International Journal of Women's Health

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

Knowledge of Pre-Eclampsia and Its Risk Factors Among Pregnant Women Attending Antenatal Care in Lango Sub-Region, Northern Uganda

Joan Kirabo Nanyonga[1], Rebecca Nakaziba[2]

[1]Department of Midwifery, Lira University, Lira, Uganda; [2]Department of Pharmacology, Lira University, Lira, Uganda

Correspondence: Rebecca Nakaziba, Department of Pharmacology, Lira University, P.O Box 1035, Lira, Uganda, Email rnakaziba@lirauni.ac.ug

Background and Aim: Pre-eclampsia, while poorly understood, is a major public health concern in Africa and one of the leading causes of maternal morbidity and mortality. Its prevention and treatment depend on early detection. Sadly, many mothers globally have limited knowledge of the same. The present study evaluated the level of knowledge of Pre-eclampsia and its risk factors among pregnant mothers attending antenatal care in Lango sub-region, northern Uganda.

Methods: A descriptive cross-sectional study was conducted among 250 pregnant women attending antenatal care at Lira regional referral hospital using a consecutive sampling technique to recruit study participants who met the inclusion criteria. Data was collected using a validated well-structured questionnaire and analyzed at univariate and bivariate levels employing binary logistic regression using Statistical Package for Social Sciences (SPSS) version 23.

Results: 71.2% of the study participants had never heard of pre-eclampsia while 71.6 had no idea when one is most likely to experience preeclampsia. Only 26% of the participants had received health education talks regarding pre-eclampsia whereas 16.8% had adequate knowledge of pre-eclampsia and its risk factors. The level of knowledge of pre-eclampsia and its risk factors was associated with the participants' level of education, and age (P-values ≤ 0.05).

Conclusion: The knowledge level of pre-eclampsia and its risk factors among pregnant women attending antenatal care was very low in Lango sub-region, Northern Uganda based on education level and age. More efforts are needed to educate mothers on the danger of pre-eclampsia and its risk factors in this particular region and Uganda as a whole.

Keywords: gestation, obstetric, morbidity, blood pressure

Introduction

Pre-eclampsia (PE) is a multisystem disorder of pregnancy characterized by high blood pressure (HBP) and proteinuria that occurs most often after 20 weeks of gestation and frequently near term with possible extension of up to 7 weeks postpartum.[1] PE is characterized by systolic blood pressure (SBP) ≥140mmHg and diastolic blood pressure (DBP) ≥90mmHg taken on two occasions at least 4 hours apart and proteinuria >0.3g in a 24 hour urine sample.[2] PE is the leading cause of maternal and perinatal morbidity and mortality among obstetric diseases worldwide.[3] The disorder can lead to chronic disability, severe morbidity, and also contributes to neonatal mortality.[4–7] PE exists in two forms: the early-onset form, often associated with delivery before 34 weeks of gestation and the late-onset form, with delivery after 34 weeks of gestation.[8] Another classification includes PE with and without severe features.[9] Globally, PE complicates 5% to 10% of all pregnancies and it is responsible for 18% of all maternal deaths.[10,11] The disorder is responsible for greater than 50,000 maternal deaths worldwide each year[12] and most of these deaths occur in developing countries, Uganda inclusive.[13] In Sub-Saharan Africa, the prevalence of PE ranges from 1.8% to 16.7%[14–16] accounting for about 66% global maternal deaths.[17] In Ethiopia, PE accounts for 25% of fetal and neonatal mortality annually.[18] In Uganda, PE complicates about up to 12% of pregnancies.[19] In a prospective study to determine the incidence of PE and prenatal care retention among pregnant mothers in northern Uganda, the PE cases were 4.3%.[20] In related studies, PE was

https://doi.org/10.2147/IJWH.S587472
Received: 8 December 2025
Accepted: 7 March 2026
Published: 17 March 2026

associated with adverse maternal and neonatal outcomes in Uganda.[21,22] PE also accounts for 25% of fetal and neonatal mortality every year.[23] PE presents with diverse signs and symptoms which include persistent headaches, pulmonary edema, visual disturbances, abdominal pain, back pain, chest pain, and nausea and vomiting which occur as a result of multi-organ system dysfunction in PE.[2] Studies show that there is a link between PE and failure of, or inadequate trophoblastic invasion into the uterine wall to remodel the maternal spiral arteries which in turn leads to higher vascular resistance of uterine arteries leading to inadequate blood flow to the uterus and the placenta.[24] Inadequate blood flow to the uterus and placenta leads to ischemia that can trigger a cascade of events including the release of factors that contribute to high blood pressure.[25] PE also affects the fetus leading to complications such maternal deaths, preterm births, low birth weight, small for gestational age, placenta abruption, still births and perinatal death.[26] These deaths are attributed to late antenatal care seeking behaviors of mothers, lack or inadequate knowledge of the danger signs of PE with a resultant raise in maternal morbidity and mortality in Uganda rated 4 at per 100,000 live births.[27] Risk factors for PE include first pregnancy, multiple pregnancy, advanced maternal age, or under 18 years of age, preexisting chronic hypertension, previous history of PE, family history of PE, obesity, and gestational diabetes.[28] While hypertension pharmacotherapy using Labetalol, Nifedipine, and Magnesium sulfate is helpful, current research recommends the use of biomarkers for prediction, early detection and management.[29–31]

Despite the various interventions put in place by the Ugandan Ministry of Health in order to mitigate the increased incidences of PE and its associated complications, it remains one of the major direct leading causes of maternal morbidity and mortality.[32,33] Such interventions include: establishing updated treatment guidelines, supply of drugs and equipment, training and recruitment of medical staff into health facilities.[34] Unfortunately, there persists a knowledge gap concerning PE and its risk factors particularly among pregnant women across Africa.[34,35] Moreover, limited studies have been conducted in the region to assess PE knowledge during pregnancy. Hence, this study aimed at evaluating the knowledge of pre-eclampsia and its risk factors among pregnant women attending antenatal care (ANC) in Lango sub-region, Northern Uganda to provide relevant data to inform interventions.

