COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF PBLIC HEALTH

MAGNITUDE OF PRE-ECLAMPSIA AND ASSOCIATED FACTORS AMONG PREGNANT WOMEN AT DELIVERY WARD CROSS SECUTIONAL PUBLIC HOSPITALS OF SOUTHERN TIGRAY, ETHIOPIA

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A RESEARCH THESIS TO BE SUBMITTED TO MEKELLE UNIVERSITY COLLEGE OF HEALTH SCIENCES, DEPARTMENT OF REPRODUCTIVE HEALTH IN PARTIAL FULL FILLING OF THE REQUIREMENT FOR THE DEGREE OF MASTERS IN REPRODUCTIVE HEALTH

MAY, 2025

MEKELLE, ETHIOPI

Advisors' Approval Sheet

Mekelle University

Collage of Health Sciences

Department Of Reproductive Health

This is to certify that the thesis entitled "**magnitude of pre-eclampsia and associated factors among pregnant women at delivery ward in selected hospitals of southern Tigray, Ethiopia, 2024**" is submitted to the graduate program of Mekelle University college of health sciences of in partial fulfillment of the requirements for the master's degree in Reproductive Health and has been carried out by Mesfin Berihun under my supervision. Therefore, I recommend that the student has fulfilled the requirements and hence hereby I can submit the thesis to the department.

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Declaration

I hereby declare that this MSc thesis is my original work and has not been presented for a degree in any other university and all sources of material used for this thesis have been duly acknowledged.

Name: Mesfin Berihun

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Date:

This MPH thesis had been submitted for examination with my approval as thesis advisor.

Name: _____

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Examiners' Approval Sheet

We, the undersigned, members of the Board of Examiners have read and evaluated his thesis entitled "***magnitude of pre-eclampsia and associated factors among pregnant women at delivery ward in selected hospitals of southern Tigrai, Ethiopia, 2024***." and evaluated the candidate. This is therefore to certify that the thesis has been accepted in partial fulfillment of the requirements for the Master's Degree in Reproductive Health.

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Final approval and acceptance of the thesis is contingent upon the submission of the final copy of the thesis to the candidate's Department through the office of the Department Graduate Program Coordinator.

Thesis report Approved by

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Certification of the Final Thesis report

I hereby certify that all the corrections and recommendations suggested by the Board of Examiners are incorporated into the final thesis entitled "***magnitude of pre-eclampsia and associated factors among pregnant women at delivery ward in selected hospitals of southern Tigray, Ethiopia, 2023/24***." by Mesfin Berihun.

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Table of Contents

List of Tables

List of figures

List of Abbreviations and Acronyms

ANC	Antenatal care
BMI	Body Mass Index
CI	Confidence Interval
DBP	Diastolic Blood Pressure
FEFOL	Iron and Folic acid
GH	Gestational Hypertension
IRB	Institutional Review Board
OR	Odds Ratio
PE	Pre-eclampsia
PI	Principal Investigator
SPSS	Statistical Package for Social Sciences
SD	Standard Deviation
TT	Tolerance Test
VIF	Variance Inflation Factor
WHO	World Health Organization

Abstract

Back ground: Pre-eclampsia is still one of the four groups of Hypertension disorder of pregnancy that requires the most public involvement to improve outcomes for both the mother and the fetus.

Objectives: To assess the magnitude of pre-eclampsia and associated factors among pregnant women at delivery ward in selected public hospitals of southern Tigray, Ethiopia, 2024.

Methods: An institution based cross sectional study was employed from 1 to 30, June, 2024. Two public Hospitals was selected from five public hospitals found in southern Tigray using simple random sampling. A systematic random sampling technique was used to select a sample of 351 participants. One day training was held for data collectors and supervisor. Verbal consent was obtained and data were collected via face-to-face interview using a structured and pretested questionnaire. The collected data were entered into EPI- Data version (3.1) and then exported to Statistical packages for social science Version-27 for analysis. Missing values, outliers and normality of data checked by data exploration. Descriptive statistics, bi-variable and multiple variable logistic regression analysis were carried out. .

Result: Thirty-six (10.3%) (CI: 7.1-13.7) pregnant mothers had Pre-eclampsia. The results of logistic regression analysis showed that Pre-eclampsia was statistically associated with history of diabetic mellitus disease (AOR; 2.99:95%CI 1.14-7,8), family history of hypertension (AOR; 3.61:95% CI1.13-11.5) and age 15-19 (AOR;0.177:95% CI 0.34-0.91) and 20-34 (AOR;0.39:95% CI0.171-0.86) with PV <0.05.

Conclusion and Recommendation: Pre-eclampsia was similar prevalent in this study than other most similar studies in Ethiopia context. Factors such as having history of diabetic mellitus, family history of hypertension and Age of respondent were significant predictors of pre-eclampsia among pregnant women. Thus, those women should receive close prenatal care to monitor for signs and symptoms of pre-eclampsia and to manage their underlying conditions and it needs more attention for advanced age of women during pregnancy.

Key words: Associated factors, Magnitude, Pre-eclampsia and south Tigray

1. Introduction

1.1 Background

Pregnancy and childbirth are physiological processes that entail many implications. One of the dangerous side effects of pregnancy is hypertension, which is a significant contributor to maternal and perinatal morbidity and mortality (1). The term "hypertension in pregnancy" is often used to refer to a broad range of patients, from those with modest blood pressure rises to those with significant organ dysfunction. As a result, it comes with small to large difficulties. Worldwide, 5–22% of pregnancies have hypertension disease in pregnancy (HDP), which accounts for 5–10% of all pregnancy complication (2). Of the four categories of HDP, preeclampsia continues to be the most common cause. It requires strict public intervention to improve outcomes for both the mother and the fetus. Preeclampsia affects as many as 5–8% of pregnancies (3).

Pre-eclampsia is a hypertension condition associated with pregnancy that typically manifests after 20 weeks of gestation. It's a situation where a previously normotensive woman has increased blood pressure (>140/90) along with proteinuria (4). Worldwide about 76,000 maternal deaths and 500,000 prenatal mortalities are occurring due to PE annually (5).

If a woman with a pre-eclamptic diagnosis does not receive the proper care and an early inquiry. It progresses to a severe type known as eclampsia, which has negative effects on both the mother and the fetus.(6). Therefore, the origin for eclampsia is pre-eclampsia (Eclampsia is the definition of Preeclampsia plus ≥ +2 proteinuria plus the occurrence of convulsion or coma) (7).

One of the leading five direct causes of maternal death and poor outcomes for infants, pre-eclampsia can progress into the severe, life-threatening condition known as eclampsia if it is not identified and treated in a timely manner (4). Despite the fact that pregnancy-related hypertension illnesses are more prevalent in low- and middle-income nations than in high-income ones, little is known regarding the incidence of GH and how it progresses to PE (8). The incidence of pre-eclampsia in Europe and Africa was 3.8% and 4% respectively (9) However, the incidence rates were 50% and 51.8%, respectively, at seven institutions in Tigrai and the Jima Specialty Hospital (10, 11).

1.2 Statement of the problem

Pre-eclampsia is a pregnancy-specific, multisystem disorder characterized by the new onset of hypertension and proteinuria after 20 weeks of gestation in a previously normotensive woman. In the absence of proteinuria, the diagnosis can also be made in the presence of severe features such as thrombocytopenia, renal insufficiency, impaired liver function, pulmonary edema, or cerebral or visual disturbances(12). It represents one of the leading causes of maternal and perinatal morbidity and mortality worldwide. Addressing hypertensive disorders in pregnancy, including pre-eclampsia, has become a priority within both global and national maternal health improvement agendas, aligning with the Sustainable Development Goal (SDG) 3 target of reducing global maternal mortality to less than 70 per 100,000 live births by 2030(13).

