Asrat Woldeyes Health Science Campus School Of Nursing And Midwifery Department Of Nursing.

Time To Recovery From Preeclampsia With Severe Features And Its predictors In North Shoa Zone Public Hospitals Amhara Region, Ethiopia, 2023.

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A Thesis Submitted To Debre Berhan University Asrat Woldeyes Health Science Campus, School Of Nursing And Midwifery Department Of Nursing: To Partial Fulfillment Of The Requirements For The Degree Of Master Science In Maternity And Reproductive Health Nursing.

June , 2023

Debre-Berhan,   Ethiopia

Approval sheet

Asrat Woldeyes Health Science Campus

School of Nursing and Midwifery

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Abstract

Background: preeclampsia severe feature is a multisystem disorder present only in human pregnancy. It is the leading cause of maternal death worldwide, with the majority of deaths occurring in developing countries. There was no literature that describes the recovery time of preeclampsia with severe feature and its determinants in Ethiopia. Therefore, this study aimed to assess the recovery time from preeclampsia with severe feature and its determinants in North Shoa Zone public Hospitals.

Objective: This study aimed to determine the time to recovery and its determinants among woman with preeclampsia severe feature in North Shoa Zone public Hospitals Ethiopia, 2023

Methods: Institutional-based retrospective follow-up study was conducted in 668 women admitted with preeclampsia with severe features from april 12, 2020–April 1st, 2023. Systematic random sampling technique was used to select study participants. The data were collected by using an extraction tool from chart review. The collected data were entered into Epi-data version 4.6 and exported to Stata version 14. and Kaplan Meier curve and log rank were used to estimate recovery time and to compare the probability of survival time. Cox Proportional Hazard regression model was performed. Adjusted hazard ratio (AHR) with a 95% confidence interval and p-values <0.05 was used to measure the strength of association.

Result: The median time to recovery was 6 days (IQR: 4-8 days).The recovery rate was 14.5 per 100 person per day and the overall recovery probability was 4.14% (95%CI: 0.02,0.06). Referral status AHR:1.67 (95%CI: (1.34,2.12), magnesium sulphate AHR: 2.5 (95% CI: 1.38, 4.60), hydralazine` AHR: 0.50 (95% CI: 0.40, .64), age $\geq$ 25 years AHR: 1.93) and presence of ANC follow up AHR: 2.33 (95% CI (1.67, 3.25) were statistically significant determinant to recovery of preeclampsia with severe feature.

Conclusion: The median recovery time from pre eclamptia severe features among eclamptic mothers in North Shoa Zone Hospitals was 6 days. It is affected by age, referral status, antihypertensive anticonvusant drug and presence of ANC follow up. Special attention to the availablility of essential drugs (antihypertensive and anticonvulsant), ANC follow up and timely referral system is recommended in this follow up study.

 Key words: Pre-eclampsia, Time to recovery, north shoa , Ethiopia

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List of Acronyms and Abbreviation

AHR	Adjusted Hazard Ratio
APGAR	Appearance-Pulse-Grimace Stimulant-Active muscle tone-Respiration
EDHS	Ethiopian Demographic Health Survey
HDP	Hypertenson Dsorder Of Pregnancy
HEELP:	Hemolysis, Elevated liver Enzyme, Low Platelet count
IRB	Institutional Review Board
IUGR	Intra-Uterine Growth Restriction
NICU	Neonatal Intensive Care Unit
SSA	Sub Saharan Africa
WHO	World Health Organization

1. Introduction

1.1 Background

Pregnancy and childbirth-related complications are widespread issues that frequently result in fatalities and permanently affect many women(1). Pregnancy-related hypertensive diseases are a significant contributor to severe morbidity, chronic disability, and infant and maternal mortality (1, 2). Ten percent of pregnant women experience hypertensive disorders of pregnancy, and preeclampsia complicates between two and eight percent of pregnancies (3). Preeclampsia continues to pose a serious risk to both mother and child (4).

Globally, pre-eclampsia incidence varies from nation to nation (5). Estimates from the World Health Organization (WHO) show that developing nations experience greater rates of pre-eclampsia than industrialized nations, in terms of incidence, death, and morbidity (5, 6). Preeclampsia is among the top diseases, according to evidence, in SSA (sub-Saharan African) countries (5, 7). Ethiopia is one of the SSA nations with the heighest repored prevalence of severe pre-eclampsia (8).

Previously, preeclampsia is defined as gestational hypertension with proteinuria after 20 weeks of pregnancy in a previously normotensive woman and mostly use a dichotomous "mild" and "severe" classification (9, 10). Using proteinuria as diagnostic criterion and classifying as mild and severe is problematic because some women with the preeclampsia syndrome does not have overt proteinuria(11). However, it is increasingly recognised that proteinuria is not essential for the diagnosis of pre-eclampsia, which can be based on other end-organ complications (such as elevated liver enzymes) (12), and there is no agreed criteria for "moderate" preeclampsia (12, 13).

The current classification of pre-eclampsia is pre-eclampsia without severe features and pre-eclampsia with severe features. Severity features of preeclampsia are: Headache, blurred vision, oliguria (<400 ml/24 hours), epigastric pain or pain in right upper quadrant, difficulty breathing (pulmonary edema), Low platelet count (<100,000/µl), Elevated liver enzymes more than twice the upper limit of normal, Serum creatinine higher than 1.1mg/dl or a doubling or higher of the baseline serum creatinine concentration in the absence of other renal disease (13, 14).

According to the American College of Obstetrics and Gynaecology (ACOG) definition, preeclampsia is defined as the presence of hypertension and proteinuria ($\geq$140mmHg/90mmHg) or in absence of proteinuria, new-onset hypertension with the new onset of any of the following: thrombocytopenia, renal

insufficiency, impaired liver function, pulmonary edema, and unexplained new-onset headache unresponsive to medication or visual symptoms (6, 15).

Many researchers have studied the underlying causes of pre-eclampsia in a variety of settings. However, the exact etiology of this disease is unknown. Atypical placentation, cardiovascular maladaptation to pregnancy, immunological and genetic processes, an exacerbated systemic inflammatory response, and dietary, hormonal, and angiogenic variables are some of the current hypotheses. (13, 16).

Different study showed, the following risk factors for preeclampsia were discovered: primiparity, prior episodes of maternal preeclampsia, family history of preeclampsia or eclampsia, high maternal body mass index, chronic hypertension, pregnant anemia, and a lack of antenatal care visits (7, 17-19).

Pregnancy complicated with pre-eclampsia is associated with increased risk of fetal, neonatal and maternal adverse effects (20).Common complications include placental abruption, pulmonary edema, kidney injury, preterm, neonatal asphyxia, and low birth weight (21). National population based cohort study in Denmark, included more than 2.4 million participant indicated severe pre-eclampsia is associated with increased risk of death in offspring from birth to young adulthood due to perinatal period originating disorder like cardiovascular, gastrointestinal, endocrine, nutritional and metabolic diseases (2). Early diagnosis and referral of pregnant and potpartum women with pre-eclampsia with severe feature important to improve these health outcomes.

1.2 Statements of the problem

Over 830 women each day in 2015 died as a result of complications during pregnancy and childbirth (7). Pre-eclampsia with severe features is a major contributor to maternal and perinatal morbidity and mortality.(5, 22). In Sub-Saharan Africa, 550 of the 830 daily maternal deaths occurred, as opposed to 5 in industrialized nations (23). According to the 2016 Ethiopian Demographic Health Survey (EDHS), there are around 4 maternal deaths for every 1000 live births in Ethiopia or 412 deaths per 100,000 live births (22). Preeclampsia and eclampsia were cited as the cause of 16% of direct maternal deaths and 10% of total maternal deaths (direct and indirect) by Ethiopian National Emergency Obstetric and Newborn Care (EMONC) (24).

The maternal mortality rate (MMR) in the Amhara region is calculated as 266 deaths per 100,000 live births. Globally, preeclampsia is a leading cause of maternal and neonatal mortality and morbidity, predominantly in middle and low income countries (29). WHO estimates that at least one woman dies every seven minutes as a result of pregnancy-related hypertension, its incidence also seven times higher in developing countries (2.8% of live births) than in developed countries (0.4% of live births) (20).

The lifetime risk of a woman dying from a obstetrics cause is approximately 33 times higher developing country. In 2010, approximately 287,000 maternal deaths occurred, with wide regional variations in lifetime risk (from 1/3800 in developed countries to 1/39 in SSA) (30). In 2015, every day 830 women died due to obstetrics complications (550 occur in SSA and 180 in South Asia, compared with developed countries). (7, 23).

Pregnancy complicated with pre-eclampsia is associated with increased risk of fetal, neonatal and maternal adverse effects (20). Common complications include placental abruption, pulmonary edema, kidney injury, preterm, neonatal asphyxia, and low birth weight (21).

Previous studies revealed inconsistent results regarding the recovery time from severe preeclampsia. As an example, BP normalization within six weeks of delivery, in China, 75% (median, 7 days) (16) , in Uganda 93.8% (median, 2.49 weeks)(27) . But the study in Debre Markos on recovery of eclampsia is 12 hrs with an interquartile range of 1- 48 hrs(28).

A study on the causes of maternal deaths in Ethiopia showed that the proportion of maternal deaths due to hypertension disorder of pregnancy (HDP) in Ethiopia increased from 4% in 1980 to 29% in 2012

(29). In Debre Berhan comprehensive specialized hospital the prevalence of HDP tends to increase from 1.8% in 2011 to 5.7% in 2014, with pre-eclampsia accounts 67.4% of the total cases, followed by eclampsia accounting for 27.8% (31).

