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Determinants Of Knowledge And Care-Seeking Behaviour For Preeclampsia Among Pregnant Women In Northern Ghana: A Cross-Sectional Study.

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Abstract

Introduction

Preeclampsia is a form of pregnancy-induced hypertension that is a pressing public health issue in Ghana and is one of the main contributors to maternal and neonatal morbidity and mortality. Timely identification of preeclampsia symptoms and taking action (seeking care) after identifying those symptoms is essential for reducing adverse outcomes associated with pregnancy in Ghana. Pregnant women's understanding of preeclampsia, the risks, signs, and complications associated with preeclampsia differs greatly within Ghana, and is affected by societal, cultural, and health-related factors. In northern Ghana, there are unique maternal health challenges due to socio-economic disparities, educational differences, and access to health care. The only way to develop targeted health education, improve the quality of antenatal care services, and improve early detection and management of preeclampsia for women in this area is by understanding the factors influencing pregnant women's knowledge and behaviour related to seeking care for preeclampsia. For this reason, the study was conducted with a cross-sectional analysis using hospitals in Northern Ghana to identify the determinants that influence the knowledge and behaviour of pregnant women related to preeclampsia.

Method

This study was conducted in the Northern Region of Ghana at four selected health facilities: Tamale Teaching Hospital, Northern Regional Hospital, Tamale West Hospital, and Savelugu Municipal Hospital. A hospital-based cross-sectional study design with a quantitative approach was employed to assess the determinants of knowledge and care-seeking behaviour for preeclampsia among pregnant women. The

study was a multicentre prospective cross-sectional survey conducted between April 2025 and September 2025. The study population comprised pregnant women receiving antenatal care services at the selected hospitals during the study period. A total sample size of 1,011 pregnant women was recruited for the study. Data were collected using a structured questionnaire administered to eligible participants. The data was analysed by using the IBM Statistical Package for the Social Sciences (SPSS) version 27.

Results

The study found that 65.6% of the respondents were married. Respondents stated they experienced symptoms of preeclampsia during their pregnancy. The most common symptom was stomach pain (92.3%), followed by hypertension (74.2%). About 44.2% of the respondents encountered terrible migraines whereas the swelling of the head/ face (35.7%) and obscured vision (31.1%). When inquiring where they would go to receive aid in case they experienced the symptoms of preeclampsia, a larger number of respondents identified pharmacies (59.7%) than hospitals or health centres (40.3%). High awareness (71.1%) and knowledge level (71.0%) of preeclampsia were found among the respondents. Age (X^2 = 61.446, p<0.001), educational level (X^2 = 185.832, p<0.001), parity (X^2 = 29.084, p<0.001), and awareness on preeclampsia (X^2 = 441.534, p<0.001) was a predictor of the condition.

Conclusion

The research has found that while pregnant women in Northern Ghana have received significant education about pre-eclampsia, there are still some critical differences in how they seek proper care when experiencing the signs/symptoms of this condition. Hence, policy-makers should look at ways to alleviate the fear of going to the hospital by enhancing the quality of interactions between health care workers and patients and making services more patient-centred.

Keywords

Antenatal care, Care-seeking behaviour, Knowledge, Preeclampsia, Pregnant women

1. Introduction

Preeclampsia remains a leading cause of maternal and perinatal morbidity and mortality globally, with an estimated 76,000 maternal and 500,000 infant deaths annually attributed to hypertensive disorders of pregnancy (1). Preeclampsia and eclampsia are hypertensive disorders of pregnancy, categorized by new elevated blood pressures in pregnancy or postpartum (2). Clinically, preeclampsia is defined as blood pressure elevated to >140/90 on two separate occasions at least four hours apart, occurring after 20 weeks gestation in a patient with previously normal blood pressures, and associated with protein in the urine or other laboratory abnormalities or symptoms (3). Preeclampsia with severe features involves at least one of the following: blood pressure elevated to >160/110, physical symptoms (headache, vision changes, right upper abdominal pain) or specific laboratory abnormalities (platelets <100,000, liver enzymes elevated to twice normal, creatinine >1.1 or twice baseline) (4).

Patients with preeclampsia without severe features can be managed as an outpatient with very close monitoring of blood pressures, symptoms, and foetal status, with planned delivery at 37 weeks gestation (5). However, patients with preeclampsia with severe features or eclampsia require inpatient management.

Treatment of preeclampsia with severe features and eclampsia centres on prompt delivery of the foetus and placenta, through either induction of labour or caesarean delivery. Additional treatment includes administration of antihypertensive medications to control blood pressures, injections of magnesium sulphate to reduce the risk of seizures, and monitoring for complications (6). Both preeclampsia and eclampsia are associated with high risk of maternal complications, including acute kidney injury, cerebrovascular stroke, placental abruption, and maternal death. Neonatal complications are common and include preterm delivery, low birthweight, and stillbirth (3).

Preeclampsia and eclampsia often present as obstetric emergencies, which require prompt action, repeated administration of medications, and preterm delivery of neonates with Neonatal Intensive Care Unit (NICU) admission (7). Prolonged postpartum hospital admission is often needed for both mothers and their neonates. In low- and middle-income countries (LMICs), the experience of labour and delivery can be stressful, overwhelming, and painful due to obstetric environments being limited by the number of providers and a high volume of critically ill patients. This creates challenges for communication and counselling (8).

Despite advances in obstetric care, preeclampsia continues to challenge maternal health systems, particularly in LMICs, where delays in diagnosis and treatment contribute to adverse outcomes (9). A growing body of evidence points to significant knowledge gaps among pregnant women as a key factor impeding timely recognition of warning signs and appropriate health-seeking behaviour, ultimately affecting maternal outcomes (10).

