COLLEGE OF HEALTH SCIENCE

DEPARTMENT OF PUBLIC HEALTH

DETERMINANTS OF PREECLAMPSIA AMONG WOMEN ATTENDING DELIVERY SERVICES IN DEBRE BERHAN REFERRAL HOSPITA, DEBRE BERHAN,ETHIOPIA (CASE CONTROL STUDY).

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List of Abbreviations and Acronyms

ACOG	American College of Obstetricians and Gynecologists
ANC	Ante Natal Care
APH	Ante partum Hemorrhage
BP	Blood Pressure
CHTN	Chronic hypertension
DBP	Diastolic Blood Pressure
DBRH	Debre Berhan Referral Hospital
DM	Diabetes Mellitus
EMOC	Emergency Obstetric Care
END	Early Neonatal Death
GA	Gestational Age
IUGR	Intrauterine Growth Restriction
HTN	Hypertension
HDP	Hypertensive Diseases of Pregnancy
HELLP	Hemolysis Elevated Liver Enzyme, Low Platelet
IUFD	Intrauterine Fetal Death
NICU	Neonatal Intensive Care Unit
PE	Preeclampsia
PIH	pregnancy induced hypertension
SBP	Systolic Blood Pressure
UTI	Urinary Tract Infection
WHO	World Health Organization

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Abstract

Background: -Preeclampsia is a leading cause of maternal and perinatal morbidity and mortality affecting 5-10% of pregnancies worldwide. Preeclampsia is among the top causes of deaths in Ethiopia. Despite the severity of preeclampsia, there is limited on preeclampsia in the study area. Considering this gap, the researcher aimed to study assesses the determinants of preeclampsia in Debre Berhan Referral Hospital.

Methods and materials: - An unmatched case-control study design was employed on this study. A total of 291participants were participated in this study. Of which 97 were cases and 194 were controls. Cases are mothers with preeclampsia whereas controls are mothers without preeclampsia. Cases and controls were selected by systematic random sampling techniques from the maternity registration book. Double population proportions formula with a 2:1 control to case ratio was used to calculate sample size with 95% confidence interval and 80% power. The data were entered to EPNFO 7.1 for checking internal consistency and cleaning and then analyzed by using SPSS version 21. Descriptive statistics was carried out to present the frequency distribution of cases and controls**.** Bivariate and multivariate logistic regression analysis were run to identify the determinants of preeclampsia and p-value of <0.05 was considered as statistically significant.

Result: - Of the total 291 participants, 97 were cases and 194 controls. From the total cases included in this study 68 (70.1%) were referrals from other health facilities. Regarding referral, women who came by referral were 22% less likely to be preeclampsia case than non-referral [AOR=0.22, 95% CI (0.052, 0.907). The finding of this study also revealed that occupation (housewife) (AOR=8.39(1.037-67.96), primigravida (AOR: 2.68, 95% CI: 1.38, 5.22), history of diabetics mellitus (AOR=5.15, 95% CI 1.544-17.18) were the determinants of preeclampsia.

Conclusion: -occupation, primigravida and history of Diabetes Mellitus were the determinants of preeclampsia. Different stakeholders should focus on home related factors. Besides, health care providers should have integrated preeclampsia screening at delivery settings. **Key words**: preeclampsia, maternal factors, case control, Debre Berhan.

1. Introduction

1.1 Background Information

Preeclampsia is a hypertension that occurs after 20 weeks of gestation in a woman with previously normal blood pressure. Maternal blood pressure elevation of ≥140 mm Hg systolic or ≥90 mm Hg diastolic on 2 occasions 6 hours apart with Proteinuria that refers to urinary excretion of ≥300 mg of protein in a 24-hour urine specimen is considered as preeclampsia (1). Gestational blood pressure elevation is defined as a blood pressure greater than 140 mm Hg systolic or 90 mm Hg diastolic in a woman normotensive before 20 weeks (2).

Preeclampsia may progress into severe one and this includes: Eclampsia, abruption, progression to Hemolysis Elevated Liver Enzyme Low Platelet (HELLP) and its complication, disseminated intravascular coagulation, pulmonary edema, acute renal failure, Hepatic rupture, post-partum hemorrhage and anesthesia complication. Severe preeclampsia in pregnancy is defined as systolic blood pressure ≥ 160 mm Hg or diastolic blood pressure ≥ 110 mm Hg or both. The Society of Obstetricians and Gynecologists of Canada (SOGC) expert consensus suggests that a single reading at this level be confirmed the sever pregnancy induced hypertension within 15 minutes (3).

The exact cause of preeclampsia remains unclear. However, abnormally implanted placenta is considered to be major predisposing. This abnormally implanted placenta is believed to result in poor uterine and placental perfusion, which results a state of hypoxia and increased oxidative stress and the release of anti-angiogenic proteins into the maternal plasma along with inflammatory mediators into the maternal plasma(4).

Preeclampsia is one of the leading causes of maternal and perinatal morbidity and mortality worldwide. It is an important cause of severe morbidity, long term disability and death among both mothers and their babies. For example, the American High Blood Pressure Education Program Working Group report indicated that about 30% of hypertensive diseases of pregnancy due to chronic hypertension while 70% of the cases were preeclampsia (5). Similarly, The World Health Organization (WHO) estimates of maternal death due to hypertensive disorder of pregnancy (HDP) were 25.7% in Latin-American and Caribbean, and 9.1% in Asian and African countries (6,7).

