

# Maternal Outcomes of Severe Preeclampsia / Eclampsia and Associated Factors among Mothers Admitted in Referral Hospitals, North West Ethiopian Context, 2018

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## ABSTRACT

### Objective

Severe preeclampsia/eclampsia is a multi-systemic disorder of pregnancy occurring after 20 weeks of gestation associated with significant maternal morbidity and mortality worldwide. The study's objective was to assess factors associated with unfavorable maternal outcomes of severe preeclampsia/eclampsia, North West Ethiopian context, 2018.

### Methods

Institutional based cross-sectional study was conducted among severe preeclamptic/Eclamptic mothers admitted in Amhara regional state referral Hospitals, Northern part of Ethiopia, 2018. All severe preeclamptic/Eclamptic mothers available during the data collection period were included as a census sampling technique. Bivariate and multivariate logistic regression model was employed. Variables with P-Value <0.05 at 95% CI level was taken as statistically significant. Data were collected with pre-tested and semi-structured questionnaire, entered into Epi-info and exported to SPSS for analysis.

### Results

The study shows that the overall unfavorable maternal outcomes of severe preeclampsia/eclampsia were found to be 37.7% which is tragically high when compared with different previous study findings mentioned in the discussion section. Variables which were positively associated with unfavorable maternal outcomes were: Maternal educational status (AOR= 4.5, 95% CI: 1.95, 12.31), Residence (AOR= 2.1, 95% CI: 1.17, 3.72), Monthly family income (AOR= 2.7 95% CI: 1.25, 6.12), Parity (AOR= 6.7, 95% CI: 1.55, 12.6), History of abortion perceived (AOR= 3.5, 95% CI: 1.63, 7.58), Booking status (AOR= 5.8, 95% CI: 3.15, 9.72) and Time of drug given (AOR= 4.9, 95% CI: 1.86, 13.22).

### Conclusion and Recommendation

This study revealed that the overall unfavorable maternal outcomes of severe preeclampsia and eclampsia are found to be relatively high in Amhara regional state referral hospitals. Improving booking status of pregnant women and timely providing appropriate drugs for severe pre-eclamptic/eclamptic mothers may reduce unfavorable outcomes.

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## Introduction

Preeclampsia is a pregnancy specific syndrome that can affect every organ system. It usually occurs after 20 weeks of gestation and can be diagnosed in the absence of proteinuria if there is evidence of new hypertension and multi-organ involvement (1, 2).

Severe PE is diagnosed when one or more of the following criteria are present: Systolic/diastolic blood pressure  $\geq 160/110$  mm Hg, thrombocytopenia, renal insufficiency, impaired liver function, pulmonary edema or visual loss or cerebral disturbance (3, 4).

Hypertension was the second most common direct cause of maternal death worldwide, an estimated 303,000 maternal deaths occur globally from which hypertension accounts 14%. In developed countries, maternal mortality from hypertension is relatively rare (12.9%), however, in developing regions where approximately 99% of all maternal deaths occur, hypertension accounts 14% of it and also in sub-Saharan Africa including Ethiopia, it accounts 16% maternal death (3, 4).

Worldwide, Preeclampsia affects 8-10% of pregnancies and is a common cause of preterm delivery and also it accounts 20% of all neonatal intensive care admissions. In Africa and Asia, it accounts 10% of maternal death (5). The Ethiopian National Emergency Obstetric and Newborn Care review (EMONC) showed that preeclampsia/eclampsia is the second most common cause of maternal morbidity and third leading cause of maternal mortality (12). It affects 5.47% of pregnancy (6) and severe preeclampsia or eclampsia accounts 10% of maternal mortality (7).

A study conducted in Jimma University Hospital, Ethiopia showed that pregnancy induced

Hypertension (20%) was the second leading cause of maternal death next to hemorrhage (54%) (13)

The Government of Ethiopia in line with WHO and other nongovernmental organizations takes a commitment to reduce maternal mortality through multiple high impact interventions at both facility and community levels to remove bottlenecks such as harmful traditional practices, poor infrastructure, shortage of transportation facilities and inadequate care at health facilities that can hamper access to safe motherhood services (14).