Globally, preeclampsia complicates an estimated 2–8% of pregnancies, with rates reaching up to 10% or more in low-income settings due to disparities in risk factors and healthcare challenges (11). The frequency of preeclampsia is not consistent & differs from one to the other. Most studies conducted on populations from various African nations have shown that the incidence of preeclampsia within those nations ranges between approximately 1.80% and 16.70% of all pregnancies. The disparity in prevalence is attributed to differences in the profile of risk factors, diagnostic criteria, and other determinants of maternal health (12). In Ethiopia, institutional studies have reported prevalence estimates like 12.4% among clinic attendees at Mettu Karl Referral Hospital (13). In other settings such as Uganda, prospective cohort data showed a high incidence of preeclampsia (31.1%) in rural antenatal populations, though this may reflect specific demographic and methodological factors (14). Preeclampsia continues to be an important problem in public health in Africa and is typically associated with significantly increased rates of the condition as compared to the global average. In Africa, gaps in access to quality maternal health services, preventive care, and early detection all contribute to the higher prevalence of the condition. A multicentre prospective study conducted in Ghana showed that the prevalence of preeclampsia was 8.8% of women attending antenatal clinics in Ghana's Central Region (15).

High burden of disease and lack of knowledge about pre-eclampsia among pregnant women were consistently demonstrated to be low across multiple Sub-Saharan African Countries through numerous studies (1,8,9,16–20). Evidence conducted in South Gondar Zone (Ethiopia) found only 28.8% of women had "good" knowledge concerning pre-eclampsia; the majority had either "moderate" or "poor" knowledge. Significant associations were found between the degree of knowledge (good/moderate/poor) and educational level, when the woman initiated antenatal care, how many ANC visits she made (21).

Studies in Uganda and systematic analyses of sub-Saharan populations similarly report high proportions of inadequate awareness, with a majority of women lacking essential information on preeclampsia risk factors, symptoms and the need for timely care (14). In Ghana, a cross-sectional study found that 88.6% of pregnant women had inadequate knowledge of preeclampsia, with only 11.4% demonstrating adequate understanding of its symptoms, risk factors, and complications (11). Pregnant women in Ghana may not know about preeclampsia unless they get more education on the topic and have better access to the right health services before giving birth.

Pregnant women must be educated about what preeclampsia is, how to prevent it, and how to get help quickly, in order to reduce the risk of negative effects associated with the disorder, but studies show that many pregnant women do not know what preeclampsia is or how to find out if they have it (11,13,15,22). Only a small number of women attending antenatal care have been able to identify the signs of preeclampsia, even after they received education about the disorder while receiving care during their pregnancy. (11).

Education level and provider counselling have emerged as significant determinants of pregnant women's knowledge of preeclampsia. Higher educational attainment consistently correlates with better understanding of the condition, while enhanced counselling from healthcare providers during antenatal care is associated with improved knowledge scores and potentially more proactive health-seeking behaviour (11).

Nevertheless, there are still questions about how knowledge leads to care-seeking behaviour concerning preeclampsia in all the various communities across Ghana, but the factors which hinder care-seeking behaviour may be different between Northern Ghana and Southern part of Ghana due to the limited socioeconomic resources available to many women and the potential obstacles tied to accessing healthcare services. It is critical to obtain an understanding of the factors that influence the development of knowledge and care-seeking behaviour within Northern Ghana in order to develop culturally appropriate health education programmes, improve antenatal care service delivery, and enhance maternal/new-borns health outcomes.

Materials and Methods

Study setting

The study was conducted at Northern Region of Ghana, specifically, Tamale Teaching Hospital, Northern Regional Hospital, Tamale West Hospital, and Savelugu Municipal Hospital. Due to the high prevalence of preeclampsia, unique cultural factors, representation across multiple levels of the health care system, and sufficient volume of patients, it was determined that the Northern Region and facilities were a good choice for studying factors impacting knowledge and seeking care for pregnant women.

Study design

A hospital-based cross-sectional study design with quantitative approach was conducted among pregnant women receiving antenatal care services in the Northern Region of Ghana. A quantitative, hospital-based,

cross-sectional method gave a cost-efficient, time-efficient and appropriately methodologically sound strategy for providing evidence to support health education programmes, clinical practices and policy decision-making processes. Thus, the design was appropriate for meeting the goals of the project in identifying the knowledge gaps and other factors influencing how Northern Ghanaian women sought care for preeclampsia during pregnancy. This was a multicentre prospective cross-sectional study conducted among pregnant women from April, 2025 to September, 2025.

Study population

The study was conducted among pregnant women receiving antenatal care at the selected hospitals. Pregnant women who were critically ill or mentally incapacitated were excluded from the study.

Sample size estimation

The sample size for the study was estimated using the formula of Rose, Spinks, and Canhoto (2015). This formula is expressed as:

$n = \frac{Z^2 pq}{d^2}$, where:

Where:

Z = z-value (1.96 for a 95% confidence level)

p = proportion of the population that possesses the desired characteristics (knowledge of preeclampsia among pregnant women), expressed as a decimal. For the current study, 75% knowledge level of pregnant women on preeclampsia in Tamale Metropolis according to (19)

C = Confidence interval stated in decimal notation (0.028 = ±2.8 percentage points).

$$\frac{1.96^2 0.75(1-0.75)}{(0.028)^2} = \frac{0.7203}{0.000784} = 919$$

The sample size was calculated using the above parameters:

Based on the above formula, the sample size for the quantitative aspect of the study was 1,011 at a 95% confidence level. An extra 92 respondents (10%) were added to the sample to address non-response and related issues, making a total sample size of 1,011.