Underdeveloped countries like Ethiopia face worse complications of preeclampsia than the developed countries. In Africa and Asia, nearly one tenth of all maternal deaths are associated with hypertensive disorders of pregnancy, whereas one quarter of maternal deaths in Latin America have been associated with preeclampsia/Eclampsia complications(8).

According to the Ethiopian National Emergency Obstetric and Newborn Care (EMONC), preeclampsia contributed for the complication of approximately 1% of all deliveries and 5% of all pregnancies. Moreover, 18% of direct maternal mortality and 10% of all maternal mortality (direct or indirect) was due to preeclampsia. On the other hand, preeclampsia and Eclampsia contributed to 24% and 9% of maternal deaths reviewed from hospitals and MCH specialty centers and health centers and clinics, respectively (9). The case fatality rate of preeclampsia/Eclampsia in two teaching hospitals in Addis Ababa (Tikur Anbessa and St Paul's Hospitals), was 13% (10).

Hence, this research was intend to study the determinants of preeclampsia among women attending delivery service in Debre Berhan Referral Hospital.

1.2. Statement of the Problem

Preeclampsia has an immense adverse impact on maternal and perinatal health. Accurate incidence figures are difficult to obtain, and the incidence varies between countries, but it is believed that worldwide, 3–5 % of pregnant women are affected (11).

In economically rich countries, preeclampsia is less lethal in an absolute sense, although the condition has responsible for more maternal deaths(12).Where as in economically poor regions, where there is often only very limited antenatal and intra-partum care, preeclampsia is a severely life-threatening condition, reflected by the fact that it is one of the leading causes of maternal mortality. Preeclampsia is common with a prevalence estimated at 2.3% of all pregnancies in developing countries (13). Women in developing countries is seven times more likely to develop preeclampsia than women in a developed countries (14).

The magnitude of preeclampsia reaches up to 16.7% and it is estimated to account for about 40% to 60% of maternal deaths in developing countries (15) . Extrapolated incidence of preeclampsia in India is 572,945; in Egypt 40,946; in Kenya 17,742 and 38,373 in Ethiopia (5). This indicates that the problem is global and highly affecting developing countries than their counter parts.

Besides maternal complication, preeclampsia has also greater negative effect on the child. Overall the perinatal mortality is increased five folds in mothers with preeclampsia than the general population (14). And it is about two-fold higher among infants of mothers with preeclampsia. Studies from industrialized countries such as Norway show that women with preeclampsia have a 35% higher risk of stillbirth (2). These excess risks for iatrogenic early delivery play a large role in the four-fold increase in low birth weight rates observed in the offspring of women with preeclampsia (16). Moreover, infants born to women with preeclampsia have a three- to four-fold increased risk of being small for gestational age (a birth weight <10th percentile) (17).

In Ethiopia, among the five major causes of maternal death preeclampsia/ Eclampsia (PE/E) accounts 24% and 9 % of maternal deaths reviewed from hospitals & MCH specialty centers and health centers & clinics, respectively (9) with varying amount from 4%-29% at different health facilities (18). According to Ethiopian Demographic Health survey (EDHS) 2016 report, maternal mortality ratio is 412 deaths per 100,000 live births and pregnancy induced hypertension have a great role for this maternal death (19). Despite the effort made in Ethiopia, maternal morbidity and mortality due to pregnancy induced hypertension was in an increasing trend (20). Therefore, the researcher triggered to assess the determinants of preeclampsia among women attended delivery services in Debre Berhan Referral Hospital.

1.3 Justification and Significant of the Study

There are some convincing reasons that make the topic of this research credible. Preeclampsia is a common cause of maternal and perinatal morbidity and mortality. As the Ethiopian Demographic Health survey (EDHS) 2016 reported, maternal mortality ratio is 412 deaths per 100,000 live births and pregnancy induced hypertension has a great role in this maternal death (19). A review study conducted on the causes of maternal mortality in Ethiopia showed that, the proportion of maternal mortality in Ethiopia due to hypertensive disorders between 1980 and 2012 is increased from 4%-29% at different health facilities(18). This shows that the problem related to preeclampsia/Eclampsia becomes increased time to time. Therefore, identifying the determinants and seriousness of the problem in this study area will help the policy-makers to make the right decision on the preventive strategies and it was a good resource for other researchers to conduct further researches.

2. Literature Review

2.1 Risk Factors of Preeclampsia

The causes and risk factors for preeclampsia remain unclear, and thus preeclampsia has been called a “Disease of theories”(21) . However, different studies suggested that socio-demographic factors, obstetrics and gynecologic, and medical characteristics are factors found to affect PE (5).

2.1.1 Socio-Demographic Factors

Women of older age above the age of 35 years has a significant association with preeclampsia. According to a study done in Pakistan(22) A similar study done in Karnataka(23) Asian Zimbabwe(27).,Dessie referral hospital those women in age category 35 and above risk of preeclampsia (23). Advancing maternal age is a risk factor for PE. Pregnant women of age less than 20 years risk of preeclampsia compared to age of more than 20years (22). Similar A study done in Asian (24). The study in Northern India also shown that women who were under 20 years of age had 3.87 times higher risk developing PE. Added to this, women age 20-24 were 3 times likely to develop PE as compared with women age 15-19 (25)

A study done in Ethiopia unmarried women were 3 times more likely to develop PE as compared to married women (30).