Materials and Methods

Study Design

The present study employed an analytical cross-sectional design to gather quantitative data from pregnant women attending antenatal care.

Study Site and Setting

The study was conducted at a referral health facility - Lira Regional Referral Hospital (LRRH), Lira city East, Lira district, Lango sub-region of Northern Uganda. The district is bordered by Pader District to the North, Otuke District to the Northeast, Alebtong District to the east, Dokolo District to the southeast, Apac District in the southwest, and Kole District to the west. Lira Regional Referral Hospital is one of the 17 regional referral hospitals in Uganda with a bed capacity of 346. It serves all the nine districts in the Lango sub-region. The antenatal clinic runs from Monday to Friday usually between 9:00 hours to 16:00 hours and has a monthly attendance of about 640 pregnant women. Most Pre-eclampsia cases are identified during the routine antenatal care services, while others are referrals from the lower health facilities especially health center IVs.

Study Population

The study was conducted among adult (18 −50 years) pregnant women at any gestation age seeking ANC services at LRRH particularly those that had booked for and received care at the facility. Only those that consented to participate in the study were recruited excluding those in critical condition thus unable to respond to questions.

Sampling and Data Collection

The sample size of the study was calculated using the formula for finite population below

$n = \frac{N}{1+N*(e)^2}$ Where n is the sample size, N was the population size, and e was the precision level = 0.05. The ANC clinic attended to approximately 640 mothers monthly, and the study collected data for a period of one month taking N = 640 as the total population from which sampling was made, thus n = 246. Adjusting to include 10% non-respondents yielded 271.

The consecutive sampling technique was used to select the individual study participants from the ANC clinic at LRRH who met the inclusion criteria. An approximate of 23 participants were interviewed each day. The procedure was repeated until the target number of participants (271) was reached. This procedure was selected to achieve the selected sample space with the limited resources and time. Potential study participants who met the inclusion criteria were contacted and written-informed consent was sought from them. Those who consented were recruited into the study. The study employed a face to face interview method using a validated well-structured questionnaire to gather data. This method was to prevent collection of incomplete data. Data was collected using a validated well-structured questionnaire designed by reviewing previous studies conducted and literatures from other parts of the world with similar objectives.[36] The questionnaire contained three sections: section A – social-demographic data of participants (age, parity, gestational age, education level, marital status, occupation, place residence) and history of PE (personal and first degree family history of PE); Section B – health facility related factors (ANC attendance, distance to health facility) and Section C – knowledge of PE and its risk factors. Data was collected from pregnant women attending ANC at LRRH. After obtaining written-informed consent, the study participants were privately interviewed using a structured questionnaire while documenting their responses. After each interview, the questionnaires were checked for completeness coded and kept. Reliability was ensured by pre-testing the questionnaire before data collection in a pilot study conducted among 20 pregnant women attending Antenatal Care at Lira University Hospital and a revised version of the questionnaire used for final data collection.

Data Analysis

Data analysis at univariate, bivariate, and multivariable levels was done using Statistical Package for Social Sciences (SPSS) version 23. At the univariate level, descriptive data was summarised as frequencies, and percentages. At the bivariate level, association was determined between the dependent variables (knowledge of pre-eclampsia and its risk factors) and the independent variables (social demographic characteristics and health facility related factors) and data was summarised into Odds ratios, and P-values. Chi-square and one way ANOVA tests were done at a 95% level of confidence with P-values < 0.05 indicating significance. At the multivariate level, a Multinomial Logistic Regression Analysis was also performed to predict the Knowledge of Preeclampsia using Adequate Knowledge as the Reference Category. The level of knowledge of PE was determined by summing up the responses to questions regarding the awareness, signs/symptoms, complications and risk factors of PE and were graded as follows: Respondents who never heard about PE scored zero and were graded as having "No knowledge"; respondents with the sum of responses that was less than or equal to 14 were graded as having "In adequate knowledge" while those whose sum of the responses was more than 14 were graded as "Adequate knowledge". The results were described in proportions and percentages.

Ethical Considerations

The study was approved by the Lira University Research and Ethics Committee (LUREC −2024-145). Administrative clearance was obtained from the Hospital administrator of LRRH. In addition, voluntary informed consent was obtained from the respondents before participating in the study after explanation of the purpose of the study, and potential benefits or risks in the language they understand best. For confidentiality, interviews were conducted privately with individual participants away from the crowded antenatal waiting area and participants' initials instead of their names were used.

Results

Out of the 271 participants recruited for the present study, only 250 were valid. Thus, the results presented correspond to 250 participants.