Reduction maternal mortaliy has been one of the Ethiopian government's top priorities in the health sector(25).To this goal, Ethiopia's government train a number of health professional, making maternal health care survice free and allocate ambulance to minimize morbidity and mortality, but there persistent and intolerably high numbers of maternal deaths (26). so, more work remains to be done to address the specific survival needs of mother with in Ethiopia

Despite the fact that pre-eclampsia with severe feature is a leading causes of maternal morbidity and mortality during pregnancy and postpartum period and its incidence is an increasing pattern, There was no literature that describes the recovery time of preeclampsia with severe feature and its determinants in Ethiopia. , but also scarce in the Africa. Therefore, this study aimed to assess the recovery time from preeclampsia with severe feature and its determinants in North Shoa Zone public Hospitals.

1.3 *Significance of the study*

- Identification of baseline factors that determinants recovery will help for their possible modification to pregnant and postpartum mother care and increase recovery from severe pre-eclampsia

- Estimating survival rate and understanding explanatory variables for survival among pregnant and postpartum mother provide vital information for policy makers to revise guidelines of maternal care and treatment.

- The study results will also have implications for HDP and treatment programming, and will inform decision making at various level of HDP care and treatment and support programs.

- Studies on survival pregnant and postpartum mother and associated factors are limited in the study area and the evidence for this study can serve as a baseline for further researcher.

2. Literature review

Overview of preeclampsia with severe feature

Preeclampsia is a common condition of pregnancy, characterized by the development of hypertension and proteinuria in women with previously normal blood pressure (14). While eclampsia is defined by recent-onset focal, or multifocal tonic-clonic seizures in women with signs and symptoms of preeclampsia in the absence of other etiologies such as epilepsy, cerebral ischemia and infarction, intracerebral hemorrhage or drug use (11). But a small percentage of women with eclampsia have normal blood pressure (9).

Pre-eclampsia is human pregnancy-specific disorder and contributes significantly to maternal and perinatal morbidity and mortality worldwide(32). Hypertension Disorder of Pregnancy accounts for nearly 18% of all maternal deaths worldwide, with an estimated 62,000–77,000 deaths per year. Severe pre-eclampsia is a major health problem in developing countries and every year, it is associated with an estimated 50,000 maternal deaths Worldwide (7)

The prevalence of preeclampsia is higher in low- and middle-income countries (LMICs), where associated illnesses are also more common. Global estimates of the prevalence of eclampsia range from 0.1% in Europe to 4% in sub-Saharan Africa. Similarly, mortality from eclampsia varies widely, from 0% to 2% in high-income countries to 18% in low-income countries (23).

In Ethiopia, the estimated maternal mortality rate for the 7 years prior to the 2016 Ethiopian Demographic and Health Survey (EDHS) was 412 deaths per 100,000 live births; This means that for every 1,000 births in Ethiopia, there are about 4 maternal deaths (17). In addition, according to Ethiopia's National Emergency Maternal and Neonatal Care Agency (EMONC), 16% of direct maternal deaths and 10% of total maternal deaths (direct and indirectly) is due to preeclampsia/eclampsia (24).

Survivals of women from severe preeclampsia

The rates of morbidity, mortality in developing countries are higher than in developed countries. A study conducted in China showed that a mean interval of BP normalization of 24.1 ± 22.8 days (median, 7 days). Forty-six percent of patients recover from hypertension within three days and 75% recover within six weeks of delivery. About 90% of patients need 60 days for blood pressure to return to normal after delivery. After adjusting for confounding factors, it was found that postpartum hypertension recovery

was influenced by the severity of hypertension, maternal serum albumin level, family history of hypertension, and week from pregnancy. until birth. (33).

Another study from Uganda found that most women (93.8%) recovered from hypertension within 6 weeks of giving birth with a median time to resolution of 2.49 weeks. About 81% of the women recovered their kidney function, and the median recovery time was 24.54 days. Proteinuria resolved in about 84% of women, and the mean time to time to proteinuria was 32.85 days. Multiple versus single pregnancy is associated with hypertension lasting six weeks after childbirth (32, 34, 35).

Another study done in Debre Markos on recovery from eclampsia showed that the median time to recover from eclampsia was 12 hours with the interquartile range (1 to 48 hours)(28).

Socio-demographic factors

Extremes of maternal age have been associated with risk of pre-eclampsia (11). Maternal age >35 years has been associated with an increased risk (36). The WHO Multicountry Survey of Maternal and Newborn Health reported that women >35 years were at high risk of pre-eclampsia (30). The cure rate for eclampsia in mothers over the age of 20 is halved compared with that of teenage girls. The risk of late recovery from eclampsia is about 50% in people aged 20 to 24 years compared with adolescents. Similarly, mothers aged 25 to 29 years recovered from eclampsia 0.48 times slower than mothers aged 16 to 19 years (28). Another study in china (33) was statisticaly significance.

The prospective multi-centere case-control study in Ethiopia had shown, rural dwellers were twice as likely to develop pre-eclampsia compared with those living in urban areas (37), but in Ghana, it is more common in urban (3.1%) than in rural (0.4%) (38).

Educational status did not affect on the recovery from eclampsia (28), but Persons with less than secondary education were high risk of pre-eclampsia (37).

The study conducted in nigeria teritiary hospital showed that there is no association between maternal ABO blood type and risk of pre-eclampsia reference.

Obstetrics factors

Lack of antenatal care visits increased the occurance when compared wth those mother have ANC follow up (39). The mother with no antenatal care double risk of death by pre-eclampsia (40) .

Pre-eclampsia is recognised to more commonly complicate a woman's first pregnancy (13). A meta analysis study in SSA reported that nulliparous women were at increased risk of pre-eclampsia compared with multi-parous women (39). The study in Debreberhan had shown, 58% were primi-gravida among from all addmited HDP ladies (31).

Women with a history of pre-eclampsia/ eclampsia in a previous pregnancy had an increased risk of pre-eclampsia in the current pregnancy compared with parous women with no previous pre-eclampsia (39). Previous history of gestational hypertension increase progression to severe preeclampsia (41).

Those mothers who had prolonged labor was 1.3 times higher than those whose labor was less than 12 h to recover from the disease (28).

The rate of recovery of mothers from eclampsia among those who developed the disease at the postpartum period was 1.8 times higher than the antepartum eclampsia (28). Gestational weeks at the onset of HDP stastically significance risk factor for preeclampsia(16).

Multiple gestations are a risk factor for pre-eclampsia (13). Study in metu showed that no current multiple pregnancy were less likely to be preeclamptic women than those women with current multiple pregnancy (36).

Weight gain during pregnancy increase risk of preeclampsia (16). Meta-analysis in SSA also showed that BMI is associated with an increased risk of pre-eclampsia (39)

According to a study by Debre markos, mothers whose labor lasted for less than 12 hours was 1.3 times more likely than mothers whose labor lasted less than 12 hours to be cured (28).

laboratory finding

According to an institutional based retrospective cohort study conducted in China 24-hour proteinuria, and uric acid were associated with recovery blood pressure, regardless of postpartum period (33).

The laboratory findings which showed a statistically significant association with maternal

death were hemoglobin <12gm/dl (CHR=2.3 - 3.7), platelet count <100,000/mm3 (CHR=7.0), creatinine ≥1mg/dl (CHR=3.7), and SGOT ≥ 2- fold raised (CHR=2.7). Proteinuria was not associated with maternal death (40).

An Ethiopian cohort study of the determinants of maternal complications associated with the occurrence of eclampsia presence of maternal leukocytosis, elevated serum creatinine (42). age at birth were significantly associated with the recovery of blood pressure three days after birth.

Maternal serum albumin levels were significantly associated with 6-week postnatal BP recovery. Maternal serum albumin levels with BP recovery at 12 weeks postpartum (16).

Over one-third of the patients were found to haveleukocytosis (38.7%), liver function derangements indicated by elevated AST (41.0%), and elevated lactate dehy- drogenase (25.8%). But, slightly below one-quarter of the women had a raised serum creatinine level of above and equal to 2 mg/dL (23%), while a far lower proportion of the patients had a low hemoglobin level of 11 mg/dL or below (17%) (42).

Drugs

The China Hospital Cohort Study The median time to blood pressure return to normal without taking any antihypertensive drugs was 24.1+ 22.8 days postpartum (mean, 7 days). More than eight percent of patients developed persistent hypertension after the 12-week study period and seven patients developed hypertension after one year(33). Women who were not given any antihypertensive drug were at higher risk for death (CHR=2.5) compared to those who take antihypertension (40).

Hypertensive mothers who were given magnesium sulphate were better protected from death (Log

Rank: P<0.0001)(40).