The study done in Addis Ababa house wife 1.72 time more likely developed preeclampsia compare to employ (AOR=1.72,95%CI,0.83,3.58)(31).

An Analysis of 271 consecutive cases at a Tertiary Hospital showed that the referral rate was 26.2%. Among the 125 patients with severe preeclampsia, 54 were referred from other hospitals, a 43.2% referral rate. We found that factors associated with the development of severe preeclampsia(32).

2.1.2 Obstetrics and Gynecologic Factors

PE is considered as the disease of nulliparous women. A cohort study conducted in Jerusalem indicated that developing PE were 2.58 times higher among women with a first pregnancy compared to multiparous women (95%, CI: 2.23, AOR: 2.58) (23). Similarly, the case control study in Egypt revealed that nulliparous women PE were 2.16 times more likely higher to develop PE among nulliparous compared with multiparous women (95%, CI: 1.18, 3.96, AOR:2.16) (1).

A study done in Addis Ababa revealed that primigravida was found to be risk factor for preeclampsia on the multivariable analysis. The odds of developing preeclampsia were 2.68 times higher in women with primigravida comparing to the women with multigravida (95% CI: 1.38, 5.22, AOR: 2.68). Women who had multiple pregnancies (twin) had higher risk of preeclampsia comparing to women with singleton pregnancy in the multivariable analysis (95% CI: 2.97, 22.78, AOR: 8.22) (31).

According to mother and child cohort study of Norway, a single previous history of induced abortion reduces the risk of PE moderately (, 95%, CI: 0.69–1.02, AOR 0.84).

Women with two or more induced abortions had a significantly lower risk of PE compared with women without abortion (95%, CI:0.18–0.73, AOR: 0.36) (33).

A study done in Addis Ababa, multiplicity of pregnancy was independently associated with preeclampsia/Eclampsia. Another studies conducted in Pakistan(34), India and England also has a finding in harmony with this study (5). The result revealed that multiple pregnancies obstetric conditions had a large placenta which results in decreased placental perfusion. The excess of placenta tissues could not be perfused adequately comparing to the women with singleton pregnancy which lead both the mother and the fetus to the risk of preeclampsia.

2.1.3. Medical Risk Factors

The risk of PE during a subsequent pregnancy is also found to be dependent on the history of the disease in the first pregnancy (21). A systematic review of observational studies revealed that women with a previous history of PE had 7.19 times higher risk of PE (95%, CI: 5.85, 8.83 AOR: 7.19) compared with counterparts (35). Likewise, a cohort study of Swedish birth register indicated that the risk of developing PE during second pregnancy was 14.7% and 1.1% for women with and without PE in their first pregnancy respectively (36). A similar finding was study conducted in s Addis Ababa; which found the risk of acquiring PE to be 4.28 times higher (95%, CI: 1.61, 11.43, AOR: 4.28,) among women with PE in previous pregnancy compared with women without PE (37).

A significantly higher proportion of cases had a family history of PE (95%,CI: 1.93, 178.16, AOR: 18.57,) compared with controls (38). Similarly, having multiple pregnancies (1,38,39). being nulliparous(13). and female sex fetuses (40).were found to be significant risk factors for PE.

Medical conditions such as diabetes mellitus (DM), chronic hypertension (CHTN), anemia and urinary tract infection (UTIs) play a significant role in the risk of PE (1,41). A case control study in Egypt indicated that UTI, vaginosis, asymptomatic bacteriuria,

DM, and stress as a significant risk factors for PE (1). Likewise, subclinical infection is also found to be a significant risk factor for PE (42).

Mothers who had preeclampsia in the first pregnancy are known to be at a substantially higher risk to develop preeclampsia than those with a subsequent pregnancy (43). Multiparous patients with a past history of severe preeclampsia are at high risk in early pregnancy(34). Another study in Addis Ababa also showed that developing preeclampsia were 4 times higher for the women with history of preeclampsia comparing with those without (95% CI: 1.61, 11.43, AOR: 4.28) (37).

In women with pre-gestational diabetes, the rates of preeclampsia and adverse neonatal outcome increase with increased severity of diabetes (44). Similarly study conducted in Pakistani showing a relationship between preeclampsia and diabetes among women is also