Socio-Demographic Characteristics of Participants

Out of 250 participants who were enrolled, majority 160 (64.0%) were between 20 to 30 years; 135 (54.0%) were in second trimester; 222 (88.8%) were married; 127 (50.8%) were unemployed; 168 (67.2%) were from urban areas; 125 (50%) with primary education level; 178 (71.2%) were not pregnant for the first time and 144 (57.6%) had 0 to 1 child (Table 1).

Hospital Related Demographics

Out of 250 participants, majority 113 (45.2%) had attended Antenatal care 1–2 times; 160 (64.0%) lived within short distances (≤5 km) from the health facility; and 185 (74.0%) did not receive health education talk on PE (Table 2).

Knowledge of PE and Its Risk Factors Among Study Participants

In this study, majority of the respondents; 178 (71.2%) had never heard of PE (Figure 1). Of those that knew about PE, 57 (22.8%) had never experienced PE (Figure 2); whereas 56 (22.4%) and 64 (25.6%) reported that one was more likely to experience PE at 20 weeks and above and that PE was very severe, respectively (Figures 3 and 4). Additionally, the most cited sign and symptom of PE included high blood pressure 67 (26.8%), followed by persistent headache 64 (25.6%) while the most cited complication and risk factor of PE were feta death 67 (26.8%) and obesity 66 (26.4%), respectively

Table 1 Participant Social Demographic Characteristics

Variable	Frequency (n)	Proportion (%)
Age (years)		
Below 20	36	14.4
20-30	160	64.0
Above 30	54	21.6
Gestational age (Trimester)		
First trimester	38	15.2
Second trimester	135	54.0
Third trimester	77	30.8
Marital status		
Married	222	88.8
Single	25	10
Divorced	3	1.2
Occupation		
Employed	123	49.2
Unemployed	127	50.8
Residence		
Rural	82	32.8
Urban	168	67.2
Education level		
Primary	125	50.0
Secondary	83	33.2
Tertiary	36	14.4
No formal education	6	2.4
First pregnancy		
Yes	72	28.8
No	178	71.2
Number of children (parity)		
0-1	144	57.6
2-3	87	34.8
4-5	15	6.0
5-6	4	1.6

Table 2 Hospital Related Factors

Variables	Frequency (n)	Proportion (%)
Antenatal visits		
1-2	113	45.2
3-5	108	43.2
Above 5	29	11.6
Distance from the facility		
Short (≤5km)	160	64.0
Long (≥5km)	90	36.0
Health education talk on PE		
Yes	65	26.0
No	185	74.0

(Table 3). On the other hand, obesity (26.4%), pre-existing chronic hypertension (26%), PE history (25.6%) and maternal age (24.4%) were the most cited risk factors for PE (Table 3).

Level of Knowledge of PE and Its Risk Factors Among Study Participants

Results showed that, only 16.8% had adequate knowledge while 71.6% had no knowledge of PE (Figure 5).

Participant Socio-Demographic Factors Associated with Knowledge of PE and Its Risk Factors

Bivariate and multivariate analysis using multinomial logistic regression indicated that women with higher education were 77% less likely to have no knowledge about preeclampsia. Besides, women aged 20–30 years had 4 times higher odds of having no knowledge compared to those above 30 years (OR = 4.02, 95% CI: 1.36–11.83, p = 0.012). The model was statistically significant, $\chi^2(20) = 116.37$, $p < 0.001$, explaining 46.9% of the variance in knowledge levels. Education level emerged as the strongest predictor where by Higher education status was associated with significantly lower odds of having no knowledge compared to adequate knowledge (OR = 0.23, 95% CI: 0.12–0.44, p < 0.001) (Table 4 and Table 5).

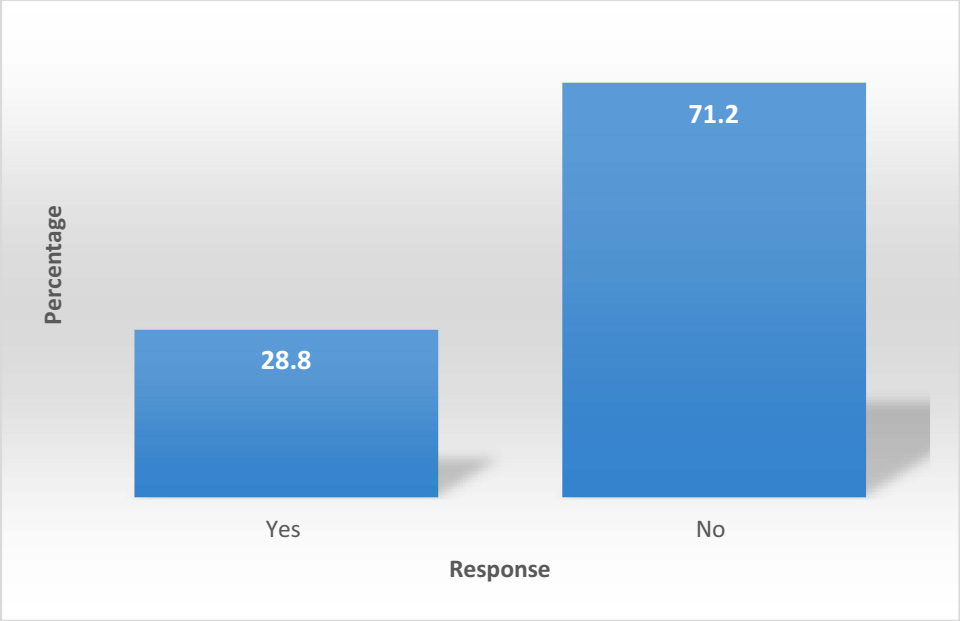

Figure 1 Showing participants who had ever heard of Pre-eclampsia.