Sampling technique

The research utilised a multistage sampling method in the selection of pregnant women receiving antenatal care (ANC) services at the Tamale Teaching Hospital, Northern Regional Hospital, Tamale West Hospital, and Savelugu Municipal Hospital. As for the initial stage, the four health centres were purposely selected for their contribution to maternal health service provision in the Northern Region. These centres offer varying degrees of care (tertiary, regional, district, and municipal) and possess both high levels of antenatal care attendance and consistent oversight of hypertensive disorders of pregnancy, especially preeclampsia.

Selecting these hospitals provided the study with a sufficient and varied sample of pregnant women and improved the pertinence of the study results in relation to the regional healthcare system.

For the second stage, the respondent recruitment from each facility was determined using proportionate allocation based on the average monthly ANC attendance of each hospital. This methodology guaranteed that the hospitals with higher levels of client volume provided a greater proportion of participants and that the sample was in line with the distribution of pregnant women across the chosen hospitals.

Sample random sampling was used to select pregnant women to respond to the questionnaire. Using this method, all pregnant women at the health facility had an equal chance of being selected for the study. Papers were labelled "Yes" or "No," folded, and placed inside a box. All pregnant women present for ANC at the time of the study were required to choose a sheet from the box. A pregnant woman who selected a sheet bearing the word "Yes" was assessed after providing informed consent. Conversely, a pregnant woman who selected a sheet bearing the word "No" was not allowed to participate in the study. The purpose, benefits, and risks of participating in the study were explained to all respondents before data collection was done. During data collection, pregnant women who met the inclusion criteria were assessed.

Data collection instrument and technique

A self-administered questionnaire was used to collect data from pregnant women at the facility. The questionnaire was structured based on the objectives of the study. The literature review for each objective guided the formulation of the questions included in the questionnaire (16–21,23–28). A pre-test (pilot study) was conducted among pregnant women attending antenatal care in Sagnarigu with similar characteristics to the study sites but not included in the main study. After pre-test the instrument had Cronbach's alpha coefficient of 0.84. The questionnaires were filled out in the presence of the researchers after informed consent was obtained. English was primarily the medium of communication for the primary data collection. However, for participants who did not comprehend English, the questionnaire was translated into their native language, and their responses were recorded accordingly. All completed questionnaires were reviewed daily by the researchers for completeness, accuracy, and uniformity before submission.

Statistical analysis and presentation

The data were cleaned, coded and analysed using the computer software IBM Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics were performed for continuous data using means and standard deviations, and for categorical data using percentages and frequency tables. The data were analysed through univariate analysis to describe the results obtained. Frequencies, percentages, means, and standard deviations were used to summarise participants' demographic characteristics, knowledge levels, sources of information, and patterns of health-seeking behaviour. The knowledge level of pregnant women on preeclampsia was measured using a structured questionnaire containing both closed- and open-ended questions. Knowledge levels were categorised as adequate or inadequate based on the scores obtained. The first was categorised as 'Inadequate Knowledge' with scores ranging from 0 to 11 points (0% to 50%). The second category was 'Adequate Knowledge' with scores ranging from 12 to 22 points

(>50%). This dichotomisation aligns with Bloom's taxonomy, where performance above 50% typically reflects understanding beyond rote recall (29).

Ethical considerations

The study team complied with the right ethical procedures in conducting the study. Ethical approval was obtained from the University for Development Studies (UDS) Ethical Review Board (Ref: UDS/009/25).

Results

Socio-demographic characteristics of the respondents

A total of 1011 pregnant women responded to the survey. Out of these, 52.9% of them were aged 26 to 35 years. the mean age of the respondents was 27.16 years with a standard deviation of 4.75 years. It was found that 65.6% of the respondents were married. It was revealed that 61.5% of the respondents had primary education.

A good proportion (37.7%) of the respondents were employed. Most (65.4%) of the respondents had a parity of 1 to 3. The respondents had a mean parity of 1.43 with a standard deviation of 1.13. It was found that 50.2% of the respondents were in their second trimester during the period of the study. More than half (51.0%) of the respondents were Muslims, with 37.4% of the respondents residing in peri-urban areas. Table 1 contains more data.

Table 1: Socio-demographic characteristics of the respondents

Variable	Frequency	Percentage
Age	**Mean = 27.16, *SD* = 4.75**	
18 – 25	426	42.1
26 – 35	535	52.9
36 – 47	50	4.6
Marital status		
Unmarried	348	34.4
Married	663	65.6
Educational level		
No formal education	20	2.0
Primary	622	61.5
Junior High School	134	13.3
Senior High School	218	21.6
Tertiary	17	1.7
Occupation		
Employed	381	37.7
Unemployed	413	40.9
Self-employed	207	20.5
Parity	**Mean = 1.43, *SD* = 1.13**	

1 – 3	964	95.4
4 – 6	47	4.6
Trimester of current pregnancy		
First	321	31.8
Second	508	50.2
Third	182	18.0
Religion		
Christian	398	39.4
Muslim	516	51.0
Traditionalist	97	9.8
Place of residence		
Urban	353	34.9
Peri urban	378	37.4
Rural	280	27.7

Knowledge level of respondents on preeclampsia

A total of 71.1% (at 95% CI: 68.3% to 74.0%) of the respondents were aware of preeclampsia (Figure 1). Out of these, 54.0%, 37.7%, and8.3% had health facility, school, and friends as their source of information, respectively (Figure 2). It was revealed that 71.0% (at 95% CI: 68.3 to 73.9%), and 29.0% (at 95% CI: 26.1% to 31.7%) of the respondents had adequate, and inadequate knowledge on preeclampsia, respectively (Figure 3).