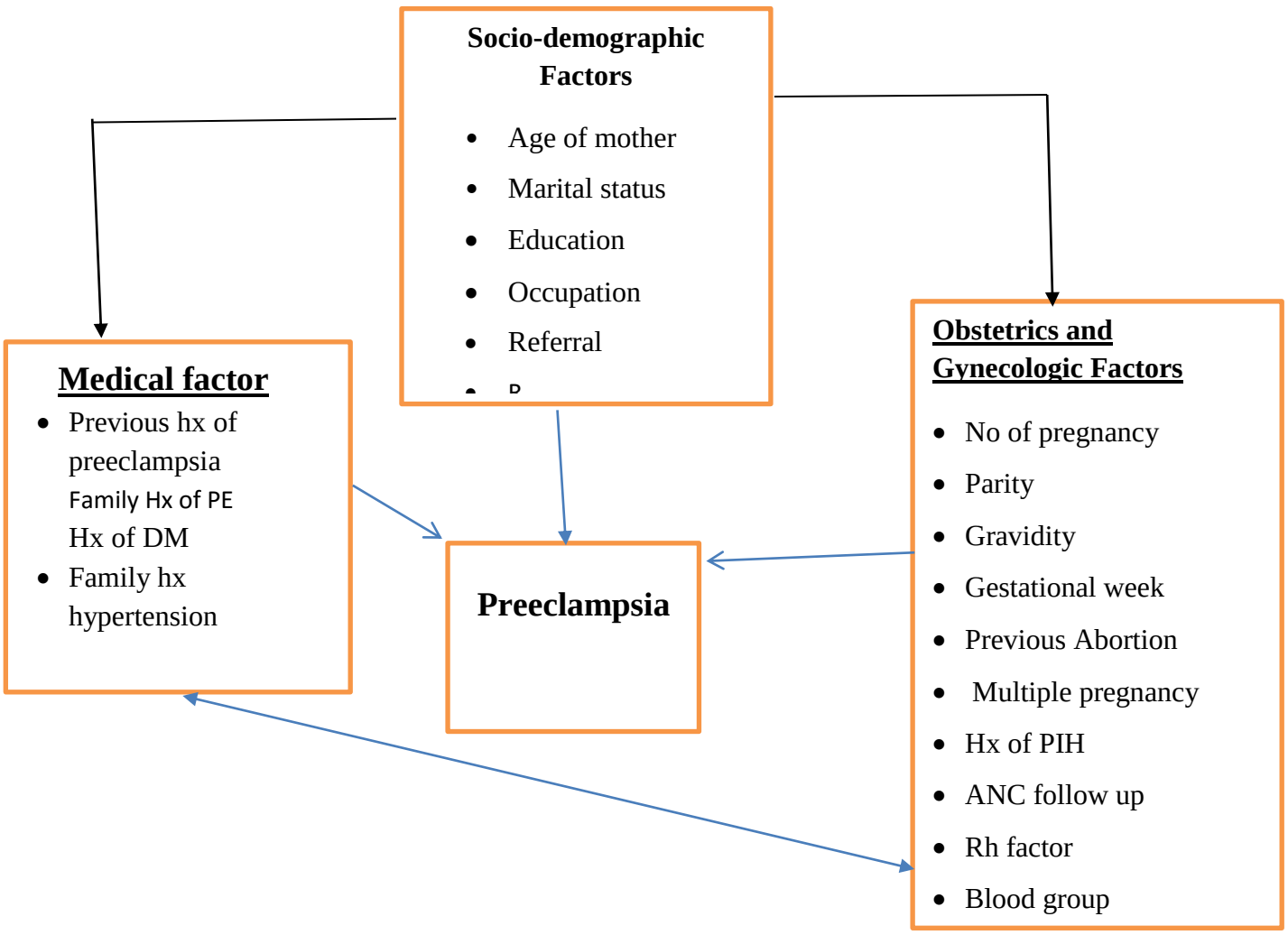
consistent with other studies findings (34). In women with pre-gestational Type 1 diabetes, the rates of preeclampsia and adverse neonatal outcome increase with the presence of diabetes (45).

Some studies show a significant increase in urogenital infection in preeclampsia pregnancy. This may reflect higher rates of underlying renal disease and placental bed abnormalities occurring in preeclampsia(46). Antepartum urinary tract infection is a risk factor for preeclampsia(47).

On the other hand, anemia during pregnancy is found to be a significant risk factor for PE. A study in eastern Sudan revealed that acquiring PE was 3.6 times higher among women with severe anemia compared with counterparts (48). The relation might be due to low ANC attendance, low socioeconomic condition and poor health seeking behavior. Anemia was the most commonly associated medical disorder in these women (16.4%) (49).

Studies indicated that family history of CHTN and DM were found to be a significant risk factor for PE. The study conducted in Dessie hospital revealed that PE was 7.19 and 2.4 times higher among women who had family history of CHTN (95%, CI: 3.4, 15.2) and DM (95%, CI: 1.09, AOR: 5.6) respectively compared to counterparts (50). The study in Bahir Dar also indicated that the risk of acquiring PE was found to be 11.16 (95%, CI: 5.41, 41.43) and 6.17 (95%, CI: 2.11, 20.33), times higher among women who had a family history of CHTN and DM respectively (3).

2.6. Conceptual Frame work of the Research



Source:-Conceptual Framework determinants of Preeclampsia : adapted from (3)

Figure 1:- Conceptual frame-work revealing the relationship between determinants Preeclampsia. Women (mothers) who were attending delivery services in Debre Berhan referral hospitals, Debre Berhan, Ethiopia in 2019(2016-2018)

3. Objectives of the study

3.1 General Objective

To identify factor associated with preeclampsia among women who gave birth in Debre Berhan Referral Hospital from January 1, 2016 to December30, 2018.

3.2 Specific Objectives

- To identify socio –demographic factors associated with preeclampsia.
- To identify obstetric and gynecological factors which associated with preeclampsia.
- To identify Medical risk factors which associated with preeclampsia.

4. Method and materials

4.1 Study Area and period

The study was conducted in Debre Berhan Referral Hospital. The hospital was established during the Italian Invasion in1929 E.C. It is located at Debre Berhan town, the capital of North Showa zone. Debre Berhan town is found 130 km apart from North East of Addis Ababa on the main road to Dessie. The town has one governmental and one private hospital. Debre Berhan Referral Hospital is the only Referral hospital in North Shoa. The hospital gives service for North Shoa zone of Amhara region and some woredas of Oromia and Afar regions. It has 150 beds and 523 staffs.