https://doi.org/10.2147/IJWH.S587472

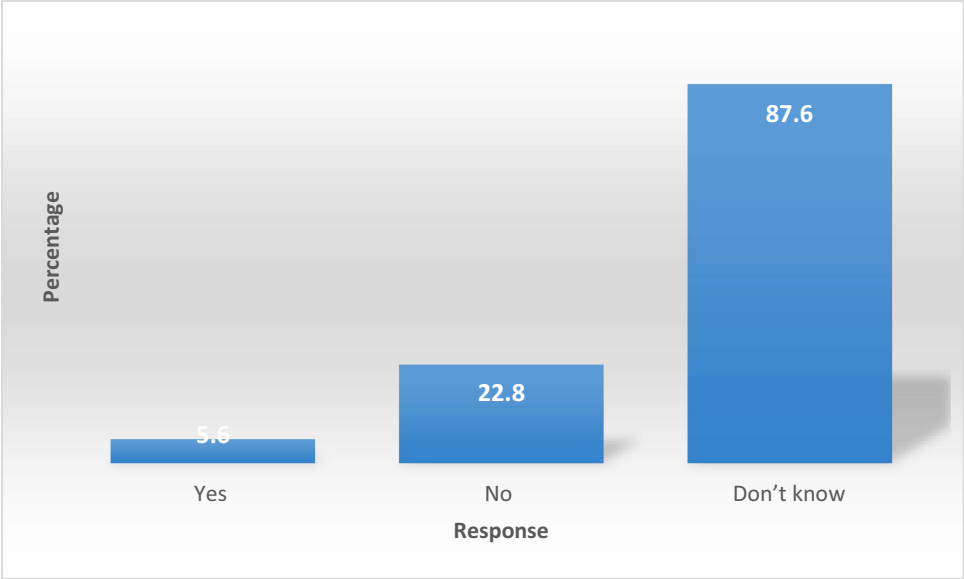

Figure 2 Experience of Pre-eclampsia among study participants.

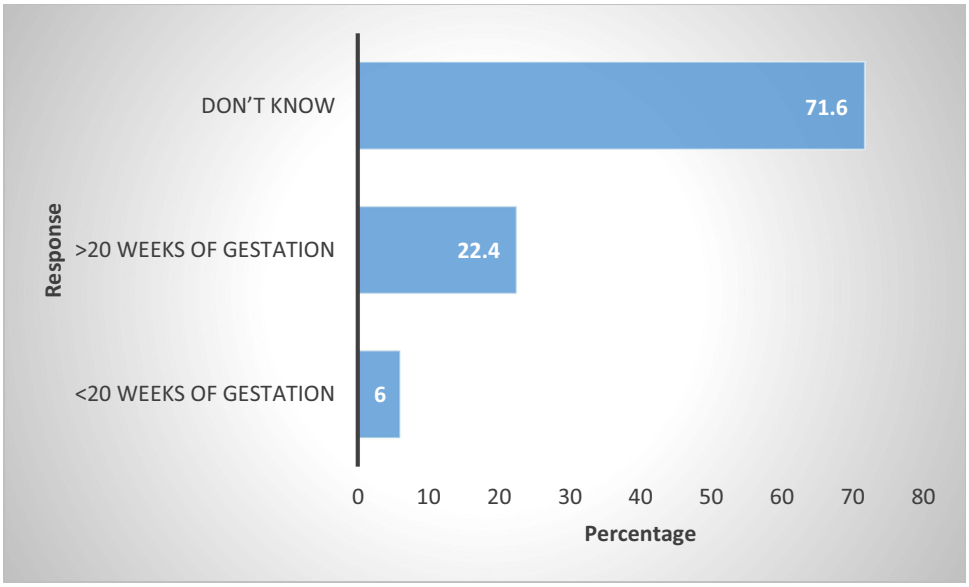

Figure 3 Participant knowledge of PE likelihood.

Discussion

Summary of the Findings

The present study revealed a very high knowledge gap regarding PE and its risk factors among the study participants. 71.2% had never heard of PE; 87.6% did not know whether they have ever experienced PE or not; 71.6% had no idea of the likelihood of PE occurrence; and only 16.8% had adequate level of PE knowledge. The knowledge of PE was strongly associated with the education level of the study participants.

Knowledge of PE and Its Risk Factors

PE is still a major public health concern in northern Uganda with most of the affected population (the pregnant women) lacking knowledge about the disorder and its risk factors. In this study, the prevalence of adequate knowledge about PE