Globally, hypertensive disorders of pregnancy affect an estimated 10–15% of pregnancies, with pre-eclampsia alone complicating approximately 2–8% of all pregnancies (14). According to the WHO, hypertensive disorders, including pre-eclampsia and eclampsia, contribute to nearly 14% of maternal deaths worldwide, making them one of the top three causes of maternal mortality alongside hemorrhage and sepsis. The global burden, however, is not equally distributed. While high-income countries report lower case fatality rates due to well-established health systems and early detection services, low- and middle-income countries (LMICs) carry a disproportionately high burden due to weak health infrastructure, late diagnosis, and suboptimal management of cases(15).

Studies from sub-Saharan Africa indicate that the prevalence of pre-eclampsia ranges between 3% and 10%, with case fatality rates significantly higher than global averages due to limited access to emergency obstetric care and trained healthcare professionals(16)A systematic review by the African Population and Health Research Center (APHRC) highlighted that in sub-Saharan Africa, for every maternal death due to pre-eclampsia/eclampsia, several more women experience severe maternal outcomes including life-threatening complications and long-term disabilities (17).

In Ethiopia, hypertensive disorders of pregnancy remain a major public health problem. The 2022 Ethiopian Demographic and Health Survey (EDHS) reported a maternal mortality ratio of 412 per 100,000 live births, with hypertensive disorders ranked among the top three direct causes of maternal deaths (18). Studies conducted in different regions of Ethiopia indicate significant variations in the magnitude of pre-eclampsia, ranging from 2% to 12%, depending on study design, setting, and population characteristics. For example, a study from the Amhara region reported a higher prevalence of 8.4% (19). Similarly, a study conducted in the Tigray region in 2018 reported a prevalence rate of 5.5% among women attending delivery wards (20). However, due to limited research in certain parts of the country, including Southern Tigray, the exact burden of pre-eclampsia remains under-documented, impeding region-specific interventions and resource allocation.

The consequences of pre-eclampsia are severe and far-reaching. For the mother, it can lead to complications such as placental abruption, acute kidney injury, disseminated intravascular coagulation (DIC), pulmonary edema, stroke, and progression to eclampsia. Furthermore, both mothers and infants who survive pre-eclampsia are at higher risk of long-term health complications, including cardiovascular diseases later in life (21).

Multiple factors have been identified as associated with an increased risk of pre-eclampsia. These include maternal age (particularly women under 18 and over 35 years), prim gravidity, multiple pregnancies, previous history of hypertension, family history of pre-eclampsia, obesity, poor socio-economic status, inadequate antenatal care (ANC) attendance, and underlying chronic diseases such as diabetes and renal disorders and certain socio-demographic, nutritional, and obstetric factors specific to Ethiopia, such as rural residence, lack of health education, and cultural practices delaying ANC initiation, also contribute to the risk(20).

Various global and national efforts have been made to address pre-eclampsia. The WHO recommends routine blood pressure screening, urine testing for proteinuria during ANC visits, and administration of magnesium sulfate for severe cases(22). The Ethiopian Federal Ministry of Health has incorporated these guidelines into the national maternal and child health program, emphasizing the importance of focused antenatal care, early detection of high-risk pregnancies, and provision of emergency obstetric care (23).

Despite these interventions, pre-eclampsia continues to contribute significantly to maternal and perinatal mortality, especially in rural and underserved regions like Southern Tigray.

However, these efforts face considerable limitations, including inadequate health infrastructure, shortage of trained healthcare providers, low ANC coverage and utilization, poor community awareness, and socio-cultural barriers that delay care-seeking behaviors (21). Additionally, most existing studies have been conducted in urban or central regions, with limited research from Southern Tigray, an area affected by recent conflict and health service disruptions, further complicating maternal health outcomes.

In light of these gaps, this study seeks to assess the magnitude of pre-eclampsia and associated factors among pregnant women at delivery wards in selected hospitals of Southern Tigray, Ethiopia. The findings will help fill the existing data gap, support the design of evidence-based interventions tailored to the local context, and inform health policy and programming aimed at improving maternal and neonatal health outcomes in the region.

1.3 Significance of the study

Pre-eclampsia remains a significant global health concern, particularly in low- and middle-income countries like Ethiopia, where maternal and neonatal mortality rates are still unacceptably high. This study aims to assess the magnitude of pre-eclampsia and associated factors among pregnant women in selected hospitals of southern Tigrai, Ethiopia, during the 2024 period. The significance of this study lies in several key aspects:

Public Health Importance: By investigating its prevalence and associated factors in the context of southern Tigray, this study contributes valuable data to the global understanding of pre-eclampsia epidemiology.

Local Relevance: Southern Tigray, like many regions in Ethiopia, faces unique challenges in maternal healthcare delivery, including limited access to prenatal care, skilled birth attendants, and essential obstetric services. Understanding the burden of pre-eclampsia in this setting is crucial for designing targeted interventions and improving maternal and neonatal health outcomes.

Clinical Implications: The findings of this study can inform clinical practice by highlighting the specific risk factors associated with pre-eclampsia in the study area. Healthcare providers can use this information to enhance antenatal screening, diagnosis, and management protocols, ultimately leading to better maternal and neonatal health outcomes.

Policy and Planning: By providing reliable data, this study can guide resource allocation, capacity building, and program development aimed at reducing the burden of pre-eclampsia and improving maternal healthcare delivery.

Contribution to Knowledge: While several studies have investigated pre-eclampsia in various contexts, there is limited research focusing specifically on southern Tigray, Ethiopia. By filling this gap in the literature, this study expands the body of knowledge on pre-eclampsia epidemiology and contributes to the growing understanding of maternal health disparities within Ethiopia and beyond.

2: Literature review

2.2 Magnitude of pre-eclampsia

Pre-eclampsia, which complicates 2 to 4% of pregnancies globally and the prevalence of pre-eclampsia in Sweden and China were 2.9% and 2.3%, respectively(24). In Africa context the pre-eclampsia among pregnant women sub-Saharan Africa: a systematic review and meta-analysis was 13%(25) and the central region of Mozambique was 12 %(26).

In Ethiopia context the, the overall prevalence of pre-eclampsia in Addis Abeba (27), Jima specialized hospital(28), Shishman Comprehensive Specialized, Melka Oda General Hospitals, Oromia, Ethiopia(29) , Arba Minch Town, Southern Ethiopia(30), Dessie referral hospital(31), Debretabor, Ethiopia(32), in seven hospitals of Tigray(33) were 5.57%, 51.8%,9.02, 18.25, 8.4 %, 15.7and 50% respectively.

2.3 Associated factors in pre-eclampsia

2.3.1 Socio-demographic factors

The study done in Nairobi, Kenya showed that maternal age and maternal level of education were significantly associated with pre-eclampsia. Compared to mothers aged less than 20 years, mothers 20–34 years of age were 1.5 times more likely to suffer pre-eclampsia, whereas mothers aged 35–49 years were 2.5 times more likely to experience pre-eclampsia than mothers aged less than 20 years(34). Retrospective cross-sectional study done in Northern Tanzania also revealed that maternal age of >35 years and having 12 or more years of education were significantly associated with an increased risk of pre-eclampsia(35).According to a study done in Addis Ababa, the study confirmed that the women age greater than 35 years old were significantly associated with pre-eclampsia(27), another a Hospital based cohort prospective study in Debremarkos showed that, being ≥35 years old age was the significant predictors of pre-eclampsia (36). A systematic review and meta-analysis in Ethiopia age > 35 years old was the determinants of pre-eclampsia.(21). According to study Sidama Regional nested case-control Women who did not attend school were three times more likely to develop pre-eclampsia and eclampsia compared to women who attended college/university (37).