Conceptual framework

The conceptual frame was developed by reviewing the previous studies (28, 33, 34). The variables that this study will focus on Recovery time and its determinant mother, socio demographic obstetric history, maternal complication, and maternal drug exposure.
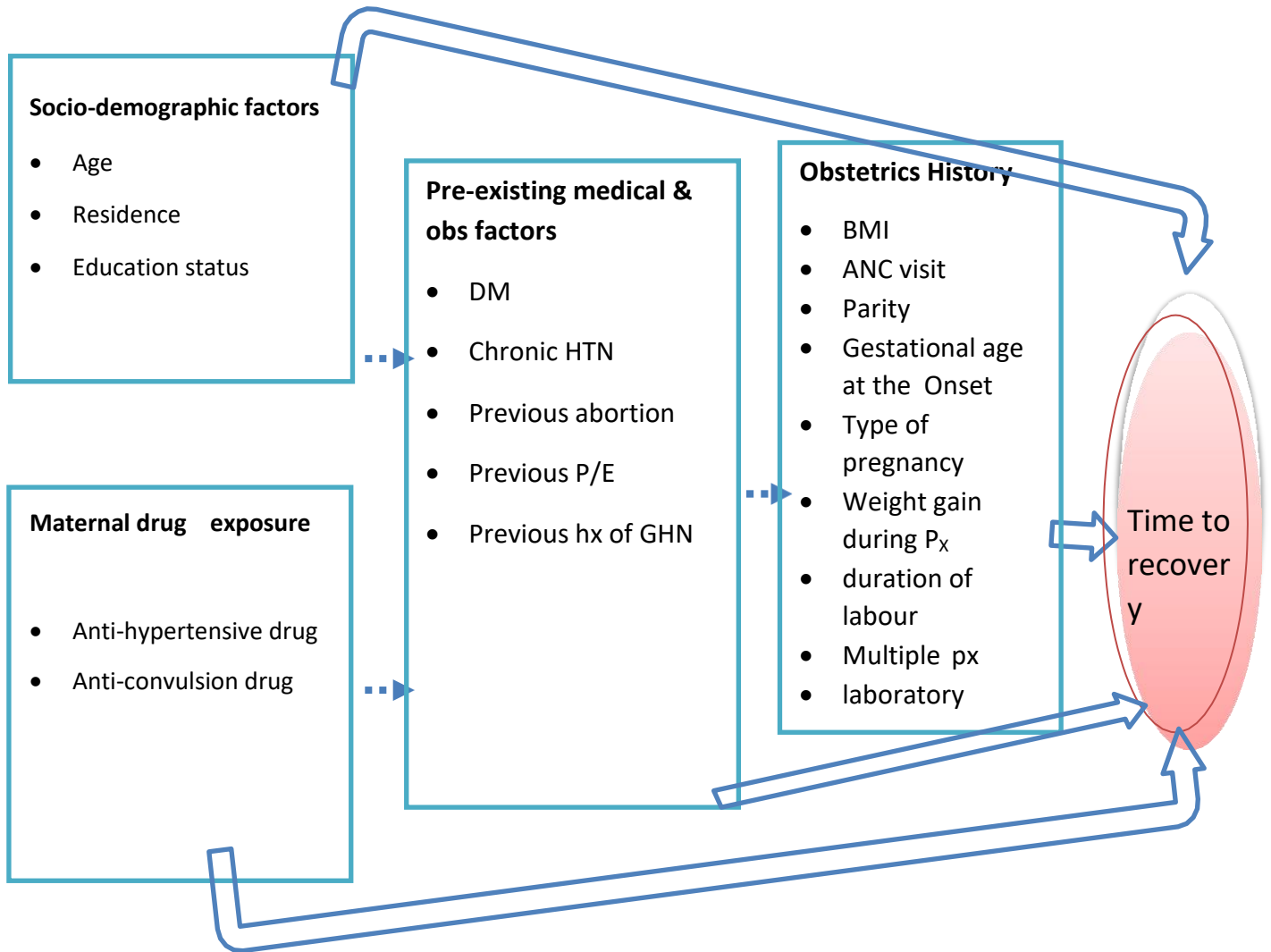
Figure 1: Conceptual framework on time to recovery and predictors among pregnant and postpartum women in North Shoa Zone Hospitals Amhara region Ethiopia, 2023

3. OBJECTIVE

General objective

To assess the recovery time and predicters among a woman with severe pre-eclampsia in North Shoa Zone Public Hospitals Ethiopia, 2023

Specific objectives

 To determine the recovery time among a woman with pre-eclampsia with severe feature in North Shoa Zone Public Hospitals Ethiopia, 2023

To identify predicters of recovery among a woman with pre-eclampsia with severe feature in North Shoa Zone Public Hospitals Ethiopia, 2023

4. METHODS AND MATERIALS

4.1 Study setting

The study was conducted in Hospitals that are found in the North Shoa Zone Amhara region, Ethiopia. North Shoa zone is one of the thirteen zones found in the Amhara regional state. Its city Administration is Debre Birhan city which is located 130 km far from Addis Ababa and 695 Km far from Bahir Dar capital city of Amhara Regional state. The total population of the zone is 2,322,148 out of those 1,171,150 males and 1,150,638 females.

It is bordered on the south and the west by the Oromia region, on the north by south wollo, on the northeast by the Oromia Zone, and on the East by the Afar region. According to the zonal health Department report, North Shoa has, 164 private clinics, 97 governmental health centers, 391 health posts, 8 primary hospitals (of which one private hospital), 3 general hospitals (of which one private hospital), and one comprehensive specialized hospital. In the hospitals where the study was conducted, a similar standard of treatment of pre-eclamptic mothers is applied. All pre-eclamptic women are managed with antihypertensive and anticonvulsant medications in addition to general and emergency management. The commonly used anticonvulsant is magnesium sulfate while the antihypertensive is hydralazine.

4.2 Study Design and period

An institutional-based retrospective follow-up study was conducted between April 12, 2020, to April 1st, 2023 in North Shoa Zone Public Hospitals, Amhara region, Ethiopia.

4.3 Population

4.3.1 Source population

The source population was pregnant and postpartum woman admitted to North Shoa Zone public Hospitals.

4.4 Study population:

The selected pregnant and postpartum mothers who were admitted to hospitals in the north Shoa zone public hospital with the diagnosis of pre-eclampsia with severe feature within the last three years

4.5 Inclusion and exclusion criteria

Inclusion Criteria:

All Mothers admitted with a diagnosis of pre-eclampsia severe feature during the study period in North Shoa Zone hospitals will be included.

Exclusion criteria

Incomplete chart records and records which are not available at the time of data collection.

4.6 Sample size determination

4.6.1

The sample size was determined by using the sample size determination formula for time-to-event data based on the Cox's proportional hazards model sample size calculation with the assumptions of the null hypothesis (Ho): b = 0 and Alternative hypothesis (Ha): b ≠ 0, by the log-rank test, and Freedman method using STATA software version 14.0.

$$E = \frac{\left(Z_{\frac{\alpha}{2}} + Z\beta\right)^2}{(\ln HR)^2 \quad p(1-p)} \qquad \text{And} \quad pr(E) = 1 - \frac{(\exp S1\,(t) + \exp S1\,(t)*HR)}{2}$$

Where: Zα/2 = standard normal variable at 95% confidence interval level = (1.96), Zβ = power of 80% =(0.842) , P= cumulative survival probability at end of study (40 days) is 9.2 %, Hazard ratio= 0.5, Pr (E)= probability of an event for outcome variable(recovery) and IR = incidence rate (34.1%)) as obtained from a prospective follow-up study in Hawssa on Predictors of time to maternal mortality (42). E = number of events that are interested is 66 and the probability of an event (recovery) is 0.223 .So the total sample size was calculated as

$$n = \frac{E}{pr(E)} = 445$$

The sample size for different factors which were significantly associated to eclampsia was considered by using the following assumption; 95% confidence level, Margin of error=5%=0.05 and 10% of non-respondent rate /with drawl/. Different variables that have high contribution for pre eclampsia with severity sign were selected based on the hazard ratio by considering previous studies in Debremarkos,east gojjam zone public hospitals(28).

Two variables were selected from the study having the maximum hazard ratio from the predictors. The formula used to calculate is N=E/P (E), and by using STATA the following table is found to be the result (Table1).

Table 1: Sample size calculation to assess survival status & predictors of recovery time among pregnant and postpartum mothers at a selected hospital in north shoa zone .

Predictors	Hazard Ratio	Survival probability	Calculated from STATA	Total sample size after 10% non-response rate
Maternal age	0.55	P1=0.21 P2=0.49	607	**668**
Duration of labour (greater than 12 hrs)	1.25	P1=0.036 P2=0.01	601	661

Where p1=survival probability of exposed

P2= survival probability of non-exposed

❖ Since the sample size of the first objective is smaller than the sample size of the second objective, the larger sample size (668) which is calculated by second objective (factors) was taken.

4.7 Sampling technique

All 10 hospitals were selected. The sample size of each Hospital was proportionally allocated. The sampling interval of each hospital was calculated by dividing the number of eligible study participants by the allocated sample size of that Hospital. Finally, participants were selected using a systematic random sampling technique at every K^{th} interval for all Hospitals by starting selection of the first participant by lottery method and subsequent participants were included randomly based on K^{th} interval

