



# Prevalence, Risk Factors, and Outcomes of Pregnancy-Induced Hypertension at Tamale Teaching Hospital, Northern Region

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## Abstract

**Introduction:** Pregnancy-induced hypertension (PIH) is a significant cause of morbidity and mortality among expectant mothers. While some women may be unaware of its existence, others hold misconceptions about its nature or attribute symptoms to superstitions. This study aimed to assess the prevalence, risk factors, and complications of pregnancy-related hypertension among women at Tamale Teaching Hospital. **Methods:** This cross-sectional study utilized hospital record data from pregnant women at Tamale Teaching Hospital. A simple random sample of 115 women was selected for analysis. Data was gathered through a pretested questionnaire addressing background information, risk factors, and complications of pregnancy hypertension. Means and standard deviations were calculated for continuous variables, while Pearson's chi-square test assessed associations between variables. Multivariate logistic regression was performed to evaluate the strength of associations with PIH, using two-sided p values at a significance level of 0.05. **Results:** In a study of 115 women over 20 weeks pregnant, the prevalence of Pregnancy-Induced Hypertension (PIH) was 7.8%. Strong correlations were observed with factors such as a family history of PIH and previous PIH in pregnancies. Among those with PIH, 77.78% underwent Caesarean sections. Birth outcomes indicated that 55.56% resulted in live births, while 44.44% were stillbirths. Additionally, 22.22% of births were preterm, and 11.11% were complicated by spontaneous abortions, highlighting the serious impact of PIH on maternal and fetal health. **Conclusion:** Pregnancy-induced hypertension was less common than at Korle Bu Teaching Hospital, with key risk factors being parity, family history, and

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previous PIH. Caesarean sections were the most significant delivery outcome, with complications including preterm birth and spontaneous abortion.

## Subject Areas

Gynecology & Obstetrics

## Keywords

Pregnancy-Induced Hypertension (PIH), Proteinuria, Gestational Hypertension, HELLP Syndrome

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## 1. Introduction

Pre-eclampsia is a new onset of systolic blood pressure  $\geq 140$  mmHg and/or diastolic blood pressure  $\geq 90$  mmHg on at least 2 occasions at least 4 hours apart after 20 weeks of gestation in a previously normotensive individual. Patients with systolic blood pressure  $\geq 160$  mmHg and/or diastolic blood pressure  $\geq 110$  mmHg should have their blood pressure confirmed within a short interval (minutes) to facilitate the timely administration of antihypertensive therapy.

And Proteinuria ( $\geq 300$  mg per 24-hour urine collection [or this amount extrapolated from a timed collection], or Protein: Creatinine ratio  $\geq 0.3$ , or urine dipstick reading  $\geq 2+$  [if other quantitative methods are not available [1]. The types of Hypertension Conditions during Pregnancy are explained further in subsequent paragraphs.

Gestational hypertension is defined as the sudden increase in systolic blood pressure to  $\geq 140$  mmHg and/or diastolic blood pressure to  $\geq 90$  mmHg, observed on at least two occasions, with a minimum time interval of 4 hours after the 20th week of pregnancy in an individual who had previously maintained normal blood pressure. This condition is characterized by the absence of proteinuria and shows no signs or symptoms of preeclampsia-related end-organ dysfunction, such as thrombocytopenia, renal insufficiency, elevated liver transaminases, pulmonary edema, or cerebral/visual symptoms [1].

In a patient with new-onset hypertension without proteinuria, the diagnosis of pre-eclampsia can still be made if any features of severe disease are present [1].

Symptoms of severe pre-eclampsia include any of the following signs or symptoms in a pre-eclampsia patient, which indicate a serious illness:

- 1) Systolic and/or diastolic blood pressure measurements taken twice, at least four hours apart (unless antihypertensive therapy is initiated before this time).
- 2) Platelet counts less than 100,000/microL, or thrombocytopenia.
- 3) Decreased liver function as seen by liver transaminase values that are at least twice normal or by severe, ongoing right upper quadrant or epigastric discomfort that is not relieved by medicine and is not explained by other illnesses, or both.
- 4) Progression of renal insufficiency (serum creatinine  $> 1.1$  mg/dL [97

micromol/L] or doubling of serum creatinine concentration without other renal illness).

5) Pulmonary edema.

6) Consistent neurological or visual issues.

Eclampsia is a generalized seizure in a patient with pre-eclampsia that cannot be attributed to other causes [1]. Hemolysis, Elevated Liver Enzymes, and Low Platelets are all components of the HELLP syndrome. There might be hypertension (HELLP in such cases is often considered a variant of pre-eclampsia). Chronic (preexisting Tranquilli hypertension is defined as hypertension that was diagnosed or was present at least twice before 20 weeks of gestation or before the pregnancy. Chronic hypertension is defined as hypertension that develops for the first-time during pregnancy and lasts for at least 12 weeks after delivery [2].

Pregnant women can sometimes develop high blood pressure, which is known as hypertensive disorder in pregnancy. Pre-eclampsia, a more severe form, is characterized by hypertension accompanied by proteinuria, and it typically develops after the 20<sup>th</sup> week of pregnancy. In some cases, pre-eclampsia may progress to eclampsia, a rare but potentially life-threatening condition that involves seizures in addition to hypertension and proteinuria. These hypertensive disorders in pregnancy collectively affect a significant portion of pregnancies worldwide, making them a matter of critical concern for both maternal and fetal health [3].