2.3.2 Behavioral factors

Study done in china and Sweden showed that, Obesity (defined as BMI ≥28 in China and BMI ≥30 in Sweden) was a stronger risk factor (24). Same study done in DebreTabor respondents who had a BMI of ≥ 30 Kg/m2 were nearly two times the odds of developing pre-eclampsia as compared to those women who had a BMI of < 18Kg/m2 (32). A case-control study done in Bahirdar, Ethiopia showed that, The odds of developing PE were 3.47 times higher in overweight or obese pregnant women compared to those pregnant women having normal BMI (38).

Speaking of a same study done in Debre Tabor showed that, women who had consumed alcohol intake were 2.12 times higher odds of developing pre-eclampsia as compared to their counterparts (32). Another case-control study done in Tigray showed that, in the multivariate analysis, women who reported drinking alcohol during their pregnancy period had an increased risk of pre-eclampsia as compared to those women who did not drink alcohol (33). The research on the link between alcohol consumption and pre-eclampsia is inconclusive. Some studies suggest a possible association, while others do not(39).

Those pregnant women who could not take iron and folic acid supplements were 4.46 times more likely of developing PE as compared with pregnant women who took iron and folic acid as supplements (38).

2.3.3 Obstetric factors

A case-control study done in Bahirdar, Ethiopia showed that, women who had ANC visits <3 times were significant association of pre-eclampsia (27). The odds of developing PE in pregnant women who could not complete their ANC visits were 5.43 times more likely as compared with the pregnant women who could complete their ANC visit (38). This is due to, Women who attend fewer ANC visits are: More Likely to Have Undetected Pre-eclampsia: This can lead to delayed treatment and potentially serious complications for both mother and baby.

The study done in china and Sweden showed that, Nulliparity had a much stronger association with severe pre-eclampsia in Sweden compared with China (24). A case-control study done in Bahirdar, Ethiopia showed that, The odds of developing PE in primiparous pregnant women were 3.19 times higher compared to multiparous pregnant women (38). Another case-control study done in Tigrai showed that, from factors related to the obstetric history of pregnant women, primigravida was found to be a risk factor for pre-eclampsia on multivariable analysis. The odds of developing pre-eclampsia were 5.41 times higher in women with primigravida comparing to the women with multigravida (33).

Speaking of a study done in Debre Tabor showed that, Women whose pregnancies were unwanted and unplanned were 1.29 times higher odds of developing pre-eclampsia as compared to those women whose pregnancies were wanted and planned (32). Another study done in DebreTabor, Ethiopia showed that women whose age at menarche ranged from 10-15 years were nearly five times more likely to develop pre-eclampsia than women whose age at menarche were greater than 15 years (32).

Pregnant women who had history of pregnancy related hypertension more likely to develop preeclampsia than those who didn't have history pregnancy related hypertension(40).

2.3.4 Medical conditions

Speaking of a same study done in DebreTabor showed that, a history of chronic hypertension were nearly three times more likely to develop pre-eclampsia than their counterparts(32). According to a study done in Addis Ababa, Ethiopia. Women who had history of hypertension, and pregnant women who had a family history of hypertension were significantly associated with pre-eclampsia (27). Another case-control study done in Tigray showed that, the pregnant women who had a family history of pre-eclampsia were 5.24 times more likely to develop pre-eclampsia than those who had no family history of pre-eclampsia (33).

A case-control study done in Bahirdar, Ethiopia showed that, the odds of developing PE in those pregnant women having family history of hypertension were 4.14 times higher as compared with the women who had no family history of hypertension(41). Similarly, the odds of developing PE

in pregnant women having previous history of PE were 7.97 times higher as compared to the women who had no previous history of PE (38).

Another case-control study done in Tigray showed that, the odds of developing pre-eclampsia were 5.55 times higher for women with a history of pre-eclampsia comparing to women who had no history of pre-eclampsia and the odd of developing pre-eclampsia was 3.23 times associated with those who had anemia than those who had no anemia and. history of diabetes mellitus were significantly associated with pre-eclampsia(33).

Having history of diabetic mellitus disease was positively associated with pre-eclampsia. Women who had diabetic mellitus disease were more likely to be preeclamptic as compared to their who had no history of diabetic mellitus disease(31, 42, 43). Women who had family history of hypertension were more likely to develop preeclampsia than those who didn't have family history of hypertension(21, 31, 43).