 https://doi.org/10.2147/IJWH.S587472

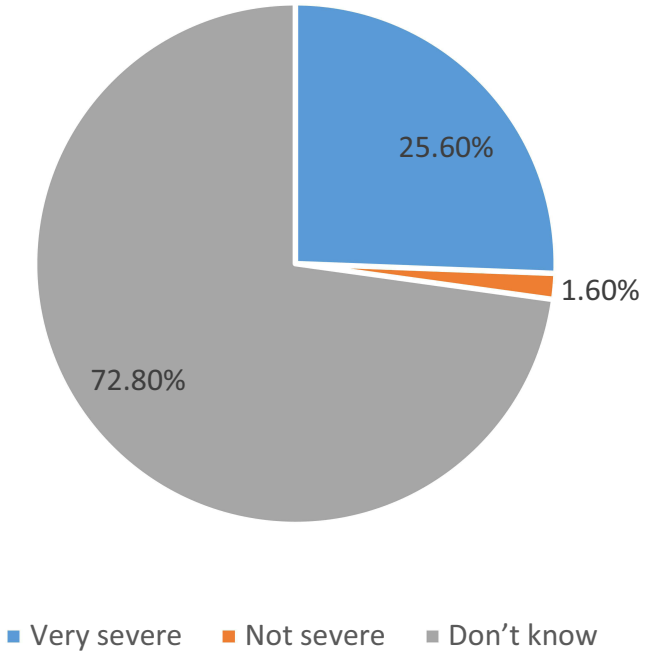

Figure 4 Knowledge of the severity of Pre-eclampsia among study participants.

was only 16.80%. This study finding was comparable to the cross-sectional study that was conducted at the University Hospital in Kumasi, Ghana, where the prevalence of inadequate and adequate knowledge of PE was 88.6% (mean score = 55.5 ± 4.3%) and 11.4% (mean score = 76.3 ± 5.9%), respectively.[28] In addition, a study conducted at Kampala

Table 3 Participant Knowledge of PE and Its Risk Factors

Variable	Frequency (n)	Percentage (%)
Signs and symptoms of PE		
High blood pressure	67	26.8
Persistent headache	64	25.6
Edema	57	22.8
Blurred vision/Visual disturbances	54	21.6
Chest pain	39	15.6
Abdominal pain	39	15.6
Nausea and Vomiting	38	15.2
Back pain	43	17.2
Complications of PE		
Maternal death	65	26.0
Preterm birth	53	21.2
Low birth weight babies	53	21.2
Fetal death	67	26.8

(*Continued*)

https://doi.org/10.2147/IJWH.S587472

Table 3 (Continued).

Variable	Frequency (n)	Percentage (%)
Risk factors for PE		
First pregnancy (being pregnant for the first time)	43	17.2
Multiple pregnancy	38	15.2
Maternal age (above 35yrs) and under 18yrs.	61	24.4
Preexisting chronic hypertension	65	26.0
Previous history of PE	64	25.6
Family history of PE	41	16.4
Obesity (Being overweighed)	66	26.4
Gestational diabetes mellitus	28	11.2

International university hospital revealed that 89.4% of the participants had inadequate knowledge about pre-eclampsia with a mean score of 51.5 ± 5 while only 10.6% had adequate knowledge about PE with a mean score of 72.8 ± 3.6.[37] Meanwhile, a related study conducted in Port Blair India in 2022 among 207 participants assessing level of knowledge, attitude and practice of women towards PE revealed that 26.19% of women had knowledge on PE,[38] a statistic not far from the present study. Moreover, a related study in Lebanon revealed a PE knowledge level of only 15.3%,[39] closely related to the current findings. While there are slight differences in the study findings from different countries, the results underscore an urgent need to educate women of reproductive age on PE and its risk factors. This will empower them to prevent but also to identify the signs and symptoms of PE for prompt attention.

Factors Associated with Knowledge of Pre-Eclampsia and Its Risk Factors

The present study findings indicated that the education level of the study participants was significantly associated with the knowledge of pre-eclampsia. Participants who did not attend any formal education were less likely to be knowledgeable on

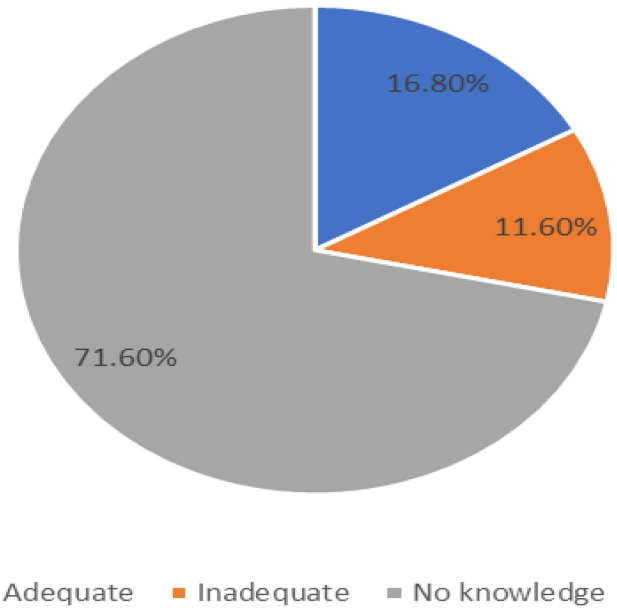

Figure 5 Level of knowledge of PE among study participants.