According to a study conducted by Goldenberg *et al.* [4] in 2011, hypertensive disorders in pregnancy have a significant impact on maternal mortality, accounting for nearly 15% of all maternal deaths worldwide. Tragically, a substantial majority of these fatalities occur in developing countries, underscoring the urgent need for improved healthcare interventions and resources in these regions to address and reduce the risks associated with these conditions.

It contributes to around 12% of maternal deaths worldwide that are directly related to pregnancy [5]. Hypertensive disorders of pregnancy pose a serious threat to both neonatal and maternal health. This condition has emerged as a significant global public health concern, warranting heightened attention and comprehensive efforts to mitigate its impact on maternal and infant well-being.

PIH is a condition that can happen during pregnancy. It can be more likely to happen if the person has had it in previous pregnancies or if they have certain health problems like kidney disease, diabetes, or heart disease. It can also be more likely if there is a history of PIH in the family. Other factors include being younger than 20 or older than 40 and having psychological issues.

Stress, alcohol usage, rheumatoid arthritis, low BMI, obesity, and low socioeconomic position are all associated with PIH [6].

Pregnancy-related hypertension can range from mild to severe. When the blood pressure consistently registers between 160 and 110 millimeters (mm) of Mercury (Hg) systolic and 90 to 90 millimeters (mm) of Mercury (Hg) diastolic, the former diagnosis is made. When blood pressure regularly registers between 140 and 90 millimeters (mm) of Mercury (Hg) of systolic and 90 millimeters (mm) of

Mercury (Hg) diastolic [7]. Because some women have a very serious form of the sickness, PIH is connected to a high number of deaths, which has been well-studied and written about.

Pregnancy and other natural stages of growth are being affected by high blood pressure, which is a significant health problem for the general public. During pregnancy, there are four main types of high blood pressure disorders that doctors look out for. These include pre-eclampsia, eclampsia, gestational hypertension, and chronic hypertension. Chronic hypertension can also lead to a condition called superimposed pre-eclampsia. These four primary hypertensive disorders increase the risk of problems for women who already have high blood pressure.

Around 350,000 pregnant women globally perish yearly from pregnancy and its related causes; over fifty percent of such mortality happens in Africa in sub-Saharan (SSA). Studies show, PIH contributes to 12 percent of mortality among pregnant women [8]. Ten percent of expecting mothers worldwide have high blood pressure [9].

In Africa, PIH and its associated complications constitute the third greatest cause of expectant mothers' mortality, whereas, in Latin America and the Caribbean, they account for about 25.7% of mortality [10].

Pregnancy-related hypertension diseases in Africa account for 9.1% of all maternal fatalities [11].

PIH is linked to premature birth, intrauterine growth restriction, placental abruption, and intrauterine fetal mortality in addition to the substantial mortality rate [9]. Additionally, PIH problems typically have an impact on both the expectant mother and the fetus [12].

Researchers have discovered certain factors that increase the chances of getting PIH. Having no previous pregnancies, having multiple pregnancies, having ongoing high blood pressure, having diabetes during pregnancy, fetal abnormalities, and being overweight are all linked to pregnancy-induced hypertension [13].

Certain health conditions such as rheumatoid arthritis, being very underweight or very overweight, kidney disease, diabetes, cardiovascular diseases, high blood pressure that hasn't been diagnosed, having a family history of hypertension during pregnancy because of familial aetiologies, chronic stress, drinking alcohol, and having a low income are all connected to a condition called pregnancy-induced hypertension (PIH). Young mothers or older mothers have a higher chance of having PIH. Mothers who are under 20 or over 40 are also more likely to have PIH [14].

The link between PIH, risk factors, and outcomes for pregnant women hasn't been the subject of many studies in Tamale. This research was carried out to ascertain the prevalence of pre-eclampsia in Tamale Teaching Hospital (TTH), pinpoint PIH risk variables, and assess the maternal and fetal outcomes among women with PIH.

Pre-eclampsia is responsible for around 15% of all maternal deaths worldwide, almost all of which (more than 99%) take place in underdeveloped nations [4].

Worldwide [15], Pregnancy-related hypertension problems can occur in one (1%) to 35% of women.

Nearly 12% of maternal mortality directly related to pregnancy is caused by it globally [5]. In both industrialized and developing nations, neonatal and maternal morbidity and death are increased by Pregnancy hypertension. This condition is a significant worldwide public health issue.

Pregnancy-induced hypertension is one of the major causes of maternal mortality and morbidity for expectant mothers across the world [16]. Maternal fatalities due to Hypertension Disorders during Pregnancy (HPD) were estimated by the World Health Organization (WHO) to be 25.7% in countries in Latin America and the Caribbean and 9.1% in those in Asia and Africa [17] [18].

In 2013, over 289,000 women perished worldwide due to obstetric-related complications. Approximately 99% percent of deaths take place in undeveloped nations. The majority of maternal deaths—about 56 percent—occur in sub-Saharan Africa. In impoverished nations, a woman has a 14 times greater lifetime chance of dying from complications related to pregnancy than in wealthy nations [10].

