occupation status		
self-employed (business)	114	48.7
government or private employed	65	27.8
Unemployed	55	23.5
Monthly Income (in GHS)		
<500	124	53.0
500-1000	64	27.4
above 1000	46	19.7
Residence		
Rural	80	34.2
Urban	154	65.8
Religious affiliation		
Christianity	90	38.5
Islam	134	57.3
Traditional	10	4.3

Note: GHS denotes Ghana Cedis (*Country Currency*)

Table 1 shows the sociodemographic characteristics of the pregnant women. A total of 240 questionnaires were administered, but only 234 were successfully retrieved and completely answered (response rate: 97.5%). In this study, approximately 30.8% of pregnant women were aged 27 to 30 years old, 44.0% had tertiary education, 64.5% were currently married, 48.7% were self-employed (in business), 53.0% earned less than GHS 500, 65.8% were from urban areas, and 57.3% were identified as Muslims.

Table 2: Obstetric history information of pregnant women (N = 234)

Variable	n	%	Mean ± SD	Min-max
Number of pregnancies (gravida)			2.33 ± 1.80	1-6
≤ 2	147	62.8		
3-4	69	29.5		
>4	18	7.7		
Age at first pregnancy			21.63 ± 3.91	16-32
20 years or less	89	38.0		
21-25 years	116	49.6		
Above 25 years	29	12.4		
A previous history of intrauterine fetal distress (IUFD)				
Yes	18	7.7		
No	216	92.3		
Had ever had an abortion before				
Yes	36	15.4		

Variable	n	%	Mean ± SD	Min-max
No	198	84.6		
Had a chronic illness				
Yes	19	8.1		
No	215	91.9		
Number of weeks of current pregnancy				
0-11	30	12.8		
12-27	88	37.6		
28-40	116	49.6		

Table 2 presents the obstetric history information of the pregnant women. The study revealed that 62.8% had two or fewer pregnancies, 49.6% had their first pregnancy between the ages of 21 and 25 years old, 92.3% had no previous history of intrauterine fetal distress (IUFD), 84.6% reported having no history of abortion, 91.9% had no form of chronic illness, and 49.6% of them reported a current pregnancy duration of 28 to 40 weeks.

Table 3: Knowledge of direct obstetric causes of maternal mortality among pregnant women (N = 234)

Variable	Yes		No		I Don't Know	
	n	%	n	%	n	%
Excessive loss of blood during pregnancy can lead to maternal mortality.	217	92.7	5	2.1	12	5.1
Excessive loss of blood during childbirth can lead to maternal death.	228	97.4	3	1.3	3	1.3
Termination of pregnancy through unsafe ways (unsafe abortion) can result to the death of a mother.	194	82.9	22	9.4	18	7.7
Contraction of infection during childbirth can cause death of a childbearing mother	152	65.0	39	16.7	43	18.4
Having pre-eclampsia during pregnancy can cause maternal death.	182	77.8	11	4.7	41	17.5
Obstructed labour is one of the causes of maternal mortality.	162	69.2	34	14.5	38	16.2
Malaria during pregnancy can cause maternal mortality.	142	60.7	66	28.2	26	11.1
Anaemia in pregnancy can cause death of mothers.	214	91.5	4	1.7	16	6.8
Domestic accident such as falls during pregnancy can lead to maternal death.	199	85.0	21	9.0	14	6.0
Intimate partner violence especially during pregnancy can cause maternal death.	205	87.6	12	5.1	17	7.3
Gestational diabetes mellitus is one of the causes of maternal mortality.	145	62.0	19	8.1	70	29.9
Untimely access to maternal health services can lead to maternal death.	202	86.3	12	5.1	20	8.5
Delivery by unskilled birth attendants may lead to maternal death.	206	88.0	11	4.7	17	7.3

Variable	Yes		No		I Don't Know	
	n	%	n	%	n	%
Pre-existing heart disease can cause maternal death	169	72.2	14	6.0	51	21.8
Hypertension in pregnancy can cause maternal death.	142	60.7	58	24.8	34	14.5
Excessive thickening of the heart muscle can cause maternal death.	142	60.7	15	6.4	77	32.9