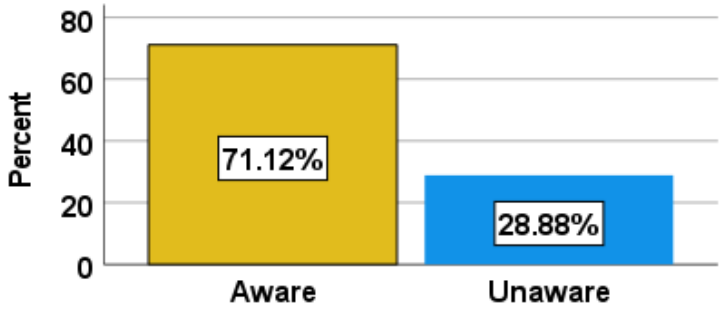

Figure 1: Respondents' Awareness level on preeclampsia

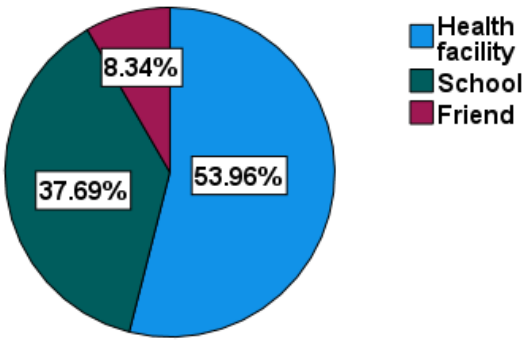

Figure 2: Respondents' sources of information on preeclampsia

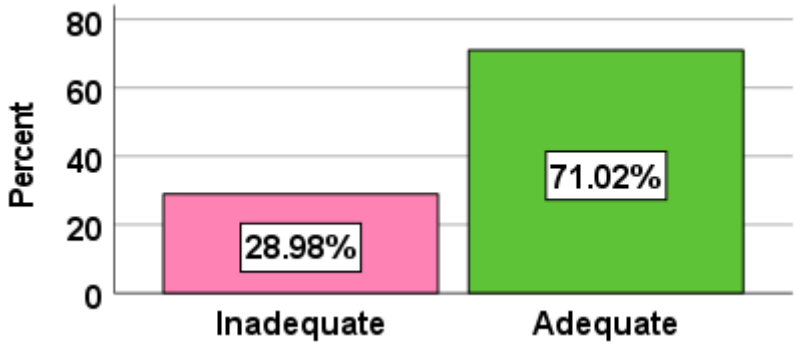

Figure 3: Knowledge level of respondents on preeclampsia

Distribution of respondents' knowledge level on preeclampsia according to their characteristics

The study found that 80.6% of respondents aged 26 to 35 years had more adequate knowledge on preeclampsia as compared to 40.0% of respondents aged 36 to 47 years. Age of respondents showed significant association with knowledge on preeclampsia (X^2 = 61.446, p<0.001). Meanwhile, 83.0% of respondents with primary education demonstrated higher knowledge level on preeclampsia as compared to 64.2% of respondents with Senior High School education. Education level of respondents had a significant association with knowledge level on preeclampsia (X^2 = 185.832, p<0.001).

Moreover, 73.8% of respondents who were unemployed showed higher knowledge level on preeclampsia as compared to 66.7% of respondents who were employed. There was no significant association between occupation of respondents and knowledge level on preeclampsia (X^2 = 5.640, p = 0.060). It was further revealed that 72.7% of respondents with parity of 1 to 3 were more knowledgeable on preeclampsia as compared to 36.2% of respondents with a parity of 4 to 6. Parity of respondents demonstrated a significant association with knowledge level on preeclampsia (X^2 = 29.084, p<0.001). It was found that 90.1% of respondents who were aware of preeclampsia had more knowledge on it as compared to 24.0% of respondents who were unaware. Awareness on preeclampsia had a significant association with knowledge level on preeclampsia (X^2 = 441.534, p<0.001). Table 2 contains more data.

Table 2: Distribution of knowledge level according to respondents' characteristics

Variable	**Knowledge level**		
	Inadequate	**Adequate**	**Chi-square**
	n (%)	**n (%)**	**p-value**
Age			
18 – 25	159(37.3)	267(62.7)	**61.446**
26 – 35	104(19.4)	431(80.6)	**(<0.001)**
36 – 47	30(60.0)	20(40.0)	
Marital status			
Unmarried	101(29.0)	247(71.0)	0.001
Married	192(29.0)	471(71.0)	(0.983)
Educational level			
No formal education	20(100.0)	0(0.0)	**185.832**

Primary	104(16.7)	518(83.3)	**(<0.001)**
Junior High School	74(55.2)	60(44.8)	
Senior High School	78(35.8)	140(64.2)	
Tertiary	17(100.0)	0(0.0)	
Occupation			
Employed	127(33.3)	254(66.7)	5.640 (0.060)
Unemployed	109(26.2)	307(73.8)	
Self-employed	57(26.6)	157(73.4)	
Parity			
1 – 3	263(27.3)	701(72.7)	**29.084 (<0.001)**
4 – 6	30(63.8)	17(36.2)	
Trimester of current pregnancy			
First	81(25.2)	240(74.8)	4.087 (0.130)
Second	161(31.7)	347(68.3)	
Third	51(28.0)	131(72.0)	
Religion			
Christian	117(29.4)	281(70.6)	0.098 (0.952)
Muslim	149(28.9)	367(71.1)	
Traditionalist	27(27.8)	70(72.2)	
Place of residence			
Urban	101(28.6)	252(71.4)	1.828 (0.401)
Peri urban	118(31.2)	260(68.8)	
Rural	74(26.4)	206(73.6)	
Awareness on preeclampsia			
Aware	71(9.9)	648(90.1)	**441.534 (<0.001)**
Unaware	222(76.0)	70(24.0)	