2.3 Conceptual frame work

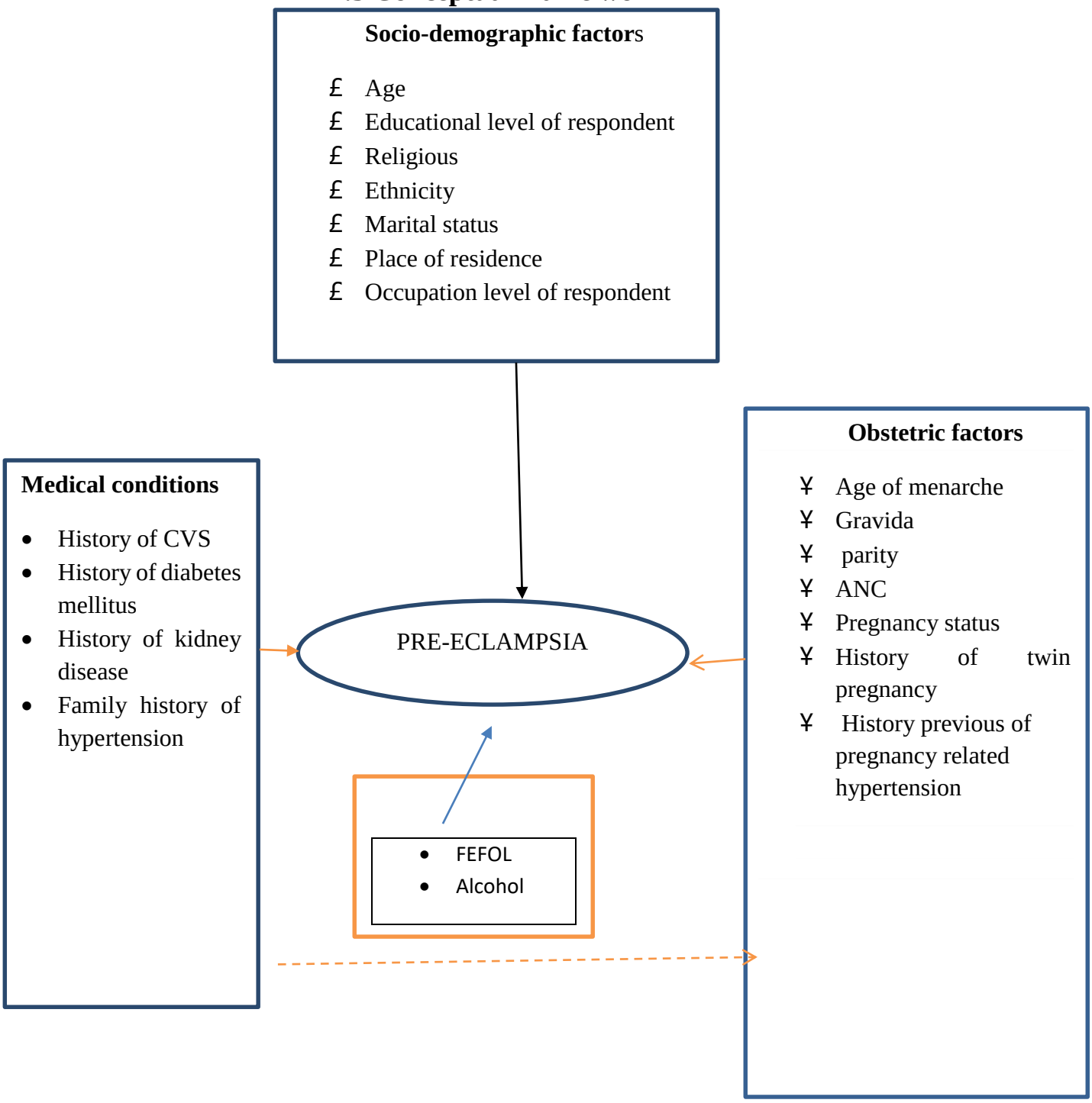

Figure 1: Conceptual framework that illustrates how the independent variable affects the dependent variable (27, 32, 41, 44)

3: Objectives

3.1 General objective

- To assess the magnitude of pre-eclampsia and associated factors among pregnant women at delivery ward in public hospitals of southern Tigray, Ethiopia, 2024.

3.2 Specific objectives

- To determine the magnitude of pre-eclampsia among pregnant women at delivery ward in public hospitals of southern Tigray.
- To identify the associated factors among pregnant women at delivery ward in public hospitals of southern Tigray.

4. Methods

4.1. Study setting and period

The study was carried out in Hospitals of southern Tigray. There are five public Hospitals in southern zone of Tigray. According to the Mini EDHS 2019 Tigray report the maternal mortality rate, Antenatal care and Delivery service were 186/100000, 94% and 73.3% respectively.

Lemlem Karl & Mekoni hospital provides Antenatal Care (ANC), maternity services, Postnatal Care (PNC), Comprehensive Emergency Obstetric Care (CEmOC) activities, and general gynecologic health services. The key technical staff with in the maternity unit includes obstetricians/gynecologists, general practitioners, and nurses/midwives with different experiences Even though the catchment is hard to reach with the hilly and mountainous landscape the hospital works especially focusing on the delivery of quality maternal and newborns care, and reducing maternal, and neonatal deaths. The data was collected from1-30, June,2024.

4.2. Study design

Facility based cross-sectional study was employed

4.3. Source population

All pregnant women who attended at the delivery ward in public hospitals of southern Tigray 2024

4.4 Study population

All pregnant women who attended at the delivery ward in the selected public hospitals of southern Tigray from1-30, June,2024.

4.5. Study Unit

SystematicSelected pregnant women who met the inclusion criteria and who were admitted to delivery ward.

4.6. Eligibility criteria

4.6.1. Inclusion criteria

Woman whose gestational age was above 20 weeks and who stayed at least 24 hours after delivery were included in this study.

4.6.2. Exclusion criteria

Pregnant women who were in labor and pregnant women who had severe illnesses and mental health problems were excluded from the study.

4.7. Sample size determination and sampling technique

For the first objective, the sample size was calculated with single proportion population formula with the assumption of 95% CI and 4% margin of error and based on proportion of pre-eclampsia at Debre Tabor specialized hospital was 15.7% (32). Taken p= 0.157 and the total sample size was

$$n = \frac{(z\alpha/2)2 \ * \mathrm{P}\ (1 - \mathrm{P})}{(\mathrm{d})\ 2}$$

$$n = \frac{(1.96)2 \ * 0.157(1 - 0.157)}{(0.05)\ 2}$$

n=319

By considering 10% non-response rate, the total sample size will be, n= 351

A double population proportion sample calculations equation using EPI - Info Version 7.2.6.0 was used to address the second specific objective.

Table 1: Summary of sample size based on double population proportion formula calculated by EPI – info version-7.2.6.0 for second specific objective using three factors.

Factors	Proportion in exposed	Proportion in un-exposed	Odds ratio	Sig. test	Power	Ratio of exposed: unexposed	Final sample size= (total sample size * design effects + non response rate (10%))

History of chronic HPN(32)	30%	13.3%	2.8	95%	80%	1:1	200+200*10%=220
BMI(32).	58.6%	28.6	3.56	95%	80%	1:1	98+98*10%=108
Alcohol intake(32)	20.6%	8.4%	2.82	95%	80%	1:1	292+292*10%=321

However, comparing single and double proportion, the sample size computed via single population proportion was taken since it's greater and gives the highest sample size. The final sample size was 351.

4.8 Sampling techniques and procedures

Two public Hospitals were selected from five public hospitals found in southern Tigray using simple random sampling. The sample frame for this study was 1500 study populations which were taken the previous registration from Lemlem karl and Mokoni primary hospitals.

The sampling interval was determined by dividing the total study population to the sample size. (N/n=1500/351=4). The final sample size was proportionally allocated based on their respective population. Then, finally, the study units were selected by systematic random sampling method every four pregnant woman until the desired sample size attained once the first study subject was selected randomly from among 1-4 participants attained daily (Figures 2)