Table 3 depicts the knowledge of direct obstetric causes of maternal mortality among the pregnant women. A significant number (92.7%) knew that excessive blood loss during pregnancy can lead to maternal mortality, 97.4% were aware that excessive blood loss during childbirth can result in maternal death, 91.5% knew that anaemia in pregnancy can cause the death of mothers, and 88.0% were informed that delivery by unskilled birth attendants may lead to maternal death. Additionally, 85.0% recognized that domestic accident such as falls during pregnancy can lead to maternal death, while 87.6% were aware that intimate partner violence especially during pregnancy can cause maternal death. Furthermore, 82.9% knew that termination of pregnancy through unsafe methods could result in the death of a mother.
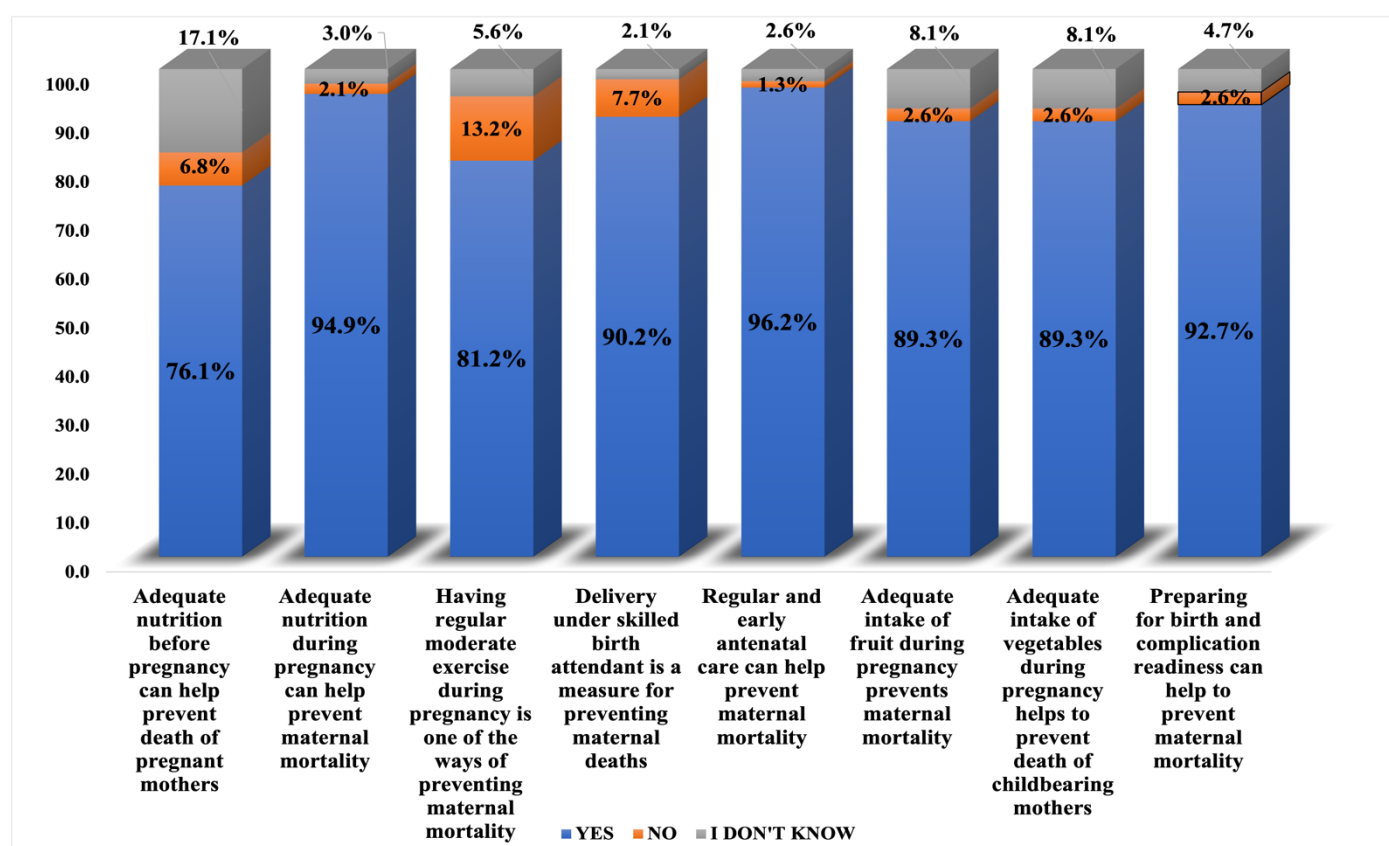
Figure 1: Knowledge of preventive measures of maternal mortality among pregnant women (N = 234)

Figure 1 displays pregnant women's knowledge of preventive measures of maternal mortality. Over half of pregnant women (96.2%) recognized the importance of regular and early antenatal care in preventing maternal mortality, 94.9% were aware that adequate nutrition during pregnancy can contribute to preventing maternal mortality, 92.7% knew that preparing for birth and complication readiness is crucial in preventing maternal mortality, and 90.2% acknowledged that delivering under the care of a skilled birth attendant is a preventive measure against maternal deaths.