Pre-eclampsia is estimated by the World Health Organization to be about seven (7) times more likely in developing countries than in industrialized countries [16]. Compared to a study conducted in Western Syria, pregnancy-related hypertension caused 12.3% of maternal deaths [19].

There are variances in pregnancy outcomes even within nations, particularly in sub-Saharan Africa, because of sociocultural inequalities and differences in the dispersion and caliber of healthcare [4].

Pre-eclampsia caused complications in about 1% of deliveries and 5% of pregnancies, according to Ethiopia's National Emergency Obstetric and Newborns Care (EMONC) study. Additionally, pre-eclampsia/eclampsia was the cause of 10% of all maternal deaths (direct and indirect) and 16% of direct maternal mortality [20]. Pre-eclampsia has been on the rise in Ethiopia, according to a trend study of maternal mortality [21].

According to estimates, hypertension problems during pregnancy complicate about 5% - 10% of pregnancies in Nigeria [22]-[24], which is the illness that causes the most antenatal admissions of any other [23].

In these situations, HDPs are responsible for about 25% of perinatal deaths [25]. The majority of tertiary health facilities in Ghana and other nations [26] [28], as well as the majority of tertiary facilities and rural hospitals in some parts of Nigeria. Ekele *et al.* [29] have stated that these illnesses are the leading factor contributing to maternal mortality in Sub-Saharan Africa.

While the management of hypertensive disorders of pregnancy (HDPs) follows universal principles, the unequal rates of poor pregnancy outcomes in resource-burdened settings can mostly be attributed to concerns regarding the management and quality of care for HDPs in these contexts [30].

A couple of research works have been carried out in areas with adequate resources to assess mothers' and babies' outcomes linked to the full spectrum of

HDPs. Other research work has been based on trends in maternal mortality [31]. Such information is, however, scarce in less developed environments, such as the Saharan Sub of Africa, where the majority of research work has concentrated on Hypertension during Pregnancy, possibly due to higher probabilities of negative complications.

In line with a study done in Ghana, pregnancy-related hypertension is to blame for 8.9% of all maternal deaths [11].

Pre-eclampsia remains a significant public health concern in both advanced and low-income countries, as highlighted by Chawla & Anim-Nyame [32]. According to the World Health Organization, PIH and its related problems are seven times more likely to occur in developing countries compared to advanced countries. In less developed countries, PIH affects 2.8 percent of live births. Regarding PIH, around two (2%) to ten (10%) percent of expectant mothers worldwide are identified as pre-eclampsia or eclampsia. PIH greatly affects the health problems and death rates of mothers and newborn babies [9].

Underutilization of mother's health services in Southern Africa is a factor in the region's high prevalence of PIH (16.7%) and maternal mortality rates of 40% - 60%. The likelihood of PIH and its effects are accountable for about nine percent of maternal fatalities in Ghana [33]. Organs in the mother, notably the renal system (kidneys), start to deteriorate as soon as blood pressure starts to rise and stays elevated. This systemic deterioration is often attributed to underlying endothelial dysfunction, a phenomenon actively studied in Ghanaian women [34]. A high risk of stillbirths in afflicted women is another impact of PIH and its side effects [35]. Expectant Mother health is heavily emphasized in Sustainable Development Goals 3 and 5 since it is essential to reducing maternal and newborn mortality [36].

At Tamale Teaching Hospital, five main issues postpartum hemorrhage, puerperal infection (sepsis), pregnancy-related hypertension, botched abortion, and obstructed delivery account for seventy-one (71%) of all maternal mortality [31].

From 2008 to 2010, it remained the second most prevalent factor contributing to fatalities in the Tamale Teaching Hospital (TTH) [31].

There hasn't been much research on the prevalence of pre-eclampsia, risk factors, and its effects among expectant mothers who are evaluating the facility's medical care.

At Tamale Teaching Hospital, five main issues postpartum hemorrhage, puerperal infection (sepsis), pregnancy-related hypertension, botched abortion, and obstructed childbirth account for 71% of maternal demises [31].

During the period from 2008 to 2010, it retained its position as the second most frequent cause of maternal deaths at Tamale Teaching Hospital (TTH) [31]. Additionally, there may not always be access to the interventions, tools, and knowledge needed to manage expectant mothers with Pregnancy during Hypertension versus those with chronic or gestational hypertension.

This research aims to assess the prevalence, risk factors and foeto-maternal outcomes of pregnancy-induced hypertension at Tamale Teaching Hospital in the

Northern region of Ghana.

## 2. Methodology

### 2.1. Study Location

This investigation was conducted at Tamale Teaching Hospital. The third largest hospital in Ghana is the Tamale Teaching Hospital, which is found in Tamale in the Northern region. As a referral hospital, it serves Ghana's five northern regions. 2 kilometers southeast of the city is the primary hospital of the Northern Region of Ghana. To provide undergraduate and postgraduate programs in medicine, nursing, pharmacy, Physician Assistance, and nutrition, it collaborates with the University for Development Studies in Northern Ghana. After the Korle Bu Teaching Hospital in Accra and the Komfo Anokye Teaching Hospital in Kumasi, it is the third teaching hospital in Ghana.

