Assessment of Maternal Outcome Among Preeclamptic Women at Dilla University Referral Hospital, Dilla Ethiopia

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Abstract: Background: Pre-eclampsia is hypertension in pregnancy after 20 weeks of gestation characterized by blood pressure greater than 140/90 mm Hg, using the Korotkoff phase V sound for the diastolic value, on two occasions 4 hours apart. It is one of a spectrum of pregnancy disorders which result in different complications including maternal death. Methodology: Retrospective cross-sectional study design was employed. A total of 295 samples were recruited and systematic sampling technique was used to select study subjects who were admitted with preeclampsia from January 1, 2016 and December 31, 2018 at Dilla University Referral Hospital. Medical records review was done using pretested data abstraction tool. Data was entered in EpiData version 4.4.2.1 and exported into SPSS (statistical package of social science) version 25.0 for analysis. Binary and multiple logistic regressions were used to identify association between variables. Adjusted odds ratio along with 95% confidence interval was estimated to assess the strength of the association, and a p-value ≤ 0.05 was used to declare the level of statistical significance. Results: In this study 295 medical charts of pre-eclamptic women were reviewed. The most 210 (72.2%) of the participants were between the age of 20-34 years. Severe type of pre-eclampsia was 174 (58.0%). HELLP syndrome was the most common complication of severe preeclampsia 81 (66.6%) followed by DIC, renal failure and liver failure, 25 (20.5%), 9 (7.4%) and 1 (0.8%) respectively. Maternal deaths due to preeclampsia were 6 this gives case fatality of 2%. In multivariable logistic regression, rural residence has 5.038 times more risk of unfavorable maternal outcome [AOR=5.038, 95%CI 1.971-12.879], gestational age ≤33 weeks has 3.67 times higher risk of unfavorable maternal outcome [AOR=3.67, 95%CI 1.829-7.364] and admission of women with diagnosis of severe preeclampsia has 6.42 times higher risk of unfavorable maternal outcome [AOR=6.42, 95%CI 2.017-21.103]. Conclusion and recommendation: Although there was current envisaged on maternal health improvement, this study has shown that maternal complications were common among pre-eclamptic women. The most common maternal complications due to preeclampsia were HELLP syndrome, DIC and renal failure. Health care professionals specially who work at PHC center should take appropriate trainings on immediate management and counseling a women coming for ANC and prompt referral for preeclampsia women with severity sign.

Keywords: Preeclampsia, Maternal Outcome, Maternal Death, Ethiopia

1. Introduction

Pre-eclampsia is HDP after 20 weeks of gestation usually diagnosed as mild preeclampsia when blood pressure measured at least 140 mm Hg (systolic) or at least 90 mm Hg (diastolic) on at least two occasions and at least 4–6 h apart and excretion of 300mg of protein in a 24-hour urine collection, alternative to a urine protein (mg/dL)/creatinine ratio (mg/dL) ≥ 0.3 has good sensitivity (98.2%) and specificity (98.8%) in women known to be normotensive before 20 weeks of gestation and regarded as severe if there are sustained rises in blood pressure to at least 160 mm Hg (systolic), at least 110 mm Hg (diastolic) and proteinuria (≥5 g/24 hours or ≥3+ on two random samples 4 hours apart) with manifestations of end-organ disease: oliguria (<500 mL
in 24 hours), cerebral or visual disturbances, pulmonary edema, cyanosis, epigastric or right-upper quadrant pain, impaired liver function, thrombocytopenia [1, 2].

Globally, the MMR fell by nearly 44% over the past 25 years, to an estimated 216 maternal deaths per 100,000 live births in 2015, from an MMR of 385 in 1990 with annual decrease of maternal deaths by 43% from 532 000 in 1990 to an estimated 303 000 in 2015. However, in developing regions account for 99% (302 000) of the global maternal deaths in 2015, with sub-Saharan Africa alone accounting for roughly 66% (201 000), followed by Southern Asia (66 000) [3]. Thus hypertension was the second most common direct cause worldwide after hemorrhage by 14% of maternal death [4]. One third of all pregnancy-related deaths are due to complications of preeclampsia at a rate of 1.5/100,000 live births. Approximately 40% of these deaths are attributable to cerebrovascular events caused by preeclampsia. Early-onset preeclampsia increases the risk of fetal death, perinatal death and severe neonatal morbidity [5].