Level of knowledge of Maternal Mortality

47.40%　52.60%

■ Good Knowledge　■ Poor Knowledge
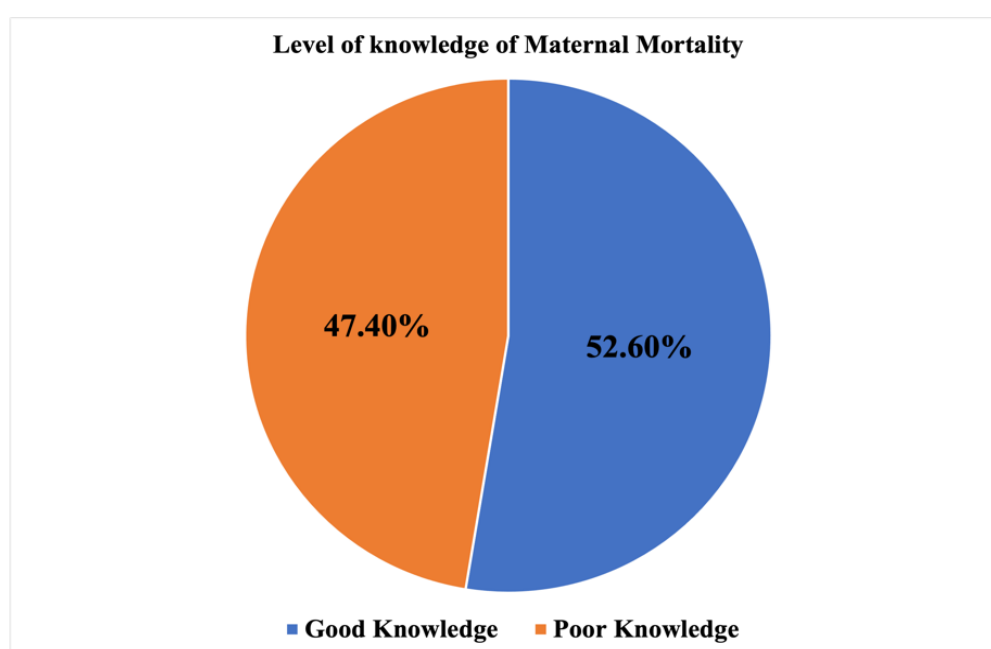
Figure 2: Level of knowledge of maternal mortality among pregnant women (N = 234)

As presented in Figure 2, the majority of pregnant women (52.6%) had good knowledge of maternal mortality, while 47.4% had poor knowledge.

Table 4: Association between knowledge of maternal mortality and sociodemographic and obstetric characteristics (N = 234)

Variable	COR	95% C. I.	P value	AOR	95% C. I.	P value
Age (in years)						
18-20	Ref					
21-23	1.13	0.43-2.94	0.796	0.49	0.13-1.79	0.285
24-26	1.73	0.68-4.37	0.243	1.57	0.39-6.19	0.518
27-30	1.34	0.58-3.08	0.492	0.58	0.12-2.68	0.492
>30	1.08	0.44-2.64	0.849	0.60	0.11-3.24	0.554
Educational level						
Not educated	Ref					
Basic	0.92	0.35-2.40	0.874	1.25	0.38-4.06	0.703