### 2.2. Study Design

A study was done at Tamale Teaching Hospital in Tamale to find out how common and what factors are involved in pregnancy-induced hypertension and also to determine fetal-maternal outcomes. The study looked back at medical records. This study looked back at data to measure the results and factors that were present.

### 2.3. Study Population

The group of people being studied were all expectant mothers who were taken care of by the hospital.

#### 2.3.1. Inclusion Criteria

- This study included pregnant women who were between 18 and 50 years old.
- The study included all expectant mothers at the Tamale Teaching Hospital who were more than 20 weeks pregnant.

#### 2.3.2. Exclusion Criteria

- We didn't include any referrals or pregnant women who didn't have all the necessary information when we collected the data.

### 2.4. Sample Size Calculation

The number of pregnant women with pre-eclampsia in a previous research work done in Ghana was used to figure out how many people should be in this study. The research found that 7.03% of people have the disease [37]. So, the number of people in this study was determined using Cochran's formula for calculating sample size, with a confidence level of 95%. The formula is shown with this equation:

$$n = \frac{Z^2 pq}{e^2}$$

where:

- $n$  = the needed sample size

- $Z$  = Standard deviation of the mean for a bidirectional test based on a Confidence interval of 95% = 1.960
- $p$  = % expectant mothers with pre-eclampsia = 7.03% = 0.0703 [37].
- $q = 1 - p$  = the amount of pregnant women who do not have pre-eclampsia =  $1 - 0.0703 = 0.9297$
- $e$  = a measure of error/inaccuracy will be 5% = 0.05
- The study sample size is calculated below.

$$n = 1.962 \times 0.0703 (1 - 0.0703)/0.052$$

$$n = 3.8416 \times 0.0703 \times 0.9297/0.0025$$

$$n = 0.2510/0.0025$$

$$n = 100.43 = 100 \text{ individuals}$$

The sample size was increased by 15%. So, when you multiply 1.15 by 100, you get 115 to cover for patients with missing Data. So, 115 women who were expecting babies were chosen to take part in this research.

#### 2.4.1. Sampling Method

Medical documents of all women who were managed for Pre-eclampsia/eclampsia during the period of January 2022 and that of December 2022 were obtained. We collected information about personal details, and the end results of the mother, using a special form created for this research study. Furthermore, we also found out how many deliveries happened during that time to determine how common Pre-eclampsia/eclampsia is.

#### 2.4.2. Data Collection Techniques and Tools

Proforma containing anonymized data was created, and the data on the proforma was then entered into a computer. In order to analyze the data, IBM SPSS v 20.0 was used (IBM Corp., Armonk, NY, USA). All variable frequencies and rates of PE/E underwent a descriptive analysis.

Medical records that had information on variables like age, parity, estimated gestational age, and mother and baby outcomes were used to assess the outcomes for both the mother and the baby. The main things they looked at were when the baby doesn't survive (stillbirth) and when the mother dies during childbirth (maternal death). The calculations looked at the average age of the patients, how many times they had given birth, how far along they were in their pregnancy when they gave birth, and the outcome of the baby at birth: either preterm, underweight, etc.

To determine the relationship between independent factors (age, parity, education attainment, and prior history of Hypertension in Pregnancy) and expectant mother fatalities and stillbirths, the chi-squared test was utilized. The factors that appear to be independently related to maternal fatalities or stillbirths were subsequently found using a method called logistic regression analysis.

To fill in any gaps in the case notes' information, other ward and theatre registers were examined. The use of nurses' inpatient treatment notes and records was added to them. None of the cases that were supposed to be eliminated from the

study lacked documentation for the major principal maternal and fetal outcomes.

## **2.5. Data Quality Control**

The study maintained all information acquired before, during, and after the data collection period confidential. Additionally, a week before the data collection began, the research assistants who were used in this study received training to ensure that they were familiar with the tools. Field supervisors kept an eye on research assistants during the data collection sessions to make sure they followed the rules.

Additionally, the questionnaires were checked, and all errors were fixed after each data inputting session. To verify validity, data were double-entered again by other independent data entry clerks after data collection.

## **Data Analysis**

For frequencies, we used descriptive statistics. Categorical variables were shown as percentages. For numbers that can take on any value, we found the averages and spread. The frequency of women with pre-eclampsia was shown using pictures and numbers. Furthermore, the study looked at how pregnancy-induced hypertension is connected to other factors, such as social and demographic characteristics, using a statistical method called Pearson Chi-square. Moreover, a basic binary logistic regression method was employed to analyse the associations.

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## **2.6. Ethical Considerations**

The ethical approval for the study was granted by the Ethics Committee of the Navrongo Health Research Centre Institutional Review Board (NFIRCIRB) with ETHICS APPROVAL ID: NHRCIRB62T. Following an explanation of the study's purpose and significance, and with the assurance of anonymity, permission was given for the studies to be conducted at the Tamale Teaching Hospital.

## **2.7. Limitations of the Study**

Some participants had differing recollections, particularly regarding their lifestyle and how they had lived their lives.