Table 4 Bivariate Analysis of Association of Participant Socio-Demographic Factors with Knowledge of PE and Its Risk Factors

Characteristic	n	Adequate Knowledge n (%)	Inadequate Knowledge n (%)	No Knowledge n (%)	χ^2	df	p-value	Cramer's V
Marital Status								
Married	222	41 (18.5)	28 (12.6)	153 (68.9)	9.16	4	0.057	0.14
Single	25	0 (0.0)	1 (4.0)	24 (96.0)				
Divorced	3	1 (33.3)	0 (0.0)	2 (66.7)				
Age Group								
Below 20 years	31	0 (0.0)	1 (3.2)	30 (96.8)	50.72	4	<0.001*	0.32
20-30 years	163	19 (11.7)	15 (9.2)	129 (79.1)				
Above 30 years	56	23 (41.1)	13 (23.2)	20 (35.7)				
Residence								
Rural	82	6 (7.3)	7 (8.5)	69 (84.1)	10.20	2	0.006*	0.20
Urban	168	36 (21.4)	22 (13.1)	110 (65.5)				
Education Level								
No formal education	6	0 (0.0)	2 (33.3)	4 (66.7)	65.79	6	<0.001*	0.36
Primary	125	5 (4.0)	6 (4.8)	114 (91.2)				
Secondary	83	19 (22.9)	15 (18.1)	49 (59.0)				
Tertiary	36	18 (50.0)	6 (16.7)	12 (33.3)				
First Pregnancy								
Yes	72	4 (5.6)	1 (1.4)	67 (93.1)	23.20	2	<0.001*	0.31
No	178	38 (21.3)	28 (15.7)	112 (62.9)				
Heard of PE								
Yes	71	42 (59.2)	29 (40.8)	0 (0.0)	249.00	2	<0.001*	1.00
No	178	0 (0.0)	0 (0.0)	178 (100.0)				

Notes: χ^2 = Pearson chi-square value, *df* = degrees of freedom, Cramer's V = effect size (0.10 = small, 0.30 = medium, 0.50=large), n = frequency, * = significant value.

Table 5 Multivariate Analysis of Association of Participant Socio-Demographic Factors with Knowledge of PE and Its Risk Factors

Knowledge Level[a]		B	Sig.	Exp(B)	95% CI for Exp(B)	
Inadequate	Intercept	−19.418	0.995			
	Gestational age	0.010	0.751	1.010	[0.950,1.073]	
	Education level	−0.209	0.517	0.812	[0.432,1.527]	
	Parity	0.113	0.697	1.119	[0.635,1.973]	
	Employed	−0.321	0.582	0.726	[0.231, 2.276]	
	Unemployed	0[b]				
	Below 20 years	16.751	0.996	18,827,530.449	0.000[c]	
	20-30 years	0.526	0.414	1.693	[0.478, 5.992]	
	Above 30 years	0[b]				
	Married	18.936	0.995	167,364,729.532	0.000	[c]
	Single	35.253		2,042,026,709,223,773.200	2,042,026,709,223,773.200	2,042,026,709,223,773.200
	Divorced	0[b]				
	Rural	0.129	0.861	1.138	0.267	4.851
	Urban	0[b]				

(*Continued*)

https://doi.org/10.2147/IJWH.S587472

Table 5 (Continued).

Knowledge Level[a]		B	Sig.	Exp(B)	95% CI for Exp(B)	
	First pregnancy-Yes	−1.007	0.443	0.365	0.028	4.779
	First pregnancy-No	0[b]				
No knowledge	Intercept	3.964	0.055			
	Gestational age	−0.025	0.351	0.975	0.925	1.028
	Education level	−1.474	0.000	0.229	0.120	0.437
	Parity	−0.341	0.189	0.711	0.427	1.184
	Employed	−0.768	0.139	0.464	0.168	1.284
	Unemployed	0[b]				
	Below 20 years	18.187	0.995	79,133,073.794	0.000	[c]
	20-30 years	1.391	0.012	4.018	1.364	11.830
	Above 30 years	0[b]				
	Married	0.557	0.715	1.745	0.088	34.555
	Single	16.932	0.996	22,577,427.486	0.000	[c]
	Divorced	0[b]				
	Rural	0.003	0.996	1.003	0.296	3.394
	Urban	0[b]				
	First pregnancy-Yes	1.140	0.153	3.126	0.654	14.935
	First pregnancy-No	0[b]				

Notes: [a]Reference category, [b]Unreliable estimate due to small sample size or singular Hessian matrix, [c]Standard error could not be computed.

pre-eclampsia compared with those who attained a higher level of education. The findings of this study were found to be supported by a study carried out in South Gondar Zone, Northwest Ethiopia[40] and in Kumasi, Ghana.[28] Additionally, the study findings also indicated that age was strongly significantly associated with level of knowledge of Pre-eclampsia. Participants who were below 30 years of age were less likely to be knowledgeable about Pre-eclampsia compared to those who were above 30 years of age. This finding relates to a similar study by Fondjo and others in Ghana.[41] In the present study, participant parity was not significantly associated with knowledge of PE. This was in contradiction with a related study that revealed that participants with parity 0 and 1 were less likely to be knowledgeable on Pre-eclampsia as compared to those with 2 children and above.[42] Participants residing in rural areas and unemployed were less likely to be knowledgeable about Pre-eclampsia and its risk factors compared to their counter parts. This is consistent with previous researches in Kenya and Zambia, which also found out that urban residents, who were employed and lived nearer to the health facility were more likely to have higher knowledge of pre-eclampsia than their counter parts.[40,43]

Study Limitations

The cross-sectional nature of this study limits it from finding the causality relationship between the knowledge of pre-eclampsia and its determinants. However, a P-value of less than 0.05 was considered at bivariate analysis which makes the study results valid.

Conclusion

The knowledge of pre-eclampsia and its risk factor was low among the study participants with only 16.8% of the pregnant women having adequate knowledge. The factors associated with knowledge of pre-eclampsia included: participant level of education, age, residence, and occupation.

Recommendations

Medical practitioners should increase the health education talks on pre-eclampsia, its risk factors and preventive measures during antenatal care services.