Sampling procedure

The last three years North shoa zone hospitals gave delivery service for =38742

Proportional allocation of samples for Hospitals

DBCSH 12,129   DSPH 2788   SRPH 4,020   ATPH 4,155   MPH 1791   MGH 3555   MWPH 1233   EGH 3129   DPH 2949   APH 1239

Selected by using SRS/every **K**

668
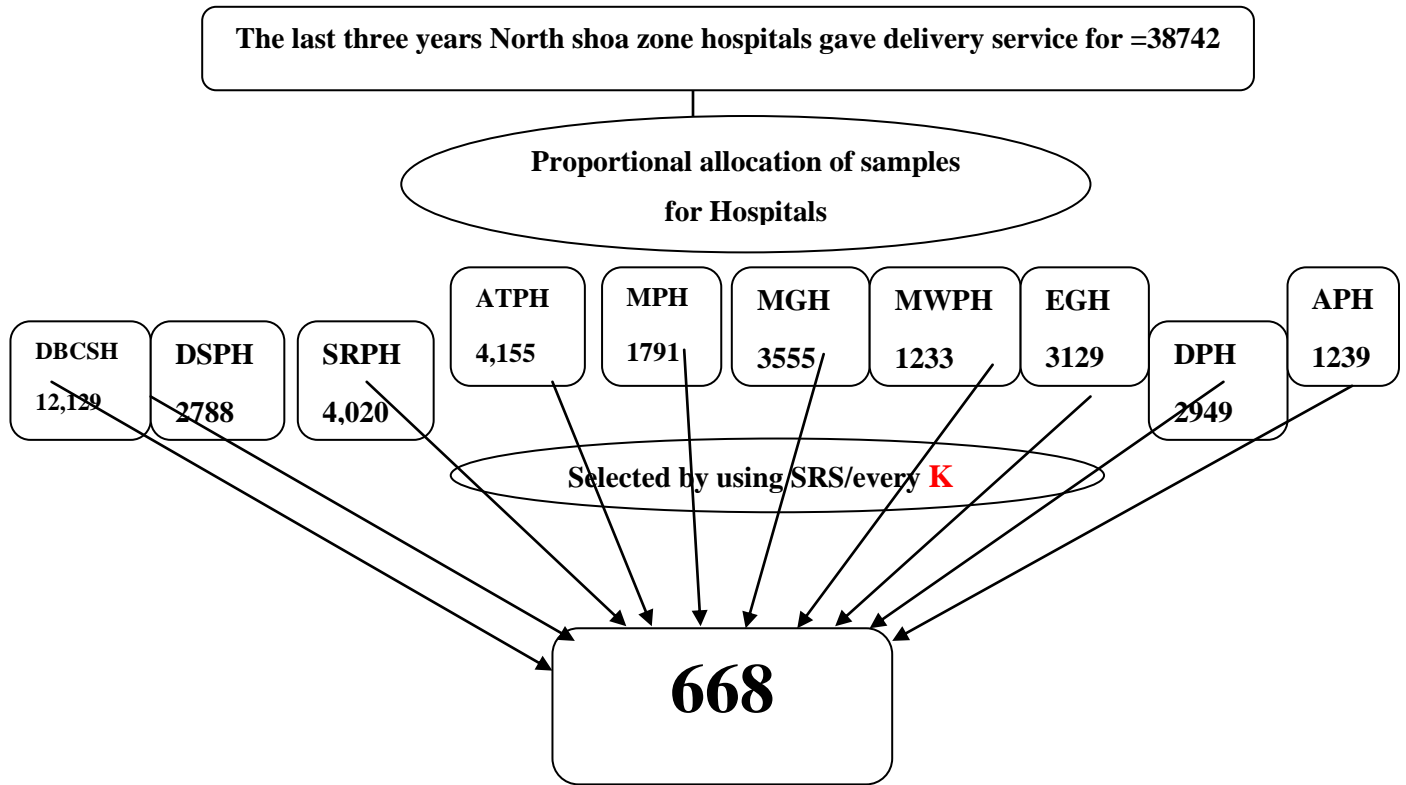
Figure 2*: Schematic presentation of sampling procedure on time to recovery and predictors of sever preeclampsia mothers during pregnancy and post partum period in north shoa zone Amhara region Ethiopia 2023 G.C*

4.8 Data collection methods

The data were collected by five trained professional midwives through a document review with a checklist. The checklist was prepared in English after a thorough literature review of previously validated published studies and it contains four parts: socio-demographic characteristics, obstetrics history, maternal complication, and drugs related factors. Finally, the English version applied to collect the data from the patient's medical records and registration books to extract the necessary information. The reliability of the tool assessed by conducting a pretest in Hakim Gizaw Hospital and content validity was ensured., finally, the extraction tool was modified based on feedback from the pre-test result

The time from the diagnosis of pre-eclampsia with severe feature was the starting point for retrospective follow-up and the endpoint is the date of recovery, the date of loss to follow-up or censored (withdrawal, referred, or against medical treatment), or the date of death.

All pre-eclampsia with severe feature charts admitted to the North Shoa Zone public hospitals from April 12, 2020, to April 1st, 2023, were checked from the HMIS registration book and medical records. The records of all study participants were selected according to the eligibility criteria. recovery was confirmed by a summary note complemented by registration and was identified by their medical record number.

4.9 Study Variables

Dependent variable

Time to recover from severe pre-eclampsia

Independent variable

Sociodemographic factors

- Age
- Residence
- Education status
- BMI

Maternal drug exposure

- Anti-hypertensive drug
- Anti-convulsion drug

Pre-existing medical & obs factoers

- DM

- Chronic HTN
- Previous abortion
- Previous P/E
- Previous hx of GHN

Obstetrics History

- Gestational age at the Onset

- Type of pregnancy

- Weight gain during P_X

- Multiple px

- congenital malformation

- Parity

- Gravidity

- ANC visit

-

4.10   Operational definitions

Recovery: Pregnant and postpartum mother discharge from the hospital with improvement as declared by the physician or any other legitimate health professional on themother chart.

Time to recovery (survival time/ time-to-event): Measures the follow-up of time from a defined starting point/from admission   or diagnosis of severe pre-eclampsia to recovery (occurrence of the event).

Starting time: Time of diagnosis with pre-eclampsia with severe featue .

End time: Time of discharge of the patient/last record on the patient chart.

Follow-up time; From the time of admission of mothers diagnosed with severe preeclampsia until either an event or censorship occurs

Censored: Lost to follow-up, died, and referred cases

4.11 Data quality control

Data quality was assured by designing proper data extraction tools. The adapted data extraction tools were prepared in English. Experts in the clinical and academic area were involved to evaluate the content of the check list.

Data extraction forms were checked before data collection by conducting a pretest on 5% of the study samples in 33 before starting the actual study period and necessary corrections were done. The two-day training given to data five collectors and three supervisors regarding the purpose of the study and the correct completion of the checklist and ethical considerations. Completeness of the collected data checked onsite daily basis during data collection and give prompt feedback by the supervisor and the principal investigator. Besides this, the principal investigator carefully entered and thoroughly clean the data before the commencement of the analysis.

4.12 Data Processing and Analysis

The Collected data were entered Epidata version 4.6 and exported to STATA 14 for data analysis. In this study, the outcome/variable of interest was the time until the mother recovered from severe symptoms of preeclampsia. Therefore, survival analysis is used to estimate survival and/or risk functions from survival data, to compare survival and/or risk functions, and to evaluate the relationship between explanatory variables and survival time. Kaplan-Meier is used to estimate the distribution of recovery time and observed the experience of recovery time between each group for categorical covariates. The log-rank test was used to compare survival (recovery) experience between two or more groups. To determine the determinants of recovery time, semi-parametric (Cox proportional hazard) and parametric methods were used. Factors significantly related to the outcome variable in the single covariate analysis at p-values less than 0.25 were included in the multivariate analysis and statistically significant associations were measured by the risk ratio. adjusted risk (AHR) with a 95% confidence interval at p-values less than 0.05

 Goodness-of-fit (GOF) was checked both statistically and graphically using the Cox Snell residuals plot to assess the assumption of the Cox proportional hazard model. Schoenfeld residuals proportional hazard assumption test for each covariate and the global test were used.

4.13 Ethical considerations

Ethical clearance was obtained from IRB of AWHSC and an official letter of cooperation was obtain for each selected North Shoa Zone Hospital from Deber-Berhan University Aserat Woldeyese Health Science campus.

In addition, the study's objectives were explained to hospital administrators, and authorization to perform the study was given. The retrieved data was kept in absolute confidence, and the study's confidentiality was protected by omitting names as code.

4.14 Dissemination of the result

Different strategies will be used to disseminate the information that is confirmed in the resulting paper. The result of this study would be circulated among groups or sectors who extremely participated in the implementation of health programs so that the recommended solution would be put into action in the desired manner.

It would be submitted to Debre Birhan University, Asrat Woldeyes Health Science campus, North Shoa Zonal health department, in the form of a written report. An effort will be made to publish in scientific and well-known journals to share the findings with others and will be present the findings of the study in seminars and conferences.

5. Result

In this study 642 women's chart diagnosis with preeclampsia with severe features were reviewed during the study period, in north shoa zone public hospitals. All the 642 participants had fulfilled the inclusion criteria of the study with a response rate of 96.14% and the remaining 26 women's charts were incomplete and considered as non-response rate, 24 were censored (4 women died, 11 were lost to follow-up, 9 referred).

Socio-Demographic Characteristics

The median age of the mothers with preeclampsia with severe features was 30years (inter-quartile range (IQR) = 23-35). Nearly three-fourths (72.27%) of the mothers were from rural residency. The occupational status of the mother was 63.86, 36.14 unemployed, and employed respectively. The majority of women who participated in this study were married.(table 2)

Table 2: *Socio-demographic characteristics of women admitted at public hospitals in the North Shoa zone from April 2020 – April 2023(N=642).*

Variable	Category	Frequency %	Survival status	
			Censored (%)	Recovered (%)
Age	16-19	32 (4.98%)	1(4.17%)	32(5.02%)
	20-14	156 (24.30%)	15(62.50%)	141(22.82%)
	25-29	118 (18.38%)	0	118(19.09%)
	30-34	148 (23.05%)	5(20.83%)	143(23.14%)
	35-39	103 (16.04%)	2(8.33%)	101(16.34%)
	≥40	85 (13.24%)	1(4.17 %)	84(13.59%)
Residence	Urban	178(27.73%)	5(20.83%)	173(27.99%)
	Rural	464(72.27%)	19(79.17%)	445(72.01%)
Marital status	Unmarried	96(14.95%)	9(37.50 %)	87(14.08%)
	Married	428(66.67 %)	14 (14.95%)	414(66.99%)
	Separated	65(10.12 %)	1(4.17%)	64(10.36%)
	Divorced	28(4.36%)	(%)	28(4.53%)
	widow	25(3.89%)		24(4.05)

			Survival Status	
Occupation	Employed	232(36.14%)	2(8.33%)	230(37.22%)
	Unemployed	410(63.86%)	22(91.67%)	388(62.78%)

Maternal current obstetrics characteristics

Among 642 mothers, 584 (90.97%) of them had two or more ANC follow-ups at nearby health institutions. From the study, the majority of mothers who develop preeclampsia with severe features occurred during pregnancy accounted for 407 (63.40%) & of these , and 389 (62.94%) of them recovered. Of all mothers included in the study, 61(9.50%) of mothers had delivered multiple newborns. (Table3).