Variable	COR	95% C. I.	P value	AOR	95% C. I.	P value
Secondary	1.30	0.53-3.15	0.559	0.76	0.23-2.43	0.646
Tertiary	3.69	1.61-8.46	0.002*	2.25	0.68-7.46	0.182
Marital status						
Married	Ref					
Single	1.28	0.75-2.20	0.356	1.28	0.48-3.39	0.612
Occupation status						
Unemployed	Ref					
Government or private employed	4.00	1.82-8.76	0.001*	4.79	1.29-17.81	0.019*
Self-employed (business)	0.87	0.45-1.66	0.680	1.59	0.60-4.18	0.344
Monthly Income (in GHS)						
<500	Ref					
500-1000	1.56	0.85-2.87	0.148	0.60	0.24-1.48	0.270
Above 1000	3.67	1.73-7.75	0.001*	0.84	0.23-3.06	0.798
Residence						
Rural	Ref					
Urban	1.71	0.99-2.95	0.052	1.67	0.77-3.65	0.191
Religious affiliation						
Traditional	Ref					
Islam	1.41	0.38-5.23	0.604	3.70	0.60-6.90	0.156
Christianity	2.25	0.59-8.53	0.233	5.47	0.88-3.94	0.068
Number of pregnancies (gravida)						
≤ 2	Ref					
3-4	0.62	0.35-1.11	0.114	0.92	0.36-2.33	0.862
>4	0.77	0.28-2.05	0.603	2.21	0.48-10.06	0.302
Age at first pregnancy						
20 years or less	Ref					
21-25 years	1.57	0.90-2.75	0.107	1.52	0.71-3.23	0.273
Above 25 years	2.84	1.16-6.94	0.021*	1.11	0.28-4.30	0.877
A previous history of intrauterine fetal distress (IUFD)						
No	Ref					
Yes	2.50	0.86-7.27	0.091	5.01	1.27-19.73	0.021*
Had ever had an abortion before						
No	Ref					
Yes	0.51	0.25-1.07	0.077	0.41	0.14-1.21	0.109
Had a chronic illness						
No	Ref					

Variable	COR	95% C. I.	P value	AOR	95% C. I.	P value
Yes	2.06	0.75-5.64	0.155	7.93	2.35-26.80	0.001*
Number of weeks of current pregnancy						
0-11	Ref					
12-27	0.41	0.17-0.96	0.041*	0.32	0.11-0.91	0.033*
28-40	1.39	0.61-3.16	0.420	1.33	0.48-3.64	0.573
Obstetric labor complications readiness						
Not fully prepared	Ref					
Fully prepared	8.66	4.56-16.44	<0.001*	8.93	3.66-21.79	<0.001*
Statistically significant at P < 0.05, COR, Crude Odds Ratio, AOR, Adjusted Odds Ratio						

According to Table 4, in the crude analysis, educational level, occupation status, monthly income, age at first pregnancy, number of weeks in current pregnancy, and obstetric labor complications readiness were found to be significantly associated with maternal mortality knowledge among the pregnant women. Women with tertiary education had 3.69 times higher odds (95% CI [1.61, 8.46]) of possessing adequate knowledge compared to those not educated. Women working at government or private institutions had 4.00 times higher odds (95% CI [1.82, 8.76]) of adequate knowledge compared to those who were unemployed. Additionally, women earning above GHS1000 demonstrated higher odds of adequate knowledge (COR = 3.67, 95% CI [1.73, 7.75]) compared to those who earned less than 500 Ghana cedis. Women who had their first pregnancy at the age of above 25 years had 2.84 times higher odds (95% CI [1.16, 6.94]) of adequate knowledge compared to those aged 20 years or younger. Similarly, women identified as fully prepared for any obstetric labor complications demonstrated 8.66 times higher odds of adequate knowledge (95% CI [4.56, 16.44]) compared to those not fully prepared. Conversely, women in their 12 to 27 weeks of pregnancy were associated with lower odds of adequate knowledge (COR = 0.41, 95% CI [0.17, 0.96]) compared to those in the 0 to 11 weeks category.

In the multivariate analysis, occupational status, a previous history of intrauterine fetal distress (IUFD), presence of chronic illness, number of weeks of current pregnancy, and obstetric labor complications readiness were significantly associated with maternal mortality knowledge. Pregnant women working at government or private institutions continued to exhibit higher odds of adequate knowledge (AOR = 4.79, 95% CI [1.29, 17.81]), as did those fully prepared for any obstetric labor complications (AOR = 8.93, 95% CI [3.66, 21.79]). Being between 12 to 27 weeks of pregnancy remained negatively associated with knowledge (AOR = 0.32, 95% CI [0.11, 0.91]), indicating lower odds of adequate maternal mortality knowledge compared to those 0 to 11 weeks. Furthermore, women with a previous history of IUFD had 5.01 times higher odds (95% CI [1.27, 19.73]) of possessing adequate knowledge compared to those who did not. Women with chronic illness had 7.93 times higher odds (95% CI [2.35, 26.80]) of adequate knowledge compared to those who did not.