Determinants of respondents' knowledge on preeclampsia

The study showed that the odds of respondents aged 26 to 35 years having knowledge on preeclampsia was 5.335 times as compared to respondents aged 36 to 47 years (AOR = 5.335, 95% CI: 1.283 to 22.186). Respondents aged 26 to 35 years was a significant predictor of having knowledge on preeclampsia (p = 0.021). Interestingly, the odds of unmarried respondents were 0.355 times less likely to have knowledge on preeclampsia as compared to married respondents (AOR = 0.355, 95% CI: 0.216 to 0.583). Unmarried respondents showed a significant association with knowledge level on preeclampsia (p>0.001).

The study further showed that the odds of respondents who were unemployed having knowledge on preeclampsia were 0.192 times less likely as compared to respondents who were self-employed (AOR = 0.192, 95% CI: 0.102 to 0.362). Respondents being unemployed was a significant predictor of having knowledge on preeclampsia (p<0.001). It was revealed that the odds of respondents residing in urban areas having knowledge on preeclampsia were 1.027 times more likely as compared to respondents who resided

in rural areas (AOR = 2.480, 95% CI: 1.027 to 5.987). Respondents living in urban area had a significant association with knowledge on preeclampsia (p = 0.043). It was revealed that respondents who were aware of preeclampsia were 26.849 times more likely to have knowledge on it as compared to respondents who were unaware on it (AOR = 26.849, 95% CI: 17.355 to 41.535). Respondents being aware of preeclampsia was a significant predictor of having knowledge on preeclampsia (p<0.001). More information is provided in Table 3.

Table 3: Determinants of respondents' knowledge on preeclampsia

Variable	B	Adjusted Odds Ratio (AOR)	95% C.I. for AOR		p-value
			Lower	Upper	
Age					
18 – 25	0.568	1.764	0.425	7.320	0.434
26 – 35	1.674	5.335	1.283	22.186	**0.021**
36 – 47	Ref.				
Marital status					
Unmarried	-1.036	0.355	0.216	0.583	**<0.001**
Married	Ref.				
Occupation					
Employed	-1.650	0.192	0.102	0.362	**<0.001**
Unemployed	-0.520	0.595	0.325	1.088	0.092
Self-employed	Ref.				
Parity					
1 – 3	0.899	2.457	0.893	6.758	0.082
4 – 6	Ref.				
Trimester of current pregnancy					
First	0.299	1.349	0.721	2.521	0.349
Second	0.108	1.114	0.607	2.044	0.727
Third	Ref.				
Religion					
Christian	-0.792	0.453	0.162	1.269	0.132
Muslim	0.317	1.373	0.599	3.147	0.454
Traditionalist	Ref.				
Place of residence					
Urban	0.908	2.480	1.027	5.987	**0.043**
Peri urban	-0.251	0.778	0.418	1.448	0.429
Rural	Ref.				
Awareness on preeclampsia					
Aware	3.290	26.849	17.355	41.535	**<0.001**

Unaware	Ref.				

Respondents' care seeking behaviour

The results describe the case where respondents demonstrate symptoms linked with preeclampsia during their pregnancy. The most common symptom was stomach pain (92.3%), and this was followed by hypertension (74.2%). About 44.2% of the respondents encountered terrible migraines whereas the swelling of the head/ face (35.7%) and obscured vision (31.1%) were also frequently noted. When it comes to this symptom management, less than one third of respondents (32.7%) mentioned that they had been to a health facility. Regarding symptom management, the great majority of respondents (82.4%) claimed that they sought help immediately the same day they noticed the symptoms. The large majority of respondents stated that they attend ANC frequently (62.5%).

When inquiring where they would go to receive aid in case they experienced the symptoms of preeclampsia, a larger number of respondents identified pharmacies (59.7%) than hospitals or health centres (40.3%). A number of difficulties are cited that delay the seeking of care. The most frequently mentioned were the cultural customs that are less likely to be diagnosed (72.2%), followed by concern of being admitted (52.9%), the absence of transportation (49.3%), the far away location of the health care services (48.9%), the lack of money (37.2%) and the absence of knowledge regarding the signs of the sickness (30.3%). Nearly all of the participants (86%) indicated a high level of autonomy over their healthcare decisions, as they did not rely on another individual's advice or opinion when they needed to seek medical attention. It was further revealed that 63% of respondents believed that contacting a healthcare facility was appropriate when experiencing pregnancy-related symptoms.

Discussion

In this study, the overwhelming majority of respondent reported symptoms of pre-eclampsia. The most common pre-eclamptic symptoms reported included abdominal pain (92.3%) and high blood pressure (74.2%). These findings are in agreement with evidence from studies conducted in Ghana and throughout sub-Saharan Africa that report similar symptoms, but these women often do not recognize them as pathological indicators of increased risk (1,3,6,8,17,27,30). Research conducted with qualitative methods with women diagnosed with hypertensive pregnancy complications in Ghana has revealed that these women often possess a very limited general knowledge of the disorder and the related symptoms, which may explain why many of these women do not recognize warning signs as indicative of the disorder, and thus do not seek medical assistance in a timely fashion (31).