Table 3: *Obstetric characteristics of women with pre-eclampsia with severe features admitted at public Hospitals in North Shoa Zone from April 2020 – April 2023(N=642).*

Variable	Category	Frequency (%)	Survival Status	
			Censored (%)	Recovered
Parity	Nulliparous	139(21.65%)	12(50.00%)	127(20.55%)
	primipara	86(13.40%)	1(4.17%)	85(13.75%)
	multipara	329(51.25%)	11(45.83%)	318(51.46%)
	grandmultipara	88(13.71%)		88(14.24%)
Gestational age *(week)*	<33weks	279(43.46%)	14 (58.33%)	265 (42.88%)
	34-36	138 (21.50%)	4 (16.67%)	134 (21.68%)
	>=37	225 (35.05 %)	6(25.00 %)	219(35.44 %)
ANC follow *Up*	Yes	584(90.97%)	24 (100.00%)	560 (90.61%)
	No	58 (9.03 %)	0 (0.00%)	58 (9.39%)
Numbers of FANC	1 visit	22(3.43%)	5 (20.83%)	17 (2.75%)
	2 visit	43 (6.70%)	6 (25.00%)	37 (5.99%)
	3 visit	154 (23.99 %)	4 (16.67%)	150 (24.27%)
	>4 visit	423 (65.89%)	9 (37.50 %)	414 (66.99%)
HDP	Yes	193(30.06%)	7 (29.17%)	186 (30.10%)
	No	449(69.94%)	17 (70.83%)	432 (69.90%)
Numbers of pregnancy	Single	581 (90.50%)	21 (87.50%)	560 (90.61%)
	Multiple	61 (9.50%)	3 (12.50%)	58 (9.39%)
Time of onset of	Pregnancy	407 (63.40%)	18 (75.00%)	389 (62.94%)

pre-eclampsia	Postpartum	235 (36.60%)	6 (25.00%)	229 (37.06%)
Gestational DM	Yes	9 (1.40%)	1 (4.17%)	8 (1.29%)
	No	633 (98.60%)	23 (95.83%)	610 (98.71%)

Management approaches characteristics

All mothers are managed based on the national guidline. For controlling convulsions all mothers were given anticonvulsant medications. About 625(97.35 %) of pre-eclampsia mothers managed with magnesium sulphate while the rest took diazepam as an anticonvulsant medication. For controlling hypertension 470(73.21%) of women given hydralyzine antihypertensive while the 172(26.79%) did take nifedipine as antihypertensive medication

Table 4:*management approaches characteristics of women with pre-eclampsia with severe feature admitted at public Hospitals in North Shoa Zone from April 2020 – April 2023(N=642).*

Variable			Survival Status	
	Category	Frequency (%)	Censored	Recovered
Antihypertensive	Nifidipine	172(26.79%)	14.17	171(27.67%)
drug	Hydralizine	470(73.21%)	23(95.83)	447(72.33%)
Anticonvulsant	MgSO$_4$	625(97.35 %)	24 (100.00%)	601(97.25%)
drug	Diazepam	17 (2.65 %)	0(0.00 %)	17 (2.75%)

Maternal pre-existing characteristics

Among the total mothers enrolled in this study, 8(1.25%) mothers had Chronic diabetes malitus , 27(4.21%) had Chronic hypertension, and 135 (21.03%) mothers had previous pre-eclampsia, of which 132 (21.36 %) mothers recovered. Furthermore, 80 (12.46 %) of mothers have a history of previous abortion, and 13 (2.02%) mothers had a History of previous asthma. (Table 5)

Table 5: *maternal pre-existing characteristics of women with pre-eclampsia with severe features admitted at public Hospitals in North Shoa Zone from April 2020 – April 2023(N=642).*

Variable	Category	Frequency (%)	Survival Status Censored	Recovered
Chronic DM	Yes	8 (1.25%)	1 (4.17%)	7 (1.13%)
	No	634 (98.75%)	23 (95.83%)	611(98.87%)
Chronic HTN	Yes	27(4.21%)	1 (4.17%)	26 (4.21%)
	No	615 (95.79%)	23 (95.83%)	592 (95.79%)
Previous pre-eclampsia	Yes	135 (21.03%)	3 (12.50%)	132 (21.36 %)
	No	507 (78.97%)	21 (87.50 %)	486 (78.64 %)
previous | asthma	Yes	25(3.89%)	1 (4.17%)	24 (3.88%)
	No	617 (96.11%)	23 (95.83%)	594 (96.12%)
Previous renal Disease	Yes	13 (2.02%)	1 (4.17%)	12 (1.94%)
	No	629(97.98%)	23 (95.83%)	606 (98.06%)
HIV status	Reactive	107(6.67%)	7(29.17%)	100(16.18%)
	non-reactive	535(83.33%)	17(70.83%)	518(83.82%)

Survival status of mother with pre-eclampsia with severe features admitted to north Shoa zone public Hospital.

The overall median hospital stay was 6 days (IQR: 4, 8) with a minimum and maximum follow-up time of 1 and 20 days respectively. The overall proportion of recovered from preeclampsia with severe feature was 618 (96.26 %). Among 24 censored preeclampsia women, 4(0.62 %) were discharged with improvement, 11(1.71 %) were discharged against medical treatment, and 9 (1.40 %) were referred to other health institutions. (Figure 3).
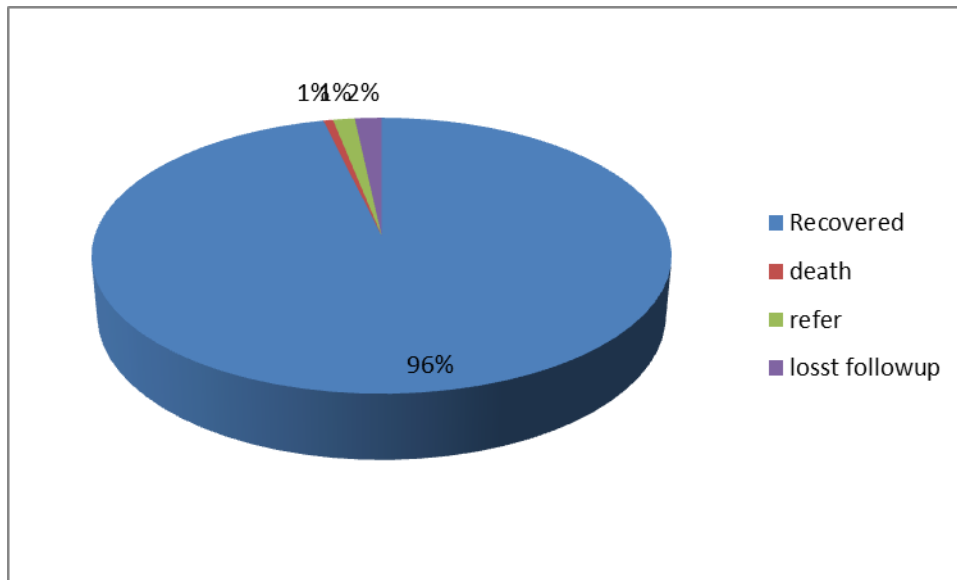
Figure 3: Outcome of preeclampsia with severe features admitted to public hospitals at North Shoa Zone Hospital, Ethiopia, April 12th, 2020 – April 12th, 2023

Kaplan-Meier survival recovery estimates of preeclampsia with severe feature

The overall Kaplan Meier estimates identified that the probability of recovery of patients admitted with preeclampsia with severe features is high on the five days of admission, which relatively decreases as follow-up time increases. The overall median recovery time of admitted mothers with preeclampsia with severe features in this study was 6 (IQR: 4, 8) days. During the second day, tenth day, and at the end of follow up of hospital stay, 93.6%, 14.7%, and 2.02% recovery probability were observed respectively. At half of the study follow-up day, the probability of recovery was also found to be 37.9% with (95%CI: 0.33,0.42). The overall study follow-up of the recovery probability was also found to be 2.02% with (95%CI: 0.008 0.04) (Table 8) (figure 4).

Table 6: A life table showing survival probability to the recovery of mother admitted to selected public hospitals in North Shoa, Amhara Region, Ethiopia, April 12th, 2020 – April 12th, 2023