The hospital delivery service unit has 37 workers (15 are males and 22 are females) composed of 2 Gynecological and obstetrician specialists, 2 medical doctors, 26 midwiferies, 3 porters and cleaners. Out of 150 beds only 12 beds are available for delivery services. According to 2010 EC annual report of the hospital, 3252 mothers was admitted to delivery service. From this number, 3177 have got live birth, 556 instrumental deliveries, 12 maternal deaths, 117 case of PIH, and 814 obstetric admissions were recorded(51).

4.2 Study design

A facility based unmatched case-control study design was used.

4.3 Population

The population of the study was all pregnant women who gave birth at DBRH from January 1, 2016 to December 30, 2018.

4.3.1 Source Population

Cases;- All pregnant mothers who came for delivery services in DBRH in 20 weeks of gestational age develop preeclampsia and gave birth from January 1, 2016 to December 30, 2018.

Controls: All pregnant mothers who came for delivery services in DBRH after 20 weeks of gestational age and (plus) without preeclampsia from January 1, 2016 to December 30, 2018.

4.4 Eligibility Criteria

4.4.1. Inclusion Criteria

- Pregnant women who came for delivery in DBRH with preeclampsia on gestational age of 20 weeks or greater considered as cases.
- Pregnant women who came for delivery in DBRH without preeclampsia on gestational age of 20weeks or greater were considered as controls.

4.4.2. Exclusion Criteria

Women with known hypertension and renal disease was excluded from the study.

4.5 Sample size determination

Sample size was determined using EPINFO 7 and is calculated by double population proportion formula assuming primigravida and pregnancy induced HTN as a factors affecting preeclampsia with lowest odds ratio of 2.16 and 39% among controls(1). With this assumption:-

- 95% confidence interval,
- 5% marginal error
- 80% power,
- Ratio of case to control were taken as 1:2.
- estimated odds ratio (OR) for primigravida a minimum odds ratio will be 2.16,
- 39% among control

The final sample size was 291 with 97 cases and 194 controls with 10% non-respondents rate.

Table 1:- Summary of sample size determination based on the main independent variables, 2019

Researcher	Assumptions	Sample size	Final sample size	Determinants of preeclampsia
El-Moselhy EA, et al in Cairo, Egypt (1).	P control 39% lowest odds ratio of 2.16	89 case 178 control	97 cases 194 controls	Primigravida
Girum T, Addis Ababa (31).	P control = 5.3%, P case = 18.6%	59 cases 117 controls	65 cases 129 controls	Pregnancy induced HTN
Endeshaw M, Abebe F. (52)	OR=case 9.37	59 case 118 control	68 case 132 control	Family history of HTN.

4.5.1 Sampling procedure

The study employed systematic sampling technique and selected the study participants with 1:2 ratio. Accordingly, 97 and 194 sample women were taken as case and control group of the study. Besides, two years of delivered mother cards prior to the study period were identified; cards with preeclampsia were separated, and checked for completeness of the necessary information