Pre-eclampsia awareness campaigns should be conducted by the Ministry of Health to inform the general public of the risk factors of Pre-eclampsia, preventive measures and encourage pregnant women to seek antenatal care services and to deliver at health facilities.

Future researchers should focus on investigating knowledge of pre-eclampsia among rural mothers and explore the impact of culture on knowledge of pre-eclampsia.

Acknowledgments

The study participants for their willingness to engage in the study.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Alemie T, Abebe A, Adal O, Azazh A, Endashaw D. Clinical features and outcomes of patients with preeclampsia and eclampsia at Gondar University hospital, Amhara, Ethiopia 2021. *Eur J Obstetrics Gynecol Reprod Biol*. 2023;X:100254. doi:10.1016/j.eurox.2023.100254
2. Taher F, Ali M, Otman G. Knowledge about preeclampsia among women of reproductive age attending al-beyda medical center. 2022.
3. Bokuda K, Ichihara A. Preeclampsia up to date—what's going on? *Hypertens Res*. 2023:1–8.
4. Narkhede AM, Karnad DR. Preeclampsia and related problems. *Indian J Crit Care Med*. 2021;25(Suppl 3):S261. doi:10.5005/jp-journals-10071-24032
5. Tassi A, Sala A, Mazzera I, Restaino S, Vizzielli G, Driul L. Long-term outcomes of patients with preeclampsia, a review of the literature. *Hyperten Pregnancy*. 2023;42(1):2217448. doi:10.1080/10641955.2023.2217448
6. Tolcher MC, Aagaard KM. Complications of preeclampsia. *Critic Care Obstet*. 2024:901–937.
7. Hapdijaya ITE, Herdiana EM, Natalia J, et al. Placental abruption as a complication of preeclampsia that causes fetal distress. *Med Clin Update*. 2022;1(1):36–38. doi:10.58376/mcu.v1i1.12
8. Staff AC. The two-stage placental model of preeclampsia: an update. *J Reprod Immunol*. 2019;134:1–10. doi:10.1016/j.jri.2019.07.004
9. 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 Global Public Health*. 2023;3(5):e0001790. doi:10.1371/journal.pgph.0001790
10. Yang YLRI, Hua J, Hua J, Hua J, Reilly M, Reilly M. Preeclampsia prevalence, risk factors, and pregnancy outcomes in Sweden and China. *JAMA Network Open*. 2021;4(5):e218401. doi:10.1001/jamanetworkopen.2021.8401
11. Van Dyk DDR, Fernandes NL, Fernandes NL. Preeclampsia in 2021—a perioperative medical challenge for the anesthesiologist. *Anesthesiol Clin*. 2021;39(4):711–725. doi:10.1016/j.anclin.2021.08.005
12. Karrar SFJ, Hong P, Hong P. Withstanding the test of time: morning versus afternoon/evening urine protein-to-creatinine ratios in preeclampsia. *Pregnancy Hypertens*. 2023;34:90–94. doi:10.1016/j.preghy.2023.10.008
13. Midala T. Determinants of preeclampsia among pregnant women at gestational age of above 20 weeks attending antenatal care at FPRRH. *Facilities*. 2019;26:27.
14. Jikamo BAM, Azale T, Alemu K, Alemu K. Incidence, trends and risk factors of preeclampsia in sub-Saharan Africa: a systematic review and meta-analysis. *PAMJ-One Health*. 2023;11(1). doi:10.11604/pamj-oh.2023.11.1.39297
15. Anto EO, Boadu WIO, Ansah E, 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. *PLoS One*. 2023;18(6):e0288079. doi:10.1371/journal.pone.0288079
16. Kokori EAN, Olatunji G, Komolafe R, et al. Prevalence and materno-fetal outcomes of preeclampsia/eclampsia among pregnant women in Nigeria: a systematic review and meta-analysis. *Eur J Med Res*. 2024;29(1):482. doi:10.1186/s40001-024-02086-x
17. Tesfahun E, Tadesse S, Hailu A, et al. Prevalence of preeclampsia and associated factors among antenatal care attending mothers at Tirunesh Beijing General Hospital, Addis Ababa, Ethiopia. *Advanc Public Health*. 2023;2023:1–5. doi:10.1155/2023/1132497
18. Tesfahun ETS, Hailu A, Minda A, Ekubay M, Tariku B, Dagnaw A. Prevalence of preeclampsia and associated factors among antenatal care attending mothers at Tirunesh Beijing General Hospital, Addis Ababa, Ethiopia. *Advanc Public Health*. 2023;2023(1):1132497.
19. Nakimuli A, Jasper BA, Nakubulwa S, et al. Risk factors associated with progression from pre-eclampsia to eclampsia: a prospective cohort study and population-wide data analysis. *Acta Obstetricia et Gynecologica Scandinavica*. 2025;104(8):1487–1495. doi:10.1111/aogs.15154
20. Awor SBR, Abola B, Nakimuli A, et al. Incidence of preeclampsia and retention to prenatal care in Northern Uganda. *East Afr Med J*. 2022;99(6).