Interval	Total	Recovery	Cencered	Survival	Std Error	[95% Conf.	Int.]
2 - 3	642	49	2	0.9236	0.0105	0.9	0.94
3 - 4	591	86	0	0.7892	0.0161	0.756	0.82
4 - 5	505	139	15	0.6687	0.0197	0.529	0.61
5 - 6	351	58	1	0.4746	0.0199	0.435	0.51
6 - 7	292	97	1	0.3167	0.0187	0.28	0.35
7 -8	194	59	0	0.2204	0.0167	0.189	0.25
8 - 9	135	22	1	0.1843	0.0156	0.155	0.22
9 - 10	112	21	0	0.1498	0.0144	0.123	0.18
10 - 11	91	21	0	0.1152	0.0129	0.091	0.14
11 - 12	70	11	0	0.0971	0.012	0.075	0.12
12 - 13	59	20	0	0.0642	0.0099	0.047	0.09
13 - 14	39	18	0	0.0346	0.0074	0.022	0.05
14 - 15	21	1	0	0.0329	0.0072	0.021	0.05
18 - 19	20	0	3	0.0329	0.0072	0.021	0.05
19 - 20	17	6	0	0.0213	0.006	0.012	0.04
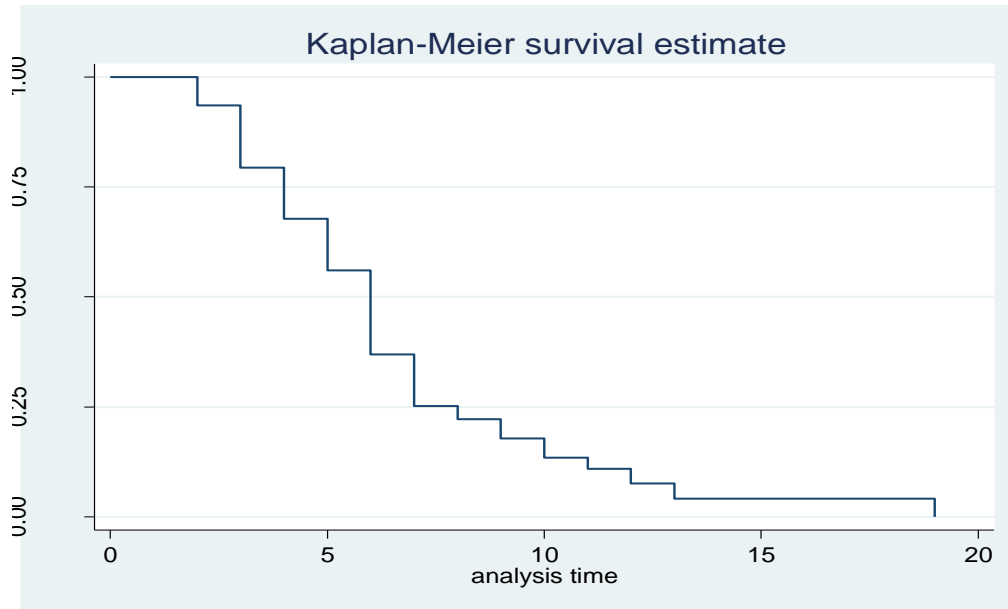
Figure 4:Overall Kaplan-Meier estimates of study participant that was admitted to selected public hospitals in North Shoa, Amhara Region, Ethiopia, April 12th, 2020 – April , 2023

Survival function and comparison of survivorship functions for different categorical variables

The Kaplan-Meier estimator survival curve gives the estimate of survivor function among different categories to make a comparison. Survivorship function line lying below another means, groups defined by the lower line curve has better recovery than other group line curve within the category. To test the equality of survival curves log-rank test was performed. The test statistics which is obtained from the log-rank showed that there is a statistical difference to test the null hypothesis, which shows there is a difference in the distribution of survival times among categorical variables (table 9).

In this study, women with preeclampsia with severe features who have no ANC follow-up have longer recovery time with median days of 11(95% CI: 10, 13) as compared to women who had more than two ANC visits 6 (95% CI: 6, 6). At the end of follow up the recovery probability of women who have and have not had ANC visit was found to be 0.00% and 1.71 % respectively. The difference was statistically significant with a p-value of 0.001 (figure 5).
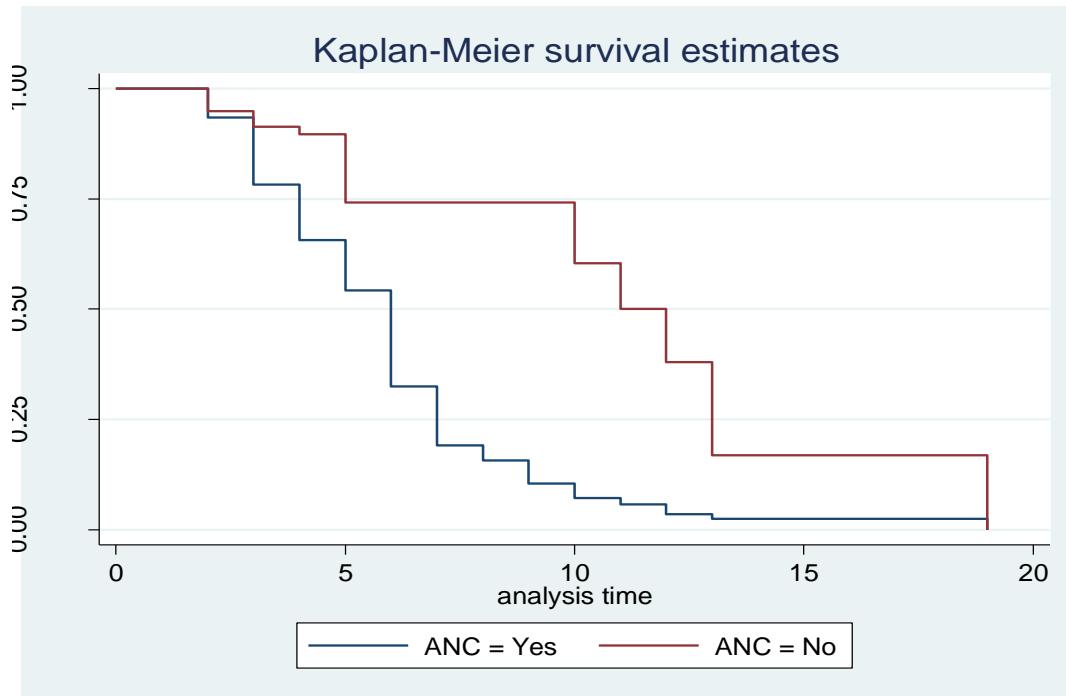
Figure 5: *The Kaplan-Meier survival curve compares the survival time of category of ANC follow-up for participants admitted with preeclampsia with severe features in the selected public hospitals in North Shoa, Amhara Region, Ethiopia,* **April 12th, 2020 – April 12th, 2023**

This study revealed that those participants treated with magnesium sulphate used in the management of convulsion in women with preeclampsia with severe features at admission time had faster recovery time with median days of 6 (95% CI: 5, 6) as compared to those treated by diazepam with median days of 13(95% CI: 4, 5). At the end of follow up the recovery probability of magnesium sulphate and diazepam was found to be 2.94% and 12.32% respectively. The difference was statistically significant with a p-value of 0.00001 (figure 6).
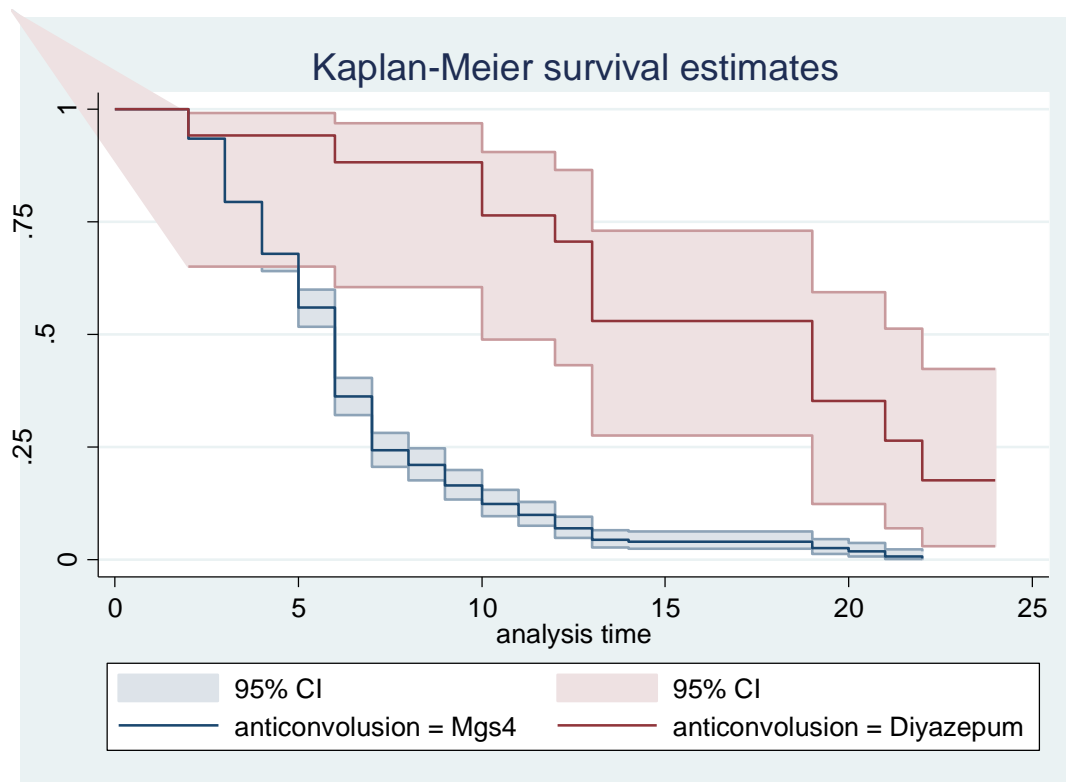
Figure 6: *The Kaplan-Meier survival curve compares the recovery time of the category of anti convulsant admitted with preeclampsia with severe feature in the public hospitals in North Shoa, Amhara Region, Ethiopia, April 12th, 2020 – April 12th, 2023*

Table 7: *Median survival time and log-rank test for equality of survivor function among preeclamptic mothers with severe features admitted to selected public hospitals in North Shoa, Amhara Region, Ethiopia, April 12th, 2020 – April 12th, 2023.*

Categorical Variable	Category	Median	Log-rank test(Chi^2)	P-value
Referral	Yes	6(6,6)	**8.65**	**0.0033**
	No	5(5,5)		
Age	16-19	5(4,)	**29.54**	**0.000**
	20-24	6(6,6)		
	25-29	6(4,6)		
	30-34	6(5,6)		
	35-39	5(5,6)		
	≥40	6(6,6)		
Residence	Urban	6(5,6)	**3.96**	**0.0465**
	Rural	6(6,6)		
Marital status	Unmarried	6(6,6)	**17.96**	**0.0013**
	married	5(5,6)		
	Separated	7(7,7)		
	Divorced	7(4,7)		
	Widowed	6(2,7)		
	Employed	6(6,6)	**2.66**	**0.1032**
	Unemployed	6(5,6)		
Parity	nulipara primipara	6(5,6)	**3.05**	**= 0.3841**
	multipara	6(6,6)		
	grandmultipara	6(5,6)		
		6(5,6)		
Gestational age	≤ 33weks	6(6,6)	**= 5.22**	**0.0735**
	34-36	6(5,7)		
	> =37	6(5,6)		