The risk of getting maternal preeclampsia and pregnancy induced hypertension were higher in Sub-Saharan African countries the only exception being Australia [6]. Most common risks for developing preeclampsia were nulliparous women in whom the incidence of preeclampsia may be as high as 7.5%, change in paternity or an increased inter pregnancy interval, young maternal age, women with a history of preeclampsia in a prior pregnancy, medical conditions like chronic hypertension, diabetes mellitus, renal disease, body mass index (BMI) > 30 before pregnancy, age ≥ 40 years, metabolic syndrome, and hypercoagulable states and obstetric conditions with increased placental mass, such as multifetal gestation and hydatidiform mole, increase preeclampsia risk [7, 2].

Predicting whether or not a particular pregnancy will be complicated by preeclampsia is important to ensure the mother receives optimal care. Because current science does not have preventive therapies, predicting the risk of preeclampsia should lead to more optimal treatment of the progression of a patient’s hypertension as well as reducing the severity of the disease [5]. The data of research conducted on maternal outcome in preeclampsia Ethiopia and other Africa countries are limited this make abridged attention on prevention and management hence, the maternal mortality and morbidity still remain high in Africa and other developing countries. This study was planned to assess maternal outcome and factors associated with it among preeclamptic cases.

2. Methodology

2.1. Study Area and Period

This study was conducted at Dilla University referral hospital (DURH). DURH is one of the University referral hospitals in country which found in SNPPR, Gedeo Zone Dilla town. Dilla town is capital of Gedeo zone and found 89km away from regional capital Hawassa and 365km from capital city of Ethiopia, Addis Ababa it is located at an altitude of 1300-3000m above sea level and the climate favor desert conditions has one referral hospital and two health center under city administration with population size of 79,892 (5). This hospital was referral and emergency service for 24hrs/7days and has OBS/GYN, medical, surgical, dental clinic, pathologic and dermatology units, and man power of 18 specialists, 44 GPs, 24 midwifery, 130 nurses and others. Total catchment area of this hospital hosts around 3.5 million population. Study was conducted in Dilla University Referral Hospital (DURH) from February 1 to April 15, 2019.

Study design and population

Retrospective cross-sectional study design was employed. Study population was pre-eclamptic women who admitted at Dilla university referral hospital. The study was carried out on medical records of mothers diagnosed with preeclampsia at DURH between January 1, 2016-December 31, 2018.

Sample size determination and sampling procedure

Single population proportion formula was used to calculate the sample size n required to estimate a population proportion with a given level of precision d was:

\[
 n = \frac{(Z \times 2)^2 \times P \times (1-P)}{d^2}
\]

where, Z=1.96 reflects the confidence level, N=total population size, P=Population proportion 0.225 from maternal outcome which was mgso₄ toxicity (6), and d=degree of accuracy expressed as proportion (0.05)

\[
 n = \frac{(1.96)^2 \times 0.225 \times (1-0.225)}{0.05^2} = 268
\]

Then by adding 10% of incomplete documentation 268+27=295

The participants were selected by using systematic random sampling technique after identifying pre-eclamptic cases from delivery registration and incomplete documentations were excluded. Total number of pre-eclamptic women admitted and gave birth at DURH in last three years were 825. So number of study subjects was selected after dividing five years cases to sample size at kⁿ value.

\[
 n=825/295=2.79\approx3
\]

Hence, study subjects were included every 3rd units after selecting the first participant by randomly out of three.

Data collection instrument and procedure

The data was collected using pre-tested data abstraction tool the questions for variables were adopted [8] and modified based on the review of different literatures by principal investigator.

The tool consists of maternal details (age, GA, gravidity, parity, educational status, previous history of preeclampsia and hypertension), ANC follow up, type of diagnosis, gestational age of occurrence of preeclampsia, admission status of the mother to the intensive care unit, blood transfusion, duration of hospital stay, major maternal complications (Liver failure, renal failure, HELLP syndrome, aspiration pneumonia, DIC, eclampsia and oliguria) and
vital sign and investigation result. Four BSc midwives and one MSc midwifery professional were recruited as data collectors and supervisor respectively and two days training were given on objective of the study, the method of data collection and discuss thoroughly on the tools prepared for data collection by the principal investigator.