## **3. Results**

### **3.1. Demographic Characteristics of Pregnant Women**

One hundred and fifty (115) expectant mothers were enrolled in this research. The average age of all the people involved was 30.80. More females between the ages

of 25 and 29 accounted for 26.5% of the group, while those between the ages of 30 and 34 made up 25.2% of the group. Mothers who were 40 years old or older made up the smallest age group (only 10.5% of the total); the mean (SD) was 30.80 (8.5). Nearly one-third of pregnant women (32.2%) did not receive any education.

The other participants had different types of education. Around 26.1% of the participants have gone to college or university, while 20.0% have finished high school. Less than a third, which is 21.7% have completed junior high school. During the study, most of the people (84.3%) were married, while a smaller percentage (7.8%) were single. Most of the pregnant women (80%) were Muslim, a smaller group (18.3%) were Christian, and only a few (1.7%) belonged to other beliefs. When it comes to job status, most expectant mothers were working as Traders (56.50%), and 25.2% didn't have a job. (See **Table 1**)

**Table 1.** Demographic characteristics of pregnant women.

Variable	Frequency	Percentage (%)
<b>Age (in years)</b>		
18 - 24	24	21.2
25 - 29	30	26.5
30 - 34	29	25.20
35 - 39	18	15.70
≥40	12	10.5
<b>Level of Education</b>		
No education	37	32.20
Basic	25	21.70
Secondary	23	20.0
Tertiary	30	26.10
<b>Marital Status</b>		
Co-habiting	6	5.3
Divorced	2	1.7
Married	97	84.3
Single	9	7.8
Widowed	1	0.9
<b>Religion</b>		
Islam	92	80
Christian	21	18.3
Others	2	1.7
<b>Occupation</b>		
Informal/Private sector	65	56.50
Factor	21	18.30
Unemployed	29	25.20

### 3.2. Parity Demographics

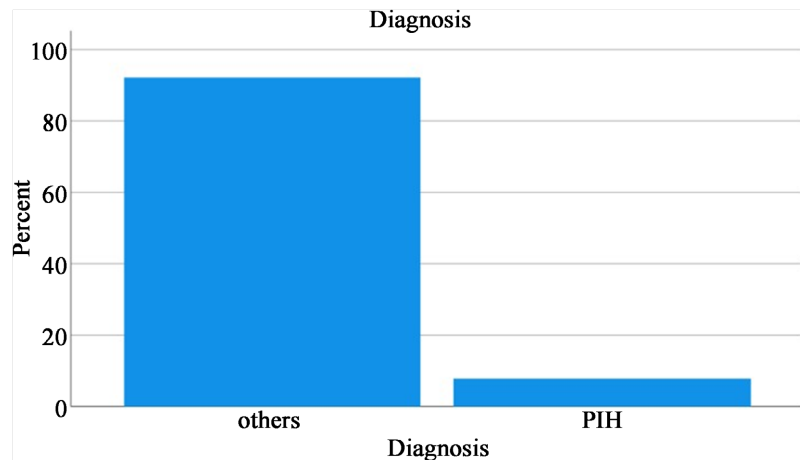
As close as, over half of the total, which amounts to 115 women who participated in this research, had been pregnant before (49.57%), while 38.26% were first-time expectant mothers, as seen in **Table 2**.

**Table 2.** Maternal obstetrics characteristics and risk factors of study participants.

Parity	Frequency	Percentage (%)
Nulligravida	9	7.83
Primigravida	44	38.26
Multigravida	57	49.57
Grand Multigravida	5	4.34
<b>Total</b>	<b>115</b>	<b>100</b>

### 3.3. Prevalence

The number of cases of pre-eclampsia is shown in **Figure 1** below. Pre-eclampsia affected 7.80% of pregnant women. Of the 115 expectant mothers tested, 92.2% did not have pregnancy-induced hypertension.



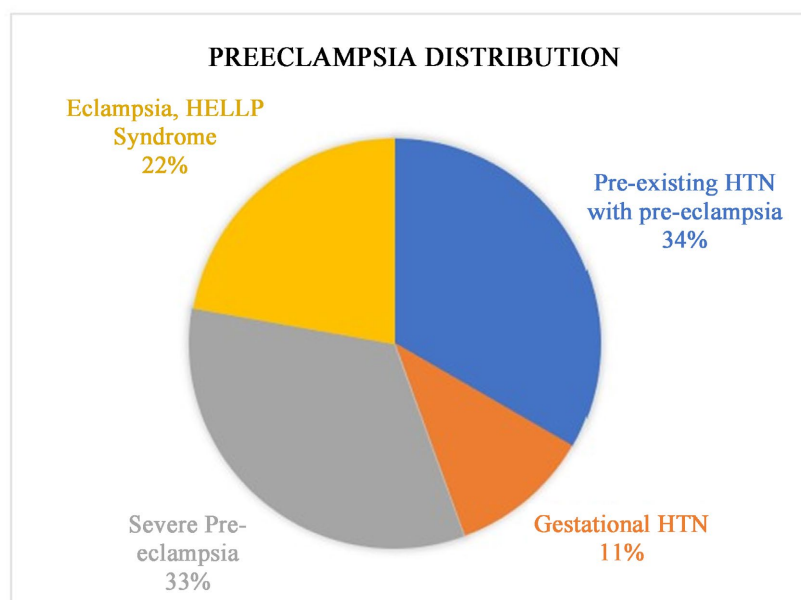
**Figure 1.** Prevalence distribution.