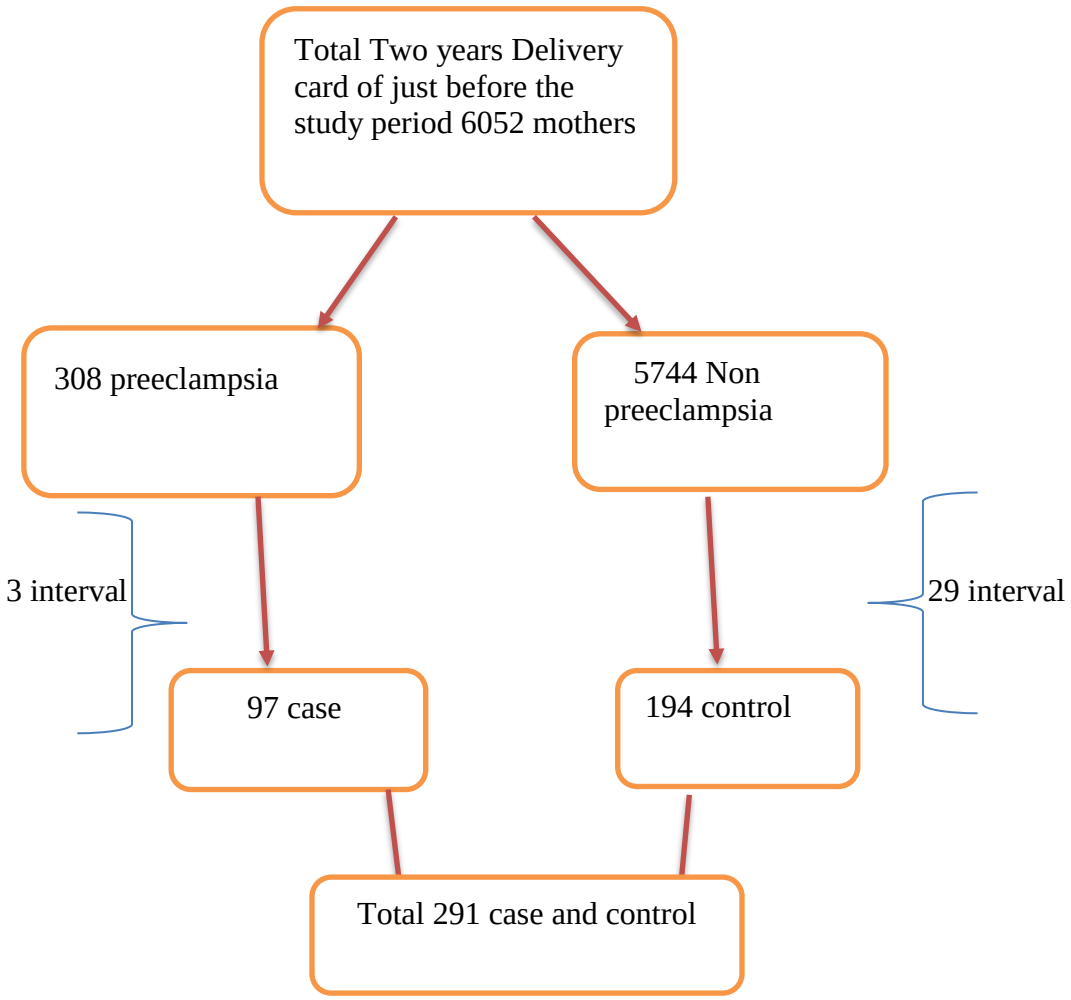


Figure 2:- shows schematic presentation of the Sampling procedure. of women (mothers) who were attending delivery services in Debre Berhan referral hospitals, Debre Berhan, Ethiopia in 2019(2016-2018)

4.6 Variables

4.6.1 Dependent variable

- Presence of Preeclampsia (yes or No)

4.6.2 Independent variables

- Socio demographic factors: - Age of the mother, Education, Occupation, Marital status area of residence.
- Obstetric factors:- Number of pregnancy, Parity ,Gravidity ,Multiplicity pregnancy, ANC follow up
- Medical factor:-Previous history of preeclampsia, History of diabetes mellitus, Cardiac disease, renal disease and family history of hypertension.

4.7. Operational Definitions

- **Preeclampsia**: - New-onset hypertension (BP is >140 mmHg systolic and/or >90 mmHg diastolic) occurring in a pregnant woman after 20 weeks' gestation, with proteinuria (defined as urinary excretion of > 0.3g protein in 24 hours it
- **Gestational age**: The period of time between conception and birth which was written by the physician on mother's card during delivery..

4.8. Data collection tools and techniques

4.8.1. Data collection instruments

The major data collecting instrument was check list. It was prepared based on review literature and related prior research works in order to achieve the objectives of the study(38). In line with this, the check list contains 6 major sections with a total of 28 leading questions. The first section deals with the general information of the participants. The rest sections focused on gynecological and obstetric history, drugs given during pregnancy, past medical history, clinical features on admission and investigations. These include yes/no, selecting from the given list and reason out for why questions.

4.8.2 Data collection procedure

The administration of data collection was followed after the legal procedure of getting permission from the hospital. Following this, pretest was made in DBRH to validate the data collection instrument. Hence, data were collected from 21 mother's cards out of the sample population. From these, 7 of them were those with preeclampsia and 14 were without preeclampsia. Based on the information gained from gathered data, modifications were made in the form of sequence, simplicity and clarity.

After that, actual data were collected by using delivery records. Case records and the corresponding obstetric data sheets of selected subjects and controls were retrieved. Relevant information had been extracted from the records and these related to their socio-demographic characteristics, obstetrics history, past medical history, mode of delivery and laboratory investigations. All information obtained had been collected on a check list designed for the study.

4.9. Data Analysis

The data were checked for completeness and consistency and was entered into Epidemiological Information (EPI info) version 7. It exported to Statistical Package for Social Sciences (SPSS) software version 21 was used to process the data for analysis activities. Descriptive statistics were carried out to identify the frequency distribution of cases and controls. Lastly Binary logistic regression analysis was done to evaluate the determinate of preeclampsia (occupation, parity, abortion, family history of hypertension, history of DM) and other pregnancy related factors separately Finally, those variables with p-value <0.25 were entered into the multivariable logistic regression was done for other determinant factors such as, socio demographic factors, and other maternal factors with the dependent variable (preeclampsia). Finally, the strength of association was measured by both crude and adjusted odds ratios with 95% confidence interval (CI) Statistically significance level was declared at p-value < 0.05.

4.10 Ethical consideration

Ethical clearance was obtained from Debre Berhan University, College of health science. And submitted to DBRH. The purpose and the importance of the study was explained and informed consent was obtained from the hospital CEO. Further permission was obtained from Medical Director of Debre Berhan Referral Hospital and the department head of the obstetric ward for the utilization of the cards. Since the cards include the name of the mothers, confidentiality was maintained by making the data collectors aware not to record any identification information found on the card.

4.11 Dissemination of the result

The result of the study will be presented to the department of Public health as part of General MPH thesis and a copy of this finding will be submitted to DBRH. Action points will be developed together with responsible parties to make use of the conclusion & recommendation of the study, Publication in a scientific journal shall also be considered.