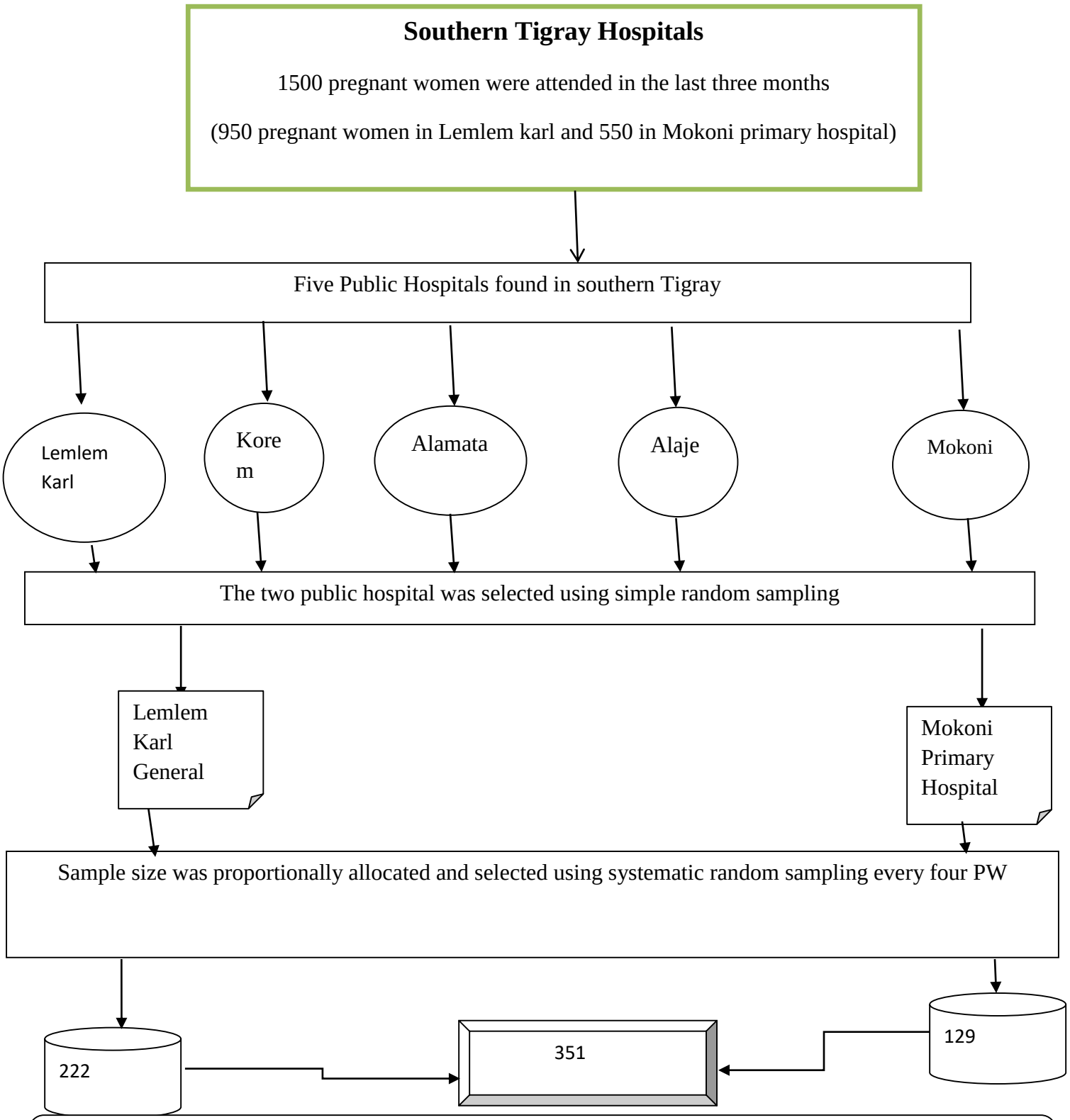

Figure 2. Schematic presentation of sampling technique among pregnant women admitted delivery ward in selected hospitals of southern Tigray, Ethiopia, cross- sectional, 2024.

4.7. Study variables

4.12.1. Dependent variable

Pre-eclampsia (Yes/No)

4.11.2. Independent variables

Socio-demographic factors

Age, educational level of respondent, religious, ethnicity, Marital status, place of residence, occupation level of respondent

Behavioral Factors, FEFOL intake, Alcohol

Medical related factors

History of CVS, history of diabetes mellitus, history of kidney disease and family history of hypertension

Obstetric factors

Age of menarche, ever gave birth, ANC, pregnancy status, history of twin pregnancy, history of abortion, history of pregnancy related Hypertension.

Operational definitions

Preeclampsia is defined as gestational hypertension [systolic blood pressure (SBP) ≥140 mmHg and/or diastolic blood pressure (DBP) ≥90 mmHg] after 20 weeks of gestation plus the presence of proteinuria. Proteinuria is assessed using urine dipstick method. Those women having a protein level of 1+ classified as having proteinuria(31).

4.9 Data collection procedure and tools

The structured questionnaire was adapted after a review of different literature(29-31).The questionnaire has different parts: question related to socio demographic, Behavioral factors, medical related and obstetric related questions was used to determine the magnitude and identify factors associated with preeclampsia among pregnant women at delivery ward public hospitals of

southern Tigray, northern Ethiopia. Data were collected by four diploma midwifery via face-to-face interview using pretested structured questionnaires and client chart review and supervised by one BSC public health officer professionals. Data was collected from 1-30, June,2024 at selected public hospitals southern Tigray, northern Ethiopia.

Blood pressure measurement was carried out after the women were allowed to take rest for about thirty minutes. Mercury sphygmomanometer apparatus was used to take blood pressure readings while the women were sat in upright position. The measurement was taken from participant's right hand. Systolic blood pressure (SBP) was taken up on hearing the first sound, and diastolic blood pressure (DBP) was taken up on 4th (muffled).

4.10. Data quality control/Assurance

The questionnaire was prepared in English for the first time and translated to the local language and back translated to English by another expert in order to maintain the consistency of the instrument.

Data collectors were selected based on their ability to speak the local language and previous experience of data collection for better communication with the mothers. One day intensive training was given for these data collectors and supervisor by the principal investigator to have a common understanding on the objective of the study, the questionnaires, data collection procedures and techniques during interview.

Prior to the start of field work; the question was pretested among 18(5%) of women at Maichew Health Center to see the accuracy of the response and to estimate the time needed for interview and after pretested, comments were included in the questionnaire and experiences were obtained on how to proceed in the final data quality control.

On regular basis supervisors checked questionnaires filled by data collectors for their completeness and logical consistency and submit them to the principal investigator within 24 hours for further checkup. The principal investigator again checked at least one tenth of the total questionnaire. Finally, in order to avoid errors during data entry 15% of the collected data were entered and checked accordingly.

4.11. Data processing and Analysis

EPI data Statistical software version 3.1 and Statistical Package for Social Sciences (SPSS) software version 27.0 was used for data entry and analysis. After organizing and cleaning the data, different descriptive statistics were calculated to all variables related to the objectives of the study. Missing values, outliers and normality of data checked by data exploration. No found evidence of multicollinearity among the predictors.

The Hosier-Leme show goodness-of-fit statistic was 0.298. Likewise, variables with P-value of less than 0.25 in bi-variable logistic regression analysis were entered into the multivariable logistic regression analysis to control con-founders to determine the separate effects of the various factors associated with unintended pregnancy. Odds ratio with 95 % confidence interval was used to examine associations and variable with P value less than 0.05 were considered significant. Finally, the result was presented by using tables, charts and narrative form.

4.12. Ethical consideration

Ethical clearance was obtained from Institutional Research board office of college of Health science, Mekelle University. Letter of support which directs the objective of this study was written to TRHB, from Mekelle University Research Director and written permission letter from regional health bureau was taken to the CEO of Lemlem karl and Mokoni primary Hospitals. The respondents were informed about the objective and purpose of the study, their rights related voluntary participation and confidentiality and their right to decline or withdraw from the study without penalty at any time, there were not any incentives to the participants during the interview and also about the information they provided will be kept confidential as the data would be used only for the purpose of generating new information. The rights and confidentiality of the study participants were maintained by using numbers only on the questionnaire and via the interview conducted individually in a separated room. Finally, the data collectors were obtained verbal consent from each study participants they have informed. The study did not inflict any harm on the study subjects, the community, and the data collectors or on the supervisors involved.

4.13. Dissemination of Result

The soft and hard copies of the final thesis report of this study will be submitted to Mekelle University College of Health Sciences School of public health, Tigray Regional health bureau, southern public hospitals and other stake holders like, local and international NGOs after presentation of public defense. Depending on the opportunities, the finding will be presented in conferences, workshops and seminars. The manuscript will be published.

5: Results

5.1 Socio-demographic characteristics

A total of 351 pregnant women responded to the questionnaire which makes the response rate of 100%. Among the study participants 189(51.2%) had a mean age of 28.35 ±6.64. Majority of the pregnant women 315(89.7%) were Tigray in ethnicity and 289(82.3%) were orthodox by religion. Majorities 291(82.9%) of participants were currently married. Regarding the educational status of the study participants 173(49.3%) had primary education and A 32 (9.1%) of participants had consumed occupationally (Table 2).

Table 2: Socio-demographic characteristics of pregnant women admitted delivery ward in the public hospitals of southern Tigray, Ethiopia. 2024.