The type affecting women the most at Tamale Teaching Hospital is Severe pre-eclampsia and pre-existing hypertension with pre-eclampsia, which make up 33.3% and 34%, respectively of the total Pregnancy-induced hypertension sample as seen in **Figure 2**.

### 3.4. Family Prevalence of Illness

**Table 3** shows that most of the people surveyed (96.5%) did not have a history of chronic hypertension, diabetes, or pre-eclampsia.

Only a small number, 3.5%, said that PIH runs in their family. Once more, 3.5% said they had high blood pressure during their previous pregnancy. Most of the people surveyed (98.2%) do not drink alcohol or smoke (99.13%).



**Figure 2.** Pre-eclampsia distribution.

**Table 3.** Distribution of risk factors in PIH.

QUESTION	FREQUENCY	PERCENTAGE
<b>Family history of Eclampsia</b>		
Yes	4	3.48%
No	111	96.52%
<b>Family history of DM</b>		
Yes	2	1.74%
No	113	98.26%
<b>PIH in Previous Pregnancy</b>		
Yes	4	3.48%
No	111	96.52%
<b>Do you Drink Alcohol</b>		
Yes	2	1.74%
no	113	98.26%
<b>Do you smoke</b>		
Yes	1	0.869%
No	114	99.13%

### 3.5. The Association between Individual Attributes, Family Medical History, Lifestyle Behaviours, and Pregnancy-Induced Hypertension

Based on the information in the table, the Chi-square test ( $\chi^2$ ) is used to determine if there is a significant association between categorical variables. In this case, it assesses whether factors like age, educational level, occupation, parity, family history

of PIH, and previous PIH are significantly associated with the development of PIH.

Age ( $\chi^2 = 36.886$ ,  $p = 0.18$ ), the Chi-square value (36.886) is relatively high, suggesting a possible variation in PIH prevalence across different age groups; however, the p-value (0.18) is greater than the significance level ( $\alpha = 0.05$ ), meaning the association is not statistically significant, this means that age does not have a strong or significant association with the occurrence of PIH in this study.

Educational Level ( $\chi^2 = 2.899$ ,  $p = 0.577$ ), the Chi-square value (2.899) is very low, indicating only minor differences in PIH prevalence across different educational levels, the p-value (0.577) is much greater than the significance level ( $\alpha = 0.05$ ), meaning the association is not statistically significant. This suggests that educational level does not have a meaningful impact on the likelihood of developing PIH in this population.

Occupation ( $\chi^2 = 8.645$ ,  $p = 0.124$ ), the Chi-square value (8.645) suggests some degree of association between occupation and PIH, however, the p-value (0.124) is greater than 0.05, meaning the result is not statistically significant at the  $\alpha = 0.05$  level, Occupation does not have a statistically significant association with Pregnancy-Induced Hypertension (PIH) in this study. While the Chi-square value indicates some variation, the lack of statistical significance means that occupation alone is not a strong predictor of PIH risk in this dataset

Family History of PIH ( $\chi^2 = 48.866$ ,  $p < 0.001$ ). A high Chi-square value (48.866) indicates a strong association between having a family history of PIH and developing the condition. The p-value ( $<0.001$ ) is very small, confirming the association is highly significant.

Previous PIH in Pregnancy ( $\chi^2 = 49.019$ ,  $p < 0.001$ ). A very high Chi-square value (49.019) suggests a very strong association between having had PIH in a previous pregnancy and developing it again. The p-value ( $<0.001$ ) is extremely small, reinforcing that this association is highly significant.

Parity ( $\chi^2 = 7.635$ ,  $p = 0.022$ ). Parity refers to the number of times a woman has given birth. The Chi-square value 7.635 suggests a moderate association. The p-value (0.022) is less than the significance level  $\alpha = 0.05$ , meaning this association is statistically significant. This indicates that parity has a significant effect on the likelihood of developing PIH. (See **Tables 4-9**)

**Table 4.** Preeclampsia-induced hypertension (PIH), and age (Chi-Square Tests).

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	36.886 <sup>a</sup>	30	0.180
N. of Valid Cases	115		

**Table 5.** PIH association and education level (Chi-Square Tests).

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.889 <sup>a</sup>	4	0.577
N. of Valid Cases	115		

**Table 6.** PIH association and occupation (Chi-Square Tests).

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.645 <sup>a</sup>	5	0.124
N. of Valid Cases	115		

**Table 7.** PIH association and family history (Chi-Square Tests).

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	48.866 <sup>a</sup>	2	<0.001
N. of Valid Cases	115		

**Table 8.** PIH association in last pregnancy (Chi-Square Tests).

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	49.019 <sup>a</sup>	3	<0.001
N. of Valid Cases	115		

**Table 9.** PIH association with parity (Chi-Square Tests).

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.635 <sup>a</sup>	2	0.022
N. of Valid Cases	115		

### 3.6. Feto-Maternal Complications with Pre-Eclampsia among the Study Participants

Of the PIH cases identified, the outcomes were as follows. Complications included Caesarean section made a significant of up of 77.78% under the mode of delivery.