All documents from January 1, 2016– December 31, 2018 include and incomplete documentations were excluded from the study.

2.2. Data Quality

To keep the quality of data: Two days training was given to the data collectors and supervisors on the data collection tool and the data collection procedure, then the questionnaire was pretested on 10% of the sample size out of the study area (Hawasa University Specialized Hospital) prior to two weeks before actual data collection takes place to ensure its validity.

Data collectors were supervised closely by the supervisors and the principal investigator. Completeness of each data abstraction checklists were checked by the supervisors on daily basis. And double data entry was done by two data clerks and consistency of the entered data was cross checked by comparing the two separately entered data. Finally, multivariate analysis was run in the binary logistic regression model to control the confounding factors.

2.3. Data Processing and Analysis

The collected data was manually checked for completeness and for any inconsistency then coded and entered into Epi Data 4.4.2.1 and then exported and analyzed using SPSS version 25.0. Descriptive statistics such as simple frequencies, percentage, measures of central tendency and measures of variability was used to describe the characteristics of participants such as Socio- demographic, like age, residence, parity, gestational age.

Binary logistic regression was fitted to assess the factors associated with maternal outcome in preeclampsia. Variables with p-value ≤ 0.25 in the binary logistic regression were considered in the multiple logistic regressions to control the confounding factors. Adjusted odds ratio (AOR) along with 95% confidence interval was estimated to assess the strength of the association, and a p-value ≤ 0.05 were used to declare the level of statistical significance. Finally, the data were presented in text, tables, and graphs.

2.4. Operational Definition

Maternal outcome: was defined as condition of mother after diagnosed with preeclampsia which is favorable or unfavorable outcome.

Favorable outcome: patient with preeclampsia whose managed expectantly and improved.

Unfavorable outcome: were defined as women admitted with preeclampsia and managed expectantly and has at least one complication from cerebral complications like (seizures, cerebral hemorrhage, cerebral infarction, severe headache and blurred vision), and liver capsular rapture, renal failure, hemolysis, elevated liver enzymes and low platelets (HEEPLP syndrome) and death.

Expectant management: Glucocorticoid administration followed by delivery for specific maternal and fetal indication.

Maternal improvement: was defined as women admitted with preeclampsia and finally improved at discharge.

Maternal death: was defined as women admitted with preeclampsia in hospital and finally died at discharge.

Early onset of preeclampsia: was defined as a pregnant women diagnosed with preeclampsia before 34 weeks of gestation.

Late onset of preeclampsia: was defined as a pregnant women diagnosed with preeclampsia after 33 weeks of gestation.

2.5. Ethical Approval

An official letter on ethical clearance for proposed research was obtained from institutional review board (IRB) of Addis Ababa University College of health science and School of nursing and midwifery, and Department of Maternity ad reproductive research publication committee. After ethical clearance received the permission to conduct study was also obtained from DURH medical director and obstetric and gynecological departments.

To keep confidentiality after retrieving medical record all records were transported by principal investigatir to privet room for data collection. All collected data was coded and locked in a separate room before entered in to the computer. After entered to the computer the data was locked-up by password, and should not be disclose to any person other than principal investigator. All information collected from mothers medical records were kept strictly confidential and names of patients or mothers were not include in the data abstraction checklist.

3. Result

3.1. Socio Demographic Characteristics

A total of 10,324 mothers were admitted to Dilla university referral hospital obstetric and gynecological units for delivery service from January 1, 2016 to December 1, 2018 among these 825 mothers were admitted with preeclampsia from those 295 charts were selected.