Sno	Variables	Characteristics	Frequency	Percent (%)
1.	Age (in years)	15- 20	72	20.5
		20-34	180	51.2
		Greater than 35	99	28.3
		Mean age 28.35±6.64		
2.	Place of residence	Urban	221	63
		Rural	130	37
3.	Ethnicity	Tigray	315	89.7
		Amhara	25	7.1
		Afar	11	3.1
4.	Marital status	Single	38	10.8
		Married	291	82.9
		Divorced	10	2.8
		Widowed	12	3.4
5.	Educational level of respondent	Illiterate	26	7.4
		Able to read and write but do not take formal education	17	4.8
		Elementary level	173	49.3
		Secondary level	102	29.1
		Tertiary	33	9.4
6.	Occupational level of respondent	Housewife	189	53.9
		Farmer	67	19.1

		Civil servant	28	8
		Daily laborer	16	4.6
		Student	24	6.8
7.	Religious	Orthodox	289	82.3
		Muslim	55	15.7
		Protestant	7	2
8.	Consumed alcohol in the last one year	Yes	32	9.1
		No	319	90.9
9	If yes how many times	Daily	8	2.3
		Occasional	24	6.8

5.2 Obstetric characteristics

Regarding ever gets pregnant 276 (78.6%) had get pregnant before the current pregnancy and age at first pregnancy, 75 (21.4%) of the respondents. Regarding ANC follow-up above nearly three forth 274 (78.1%) women had at least one ANC follow-up. Concerning the current status of pregnancies above to three froths 281(80.1 %) of the current pregnancies were planned and 37 (10.5%) pregnant women who had a history of pregnancy related HTN in the previous pregnancy (Table 3).

Table 3: Obstetric characteristics of pregnant women admitted delivery ward in the public hospitals of southern Tigray, Ethiopia, 2024.

S.No	Variable	Category	Frequency	Percent (%)
1.	Still birth	yes	11	3.1
		No	340	96.9
2.	Ever get pregnant	Yes	276	78.6
		No	75	21.4
3.	Ever gave birth	Yes	260	74.1
		No	91	25.9
4.	ANC follow up	Yes	274	78.1
		No	77	21.9
5.	Pregnancy related admission before	Yes	19	5.4
		No	332	94.6
6.	History of abortion	Yes	29	8.3
		No	322	91.7

7.	Status of the current pregnancy	Planned	281	80.1
		Un planned	70	19.9
8.	History of twin Pregnancy	Yes	10	2.8
		No	341	97.2
9.	History of pregnancy related hypertension in previous pregnant	Yes	37	10.5
		No	314	89.5

5.3 Magnitude of Pre-eclampsia

Thirty-six 36(10.3%) (CI: 7.1-13.7) pregnant mothers were having Pre-eclampsia

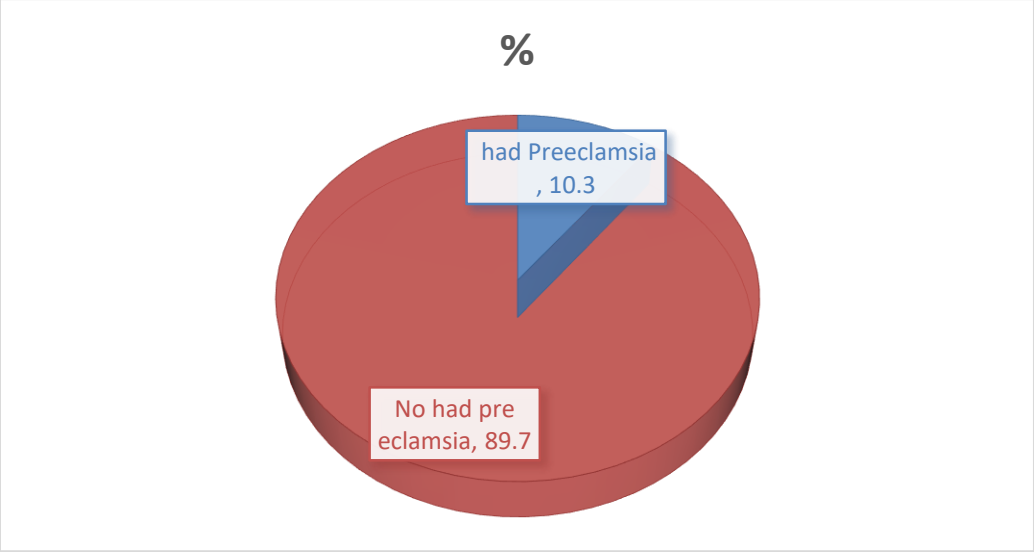

Figure 3. Magnitude of pre-eclampsia among pregnant women admitted at delivery ward in the public hospitals of southern Tigray, Ethiopia,2024

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5.4 Medical history of the study participants

Among all pregnant women who were interviewed, 11 (3.1%) had reported a history of chronic hypertension, and 37 (10.5%) had history of DM. There was family history of hypertension in 25(7.2%) of them and 14 (4%) of pregnant women had history of kidney disease(table-4).

Table 4. Magnitude of pre-eclampsia among pregnant women admitted at delivery ward in the public hospitals of southern Tigray, Ethiopia,2024

Sno	Variable	Category	Frequency	Percent (%)
1.	History of chronic hypertension	Yes	11	3.1
		No	340	96.9
2	CVS	yes	20	5.7
		no	331	94.3
3	Anemia	yes	13	3.7
		no	338	96.3
4	Family history of HTN	Yes	25	7.2
		No	326	92.8
5	History of Kidney disease	Yes	14	4.0
		No	337	96.0
6.	History of DM disease	Yes	37	10.5
		No	315	89.6

Factors associated with preeclampsia

Place of residency, Alcohol drinking, kidney diseases, DM diseases, having history previous pregnancy related hypertension, having family history hypertension, age of respondent and ever get pregnancy were factors associated with Pre-eclampsia in the bi-variable analysis. Moreover, the result of multi-variable logistic regression analysis revealed that, only three variables were statically significant with Pre-eclampsia (P-value <0.05).

This study confirmed that there is a presence of higher odds of developing pre-eclampsia in older women. Age of women 15-19(AOR ;0.177:95% CI) and 20-34 (AOR;0.391:95% CI) Years were 82% and 61 % less likely than age of women 35 and above, respectively.

Women who had diabetic mellitus disease were 2.99 times more likely to be pre-eclampsia as compared to their counter parts **(AOR; 2.99:95%CI 1.49- 7.8).**

Similarly, in this study, it was found that women who had family history of hypertension were 3.6 times more likely to develop preeclampsia than those who didn't have family history of hypertension **(AOR; 3.6:95%CI 1.13- 11.5)** (Tabel-5).