ANC follow up	Yes	6(5,6)	**62.56**	**0.0000**
	No	11(10,13)		
Number of ANC visit	< 2	6(5,)	**0.40**	**0.5245**
	>3	6(6,6)		
Numbers of pregnancy	Single	6(6,6)	**1.40**	**0.2371**
	Multiple	6(6,7)		
Duration of labor	Yes (>12 hrs.)	6(5,6)	**2.09**	**0.1487**
	No (<12 hrs.)	6(6,6)		
Fetal malformation	Yes	8(8,)	**0.03**	**0.8688**
	No	5(4,6)		
Gestational DM	Yes	9(7,11)	**21.96**	**0.0012**
	No	6(6,6)		
Antihypertensive	Hydralazine	4(4,5)	**45.50**	**0.0000**
	Nefidipine	5(6,6)		
Anticonvulsive	MgSO4	6(6,6)	**41.74**	**0.0000**
	Diazepam	12(12,)		
Chronic DM	Yes	7(6,6)	**45.50**	**0.0000**
	No	6(6,)		
Chronic HTN	Yes	7(6,9)	**1.85**	**0.1737**
	No	6(6,6)		
Previous pre-eclampsia	Yes	6(6,7)	**1.04**	**0.3089**
	No	5(5,6)		
previous | asthma	Yes	7(5,7)	**2.88**	**0.3897**
	No	5(4,6)		
Previous renal Disease	Yes	6(6,)	**1.59**	**0.2678**
	No	6(6,6)		

5.9 Factors associated with preeclampsia with severe feature recovery

Cox proportional hazard regression model was used to analyze the relationship between variables and their effect on the recovery time. Bivariate analysis was performed using Cox proportional hazard regression to identify which variable had an association with time to recovery from preeclampsia with severe features. Variables like residence, occupation, presence of ANC follow-up, numbers of ANC visits, the onset of preeclampsia, maternal MUAC, the occurrence of gestational DM, use of antihypertensive drug, use of anti-convulsion, chronic hypertensive, gestational age, and maternal age were statistically significant with a p-value of 0.25 were predictors of maternal recovery time to preeclampsia with the severe feature. Therefore, all covariants which had an association with the outcome variable with a p-value of 0.25 or less were entered into the multivariable model.

Multiple Cox regressions model was performed for those identified as independent factors in bivariate analysis. Therefore, variables like residence, presence of ANC follow-up, use of antihypertensive drug, use of anti-convulsion, and maternal age category were found to be statistically significant predictors with a p-value of 0.05 or less than for recovery time to preeclampsia with the severe feature.

In multivariate analysis, the result shows that the women admitted to the hospital without referral were 1.67 times shorter recovery time as compared to those referred to nearby health facilities (AHR:1.67 (95% CI: 1.34,2.12). Those preeclamptic mothers who had ANC follow up had a 2.33 faster recovery time as compared to those mothers who had no ANC follow-up (AHR: 2.33 (95% CI (1.67, 3.25).

Type of antihypertensive drug that the mother starts at the time of admission like those treated with magnesium sulphate had a 2.5 times short recovery time as compared to those treated with diazepam (AHR: 2.5 (95% CI: 1.38, 4.60).Those mothers treated with hydralazine to control blood pressure had 50% shorter recovery time as compared to those treated with nifedipine (AHR: 0.50 (95% CI: 0.40, .64). The hazard of recovering faster from pre-eclampsia with the severe feature was about more than 1.93 times among those aged from more than 25 years as compared to teenagers. (Table 10).

Table 8: *Results of the bivariable and multivariable Cox regression analysis among preeclampsia with severe feature women admitted to selected public hospitals in North Shoa, Amhara Region, Ethiopia, April 12th, 2020 – April 12th, 2023*

Predictors	Category	Recovery	CHR(95%CI)	AHR(95%CI)
Referral	Yes		1	1
	No		1.29(1.06,1.58)	1.67(1.34,2.12)* *
residence	Urban	173(27.99%)	1.18(.98,1.43)	1.07(.85, 1.35) *
	Rural	445(72.01%)	1	1
occupation	Employed	232(36.14%)	1.13(.73,1.04)	0.85(0.68,1.05) *
	Unemployed	410(63.86%)	1	1
ANC	Yes	584(90.97%)	2.85(2.09, 3.89)	2.33(1.67, 3.25)**
	No	58 (9.03 %)	1	1
onset	Pregnancy	407 (63.40%)	1	1
	Postpartum	235 (36.60%)	1.1(.976, 1.38)	.97(.70,1.34) *
MUAC	< 23.5	144(22.43%)	1	1
	23.5 -27.5	281(43.77%)	.90(.72, 1.13)	.95(.75,1.2) *
	> 27.5	217(33.80%)	1.14(.91,1.44)	1.25(.97, 1.61)
Gestational DM	Yes	9 (1.40%)	1	1
	No	633 (98.60%)	3.52(1.80,6.87)	1.15 (.91,1.45) *
Antihypertensive drug	Nifedipine	172(26.79%)	1	
	Hydralazine	470(73.21%)	.55(.46,0.67)	.50(.40, .64) **
Anticonvolusion	MgSO$_4$	625(97.35 %)	4.45(2.48,7.97)	2.5(1.38,4.60) **
	Diazepam	17 (2.65 %)	1	1
Chonic hypertension	Yes	27(4.21%)	1	1
	No	615 (95.79%)	1.21(.87,1.67)	1.06(.76,1.48) *
Age	16-19	32(5.02%)	1	1
	20-14	141(22.82%)	1.63(.99,2.68)	1.5190
	25-29	118(19.09%)	2.68(1.61,4.46)	2.59(1.45,4.62) **
	30-34	143(23.14%)	1.99(1.2,3.29)	2.36(1.35,4.15) **

	35-39	101(16.34%)	1.76(1.06, 2.93)	1.93(1.07,3.46) **
	≥40	84(13.59%)	2.14(1.27,3.60)	2.16(1.21,3.85)**
Gestational age	<33weks	279(43.46%)	1	
	34-36	138 (21.50%)	1.10(.87, 1.38)	1.03(.80, 1.33) *
	>=37	225 (35.05 %)	1.22(1.00, 1.49)	1.08(.79,1.46) *

Note: * Significant at (p-value <0.25),** significant at (p value<0.05), 1=reference group

5.10 Test of proportional hazard assumption

 In this study goodness-of-fit (GOF) was checked both statistically and graphically using the Cox Snell residuals plot to assess the assumption of the Cox proportional hazard model. Schoenfeld residuals proportional hazard assumption test for each covariate and the global test were used. If P-value is <0.05 the assumption is rejected. The table below shows each covariant P-value is >0.05 and the global test P-value is 0.5439, the result shows proportional hazard assumption was met (Table 9). All covariates for model assumption were checked using Cox-Snell residuals. For the residuals test, the hazard function follows 45° close to the baseline hazard, which indicates that the model was well-fitted.

Table 9: *Schoenfeld residual test for proportional assumption of each covariant and overall Cox proportional hazard model*

| Covariant	Rho	Chi^2	Df	P-value
URRI	-0.01192	0.07	1	0.7854
Asthma	0.02843	0.43	1	0.5125
Previous preeclampsia	0.01398	0.09	1	0.7585
PreviousGTN	0.00538	0.01	1	0.9058
chonicHTN	-0.06651	2.28	1	0.1308
ChronicDM	-0.06662	2.28	1	0.1311
Fetal malformation	0.01964	0.20	1	0.6512
Prolonged labour	-0.00141	0.00	1	0.9738
Neonatalsex	-0.00791	0.03	1	0.8525
Onset	0.01673	0.16	1	0.6938
Fetalnumber	0.05679	1.67	1	0.1958
HDP	-0.02271	0.26	1	0.6081
Global test		8.44	12	0.7499
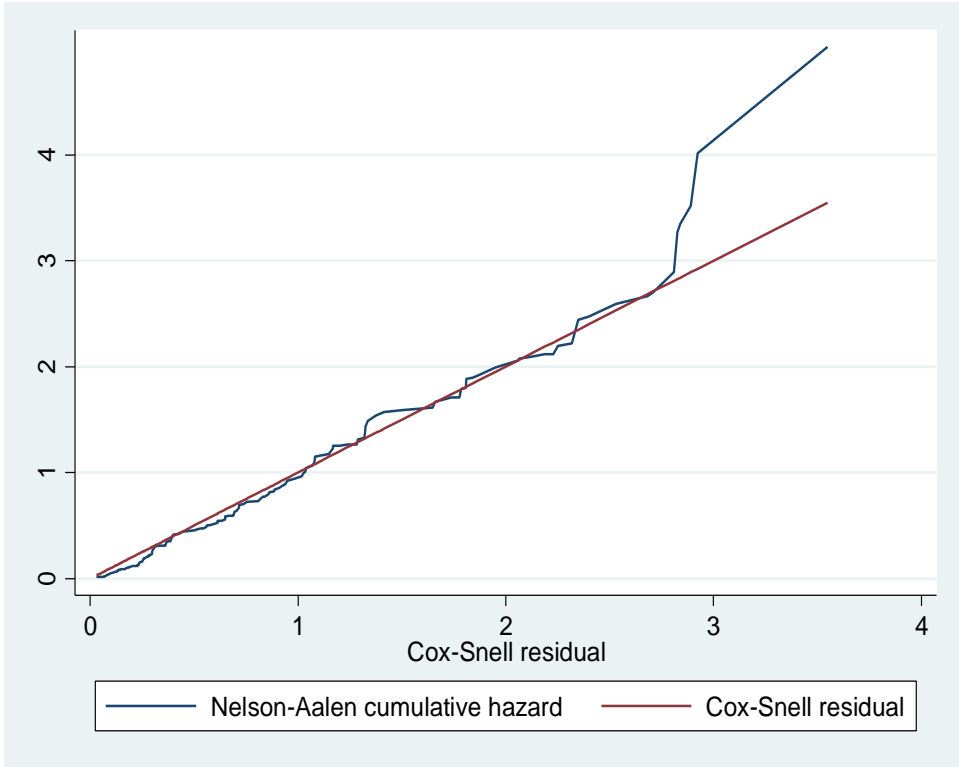
Figure 7*: Cox Snell residual test for proportional assumption of each covariant and overall Cox proportional hazard model.*

6. Discussion

In this study, the overall median recovery time from pre-eclampsia with severe features (first documentation of the diagnosis to discharge from the hospital) in this study was 6 days.