The mean and media of age participants were 25.48, and 25.0 respectively. Majority 210 (72.2%) of women were between the age group of 20 and 34 years followed by ≤19years 62 (21.0%) and ≥35years 23 (7.8%). Most of preeclamptic women were 215 (72.9%) from rural area. Prim-gravida and multi-gravida were 114 (38.3%) and 119 (40.3%) respectively. Majority of the study participants were null-para 125 (42.4%) followed by multi-para and prim-para 96 (32.5%) and 74 (25.1%) respectively. In this study women with pervious history of preeclampsia and eclampsia were 46 (15.6%) and 8 (2.7%) respectively (Table 1).
Table 1. Socio-demographic characteristics of pre-eclamptic women who admitted to OBS/GYN unit of Dilla university referral hospital (n=295), Dilla, Ethiopia 2019.

| Variable                  | Frequency | Percentage |
|---------------------------|-----------|------------|
| **Age**                   |           |            |
| ≤19                       | 62        | 21.0%      |
| 20-34                     | 210       | 72.2%      |
| ≥35                       | 23        | 7.8%       |
| **Residence**             |           |            |
| Rural                     | 215       | 72.9%      |
| Urban                     | 80        | 27.1%      |
| **Gravidity**             |           |            |
| Prim gravidia             | 118       | 40.0%      |
| Multi gravidia            | 66        | 22.2%      |
| Grand multi gravidia      | 115       | 38.7%      |
| **Parity**                |           |            |
| Null para                 | 125       | 42.4%      |
| Primipara                 | 74        | 25.1%      |
| Multi para                | 96        | 32.5%      |
| **History of preeclampsia**|         |            |
| Yes                       | 46        | 15.6%      |
| No                        | 249       | 84.4%      |
| **History of eclampsia**  |           |            |
| Yes                       | 8         | 2.7%       |
| No                        | 287       | 97.3%      |

3.2. Obstetrics Characteristics and Medical History

Regarding ANC follow up and severity of disease at admission, 206 (69.8%) of women had frequent ANC follow-up and 89 (30.2%) didn’t have frequent ANC follow up. Majority 171 (58%) of the women were diagnosed with severe preeclampsia and the rest 124 (42%) of the women were diagnosed with mild preeclampsia at admission.

The mean and media of gestational age at onset of preeclampsia were 34.4 and 35.0 respectively whereas mean and media of gestational age at delivery were 35.5, and 36.0 respectively. The majority 166 (56.3%) of women with preeclampsia were admitted to hospital with early onset of preeclampsia before gestational age of 34 weeks, and 129 (43.7%) of women admitted with late onset of preeclampsia starting from 34 weeks of gestation. Concerning gestational age at delivery as shown on figure 1 below, majority of pre-eclamptic women delivered between gestational age group 33-36weeks 138 (46.85%) followed by term or ≥37 weeks 122 (41.4%), 29-32weeks 28 (9.5%) and abortion <28 weeks.

3.3. Management and Mode of Delivery of Pre-eclamptic Women

Out of women admitted with preeclampsia 269 (91.2%) of
women received anti-hypertensive treatment the most common reason for no treatment with hypertensive medication for rest of women were non severity of disease or diagnosis with mild preeclampsia specially at term.

Regarding the mode of onset of labor, 115 (39.0%) and 180 (61.0%) of labor were initiated spontaneously and induced respectively. The mode of delivery for pre-eclamptic women, vaginal delivery 113 (38.3%) were higher than both instrumental (vacuum/forceps) delivery 82 (27.8) and cesarean section delivery 100 (33.9%) the most common indication for cesarean section were uncontrolled blood pressure 24.6%, failed induction 19.3%, non-reassuring fetal heart rate pattern 31.6% and non-reassuring biophysical profile 12.5%.

3.4. Maternal Outcome of Women Admitted with Preeclampsia

Finding of present study indicated that there were six maternal deaths from preeclampsia which accounting for a case fatality rate of 2.0%. As indicated on table 2 below, 122 (41.4%) mothers were complicated from preeclampsia.

| Variables                          | Frequency | Percentage |
|------------------------------------|-----------|------------|
| Maternal outcome                   |           |            |
| Favorable                          | 173       | 58.6%      |
| Unfavorable                        | 122       | 41.4%      |
| Mgso4 toxicity                     |           |            |
| Low urine output                   | 30        | 50.7%      |
| Depressed tendon reflex            | 6         | 11.7%      |
| Low respiratory rate               | 16        | 30.0%      |

As depicted on figure 4. From the all women with preeclampsia complications 81 (27.5%) of them developed HELLP syndrome followed by DIC 25 (8.5%), 9 (3.1%) and 1 (0.8%) acute renal failure, and acute liver failure respectively.