Table 5. Both bi-variable and multi-variable logistic regression analyses for factors associated with Preeclampsia status among pregnant women at delivery ward in public hospitals of southern Tigray, Ethiopia, 2024

		Preeclampsia status				
Variables	Characteristics	Yes (%)	No (%)	COR (95%CI	AOR (95%CI	PV
Age of respondents	15-19	2(5.2)	70(22.2)	0.34(0.024-0.47)	0.177(0.034-0.91)	0.038
	20-34	14(38.88)	167(53.1)	0.30(0.14-0.61) *	0.391(0.171-0.895)	0.026
	35 and above	22(61.1)	78(24.7)	1	1	1
Place of residence	Urban	28(77.8)	193(61.3)	2.21(0.98-5.01)	1.21(0.47-3.10)	0.7
	Rural	8(22.2)	122(38.7)	1	1	
Alcohol drinking	Yes	12(33.3)	20(6.3)	7.38(322-10.44) *	1.12(0.34-3.72)	0.248
	No	24(66.7)	295(93.7)	1	1	
Ever get pregnant	Yes	34(94.4)	242(76.8)	5.13(1.20-11.85)	1.61(0.32-798)	0.437
	No	2(5.6)	73(23.2)	1	1	
Having pregnancy related HTN In-previous preg.	Yes	12(33.3)	25(7.9)	5.8(2.59-12.96) *	1.02(0.31-3.29)	0.457
	No	24(66.7)	290(92.1)		1	
Having family history of HTN	**Yes**	**9(25)**	**16(5.4)**	**6.2(2.5-15.3) ***	**3.6(1.13-11.5) ****	**0.030**
	No	27(75)	299(94.6)	1	1	

Having history of kidney disease	Yes	3(8.3)	11(3.5)	2.51(0.68-9.46) *	1.91 (0.37-9.97)	0.73
	No	33(91.7)	304(96.5)	1	1	
Having history of diabetic' s mellitus disease	**Yes**	**12(44.4)**	**25(10.2)**	**5.8(2.5-12.96) ***	**2.99(1.15-7.8) ****	**0.025**
	No	24(55.6)	290(89.8)	1	1	

The bold value is indicated the variables associated factors with the outcome variable

* Indicates p-value<0.25, ** indicates p-value<0.05

The Hosmer-Leme show goodness-of-fit statistic was 0.234 which means the model was fitted.

6. Discussion

The aim of this study was conducted to determine the magnitude of pre-eclampsia and associated factors among pregnant women at delivery ward in public hospitals of southern Tigray, Ethiopia. Based on multi-variable logistic regression analysis, history of diabetic mellitus, family history of hypertension and Age of respondent were found to be the determinant factors of pre-eclampsia among pregnant women at delivery ward in Selected hospitals of southern Tigray, Ethiopia.

The finding of this study showed that the magnitude pre-eclampsia among pregnant women at delivery ward in selected public hospitals of southern Tigray, Ethiopia was 36 (10.3%) with (95% CI: 7.1-13.7) which was consistent with previous studies done in among pregnant women sub-Saharan Africa: a systematic review and meta-analysis was 13%(25) and the central region of Mozambique was 12 %(26), Dessie referral hospital(31) was 8.4%, and Shashemene Comprehensive Specialized, Melka Oda General Hospitals, Oromia, Ethiopia(29) was 9.02%. However, this study was lower than studies conducted Jima specialized hospital(28), Arba Minch Town, Southern Ethiopia(30) , Debre tabor, Ethiopia(32), in seven hospitals of Tigray(33) were 51.8%, 18.25, 15.7and 50% respectively. The difference might be due to place of residence, time gap, referral hospital reviving patients out of the catchment area. Except the study in Tigray others study participants were taken from urban areas only. But in our case, some of the participants were rural dwellers.

On the other hand, this study finds higher Pre-eclampsia cases (10.3%), which complicates 2 to 4% of pregnancies globally and the prevalence of pre-eclampsia in Sweden and China were 2.9% and 2.3%, respectively(24)three southwest Ethiopia hospitals 6.3% (11) and 5.5% in Ethiopia, Addis Abeba (27) . The discrepancies might be explained due to differences in the geographical locations, culture and lifestyle, study period, study design, and healthcare-seeking behaviors of pregnant women.

This study confirmed that there is a presence of higher odds of developing preeclampsia in older women. Age of women 15-19 and 20-34 years old were 82% and 61 % less likely than age of women 35 and above, respectively. This is congruent with the study conducted in Tanzania (38),

Tirunesh in Addis Ababa (30), and Debre Markos (39) and a systematic review and meta-analysis in Ethiopia (40).

This could be explained as the woman gets older, she is more likely to have cardiovascular problems. This would particularly happen due to the gradual loss of compliance of the cardiovascular vessels that is mainly associated with ageing of uterine blood vessels and arterial stiffness. In addition, when the woman gets older, the hemodynamic adaptations during pregnancy becomes more difficult.

This study finds that having history of diabetic mellitus disease was positively associated with pre-eclampsia. Women who had diabetic mellitus disease were 2.9 times more likely to be preeclamptic as compared to their who had no history of diabetic mellitus disease and this finding was consistent in other similar studies done in Public Hospitals of Wolaita and Dawuro Zones, Southern Ethiopia(43), (31)at Mettu Karl referral hospital, Ethiopia (42) and antenatal care in Dessie referral hospital, Northeast Ethiopia(31).This may be due to the fact that high levels of plasma triglycerides cause endothelial cells to accumulate triglycerides in diabetic women, resulting in endothelial cell dysfunction and a predisposition to high blood pressure. This might be explained by that diabetes is a disease in which the blood glucose, or blood sugar, levels are too high which will cause narrowing of blood vessels and interfere with the normal physiological response during pregnancy

Similarly, in this study, it was found that women who had family history of hypertension were 3.6 times more likely to develop preeclampsia than those who didn't have family history of hypertension. The finding is consistent with the reports of other studies systematic review and meta-analysis in Ethiopia(21), in Public Hospitals of Wolaita and Dawuro Zones, Southern Ethiopia(43) and Dessie referral hospital, Northeast Ethiopia: a hospital-based study(31). The reason might be the association of some cardiovascular disorders with genetic inheritance. This might have occurred due to genetic factors that contribute to the physiologic predisposition of preeclampsia.

7. Strengths and limitations of the study

7.1 Strengths of the study

- The study was done after the deadly war in Tigray so it will show the effect of war on pregnant mothers and the health care services in southern Tigray
- The study was well-suited for estimating the prevalence of preeclampsia within a specific population at a given point in time.

7.2 Limitations of the study

- It would be much better if it had been studied using follow up studies instead of a cross-sectional study
- The study can't determine cause-and-effect relationships between risk factors and pre-eclampsia. For example, while a study ght find a correlation between high blood pressure and pre-eclampsia, it cannot definitively prove that high blood pressure causes pre-eclampsia.

9. Conclusion

Pre-eclampsia 10.3% prevalent in this study area. Some of the factors associated with pre-eclampsia were Advanced age ,history of diabetic mellitus and family history hypertension.

10. Recommendations

Depending on the current study findings, the following recommendations are given to south Tigray public Hospitals.

Improving Prevention and Management:

Risk Assessment: It is important for women with a history of diabetic mellitus and family hx to receive close prenatal care to monitor for signs and symptoms of pre-eclampsia and to manage their underlying conditions.

- **Early Identification and Risk stratification:** Encourage comprehensive prenatal care and regular blood pressure monitoring to detect preeclampsia in its early stages.
- **Symptom monitoring Education** women about pre-eclampsia danger sign
- **Lifestyle Interventions:** Promote healthy lifestyle choices, such as balanced diet, regular exercise, and weight management, to reduce the risk of DM.

Addressing Health of women:

- **Targeted Interventions:** detail hx taking actively inquire about advanced maternal age, family hx of HTN and preexisting DM increase the risk so targeted interventions should to address. Though mgt of preexisting condition.
- **Community Engagement:** Collaborate with community organizations to promote health education and access to prenatal care in underserved areas.

Research and Development:

- **Etiology Research:** Continue research to better understand the underlying causes of pre-eclampsia and identify new potential targets for prevention and treatment.
- **Monitoring and Evaluation:** Implement ongoing monitoring and evaluation of pre-eclampsia prevention and management programs to assess their effectiveness and identify areas for improvement.