Even though, different health sectors and funding agencies devoted a lot to reduce maternal deaths due to severe preeclampsia/eclampsia is still increasing worldwide (7, 13, 15).

This study, therefore, was conducted to determine the outcomes of severe preeclampsia/Eclampsia by incorporating time of drug initiation in addition to the variables of the previous studies used.

## METHODS

### Study Design and Setting

An institution based cross-sectional study was conducted in Referral Hospitals of Amhara Regional State from, April 1 to

September 30, 2018. This region has a total catchment area population of 17,221,976 of whom 8,641,580 were men and 8,580,396 women and from which urban inhabitants account 2,112,595 (12.27%) of the population (23). This regional state has 67 Hospitals, 839 health centers, and 3336 health posts; among them 5 are Referral Hospitals which include University of Gondar Teaching Referral Hospital, Felege Hiwot Referral Hospital, Dessie referral Hospital, Debremarkos Referral Hospital, and Debrebirhan Referral Hospital. Each Hospital is assumed to be serving for about 5 million catchment populations, have 200-400 beds, 2000-4000 deliveries per year and 5-10 deliveries per day (24, 25, 34).

### Sample Size Determination and Sampling Procedures

Sampling was done based on the 2017 severe preeclampsia/Eclampsia case flows in each study Hospitals. Here were the case flows in 2017 six months prior to the data collection: Dessie Referral Hospital 102, Debre-Markos referral Hospital 138 and Felege-Hiwot 174 cases of the study (34). The sample size we used was the total cases of the three referral Hospitals which was totaled as 414 we added a 10% expected non-response rate which became 456. We used census to get enough sample size and we have gone with data collection until our sample size was saturated from each of the Referral Hospitals according to their case flows.

### Operational Definitions

**Severe preeclampsia:** is a preeclampsia with one of the severity signs (Blood pressure 160/110 or more, severe headache, pulmonary edema, epigastric pain, renal insufficiency, thrombocytopenia, blurring of vision and increased liver enzymes) that occurs at any gestational age after 20 weeks of pregnancy.

**Maternal complication:** complication of the mother due to severe preeclampsia including Abruptio placenta, HELLP syndrome, Acute renal failure, DIC, Pulmonary edema, Death, eclampsia, PPH, aspiration pneumonia (1).

**Favorable maternal outcome:** patient with severe preeclampsia remote from term who managed and improved without any complication (19).

**Unfavorable maternal outcome:** patient with severe preeclampsia remote from term that develops at least one complication (19).

### Data Collection Procedures and Instrumentations

Data were collected using semi-structured questionnaire adapted from similar literatures. The questionnaire was first developed in English and translated to local language, Amharic version then back to English by language experts to keep its consistency. Data collection was done by two data collectors and one supervisor for each hospital. The data collectors were BSC Midwives with previous experiences from nearby health centers and the supervisors were MSc Midwives from respective Referral Hospitals.

## Data Quality Control

Semi-structured data collection tool was utilized and clarity of the tool was tested before the final utilization. The pretest was conducted among 5% of the sample size in Debre Berhan referral Hospital. A one day training was given for data collectors and supervisors regarding the objectives of the study, data collection method and significance of the study. During data collection each data collector was supervised for any difficulties and directions and necessary corrections were provided.

## Data Processing and Analysis

All collected data were rechecked for completeness and coded. Then these data were entered using Epi Info 7.2 software, and exported to SPSS version 23 for cleaning and analysis. Bivariate logistic regression was employed to identify association, and multivariate logistic regression model was used to control the effect of confounders and identify independent predictors.

Variables having P-value less than 0.2 in the bivariate analysis were fitted into the multivariable logistic regression model. 95% confidence interval of odds ratio was computed and variables having P-value less than 0.05 in the multivariate logistic regression analysis was considered to declare statistical significant. Before the actual logistic regression analysis was done, the necessary assumption of logistic regression model was checked by using Hosmer-Lemeshow test of goodness of fit which has a chi-square distribution (P-values > 0.05 was considered as good model fit).