5. Results

5.1 Participants Socio demographic characteristics:

Of the total 291participants, 97 were cases and 194 controls. The mean age of cases were 25.42±5.533 and controls 27.96 ± 4.67. Regarding their educational status, 31(32%) of cases attended primary education. However majority 75(38.9%) of controls had diploma and above educational level. Regarding to marital status of study participants, 80 (82.5%) of the cases and 164 (84.5%) of the controls were married or living together with their partner. Regarding referral 68 (70.1%) cases and 104(53.6%) controls were a history of referral from other health institution to DBRH. Concerning residency, 51(52.6%) cases and 83(43.8) controls were living in rural areas. With regard to occupation, 36(41.4%) cases were housewife whereas 32 (33.3%) and 26 (34.7%) were engaged in farming and government jobs respectively. On the other hand from 194 control group participants, the majority 66(34%) were government employee. The rest 51(26.3) and 48(24.7%) were engaged in housewife and farming respectively (Table 2).

Table 2:-Socio-demographic characteristics of women (mothers) who were attending delivery services in Debre Berhan referral hospitals, Debre Berhan, Ethiopia in 2019(2016-2018)

Variables	Case	Control
	Number 97(%)	**Number194 (%)**
Age		
<=24	34 (35.05%)	77 (36.69%)
25-29	33 (34.02%)	58 (29.89%)
30-34	17 (17.52%)	44 (22.68%)
>35	13 (13.4%)	15 (7.73%)
Referral		
No	29 (29.9%)	90 (46.4%)
Yes	68 (70.1%)	104 (53.6%)
Resident		
Rural	51 (52.6%)	85 (43.8%)
Urban	46 (47.4%)	109 (56.2%)
Occupation		
House wife	36 (37.11%)	51 (26.3%)
Farmer	26 (26.8%)	48 (24.7%)
Government& others	35 (36.08%)	95 (48.9%)
Marital status		
Single	9 (09.3%)	11 (5.7%)
Married	80 (82.5%)	164 (84.5%)
Divorced	8 (8.2%)	19 (9.8%)
Educational level		
No formal education	26(26.8%)	40(20.7%)
Primary education	31(32.0%)	49(25.4%)
High school	11(11.3%)	29(15.0%)
Diploma &above	29(29.9%)	75(38.9%)

5.2. The Obstetric and Gynecological conditions of Participants

On this study 58(60%) of case and 73(37.37%) of the control groups were primigravida, 39(40%) of case and 121(62.63%) of controls groups were multi gravida. Among participants who have no previous history of abortions, accounts 90(92.78%) of cases and 163 (84.0%) controls had no previous history of abortion. Concerning parity 49(44.1%) cases were nulliparous, 28(28.9%) were Primipara and 20(20.6%) were multipara. Out of 194 control group mothers 63 (32.5%) were nulliparous, 67(34.5%) were Primipara, 64(33%) had multipara. In relation to number of fetus 77 (79.38%) cases and 168 (86.6%) controls were single, whereas 20 (20.6%) cases and 26 (13.4%) controls were twins. Regarding gestation week, the majority 47(48.5) case and 145 (74.7%) control were at a gestational weeks of ≥ 37 (Table 3).

Table 3:-Obstetric and gynecological characteristics of women (mothers) who were attending delivery services in Debre Berhan referral hospitals, Debre Berhan, Ethiopia in 2019(2016-2018)

variables		Case	Control
		Number (%)	Number (%)
Gravidity	Primi gravidity	58(60%)	73(37.37%)
	Multiple gravida	39(40%)	121(62.63)
Parity	Nulliparous	49(50.5%)	63(32.5%)
	Primipara	28(28.9%)	67(34.5%)
	Multipara	20(20.6%)	64(33.0%)
Number of fetus	Single	77(79.38%)	168(86.59%)
	Twin	20(20.6%)	26(134%)
Gestational week	20-34wk	25(25.8%)	9(4.6%)
	35-37wk	25(25.8%)	40(20.6%)
	>37wk	47(48.5%)	145(74.7%)
Abortion	Yes	7 (7.21%)	31(15.98%)
	No	90(92.78%)	163 (84.1%)

With regards to ANC follow up 18(18.55%) of cases and 16(8.3%) of controls were reported as they have no ANC follow up whereas 79(81.5%) cases and 178(91.75%) controls.(Figure 3)