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. Annex

Annex I: Information sheet English version

Here, I Mesfin Berihun the undersigned Mekelle University College of health sciences school of Public Health, graduate program studies, currently, I will be undertaking research on a topic entitled as *"*Magnitude of pre-eclampsia and associated factors among pregnant women at delivery ward in selected hospitals of southern Tigray, Ethiopia, 2024.*"* For this study, you are selected as a participant, and before getting your consent or permission of your participation, you need to know all the necessary information related to the study.

Objective: To assess the magnitude of pre-eclampsia and associated factors among pregnant women at delivery ward in selected hospitals of southern Tigray, Ethiopia, 2023/24.

Significance of the study: The study will assess the magnitude of pre-eclampsia and associated factors among pregnant women at delivery ward in selected hospitals of southern Tigray. It can be used as an input for stakeholders and concerned bodies (government and non-government organizations).

Confidentiality: All the information you will give, it will be kept confidential and won't be accessible to any third party. Your name won't be registered on the question sheet so that you will not be identified.

Risk and benefits of the study

Risk: The study will be carried out simply by asking you, already prepared and structured questions. The procedure doesn't bear any physical or psychological trauma. Furthermore, you will not be forced to respond to the information or questions you don't know.

Benefits: For your participation in the study no payment will granted or has no special privilege to you. But, participating in the study and giving your information to questions asked will have great input in developing new policies and provides further requirements.

Consent: your participation is totally based on your willingness, you have the right not to participate from the beginning, or stop any time after starting participation. You will not force to respond to the information you do not know.

Name of the principal investigator: Mesfin Berihun Date:Signature:

Address of PI: cell phone: +251914041518 Mail: mesfinberihun22@gmail.com

Annex II: Informed consent Form English version

Title of the project: **"**To assess the magnitude of pre-eclampsia and associated factors among pregnant women at delivery ward in selected hospitals of southern Tigrai, Ethiopia, 2024." I have been well aware that this research undertaking is for a partial fulfillment of MSc degree which is fully supported and coordinated by the school Public Health, College of Health Sciences, Department of Reproductive Health and the designate principal investigator is Mr.Mesfin Berihun. I have been fully informed in the language I understand about the research project objectives.

I have been informed that all the information I shall provide to the interviewer will be kept confidential. I understood that the research has no any risk and no composition. I also knew that I have the right to withhold information, skip questions to answer or to withdraw from the study any time I have acquainted nobody will impose me to explain the reason of withdrawal. It is also enlighten there would have no effect at all in my health benefit or other administrative effect that I get from the refuge.

I have assured that the right to ask information that is not clear about the research before and or during the research work and to contact

Mekelle Univesrty College of Health Sciences IRB Office

Tel. _____

Principal Investigator's Name: Mesfin Berihun

Tel: +251914041518

I have read this form, or it has been read to me in the language I comprehend and understood the condition stated above, therefore, I am willing and confirm my participation by signing the consent.

Name of the participant _____

Agreed to participate in the study: Yes /No (mark one of them for verbal consent)

Signature _____ (if written consent)

Annex III. English Version Questionnaires

Data Collection Questionnaire: English version

Name of Hospital…….**Code of thequestionnaire**……MRN……

Part I: Socio-Demographic Characteristics

S. No	Questions	Responses	Skip to
101	How old are you? (*in completed years*)	age in years	
102	Where is your permanent residence?	1. Urban 2. Rural	
103	What is your Religion?	1Orthodex 2.moslim 3.other----------	
104	What is your Ethnicity?	1Tigray 2 Amhara 3 Afar 4 Othger---------	
105	Your marital status	1. Single 2. Married 3. Divorced 4. Widowed 5. Separated	
106	What is your occupation?	1. Housewife 4. Civil Servant 2. Merchant 5. Daily Laborer 3. Farmer 99. Other	
107	What is your education level?	1. Illiterate 4. Secondary (9-12) 2. Can read and write 5. Tertiary (12+) 3. Elementary (1-8)	

Part II: Obstetric and Reproductive History of the women}

S. No	Questions	Responses	Skip to
201	What was your age at your first pregnancy?	Years	
202	At what age you begunThe first menses ?	Age	
203	Have you ever give birth?	1. Yes 2. No	**If nogo to 205**
204	How times gave Birth		

205	Did you receive antenatal care in this Pregnancy?	1. Yes 2. No	**no, go to QIf 207**
206	How many times did you receive ANC during this pregnancy (**Total No of visit**)	1. One 2. Two 3. Three 4. Four 5. Five and more	
207	Did you have pregnant related admissions in current pregnancy?	1. Yes 2. No	**If no, go to Q209**
208	If yes to Q213, What was the reason/s forthe antenatal admission?	1. Hyper emesis 2. Threatened Abortion 3. Bleeding during pregnancy 4. Diabetes 5. Malaria 6. Urinary Tract Infection 7. Hepatitis 8. PROM 9. Fetal problem Specify------ 10. Anemia 11. Hypertension 99. Others specify	
209	Do you have history of multiple Pregnancies?	1. Yes 2. No	**If no, go to Q211**
210	If yes to Q209, how many times?	times	
211	Did you ever planed current pregnancy?	1. Yes 2. No	
212	Do you ever give stillbirth?	1. Yes 2. No	**If no, go to Q214**
213	If yes to Q212, how many times?	_____	
214	Do you ever experience abortion?	1. Yes 2. No	**If no, go to Q217**
215	If yes to Q214, what type of abortion? **(More than one answer is possible)**	1. Spontaneous miscarriage 2. Safe Induced abortion by skilled personnel 3. Unsafe Induced abortion	
216	If yes to Q214, how many times?	times	
217	Currently do you have pregnant related HTN	1. Yes 2. No	

218	Did you experience P r e g n a n t related HTN in previous pregnancy ?	2. Yes 3. No	
Part-III: Behavior factors			
301	Have you received Fefol	1. Yes 2. No	
302	If yes Q. NO 301, how often?	1. <3monthes 2. >3monthes	
303	Have you consumed alcohol in the last 1 year?	1) Yes 2) No	
304	If yes, for question number 303 how often?	1. Daily 2. Occasional	
305	Have you drinking Coffee	1) Yes 2) No	
306	Frequency of coffee use	1)daily 2) occasional	
Part-IV: Past Medical History or Co-morbidities			
401	Do you Have Family history of hypertension?	1. Yes 2. No	
402	Do You have Anemia	1. Yes 2. No	
403	Do you have history of DM	1. Yes 2. No	
404	Do you have History of Kideny Disease	1.yes 2.No	
405	Do you have heart Problem	1yes 2 No	

Part-VI: Record review checklist

Instruction: Please look at client card or registration books (delivery/operation notes) and appropriately fill the responses for the following questions.for those **having Preeclampsia**

S. No	Questions	Responses	Skip to
If the mother had the following diagnosis, tick all the findings she have to confirm the diagnosis			
601	Type of HDP	1. chronic HTN 2. Supper Imposed 3. Eciampsia 4. Pre-eclampsia	
602	preeclampsia	SBP---------- DBP----------Protin Uria----------	
603	Severe preeclampsia **(multiple answer possible)**	1. Blood pressure > 160/110 mmHg 2. Proteinuria > 5 g over 24 hours or >2+ 3. Oliguria < 400 ml over 24 hours 4. HELLP syndrome	
604	Eclampsia (**Severe PE symptoms + seizure + Comatos**)	1. Yes 2. No	

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