DISCUSSION

The aim of the research was to evaluate the knowledge of maternal mortality and its determinants among pregnant women at Tamale Teaching Hospital in the Northern Region of Ghana. In our study, the majority of the respondents (88.0%) were aware that delivery by unskilled birth attendants may lead to maternal death. This high knowledge might be due to increased educational efforts or better access to information at the study facility. This is congruent with the study by (Yarney, 2019), which revealed that about 50.7%, representing majority were aware of unskilled birth attendants as a potential cause of maternal mortality. Similarly, according to (Addo et al., 2023)employing the services of unskilled birth attendants in the management of pregnancy and child delivery is associated with a high risk of maternal mortality. To address the concerning rates of maternal mortality, the study suggests that ongoing education for pregnant women is crucial. This includes regular prenatal care, preparing for childbirth, and being aware of potential complications. Additionally, counseling on warning signs during pregnancy can significantly reduce the risk of maternal mortality (Ayele et al., 2019).

Our study revealed that most of the respondents were aware that both excessive blood loss during pregnancy and excessive blood loss during childbirth are factors that can result in maternal mortality (92.7%, 97.4%, respectively). This implies that awareness of the causes of maternal mortality, particularly excessive bleeding during pregnancy and childbirth, is high among the respondents surveyed. A similar result was observed in a study conducted by (Asogwa et al., 2022), where most respondents identified hemorrhage as a cause of maternal mortality. However, awareness alone is not enough. Therefore, the study recommends that healthcare facilities strengthen antenatal, delivery, and postnatal care services, as this would help prevent, detect, and manage pregnancy-related complications such as hemorrhage.

In addition, the majority (91.5%) knew that anemia in pregnancy can cause the death of mothers. This finding aligns with a study conducted by (Amoo & Ajayi, 2019), where 94.1% of respondents mentioned anemia as a cause of maternal mortality. The similarity in these findings may be attributed to the geographical location of the respondents. Urban areas often have better access to media and technology, facilitating the dissemination of information. In contrast, rural areas may lack internet connectivity and media penetration, limiting women's exposure to maternal health knowledge.

The results of our study showed that majority of respondents (52.6%) had good knowledge of maternal mortality. Similarly, the results of research conducted by (Getachew et al., 2017) and (Titilayo et al., 2015) showed that 77.6% and 67.0% of respondents, respectively, had good knowledge of maternal mortality. Our finding, however, contrasts with the study by (Azuh et al., 2017) who found that majority of respondents (50.6%) had no knowledge of maternal mortality. This is encouraging because over half of the respondents knew about the causes, actions, and strategies that can be taken to prevent maternal deaths. The commendable level of knowledge displayed by the respondents regarding maternal mortality may be credited to the effective education provided by health professionals in the hospital (Afaya et al., 2020).

Our study discovered that several demographic and socioeconomic factors significantly impact the knowledge of maternal mortality among respondents. These factors include being a government employee, having a high income, holding a tertiary education, and having a history of intrauterine fetal death (IUFD). This finding aligns with a previous study by (Getachew et al., 2017). To improve knowledge of maternal

mortality and prevent it, the Government of Ghana should ensure that healthcare services are accessible and affordable for all, particularly for those in lower socioeconomic groups. This can be achieved by increasing funding for healthcare infrastructure and services, as well as implementing policies that promote equitable access to healthcare. Additionally, community-based initiatives involving local leaders and community members can be initiated to raise awareness about maternal mortality and promote healthy behaviors, especially among those with a history of birth complications.

CONCLUSION

The study found that the majority of pregnant women had good knowledge of maternal mortality. Determinants of maternal mortality knowledge were educational level, occupational status, monthly income, age at first pregnancy, number of weeks in the current pregnancy, previous history of intrauterine fetal distress (IUFD), presence of chronic illness, and obstetric labor complications readiness. These findings suggest that targeted interventions focusing on these factors could improve maternal mortality knowledge and ultimately reduce maternal mortality rates.