The literature supports the finding that only 32.7% of women experiencing symptoms searched for care through health care facilities; there is evidence of missing links in pregnant women who report experiencing symptoms of pre-eclampsia (16,18). These similarities suggest that the lack of education and counselling also hinder the use of formal health services by women experiencing symptoms. The health-seeking behaviour of most women in the current study (82.4% sought help immediately) may demonstrate that women are aware of the risk associated with preeclampsia when their symptoms become serious, but they lack adequate direction on where to access care (pharmacy versus hospital) (32).

As per the current data, pharmacies have been cited more often than hospitals as places where help can be sought (59.7% vs. 40.3%). This is consistent with the literature in Ghana demonstrating barriers to the

understanding and practical access formal care (17,19,31). Some qualitative studies have suggested that women may choose care access points like pharmacies that are more readily accessible because of concerns of convenience, costs, or fear of being admitted to a hospital (31). That 62.5% of study respondents attended antenatal care (ANC) often is a positive finding, and is in line with many studies from Ghana showing high levels of ANC attendance (5,10,27). Yet attendance does not equate to adequate understanding or positive care-seeking behaviours (33). At the Korle Bu Teaching Hospital, women had a mean of over 5 ANC visits, yet only about a third of women could accurately identify their diagnosis of preeclampsia and many had received inadequate counselling (30). This parallels the current results in which high attendance does not fully translate into optimal recognition or appropriate management of symptoms. The similarity suggests that ANC quality and content of counselling are as critical as frequency of attendance for improving recognition and care-seeking decisions (34).

The current study revealed that 71.1% of the respondents knew about preeclampsia. Among these women, the main sources of information were health facilities (54.0%) and schools (37.7%). Friends were less influential in creating awareness. This shows that, in Northern Ghana, pregnant women bulk of awareness, and thus health information is primarily channelled through antenatal clinics and formal education. In contrast, a study conducted in Kumasi at a tertiary hospital reported a significantly lower awareness of preeclampsia. Only 11.4% of participants had adequate awareness of the condition (35). Most participants had little knowledge about the signs, symptoms, and complications, even though they were aware of the condition (35). This indicates the need for more quality health education in antenatal care (ANC) (10). As noted in the Kumasi study, the highest knowledge scores correlated with health provider counselling and education.

Seventy-one percent of respondents were found to possess adequate knowledge about preeclampsia. This percentage was significantly greater than that reported by the Kumasi study, where the overwhelming majority (88.6%) of women were found to have inadequate knowledge and only a small minority had adequate knowledge (35). Reasons for the difference between our results and those of the Kumasi study may include either differences in health promotion practices within regions of the respective populations or differences in the composition of the two study populations; for example, perhaps those in the Northern Region had access to better or more comprehensive ANC educational initiatives or community health outreach programmes (27).

The present study found that women aged 26–35 years had a greater likelihood of having knowledge of preeclampsia than women aged 36–47 years. This is in line with reports from other sub-Saharan African countries including Ghana, where younger and middle reproductive-age women have better knowledge of maternal health (9,17,24,26). This could be because women in this age group have higher levels of formal education, antenatal health education, and more access to health information through modern means such as mobile phones and media (16). On the other hand, older women may have more reliance on past pregnancy experiences and traditional knowledge that does not adequately address complications of pregnancy such as preeclampsia, which could explain their lower knowledge levels (36).

The study also indicated that women with one to three previous births know more about preeclampsia than women with no previous births. This is in line with other studies in Ghana which found that having more children is positively related to better maternal health knowledge (37). This could be attributed to the

repeated exposure multiparous women have to antenatal education, health care worker education, and health education related to past pregnancies. Through repeated contact with health services, women with prior births are more likely to encounter information on pregnancy complications, including preeclampsia, thereby enhancing their understanding of the condition (38).

In the Kumasi study, an independent association between higher education and adequate knowledge was found, but this study found the opposite, whereby women with primary education have a greater level of knowledge than women with senior high school education (37). One explanation for the difference between the findings of this study and the Kumasi study could be that women receiving health education at ANC clinics in Northern Region were targeted to lower levels of education or had accumulated knowledge through their previous experiences with preeclampsia during visits to health facilities (3,35).

The current study found that there is a significant correlation between awareness and knowledge of preeclampsia. In this study, individuals who were aware of preeclampsia were significantly more likely to possess adequate knowledge than those who did not. Additionally, the results of this study are supported by the information provided in the literature, which suggests that awareness and structured education improve understanding (4,7,39). Similar results have been shown in Ghanaian studies and in other parts of Sub-Saharan Africa, where a lack of counselling and incomplete understanding were linked to low knowledge levels (1,3,4,6,7,30,39). Furthermore, urban residents were statistically more likely to have the knowledge of preeclampsia than those living in rural areas and may have had greater access to information and health services due to their location. Studies of women with hypertensive disorders during pregnancy have indicated that urban residents have greater access to health information than rural women (5,16,18,20,23,25).

Strength and limitation

An important advantage of the study in question is that it was conducted using a multicentre approach, collecting data from four major healthcare institutions of various ranks within the healthcare delivery system in the Northern Region of Ghana. This reinforces the regional scope of the study findings, provides a well-rounded picture of the understanding as well as the care-seeking behaviour concerning preeclampsia at varying healthcare delivery facilities, and further strengthens the study's representation within the Northern Region. Moreover, the study's sample size is statistically adequate making it possible to generalise the findings to pregnant women in other part of Northern region. Nonetheless, because of the cross-sectional nature of the study and the hospital-based design, the study is unable to draw a cause-and-effect conclusion between the determinants identified and the knowledge, or the care-seeking behaviour. Furthermore, the study is limited to self-report, which is susceptible to a recall bias, within symptom and care-seeking reporting. The study is further limited by the lack of a qualitative approach that would have examined deeply, and described the contexts and cultures that might have elucidated the behaviour that the study examined.