For further analysis, descriptive statistics like frequencies and cross tabulation was performed. Graphical presentation such as bar graph, tables and pie charts were used to present the result of the study.

## RESULTS

### Socio-Demographic Results

A total of 456 cases were included in this study with 100% response rate. The mean age of the participants was 28.3 (SD  $\pm$ 6.5) years. Among these cases, two hundred forty three (53.3%) were preeclamptic with severity features (Table 1).

**Table 1:** Socio-demographic characteristics of women with severe preeclampsia / Eclampsia admitted in Amhara regional state Referral Hospitals, North West Ethiopia, 2018 (n= 456).

Variable	Frequency	Percent
Maternal age		
Age $\leq$ 19	33	7.3
Age 20-35	349	76.5
Age $\geq$ 36	74	16.2
Religion		

Orthodox	347	76.1
Muslim	101	22.2
Protestant	7	1.5
Catholic	1	0.2
Marital Status		
Married	429	94.1
Single	20	4.4
Divorced	4	0.9
Widowed	3	0.7
Educational status		
Unable to read and write	193	42.3
Able to read and write	38	8.3
Elementary school	56	12.3
Secondary school	71	15.6
College and above	98	21.5
Occupational status		
Unemployed	16	3.5
Housewife	281	61.6
private worker	76	16.7
governmental worker	66	14.5
NGO	6	1.3
Student	11	2.4
Residence		
Urban	235	51.5
Rural	221	48.5
Traditional treatment use		
Yes	268	58.8
No	188	41.2
Monthly income	Family	

Income< 70.2 USA dollars	226	49.6
Income 70.2-120.9 USA dollars	95	20.8
Income>120.9 USA dollars	135	29.6

### Obstetrics Characteristics

Two hundred sixty one (57.2%) participants reported that they had more than one history of deliveries. Median gestational age was 38 weeks, which ranged from 21 to 43 weeks. Around 225 (49.4%) respondents' gestational age was found to be between 37-40 weeks. 315 (69.1%) respondents had ANC follow up, 346 (75.9%) had no history of abortion, 292 (64%) with severe preeclampsia and eclampsia were unbooked in the Referral Hospitals of Amhara regional state. Among the study participants: - One hundred seventy two (37.7%), one hundred thirty six (29.8%) and one hundred twenty seven (27.9%) gave birth through the vagina after initiation, SVD and C/S respectively.

### Maternal Outcome of Severe Preeclampsia/Eclampsia

From the total of 456 respondents admitted in Amhara region referral Hospitals for severe preeclampsia and eclampsia management, one hundred seventy two (37.7%) of them end up with unfavorable outcome (Table 2).

**Table 2:** Multiple response analysis showing maternal outcomes of severe preeclampsia and eclampsia among mothers admitted in Amhara Regional state Referral Hospitals, North West Ethiopia, 2018 (n=456).

Maternal outcomes:-	Favorable	284 (62.3%)	
	Unfavorable	172(37.7%)	
Types of unfavorable outcomes (n=172)	Frequency	Percent	
Abruptio placenta	47	27.3	
HEELPS Syndrome	68	39.5	
DIC	31	18.0	
Acute renal failure	95	55.2	
PPH	98	56.9	
Aspiration pneumonia	92	53.4	
Pulmonary embolism	3	1.7	
Pulmonary edema	9	5.2	
Death	1	0.5	

**NB:** Total percentage may be more than 100% because they are not mutually exclusive

### Time of Treatment And Drugs Given

More than half, 267 (58.6%) of the participants had received medications after they developed complications whereas, 181(41.4%) received as soon as severe preeclampsia/eclampsia was diagnosed.

Magnesium sulfate and Methyl dopa were the most frequently administered anti-convulsing and anti-hypertensive, drugs administered for 431 (94.5%) and 395 (86.6%) respondents respectively.

### Variables Associated with Maternal Outcomes of Severe Preeclampsia/Eclampsia

**In crudes analysis:** Maternal educational status, Residence, Monthly family income, Parity, History of abortion perceived, Booking status and Time of drug given were significantly associated.