21. Muteke KMM, Mukunya D, Beyeza J, Wandabwa JN, Kiondo P, Kiondo P. Postpartum resolution of hypertension, proteinuria and acute kidney injury among women with preeclampsia and severe features at Mulago National Referral Hospital, Uganda: a cohort study. *Afr Health Sci*. 2023;23(3):27–36. doi:10.4314/ahs.v23i3.6
22. Milln JNB, Natamba B, Sekitoleko I, et al. Adverse pregnancy outcomes associated with moderate elevations in blood pressure or blood glucose in Ugandan women; a prospective cohort study. *AJOG Global Rep*. 2021;1(2):100007. doi:10.1016/j.xagr.2021.100007
23. Tesfahun E, Tadesse S, Hailu A, et al. *Research Article Prevalence of Preeclampsia and Associated Factors Among Antenatal Care Attending Mothers at Tirunesh Beijing General Hospital*. Ethiopia: Addis Ababa; 2023.
24. Mou AD, Barman Z, Hasan M, et al. Prevalence of preeclampsia and the associated risk factors among pregnant women in Bangladesh. *Sci Rep*. 2021;11(1):21339. doi:10.1038/s41598-021-00839-w
25. Lane-Cordova AD, Khan SS, Grobman WA, Greenland P, Shah SJ. Long-term cardiovascular risks associated with adverse pregnancy outcomes: JACC review topic of the week. *J Am College Cardiol*. 2019;73(16):2106–2116. doi:10.1016/j.jacc.2018.12.092
26. Stepan H, Hund M, Andraczek T. Combining biomarkers to predict pregnancy complications and redefine preeclampsia: the angiogenic-placental syndrome. *Hypertension*. 2020;75(4):918–926. doi:10.1161/HYPERTENSIONAHA.119.13763
27. Muteke K, Musaba MW, Mukunya D, Beyeza J, Wandabwa JN, Kiondo P. Postpartum resolution of hypertension, proteinuria and acute kidney injury among women with preeclampsia and severe features at Mulago National Referral Hospital, Uganda: a cohort study. *Afr Health Sci*. 2023;23(3):27–36.
28. Fondjo LA, Boamah VE, Fierti A, Gyesi D, Owiredu E-W. Knowledge of preeclampsia and its associated factors among pregnant women: a possible link to reduce related adverse outcomes. *BMC Pregnancy Childbirth*. 2019;19(1):1–7. doi:10.1186/s12884-019-2623-x
29. Costa ML, de Carvalho Cavalli R, Korkes HA, da Cunha Filho EV, Peraçoli JC. Diagnosis and management of preeclampsia: suggested guidance on the use of biomarkers. *Revista Brasileira de Ginecologia e Obstetrícia*. 2022;44(09):878–883. doi:10.1055/s-0042-1744286
30. Sharma DD, Chandresh NR, Javed A, et al. The management of preeclampsia: a comprehensive review of current practices and future directions. *Cureus*. 2024;16(1).
31. Chang KJ, Seow KM, Chen KH. Preeclampsia: recent advances in predicting, preventing, and managing the maternal and fetal life-threatening condition. *Int J Environ Res Public Health*. 2023;20(4):2994. doi:10.3390/ijerph20042994
32. Namagembe I, Karavadra B, Kazibwe L, et al. Implementation challenges in preeclampsia care: perspectives from health care professionals in urban Uganda. *AJOG Global Rep*. 2024;4(2):100348. doi:10.1016/j.xagr.2024.100348
33. Nakimuli A, Akello J, Sekikubo M, et al. Variations in emergency care for severe pre-eclampsia in Uganda: a national evaluation study. *AJOG Global Rep*. 2025;5(1):100424. doi:10.1016/j.xagr.2024.100424
34. Confidence A, Wanyenze E, Groves S. Adherence and challenges in implementing national guidelines on management of severe pre-eclampsia and eclampsia by health workers at Mbarara regional referral hospital. *J Exp Clin Microbiol*. 2022;6(2):1.
35. Adamu AN, Callahan KL, Anderson PB. Awareness of preeclampsia among antenatal clinic attendees in Northwestern Nigeria. *Avicenna J Med*. 2023;13(02):111–116. doi:10.1055/s-0043-1770700
36. Taherdoost H. Designing a questionnaire for a research paper: a comprehensive guide to design and develop an effective questionnaire. *Asian J Manager Sci*. 2022;11(1):8–16. doi:10.51983/ajms-2022.11.1.3087
37. Lajul D. *Knowledge of Preeclampsia and Risk Factors Among Pregnant Women Attending Antenatal Care at Kampala*. Bushenyi District: International University Teaching Hospital. IDOSR Publications. 2023;9(3):43-58. doi:10.59298/IDOSR/JES/111.1.10104
38. Kishen S, Rao MVP. Knowledge, attitude and practice of women towards preeclampsia in Port Blair: a cross sectional study. *Int J Health Sci*. 2022:5907–5921.
39. Hamade R, Mohsen A, Kobeissy F, Karouni A, Akoum H. Knowledge of preeclampsia among pregnant women. *Curr Women's Health Rev*. 2022;18(4):41–45.
40. Mekie M, Addisu D, Bezie M, et al. 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. *BMC Pregnancy Childbirth*. 2021;21:1–9. doi:10.1186/s12884-021-03647-2
41. 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.
42. Wilkinson J, Cole G. Preeclampsia knowledge among women in Utah. *Hyperten Pregnancy*. 2018;37(1):18–24. doi:10.1080/10641955.2017.1397691
43. Alnuaimi K, Abuidhail J, Ismail H. The effects of an educational programme about preeclampsia on women's awareness: a randomised control trial. *Int Nurs Rev*. 2020;67(4):501–511. doi:10.1111/inr.12626