Conclusion

In summary, this study shows that while pregnant women's awareness and general knowledge of preeclampsia in Northern Ghana are fairly good, significant shortcomings in preeclampsia care-seeking behaviour exist. Socio-demographic characteristics and prior knowledge affect awareness levels, while

cultural systems and fear of hospitals, along with other systemic issues, cause lack of use of needed formal health services. To mitigate these shortcomings, it is suggested that the health education component of antenatal services be more focused, culturally attuned, and strengthened, in combination with community-based misperception management and support for pregnant women.

Abbreviation

Antenatal Care	:	ANC
Confidence Interval	:	CI
Intensive Care Unit	:	NICU
Low- And Middle-Income Countries	:	LMICs
Statistical Package for the Social Sciences	:	SPSS

Declarations

Ethics approval and consent to participate.

This study has been approved by UDS Ethical Review Board (Ref: UDS/009/25), and all respondents provided verbal informed consent to participate.

Consent for publication

Not applicable

Availability of data and materials

The datasets from the present study are available from the corresponding author on reasonable request.

Competing interests

Not applicable

Clinical trial number

Not applicable

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Authors' contributions

All authors contributed to the study design, data collection, data analysis, interpretation of data and writing of the manuscript. All authors have read and approved the final manuscript.

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References

1. Kagoya EK, Nsubuga AG, Authairwe I, Nakatudde P, Asiimwe C, Gidudu C, et al. Community Perceptions, Knowledge, and Experiences of Pre-eclampsia: An Exploratory Study in Uganda. medRxiv. 2024;2011–24.
2. Cowan A, Haverty C, MacDonald R, Khodursky A. Impact of early preeclampsia prediction on medication adherence and behavior change: a survey of pregnant and recently-delivered individuals. BMC Pregnancy Childbirth. 2024;24(1):196.
3. Machenje AS, Kibusi SM, Gibore N, Lilungulu A, Moshi F V. Knowledge and Myths about Preeclampsia and Eclampsia and its influence on Antenatal Service Utilization among Expecting Couples in Mtwara Regional: A Cross Sectional Analytical Study. The University of Dodoma; 2020.
4. Mpalatsouka I, Zachariou M, Kyprianidou M, Fakonti G, Giannakou K. Assessing awareness of long-term health risks among women with a history of preeclampsia: a cross-sectional study. Front Med. 2023;10:1236314.
5. Joshi A, Id TKB, Id SAO, Id CAM, Id RL. ‘ I don ’ t really understand this BP ’: Women ’ s knowledge , attitudes , and experiences with preeclampsia in Ghana. 2022;1–16. Available from: http://dx.doi.org/10.1371/journal.pgph.0000121
6. Hansson T, Andersson ME, Ahlström G, Hansson SR. Women´ s experiences of preeclampsia as a condition of uncertainty: a qualitative study. BMC Pregnancy Childbirth. 2022;22(1):521.
7. Atkinson J, Wei W, Potenza S, Simpson G, Middleton A, Walker S, et al. Patients’ understanding of long-term cardiovascular risks and associated health-seeking behaviours after pre-eclampsia. Open Hear. 2023;10(1).
8. Mir S. Education Interventions and Preeclampsia Knowledge Among Pregnant Women. 2023;
9. Machenje AS, Kibusi SM, Gibore N, Lilungulu A, Moshi F V. Knowledge and Myths about Preeclampsia and Eclampsia and its Influence on Antenatal Service Utilization among Pregnant Women and their Male Partners in Mtwara Regional-Tanzania: A Cross Sectional Analytical Study. Arch Intern Med Res. 2022;5(3):397–411.
10. Atluri N, Beyuo TK, Oppong SA, Moyer CA, Lawrence ER. Challenges to diagnosing and managing preeclampsia in a low-resource setting: A qualitative study of obstetric provider perspectives from Ghana. PLOS Glob public Heal. 2023;3(5):e0001790.
11. Fondjo LA, Boamah VE, Fierti A, Gyesi D, Owiredu E williams. Knowledge of preeclampsia and its associated factors among pregnant women : a possible link to reduce related adverse outcomes. 2019;1–7.
12. Ahmed S, Fatma M, Mohamed G, Fatthy A. Effect of Continuous Care Model on Lifestyle Modification and Pre- eclampsia Control among Pregnant Women. 2024;5(1).
13. Belay AS, Wudad T. Prevalence and associated factors of pre- eclampsia among pregnant women