**In adjusted analysis:** Maternal educational status, Residence, Monthly family income, Parity, History of abortion perceived, Booking status and Time of drug given were the predictor variables (Table 3).

**Table 3:** Both bivariate and multivariate analysis table on the factors associated with severe preeclampsia/Eclampsia among mothers admitted in Amhara regional state Referral Hospitals, North West Ethiopia, 2018 (n= 456).

Variables	Maternal outcomes		COR (95% CI)	AOR (95% CI)
	Unfavorable	Favorable		
<b>Maternal Age</b>				
Age≤19	27	6	3.6(1.33,9.8 0)*	3.9(0.52,29. 47)
Age 20-35	104	245	0.3(0.20,0.5 7)**	1.5(0.37,5.6 7)
Age≥36	41	33	1	1
<b>Educational Status</b>				
Unable to read & write	96	97	6.5(3.38,12. 37)**	4.5 (1.95,12.31)*
Read & write	16	21	5.0(2.07,11. 93)**	4.3 (1.57,11.85)
Elementary school	24	34	4.6(2.10,10.1 0)**	4.0 (1.53,10.76)
Secondary school	23	47	3.2(1.48,6.8 9)*	1.9(0.72,5.1 4)

College & above	13	85	1	1
<b>Residence</b>				
Rural	127	93	5.8(3.80,8.82)**	2.1(1.17,3.72)*
Urban	45	191	1	1
<b>Monthly Family income</b>				
Income <70.2 USA dollars	112	114	7.3(4.07,13.09)**	2.8(1.25,6.12)*
Income from 70.2-120.9 dollars	44	51	6.4(3.31,12.40)**	2.7(1.14,6.46)*
Income >120.9 USA dollars	16	119	1	1
<b>Gravidity</b>				
Premigravida	76	77	2.1(1.42,3.17)**	1.9(0.43,8.30)
Multigravida	96	207	1	1
<b>Parity</b>				
Nully para	50	20	6.5(3.64,11.73)**	6.7(1.55,12.6)*
Premipara	49	73	1.8(1.11-2.75)*	1.7(0.72,3.94)
Multipara	73	191	1	1
<b>History of Abortion</b>				
Yes	70	41	4.1(3.06,8.02)**	3.5(1.63,7.58)*
No	102	243	1	1
<b>Booking Status</b>				
Unbooked	146	146	5.2(3.23,8.55)**	5.8(3.15,9.72)*
Booked	26	136	1	1

<b>When did the drug given</b>				
Late	146	121	7.6(4.68,12.21)**	5.0(1.86,13.22)*
Early	26	163	1	1

Key: \*\*=p-value<0.001, \*=value<0.05, 1=Reference

## Discussion

The study has assessed the maternal outcomes of severe pre-eclampsia/eclampsia and associated factors among the admitted women, North West Ethiopian context. The result shows that out of 456 total cases of severe preeclampsia and eclampsia, one hundred seventy two (37.7%) ended up with unfavorable maternal outcomes which is in line with a study done in Addis Ababa (36%), Ethiopia (21) but lower than a study done in India (59%) (17). It could be due to the health care set up difference.

There was only one maternal death (0.5%) which is lower than studies conducted in

Debre Berhan Referral Hospital (2.5%) (22), India (11.2%) (17) and Haiti (1.9%) (18).

The reason for this difference might be: the time gap as time goes on: health care seeking behavior, access to health institutions and drugs, quality for professionals are likely to increase by which each can contribute for death reduction.

In this study sixty eight (39.5%) respondents developed HELLPs syndrome which is lower than the study done in Addis Ababa, Ethiopia (63.96%) (15) and Tanzania

(50.9%) (27). But this finding was higher than the study done in Mettu Karl Referral Hospital, Ethiopia (12.4%) (28) and Iran (4.9%) (29). It could be due to the health care system differences.

Maternal educational status was one of the predictor variables for severe preeclampsia/Eclampsia outcomes. Women who were unable to read/write were more likely to develop unfavorable maternal outcomes of severe pre-eclampsia/eclampsia when compared with women whose educational statuses were college and above (AOR=4.5, 95% CI: 1.95, 12.31). This finding is supported by other studies done in South East Nigeria (30) and Bangladesh (31). It could be due to the fact that uneducated people's health care seeking behavior is poor.