ACKNOWLEDGMENTS

REFERENCES

Acquaye, Nimako, Arkoh, Quarshie, & Assim. (2021). Factors Affecting Maternal Mortality at the Komfo Anokye Teaching Hospital Using the Audit Committee Report. *Open Access Library Journal*, *8*(7), 7. https://doi.org/10.4236/oalib.1107678

Addo, Acquah, Nyarko, Boateng, & Dickson. (2023). Factors associated with unskilled birth attendance among women in sub-Saharan Africa: A multivariate-geospatial analysis of demographic and health surveys. *PLOS ONE*, *18*(2), e0280992. https://doi.org/10.1371/journal.pone.0280992

Afaya, Azongo, Dzomeku, Afaya, Salia, Adatara, Kaba, Alhassan, Amponsah, Atakro, Adadem, Asiedu, Amuna, Amogre, & Ayanore. (2020). Women's knowledge and its associated factors regarding optimum utilisation of antenatal care in rural Ghana: A cross-sectional study. *PloS One*, *15*(7), e0234575.

Agambire, Adusei, Agyei, & Ansong. (2022). Knowledge and practices of birth preparedness and complication readiness among pregnant head porters in a hospital in Ghana. *International Journal Of Community Medicine And Public Health*, *9*(4), 1618–1625.

Alharbi, Alawaji, & Alluhaida. (2018). Knowledge and Attitude of Mothers on Risk Factors Influencing Pregnancy Outcomes in Qassim, Saudi Arabia: A Cross-Sectional Study. *The Egyptian Journal of Hospital Medicine*, *71*(7), 3487–3491.

Amoo, & Ajayi. (2019). Maternal mortality and factors affecting it, among pregnant women in Abeokuta South, Nigeria. *Clinical Journal of Obstetrics and Gynecology*, *2*(2), 071–078. https://doi.org/10.29328/journal.cjog.1001025

Asefa, A., Getachew, B., Belete, A. M., & Molla, D. (2022). (2022). Knowledge and Practice on Birth Preparedness, Complication Readiness among Pregnant Women

Visiting Debreberhan Town Governmental Health Institutions, North-East Ethiopia. *Journal of Women's Health Care*, *11*(6), 1–8. https://doi.org/10.35248/2167-0420.22.11.587

Asfaha, Gebremariam, Gebremariam, & Weldemariam. (2022). Knowledge about Obstetric Danger Signs and Related Factors in Reproductive-Age Women in the Southeast Zone of Tigray, 2021: A Cross-Sectional Study. *International Journal of Reproductive Medicine*, *2*(2), e7346618. https://doi.org/10.1155/2022/7346618

Asferie, & Goshu. (2022). Knowledge of pregnancy danger signs and its associated factors among pregnant women in Debre Tabor Town Health Facilities, South Gondar Administrative Zone, North West Ethiopia, 2019: Cross-sectional study. *SAGE Open Medicine*, *10*(1), 74–92. https://doi.org/10.1177/20503121221074492

Asogwa, Jemisenia, & Asogwa. (2022). Women's Perceptions of the Causes of Maternal Mortality: Qualitative Evidence From Nsukka, Nigeria. *SAGE Open*, *12*(1), 78–79. https://doi.org/10.1177/21582440221079817

Ayele, Melku, & Belda. (2019). Utilization of skilled birth attendant at birth and associated factors among women who gave birth in the last 24 months preceding the survey in Gura Dhamole Woreda, Bale zone, southeast Ethiopia. *BMC Public Health*, *19*(1), 150–151. https://doi.org/10.1186/s12889-019-7818-6

Azuh, Iweala, Adeloye, Akanbi, & Mordi. (2017). Factors influencing maternal mortality among rural communities in southwestern Nigeria. *International Journal of Women's Health*, *9*(1), 179–188. https://doi.org/10.2147/IJWH.S120184

Balde, Diallo, Touré, Soumah, Sall, Camara, Balde, Diallo, & Barry. (2021). Women's Knowledge and Attitudes about Complications during Pregnancy and Childbirth in Guinea. *Open Journal of Obstetrics and Gynecology*, *11*(10), 10.