attending anti-natal care at Mettu Karl referal hospital , Ethiopia : cross-sectional study. 2019;1–8.
14. History A. Awareness, Incidence, And Determinants Of Preeclampsia Among Antenatal Women In Rural Kisoro District, Uganda: A Prospective Cohort Study Dianna Munezero 1* , Affiong Onoyom Ekpenyong 1 , Ibinabo Fubara Bob-Manuel 2. 2025;3(1):157–61.
15. Odame E, Id A, Ivy W, Boadu O, Id EA, Tawiah A, et al. Prevalence of preeclampsia and algorithm of adverse foeto-maternal risk factors among pregnant women in the Central Region of Ghana : A multicentre prospective cross- sectional study. 2023;1–14. Available from: http://dx.doi.org/10.1371/journal.pone.0288079
16. Kaaya ES, Ko J, Luhanga E. Maternal knowledge-seeking behavior among pregnant women in Tanzania. 2021;
17. Agbeno EK, Osarfo J, Owusu GB, Aninng DO, Anane-fenin B, Amponsah JA, et al. Knowledge of hypertensive disorders of pregnancy among pregnant women attending antenatal clinic at a tertiary hospital in Ghana. 2022;
18. Karikari M, Adeleke V, Executive HS, Okafor A, Executive HS, Antwi EO. Exploring the Knowledge , Attitudes and Practices of Perinatal Women towards Hypertensive Disorders in Pregnancy (HDP) and its Implication for the Implementation of Maternal Mental Health Services (MMHS): A Quantitative Descriptive Study. 2023;(March 2024).
19. Imoro WDS. Knowledge and health seeking behaviour of pregnant women about pregnancy induced hypertension in the Tamale Metropolis. 2018.
20. Bekele D, Gudu W, Tolu LB, Birara M, Sium AF. Preeclampsia prevention : a survey study on knowledge and practice among prenatal care providers in Ethiopia. 2024;(February):1–10.
21. Mekie M, Addisu D, Bezie M, Melkie A, Getaneh D, Bayih WA. Knowledge and attitude of pregnant women towards preeclampsia and its associated factors in South Gondar Zone , Northwest Ethiopia : a multi - center facility - based cross - sectional study. 2021;2:1–9.
22. Li D, Wen L, Zhong X, Li X, Peng T, Gong M. Knowledge , attitude and practice of eclampsia pregnant women towards pre- - in Chongqing , China. 2025;1–7.
23. Smith B. Maternal knowledge is power to protect hypertensive pregnancies. University of Missouri--Kansas City; 2024.
24. Fagan EF, Palacios AM, Bland HW, Alston AA, Nazaruk D. Knowledge of pregnancy care behaviors, complications, and urgent maternal warning signs up to one year postpartum among Georgia residents. BMC Public Health. 2024;24(1):2598.
25. Id MM, Bezie M, Melkie A, Addisu D, Chanie ES, Dagnew E, et al. Perception towards preeclampsia and perceived barriers to early health-seeking among pregnant women in selected Hospitals of South Gondar Zone , Northwest Ethiopia : A qualitative study. 2022;(February 2020):1–12. Available from: http://dx.doi.org/10.1371/journal.pone.0271502
26. Agbeno EK, Osarfo J, Owusu GB, Aninng DO, Anane-fenin B, Amponsah JA, et al. Knowledge of hypertensive disorders of pregnancy among pregnant women attending antenatal clinic at a tertiary hospital in Ghana. 2022. 4 p.
27. Hussein H, Shamsipour M, Yunesian M, Sadegh M, Assan A, Fotouhi A. Prevalence and Predictors of Pre-Existing Hypertension among Prenatal Women : A Cross-Sectional Study in Ghana. 2021;50(6):1266–74.
28. Igbokwe U, Tsikasom T, Korfii U, Rajab A, Ahmad NM, Abdulssalam AF, et al. Knowledge, Attitude and Practice of Pre-eclampsia/Eclampsia Preventive Measures among Pregnant Women

in Selected Primary Health Care Facilities in Kano State: A Cross-Sectional Study. 2024;
29. Armstrong P. Bloom's taxonomy. Vanderbilt Univ Cent Teach. 2010;12(05):2023.
30. Joshi A, Beyuo T, Oppong SA, Moyer CA, Lawrence ER. Preeclampsia knowledge among postpartum women treated for preeclampsia and eclampsia at Korle Bu Teaching Hospital in Accra , Ghana. 2020;1–11.
31. Atluri N, Id TKB, Oppong SA, Moyer CA, Id RL. Challenges to diagnosing and managing preeclampsia in a low-resource setting : A qualitative study of obstetric provider perspectives from Ghana. 2023;(2):1–14. Available from: http://dx.doi.org/10.1371/journal.pgph.0001790
32. Lin AE, Prakash SK, Andersen NH, Viuff MH, Levitsky LL, Rivera-Davila M, et al. Recognition and management of adults with Turner syndrome: from the transition of adolescence through the senior years. Am J Med Genet Part A. 2019;179(10):1987–2033.
33. Vasileiou K, Barnett J, Thorpe S, Young T. Characterising and justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. BMC Med Res Methodol. 2018;18(1):148.
34. Gobran MA, Fatah MTA, Ramadan MSH, Amer GA, Rabeh MM, Elshafei RM, et al. Educational Program for Pregnant Women Regarding Obstetrics Dangerous Signs in Rural Areas. Open J Obstet Gynecol. 2021;11(5):529–52.
35. Fondjo LA, Boamah VE, Fierti A, Gyesi D, Owiredu EW. Knowledge of preeclampsia and its associated factors among pregnant women: a possible link to reduce related adverse outcomes. BMC Pregnancy Childbirth. 2019;19(1):456.
36. Sully EA, Biddlecom A, Darroch JE, Riley T, Ashford LS, Lince-Deroche N, et al. Adding it up: investing in sexual and reproductive health 2019. 2020;
37. Bukhari OF, Naaman NA, Bantan OI, Attar RH, Aloweiny FH, Alquzi RA, et al. Knowledge of Preeclampsia and its Associated Factors Among Pregnant Women. Pharmacophore. 2021;12(4–2021):107–11.
38. Pearce G, Bell L, Pezaro S, Reinhold E. Childbearing with hypermobile Ehlers–Danlos syndrome and hypermobility spectrum disorders: a large international survey of outcomes and complications. Int J Environ Res Public Health. 2023;20(20):6957.
39. Cramer EM, Ahn S, Chung JE. Communication Needs about Preeclampsia and Other Hypertensive Disorders of Pregnancy: Applying the Theory of Motivated Information Management. Int J Heal Wellness Soc. 2024;14(2):99.