This finding is inline with the study conducted in China, a mean interval of BP normalization of 24.1 ± 22.8 days (median, 7 days)(16) however it is lower as compared with the study done in Uganda, the resolution of hypertension with the mean time recovery of 2.49 weeks (95% CI: 2.13-2.82)(27). But the study was done in Debremarkos on eclampsia showed that the median recovery was half of a day with an inter-quartile range of (1–48 h) (28). It is also lower in the study conducted in Debreberhan; the mean duration of hospital stay for a mother with HDP was 0.86 and 3.62 days before and after delivery respectively(31).

This inconsistency was due to different study areas and source populations (participant is only postpartum mothers, in Uganda and China) and the criteria of recovery may be different in a different country and it is continuously updated due to the generation of new facts. In addition, the result of hypertension disorder during pregnancy does not show the real duration of stay of pre-eclampsia with severe features. This difference also may be due to different study designs and different statistical data summarization methods some of the results express in the median and others in the mean. The mean is greatly affected by the outlier value and the median is much affected by sampling fluctuations so, it is difficult to consider this expression similar.

The rate of recovery from pre-eclampsia with severe features among mothers aged more than 25 years was faster by the hazard of 1.93 and more as compared to teenagers at any time in the follow-up period. It is also consistent with the study on eclampsia, Debremarkos had better recovery aged above 20 except for the age group 30-34 with AHR 0.53 (95% C:(0.28, 1.01) (28).

This might be because the younger the age, the more organs cannot cope with the disease. Meaning, the organs of these young people are somewhat immature and do have not good capacity to cope with the disorder than elders because the survival of a patient depends on the damage level of vital organs.

Type of antihypertensive drug that the mother starts at the time of admission, like those treated with magnesium sulphate 2.5 times short recovery time as compared to those treated with diazepam. (AHR: 2.5 (95% CI: 1.38, 4.60). similarly, a retrospective hospital-based cross-sectional comparative study had

shown a greater proportion of patients in the magnesium sulphate treated group had less than four days postpartum stay as compared to the diazepam-treated patients (83.3%, n=215 versus 66.2%, n=136(43).

This is consistent with the WHO's strong recommendation with high-quality evidence magnesium sulfate is recommended for the prevention of eclampsia in women with preeclampsia with severe features (44). Evidence shows that, even though the mechanism of action of this Mg^{2+} salt is not well understood, the available evidence suggests a beneficial effect of Mg^{2+} for the mother and fetus. The use of Mg^{2+} sulphates is useful in reducing the pathophysiological consequences of preeclampsia with severe (45)

Mothers treated with hydralazine to control blood pressure had a 45% shorter recovery time as compared to those treated with nifedipine (AHR: 0.50 (95% CI: 0.40, 0.64). but a randomized controlled trial on Hydralazine vs nifedipine for acute hypertensive emergency in pregnancy revealed that both intravenous hydralazine and oral nifedipine are equally effective in lowering of blood pressure in acute hypertensive emergency pregnancy*(46)*. On the contrary, the time required for reduction in systolic and diastolic blood pressure was shorter for the oral nifedipine group (24.0±10.0 min) than intravenous Hydralazine group (34.8±18.8 min) (P≤0.016). Less frequent doses were required with oral nifedipine (1.2±0.5) compared to intravenous hydralazine (2.1±1.0) (P≤0.0005) *(47)*.

This is because, in this study blood pressure is not the only criterion to say the mother is recovered from preeclampsia with severe features (13, 14). It is also may be due to the pharmacokinetic properties of nifedipine such as rapid onset and long duration of action, good oral bioavailability and less frequent side effects, it looks preferable in hypertension emergencies of pregnancy than hydralazine

The women admitted to the hospital without referral were 1.67 times shorter recovery time as compared to those referred to nearby health facilities (AHR:1.67 (95% CI: 1.34,2.12).

Early detection and timely referral for better services can significantly improve the recovery of preeclampsia. However, evidence from a national facility-based survey showed that magnesium sulfate ($MgSO_4$), was a not widely available anticonvulsant compared with Diazepam and magnesium sulfate was more available in private for-profit facilities compared with public facilities. Nearly one-third of healthcare providers were not trained to administer $MgSO_4$ intravenously.(48). There is a significant relationship between travel time to referral hospitals and preeclampsia-related maternal mortality. This

means the longer the distance from the place of the woman reffered to the hospital her chance of survivalwas low *((49)*. The case fatality rate of HDP was among the highest in the world and a delay in initiation of treatment because of a delay in health care-seeking contributed to the majority of maternal deaths*(40)*.

Those preeclamptic mothers who had ANC follow up had faster recovery time as compared to mothers who had no ANC follow-up AHR: 2.33 (95% CI (1.67, 3.25). similar study mothers with less than 4 times of antenatal visits were at greater odds of being died from preeclampsia as compared to those who had four or more antenatal visits (OR = 4.648, CI; 1.776 –12.167*(49)*.

7. Strength And Limitations

Since the study was a retrospective follow-up in nature, missing variables were there and many variables are out of the analysis because of incompleteness such as maternal educational status, maternal nutritional, cigarette smoking & chat chewing and family income, maternal delay, alcohol consumption, BMI before pregnancy, laboratory findings were missed from the study.

The start time of the follow-up was the time of diagnosis of the patient as pre-eclampsia and documented and therefore, this may reduce the duration of recovery time because of either late diagnosis or late documentation.

Since I cannot get similar study findings, discussion in comparison with other studies not yet done by similar studies. I try to discuss with researchers other study design

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8. Recommendations

For health workers working in maternity ward:

It is better to focus on the prevention, early diagnosis, and appropriate management of preeclampsia with severe features. Counsel the mother about dangerous signs during ANC to seek medical care early and refer urgently to the hospital to avoid delay in reaching.

Use magnesium sulphate to control and prevent convulsion instead of diazepam, and hydralazine for the management of hypertension.

Researcher

Conduct a prospective cohort study to determine the effect of important determinants like maternal educational status, maternal nutrition, cigarette smoking & chat chewing and family income, maternal delay, alcohol consumption, BMI before pregnancy, and laboratory findings were missed from the study.

Government

Avail all essential supplies, medications, and referrals required and provide refresher training to healthcare providers on screening, diagnosis, and management of preeclampsia with severe features continuous supervision should be provided

9. Conclusion

The overall probability of recovery time in a mother's diagnosis of preeclampsia with feature 6(IQR 4,8), at 20 days of follow-up. Significant predictors of maternal recovery after a diagnosis of preeclampsia with severe features were; age, referral status, antihypertensive anticonvulsant drug, and presence of ANC follow-up. The measures used to increase the recovery rate need to be enhanced

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11. ANNEX

I. Extraction tool (Checklist)

S. No		Check List	
Socio Demographic Data			
001	Referral	1. Yes 2. No	
001.1	If Yes, from where?	Health center Primary hospital Private clinic Other, (specify)_____ (probably from Health post or the community, etc)	
002	Age(in years)		
003	Address:	Urban Rural	
004	Education level:	unable to read and write Elementary Secondary College and above	
005	Marital status:	Married, Single (unmarried, divorced, widowed)	
006	Occupation:	Employed Unemployed	
007	Maternal HIV status	Reactive Non-reactive	
08	Blood group and Rh		

Obstetric History			
09	Current pregnancy history	Gravidity	
		Parity	
10	Gestational age in weeks		
11	Antenatal care follow up	Yes	
		No	
12	If yes how many?		
13	Previous history of HDP	Yes	
		No	
14	Number of fetus	pregnancy	
		Twin (multiple)	
15	Time of on set of pre-eclampsia	Pregnancy	
		Postpartum	
16	If postpartum, neonatal sex	Male Female	
17	Weight gain during pregnancy		
18	**BMI during pregnancy**		
19	Prolonged labour(duration of labour > 12 hrs)	Yes No	
20	Fetal malformation	Yes No	
21	Neonatal sex		
22	Gestationa DM during current pregnancy	Yes No	

Drugs given during current pregnancy

23	Anti-hypertension	Methyldopa	
		Nifedipine	
		Hydralazine	
24	Anti-convulsion	Mgso4	
		Diazepam	

Pre-existing medical or obstetrics factors

25	• DM	Yes	
		No	
26	• Previous hx of GHN	Yes	
		No	
27	• Chronic HTN	Yes	
		No	
28	• Previous abortion	Yes	
		No	
29	• Previous P/E	Yes	
		No	
30	Asthma	Yes	
		No	
31	Chronic Renal disease	Yes	
		No	
32	Upper respiratpory tract infection	Yes	
		No	