Berhe, Legese, Gebrewahd, Gebremariam, Tesfay, Kahsu, Negash, & Adhanom. (2019). Prevalence Of Anemia And Associated Factors Among Pregnant Women In Adigrat General Hospital, Tigrai, Northern Ethiopia, 2018. *Bmc Research Notes*, *12*(1), 310. https://doi.org/10.1186/S13104-019-4347-4

Diana, Wahyuni, & Prasetyo. (2020). Maternal complications and risk factors for mortality. *Journal of Public Health Research*, *9*(2), 18-42. https://doi.org/10.4081/jphr.2020.1842

Faduyile, Soyemi, Emiogun, & Obafunwa. (2017). A 10 years autopsy-based study of maternal mortality in Lagos State University Teaching Hospital, Lagos, Nigeria. *Nigerian Journal of Clinical Practice*, *20*(2), 131–135.

Gadafi. (2024). *Tamale Teaching Hospital records increased number of maternal mortality.*

Gebre, Gebremariam, & Abebe. (2015). Birth Preparedness and Complication Readiness among Pregnant Women in Duguna Fango District, Wolayta Zone, Ethiopia. *PLOS ONE*, *10*(9), 137-570. https://doi.org/10.1371/journal.pone.0137570

Getachew, Kassa, Ayana, & Amsalu. (2017). Knowledge of direct obstetric causes of maternal mortality and associated factors among reproductive age women in Aneded woreda, Northwest Ethiopia; a cross-sectional study. *The Pan African Medical Journal*, *27*(2), 32. https://doi.org/10.11604/pamj.2017.27.32.10274

Igberase, Isah, & Igbekoyi. (2019). Awareness and perception of maternal mortality among women in a semi-urban community in the Niger Delta of Nigeria. *Annals of African Medicine*, *8*(4), 261–265. https://doi.org/10.4103/1596-3519.59582

Kamineni, Murki, & Kota. (2017). Birth preparedness and complication readiness in pregnant women attending urban tertiary care hospital. *Journal of Family Medicine*

and Primary Care, *6*(2), 297–300.

Ogu, & Ephraim-Emmanuel. (2018). Prevention of Maternal Mortality in Nigeria: Public Health to the Rescue. *Journal of Gynecology and Women's Health*, *10*(1), 1–4. https://doi.org/10.19080/JGWH.2018.10.555780

Okeke, Charles–Unadike, Eze-Ufodiama, & Nwachukwu. (2021). Knowledge of Causes and Preventive Measures of Maternal Mortality among Childbearing Mothers in Owerri Municipal Council of Imo State, Nigeria. *NIGERIAN JOURNAL OF HEALTH PROMOTION, 14*(1). https://journals.aphriapub.com/index.php/NJHP/article/view/1667

Purwati, Sukmawati, & Nisa. (2022). The relationship between knowledge of pregnant women about the danger signs of pregnancy and compliance with anc visits in the work area of the sitiung 1 public health center , dharmasraya regency in 2022. *Journal of Midwifery and Nursing*, *4*(3), 88–93.

Saaka, & Alhassan. (2021). Prevalence and predictors of birth preparedness and complication readiness in the Kassena-Nankana district of Ghana: An analytical cross-sectional study. *BMJ Open*, *11*(3), 90–96. https://doi.org/10.1136/bmjopen-2020-042906

Suglo, Ninnoni, Yiadom, Afaya, & Achaab. (2017). Barriers to Accessing Maternity Care among Expectant Mothers at Tamale Teaching Hospital. *International Journal of Novel Research in Healthcare and Nursing*, *4*(2), 185-195. www.noveltyjournals.com

Takahashi, & Chuemchit. (2016). Knowledge, attitudes and practices (KAP) of birth preparedness and complication readiness in relation to skilled birth attendant among delivered women in Svay Rieng province, Cambodia. *Journal of Health Research*, *30*(1).

Titilayo, Palamuleni, & Omisakin. (2015). Knowledge of Causes of Maternal Deaths and Maternal Health Seeking Behaviour in Nigeria. *African Population Studies*, *29*(2), 2. https://doi.org/10.11564/29-2-784

Toe, Higuchi, Htay, & Hamajima. (2021). Health care seeking behaviors regarding maternal care and the associated factors among married women in Naung Cho Township, Myanmar. *Nagoya Journal of Medical Science*, *83*(4), 727–740. https://doi.org/10.18999/nagjms.83.4.727

Yarney. (2019). Does knowledge on socio-cultural factors associated with maternal mortality affect maternal health decisions? A cross-sectional study of the Greater Accra region of Ghana. *BMC Pregnancy and Childbirth*, *19*(1), 47. https://doi.org/10.1186/s12884-019-2197-7