3.5. Factors Associated with Maternal Outcome

Six variables found to be significant in binary logistic regression which was candidates for the final analysis, therefore multivariable approach applied to determine which factors best explained and predict maternal outcome. As described on table 3 below, in bivariate logistic regression age ≥35 rural residence, diagnosis with severe preeclampsia, co-morbidity, early gestational age at onset of preeclampsia, and no antihypertensive treatment were associated with unfavorable maternal outcome.

In multivariable logistic regression four variables were significantly associated with unfavorable maternal outcome include rural residence, severe preeclampsia and early onset of preeclampsia and non-treatment with anti-hypertensive medication. Therefore, rural residence has 5.038 times more risk of unfavorable maternal outcome than women from urban [AOR=5.038, 95%CI 1.971-12.879], gestational age ≤33weeks has 3.67 times higher risk of unfavorable maternal than women with gestational age ≥34weeks [AOR=3.6795%CI 1.829-7.364] and admission with diagnosis of severe preeclampsia has 6.42 times higher risk of unfavorable maternal outcome than admission with mild preeclampsia [AOR=6.4295%CI 2.017-21.103].
4. Discussion

According to this study majority of the pre-eclamptic women were with severe preeclampsia which develop complications that result in prolonged hospital stay as well as family’s economic problem since most of the case was referred from far rural areas and also it affect immediate mother to new family’s economic problem since most of the case was referred.

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The present study result showed case fatality of preeclampsia were 2.0%, this finding were lowest of study conducted in Parel, Mumbai 57.0%, Yaounde, Cameroon 51.0% and Nigeria 42.3% of complication from preeclampsia [9, 16, 17]. This finding where again greater than study conducted in Addis Ababa Gandhi hospital 35.5%, South Africa 13.3%, Nepal 6.02% and India 23.52% [18-21], this may be because majority of study participant in this study were admitted after complication from severe preeclampsia.

From this study 59 (67.01%) of the pre-eclamptic women were complicated from early onset of preeclampsia before 33 weeks of gestation and 63 (30.7%) developed maternal complication with late onset of preeclampsia after 34 weeks of gestation. This finding was contrary with study conducted in USA, Washington city, 12.2% and Nigeria 5.5% of women developed maternal complication from early onset of preeclampsia [9, 22], this is most probably because quality of care, technological difference and early detection and treatment of disease.

The present study result showed case fatality of preeclampsia were 2.0%, this finding were lowest of study conducted in Tanzania, India and Nigeria 17.9%, 6.23.8% and 12.1% respectively [12-14]. This may be because of under reporting of maternal death in this study area. However, case fatality of preeclampsia according to study conducted in Addis Ababa, Hidar hospital and Cameroon were 0.5%, 0.6% and 1.85% respectively [6, 7, 14] and this could be almost all of the mothers were from urban residence which don’t delay in seeking health care, better quality of care and have access to health care.

According to the result of present study rural residency has 41.4% of women were complicated from sever preeclampsia. It is slightly lower when compared with the study conducted in Parel, Mumbai 57.0%, Yaounde, Cameroon 51.0% and Nigeria 42.3% of complication from preeclampsia [9, 16, 17]. This finding where again greater than study conducted in Addis Ababa Gandhi hospital 35.5%, South Africa 13.3%, Nepal 6.02% and India 23.52% [18-21], this may be because majority of study participant in this study were admitted after complication from severe preeclampsia.

Table 3. Association of selected variables with maternal outcome among preeclamptic women admitted to Dilla university referral hospital (n=292) Dilla, Ethiopia 2019.