Under birth outcomes, Live births were 55.56%, and stillbirths constituted 33.44%

Preterm constituted 22.22% of the study population, and 11.11% were complicated by Spontaneous Abortion. (See **Table 10**)

**Table 10.** Feto-maternal complications.

OUTCOME	FREQUENCY	PERCENTAGE (%)
C/S	7	77.78
Live birth	5	55.56
Still Births	3	33.34
Preterm	2	22.22
Spontaneous Abortion	1	11.11%

## 4. Discussion

In both industrialized and developing nations, pre-eclampsia (PIH) is the major

reason for deaths and health problems in mothers, unborn babies, and newborn babies [38]. To find out how common PIH is among pregnant women, as well as the factors that increase the risk and the effects it has, this study was done at the Tamale Teaching Hospital.

The prevalence of PIH varies from country to country and from one institution to the other.

In this study, the prevalence was 7.8% among all pregnant patients who attended the Tamale Teaching Hospital. This figure is closely related to other research studies in Africa, such as those in Ethiopia and Nigeria. According to retrospective research conducted in several areas of the nation of Ethiopia, the prevalence of pre-eclampsia was at 7.9% [39].

Similarly, a Nigerian evaluation research reported that 6.0 percent of people had PIH [24]. These findings, which show roughly the same or nearly similar prevalence of pregnancy-induced hypertension in this study and among other pregnant women, show a strong correlation. In Ethiopia and Nigeria, variability in antenatal care coverage, health-seeking behavior, and access to emergency obstetric services contributes both to case detection rates and outcomes. For instance, a study from Nigeria highlighted that a substantial proportion of PIH cases presented late in pregnancy or during labor, when complications had already developed, limiting opportunities for preventive care [27].

Nevertheless, a cross-sectional research carried out in Korle Bu Teaching Hospital, Ghana, found a prevalence of 21.4% [26]. These similarities suggest regional patterns in maternal risk exposure and antenatal detection practices. However, the significantly higher prevalence of 21.4% reported at Korle Bu Teaching Hospital in Ghana warrants deeper examination, particularly through the lens of health system capacity, surveillance quality, and referral patterns. Differences in healthcare system infrastructure across these countries, and even within Ghana, may explain the observed variation.

Korle Bu Teaching Hospital, as Ghana's largest tertiary referral center, serves high-risk referrals from across the country, which likely skews the prevalence upward. The hospital is better resourced with trained specialists and laboratory capabilities, allowing for more accurate diagnosis and documentation of hypertensive disorders, including mild or atypical cases that might be missed elsewhere.

In contrast, hospitals like Tamale Teaching Hospital, while also tertiary, serve more rural and underserved populations. In such settings, late antenatal booking, inconsistent blood pressure monitoring, and limited diagnostic capacity may contribute to underdiagnosis or delayed identification of PIH, thus affecting reported prevalence [39]. Moreover, the health system's readiness to manage PIH plays a key role in maternal outcomes. Facilities with access to Magnesium sulfate for eclampsia prevention, Trained personnel to recognize early signs, Consistent ANC attendance, Emergency obstetric care (EmOC) services. Compared to the prevalence from this and other research, this prevalence seems to be rather high [24] [40], but this may be due to some factors discussed below.

This study also determined the frequencies of the various types of hypertensive disorders in pregnancy at Tamale Teaching Hospital. The proportion of Pre-existing HTN with pre-eclampsia among all the women with hypertensive disorders was 34%, which was the highest, followed by Severe Pre-eclampsia (33.0%), Eclampsia with HELLP Syndrome (22%) and Gestational HTN (11%). The prevalence of Gestational Hypertension may be low due to TTH being a referral center, and most new and uncomplicated cases will be managed at peripheral health centers.

By contrast, the differences in how often PIH occurs may be linked to certain biological factors such as a family history of PIH, how far along the pregnancy is, and any health problems like asthma or kidney issues that the pregnant woman has. The difference in the number of people studied, sample size and the total number of people in each hospital could be the reason for the difference in the rate of a certain medical condition at the two hospitals. Despite the rates of pregnancy induced hypertension is low in Tamale Teaching Hospital compared to Korle Bu Teaching Hospital; more research is needed to understand this discrepancy and also to find better ways to reduce complications.

As stated by this research work, the identifiable risk factors were parity, PIH in a previous pregnancy, and a family history of PIH. Globally, the risk factors for PIH have been the subject of several research, with early teenage nulliparity, illiteracy, unemployment, and family history of hypertension being the most prevalent ones [41]. Similarly, Larry *et al.* [12], Fondjo *et al.* [42], and Ayele *et al.* [37] identified advanced maternal age, lack of knowledge of the danger of hypertension, and prior experience of PIH as frequent risk factors for PIH. The study discovered a relationship between PIH at the time of the previous pregnancy, and PIH family history among pregnant women at the multivariate analysis level. This matches what was found in a study done in Cameroon. The study showed that women who had a family history of the condition and women who had high blood pressure during a previous pregnancy were more likely to develop pre-eclampsia [41].