Maternal residence was another positively associated variable. The rural women were more likely to develop adverse severe preeclampsia and eclampsia maternal outcomes than their counterparts (AOR=2.1, 95% CI: 1.17, 3.72). This is in agreement with studies done in Jimma university Hospital, Ethiopia (32), South East Nigeria (30) and India (19). The

possible reason could be due to the fact that urban women could early and easily access the health institutions.

Monthly family income was also the other predictor variable for the response variable. Women whose family monthly income was less 70.2 USA dollars were more likely to develop the unfavorable outcome when compared with women whose monthly family income was greater than 120.9 USA dollars (AOR= 2.8, 95% CI: 1.25, 6.12) and Respondents whose monthly family income was between 70.2-120.9 USA dollars were also more likely to develop the adverse severe preeclampsia/Eclampsia outcomes compared with those whose monthly family income was greater than 120.9 USA dollars. (AOR=2.7, 95% CI: 1.14, 6.46). This finding is similar with other studies conducted in Bangladesh (31) and India (19). It could be due to those whose family income was poor might be late for the health institutions due to transportation cost.

Parity was an additional predictor variable. Women who did not have previous delivery were more likely to develop unfavorable outcomes when compared with the multiparas women (AOR=6.7, 95%CI: 1.55, 12.6). This finding is in agreement with studies done in South East Nigeria and Pakistan (30, 33). It could be due to the fact that nully para women`s labour and placenta deliveries are usually a little bit longer than the multi para ones and there are supported theories which suggest that the stem of preeclampsia/Eclampsia is placenta. So, the longer the placenta stayed inside, the higher the complication is likely.

History of abortion perceived has also been positively associated with severe preeclampsia/Eclampsia outcomes. Women who had history of abortion perceived were more likely to develop unfavorable outcomes than the counterparts (AOR=3.5, 95%CI: 1.63, 7.58). This finding is in agreement with the studies done in India and Iran (19, 29).

The possible explanation is that abortion may lead to abnormal placentation and release of placental factors that contribute to systemic endothelial dysfunction for the next pregnancy that might maximize the occurrence of unfavorable outcomes.

Unbooking (not registered) in the referral Hospitals has also predicted the severe preeclampsia/Eclampsia outcomes. Those who were un-booked were more likely to develop the unfavorable outcomes when compared with the booked ones (AOR=5.8, CI: 3.15, 9.72). This finding is supported by the study conducted in South East Nigeria (30). It could be due to the fact that the un-booked ones might be delayed for the early treatment and complications could be likely to be developed.

Late administration of the appropriate drugs has positively been associated with the response variable. Women who were provided appropriate drugs lately were more likely to develop than their counterparts (AOR=5.0, CI: 1.86, 13.22). It could be due to the fact that the unfavorable outcomes could be prevented if treated early.

**Limitation of the study:** There might be long term complications of severe preeclampsia/Eclampsia for the mother which our study did not address.

**Abbreviations:** SVD: Spontaneous Vaginal Delivery, C/S: Caesarean Section, HEELP: Hemolysis, Elevated Liver enzymes

and Low Platelet, AOR: Adjusted Odds Ratio, CI: Confidence Interval. DIC: Disseminated Intravascular Coagulation

## Ethical Approval and Consent for to Participate

Ethical clearance letter was obtained from the Ethical Review Committee of Institution Review Board of the University of Gondar.

Region Referral Hospitals and permission of each Hospital was obtained from Hospital administrative. Written permission letter was also received from Hospital managers and ward coordinators in the study set up.

Again before the data collection, written informed consent was obtained from the study participants. The purpose of the study was briefly explained to the mothers independently prior to data collection and they were informed that their participation would purely voluntary with secured confidentiality. Study participants were also informed that they had full right not to participate in or withdraw from the study and the quality of care which they would get would not be affected because of their withdrawal. There was no any participant under 18 years old.

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