| Variable | Maternal outcome | COR (CI95%) | AOR (CI95%) |
|----------|------------------|-------------|-------------|
|         | Favorable | Unfavorable |         |           |
| Age groups | ≤19 | 21 | 16 | 1.04 (0.362-2.98) | 0.49 (0.13-2.66) |
|          | 20-34 | 88 | 147 | 1.00 | 1.00 |
|          | ≥35 | 13 | 10 | 2.14 (1.904-5.10) | 0.58 (0.22-2.95) |
| Residence | Rural | 61 | 154 | 8.10 (4.156-18.39) | 5.03 (1.97-12.8) |
|          | Urban | 61 | 19 | 1.00 | 1.00 |
| Diagnosis at admission | Mild preeclampsia | 102 | 22 | 1.00 | 1.00 |
|          | Severe preeclampsia | 56 | 115 | 9.52 (4.60-38.40) | 6.4 (2.01-21.10) |
| GAO | ≤33 | 73 | 93 | 4.39 (2.626-7.35) | 3.67 (1.82-7.36) |
|          | ≥34 | 100 | 29 | 1.00 | 1.00 |
| Co-morbidity | Yes | 15 | 34 | 4.04 (2.10-0.7.8) | 1.69 (0.68-4.16) |
|          | No | 158 | 88 | 1.00 | 1.00 |
| Anti-hypertensive | Yes | 120 | 129 | 1.00 | 1.00 |
|          | No | 2 | 24 | 9.6 (2.239-41.714) | 5.7 (1.96-36.42) |

* p value ≤0.05 ** p value ≤0.01

GAO: gestational age at onset
COR: crude odd ratio
AOR: adjusted odd ratio
1=reference category
Early onset of preeclampsia increase the risk of unfavorable maternal outcome 3.67 times higher than late onset of preeclampsia, this is supported by the study conducted in Afar, Hidar hospital 6.8 times [7] and Nepal 4.09 times [21] risk of unfavorable maternal outcome with early onset of preeclampsia. This similarity may be almost similar access of health facilities. According to study in USA Washington and Nigeria the risk of unfavorable maternal outcome were 1.2 and 2.94 respectively [9, 22], this result is lower than present study, this may be due to better quality in maternity service and awareness of community about the disease in USA and Nigeria.

This study showed that the risk of developing unfavorable maternal outcome with severe preeclampsia were 6.42 times higher than mild preeclampsia. There were differences in the risk across countries and continents. According to research conducted India the risk were 9.09 times, Nigeria 11.2 times, Iran 14.34 times higher for unfavorable maternal outcome this were higher than result of this study [12, 13, 24], this is because of the fact that severe preeclampsia causes more maternal complications that can lead even to death.

5. Limitation of Study

Since the study was conducted retrospectively, there were variables that were not registered that might influence the causes of maternal outcome from preeclampsia. Due to poor chart documentation of patients information in the study area, it was difficult to increase the scope of study.

6. Conclusion

Although there were current envisaged on maternal health improvement, this study has shown maternal complications were common among pre-eclamptic women who admitted to Dilla university referral hospital. Especially the maternal morbidity was common with previous history of preeclampsia, co-morbidity or previous history of medical condition early onset of preeclampsia and severity sign of preeclampsia. Among women with complication from preeclampsia Hemolysis elevated liver enzyme and low platelet (HELLP) syndrome was the most complication followed by disseminated intravascular coagulation (DIC) and renal failure. Rural residence, early onset of preeclampsia, severity at admission, and non-treatment with anti-hypertensive medication were factors which were associated with unfavorable maternal outcome.

List of Acronyms

DURH: Dilla university referral hospital  
GHP: Gestational hypertension  
HELLP: Hemolysis elevated liver enzymes and low platelet  
HMIS: Health management information system  
HDP: Hypertensive disorder during pregnancy  
ICU: Intensive care unit  
Mgso4: Magnesium sulphate

PPH: Post-partum hemorrhage  
SNNPR: Southern, nation, nationality and people region  
SPE: Severe preeclampsia

Data Availability

The datasets used and/or analyzed during the current study are available from the principal author upon reasonable request.

Ethical Approval

Ethical clearance was attained from Addis Ababa University Institutional Health Research Ethics Review Committee. The official letter was written to Dilla university referral hospital.

Consent

Informed written consent was obtained from each participant after explaining the purpose and benefits of the study. Respondents were informed that participating in this study is up to the willingness of them.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors’ Contributions

Zerihun Figa and Tesfaye Temesgen were involved in the conception and design of the study, analysis of data, interpretation of data and writing of the manuscript. Abas Ahimed was involved in advising in proposal development, revising the paper, and drafting the manuscript. Ruth Tilahun and Etaferawu Bekele were involved in advising and revising the paper during proposal development, data analysis. All authors read and approved the final manuscript.

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