The outcomes of this study and those discovered in the research work suggest that PIH risk factors are primarily inherited and also dependent on previous exposure to PIH in previous pregnancies among pregnant women. This underscores the significance of collecting a pregnant woman's medical history at an ANC visit since it will allow doctors to identify any expectant mothers who have a history of PIH or High Blood Pressure in their families. This will influence the sort of counseling provided to such moms and their peers.

According to certain studies, women with PIH were more likely than those without it to experience unfavorable pregnancy outcome [9]. This trend has also been seen and noticed in this study. More women are susceptible to Caesarian section deliveries due to PIH as established in this research, which constituted 77.78%. This high rate reflects the clinical severity and urgency typically associated with hypertensive disorders in pregnancy, particularly when complications such as severe hypertension, pre-eclampsia with severe features, fetal distress, or

placental abruption are present.

In many low- and middle-income country (LMIC) settings, including Ghana, C-section is frequently used as a life-saving intervention in hypertensive pregnancies to prevent maternal and fetal morbidity or mortality when vaginal delivery poses a significant risk. The timing and mode of delivery in women with PIH often depend on gestational age, maternal blood pressure control, fetal growth, and signs of fetal compromise. Obed and Patience [36] reported that up to 73.9% of preeclamptic women delivered by C-section due to maternal or fetal indications. In Nigeria, Ugwu *et al.* [27] documented a C-section rate of over 70% among women with severe PIH, largely driven by emergency indications. There are some potential confounding factors that may have influenced the decision for surgical delivery. These may include:

- Late presentation to the hospital, limiting time for trial of labor.
- Limited capacity for labor induction in severe PIH cases due to lack of continuous monitoring or unfavorable cervix.
- Fetal growth restriction or distress, which often coexists with PIH and prompts urgent surgical delivery.
- Provider bias toward defensive obstetric practices, especially in tertiary centers dealing with high-risk cases.

This high rate emphasizes the need for early identification and referral, as well as clear delivery protocols that balance maternal and fetal risks with the potential for vaginal birth, where appropriate.

Expectant mothers are also at risk of adverse complications such as stillbirth (33.34%), it highlighting the serious obstetric risks associated with hypertensive disorders in pregnancy. The analysis confirmed that these stillbirths were directly attributable to PIH, without coexisting conditions such as diabetes, infection, or congenital anomalies. PIH, particularly when not detected or managed early, can lead to placental insufficiency, intrauterine growth restriction (IUGR), and abruption placentae, all of which are known precursors of stillbirth. The high rate observed in this study aligns with prior research from sub-Saharan Africa, where hypertensive disorders are a leading cause of fetal death. A study in Ghana by Obed and Patience [36] similarly reported elevated rates of perinatal loss among women with pre-eclampsia and eclampsia.

Preterm delivery accounted for 22%; these preterm births were directly linked to the severity of the hypertensive condition, with no other coexisting maternal morbidities. PIH, particularly when severe or poorly controlled, can lead to uteroplacental insufficiency, fetal distress, or maternal complications such as severe hypertension or imminent eclampsia, often necessitating urgent delivery to prevent maternal and fetal mortality. The decision to induce labor or perform a caesarean section preterm in these cases is typically a life-saving intervention, especially when signs of severe features such as proteinuria, elevated liver enzymes, or decreased fetal movement are present. This observed rate aligns with findings in similar settings. A study by Obed and Patience [36] in Ghana reported increased

rates of preterm births among women with pre-eclampsia, attributing this to the need for early termination due to deteriorating maternal or fetal status.

In the current study, spontaneous abortions were recorded in 11% of the assessed cases. This figure aligns with findings from other sub-Saharan African settings, suggesting that spontaneous abortion remains a significant contributor to adverse pregnancy outcomes in the region. Spontaneous abortion is often linked to multiple factors, including advanced maternal age, poor glycemic control in diabetic patients, hypertensive disorders, infections, and poor antenatal care attendance. Comparative evidence by Mutiso *et al.* [43] in Kenya found a spontaneous abortion rate of 10.8% among women presenting with first-trimester complications, which is consistent with the present findings. Similarly, a retrospective review in Nigeria by Okunlola *et al.* [44] reported rates ranging from 10% - 12%, indicating that the pattern observed in the cohort is not an isolated one but reflects a broader regional trend.

## 5. Conclusion

A recent study found that 7.8% of pregnant women attending the Tamale Teaching Hospital experience pregnancy-induced hypertension. This condition, especially in cases of pre-eclampsia, can lead to serious complications for both the mother and the baby, including the potential for maternal fatalities. The role of healthcare professionals in managing these issues is crucial. Early identification and treatment of pregnancy-induced hypertension can help reduce complications associated with this condition.

## 6. Recommendation

According to the study, we recommend that the relevant health authorities in the Northern Region take specific actions to improve the health of women with pre-eclampsia and decrease the number of expectant mothers experiencing this condition through regular awareness, interventions, and educational programmes. Pregnant women diagnosed as high risk for hypertension during pregnancy should be referred to the maternal-fetal medicine unit at Tamale Teaching Hospital for appropriate monitoring according to the management protocol for this condition.

## Conflicts of Interest

The authors declare no conflicts of interest.

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