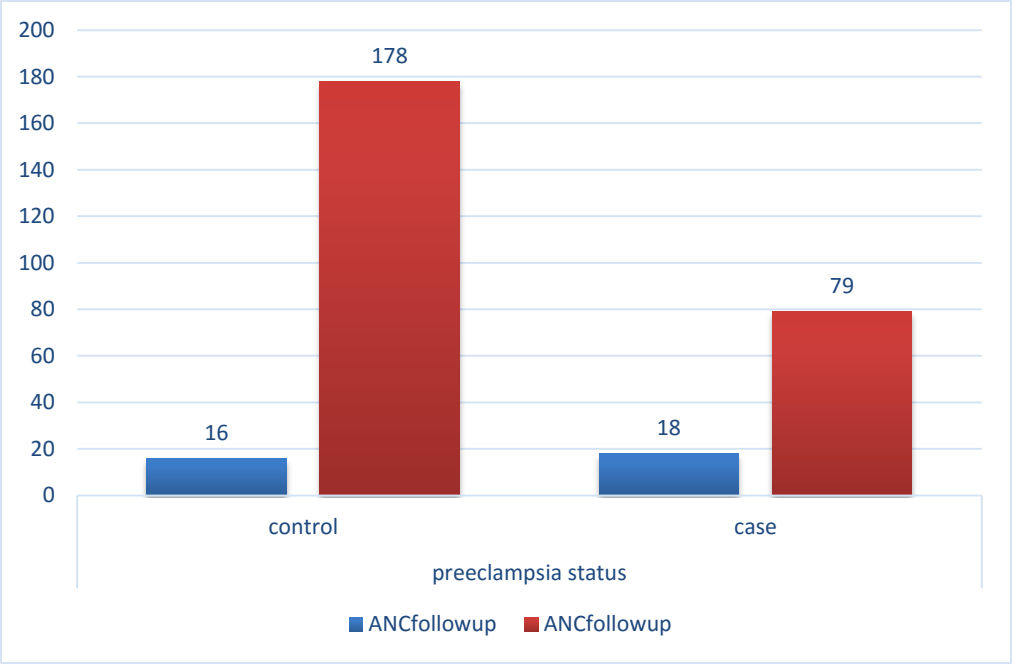


Figure 3:-Status of ANC follow up women (mothers) who were attending delivery services in Debre Berhan referral hospitals, Debre Berhan, Ethiopia in 2019(2016-2018)

With regards to ANC follow-up 1 times, 2times, 3times, 4& above times visited 1(1.03%),13(13.4%),40(41.23%) and 25(25.8%) case, and 8(4.2%), 36(18.56%),48(24..74%), 86(44.3%) of controls respectively (Figure 4).

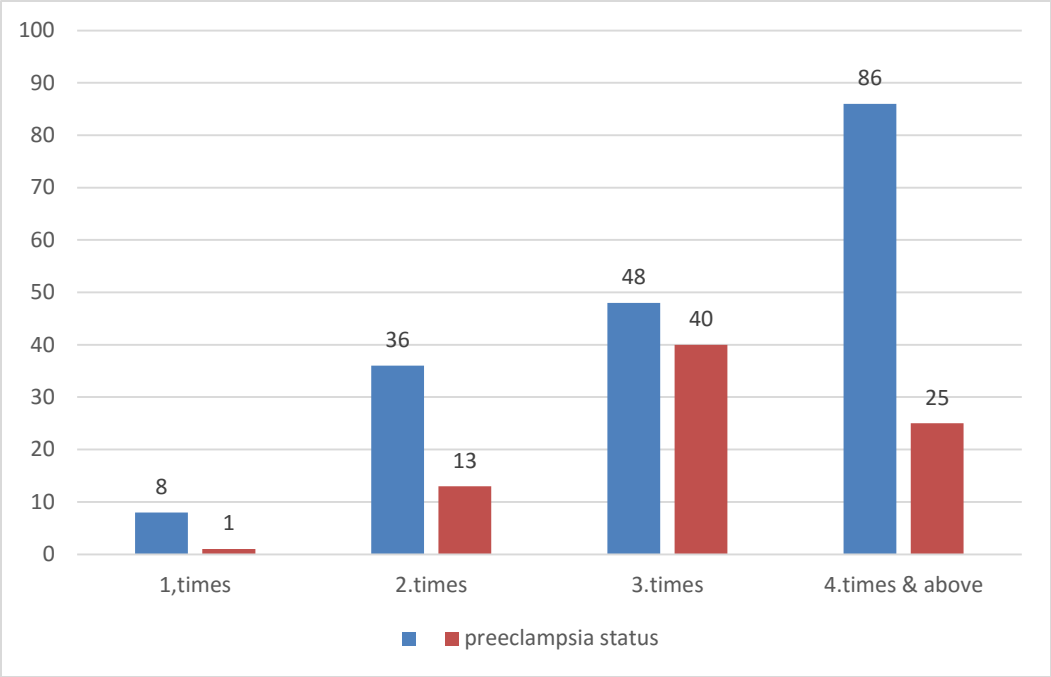


Figure 4:-Frequency of visited among women (mothers) who were attending delivery services in Debre Berhan referral hospitals, Debre Berhan, Ethiopia in 2019(2016-2018)

Of the participants, 59(60.8%) of the cases were initiated their delivery by induction, whereas 108(55.67%) of the controls were initiated their delivery spontaneously. Moreover, 26(26.8%) of the cases were delivered by instrument whereas, 98(50.5%) of the controls were delivered spontaneously. Concerning mode of delivery 43(44.3%) of case and 98(50.5%) control used spontaneous mode of delivery while 29(29.89%) and 26(26.8%) cases and 53(27.3%) and 42(21.64%) of controls delivered with the help of C/S and instrument respectively (Table 4).

Table 4:-onset of labor and Delivery characteristics of women (mothers) who were attending delivery services in Debre Berhan referral hospitals, Debre Berhan, Ethiopia in 2019(2016-2018)

variables		Case	Control
		Number (%)	Number (%)
On set of labor	Spontaneous	21(21.64%)	108(55.67%)
	Induction	59(60.8%)	58(29.89%)
	C/S	17(17.5%)	28(14.43%)
Mode of delivery	Spontaneous	43(44.3%)	98(50.5%)
	Instrumental	26(26.8%)	42(21.64%)
	C/S	29(29.89%)	53(27.3%)

Hematocrit Level and RH Factors

18(18.6%), 73(75.3%) and 6(6.18%) of cases have a Hematocrit label of <35, 36-50 and >50 respectively. While in the controls 32(16.5%), 159(81.95%) and 2(1.03%) have a Hematocrit label <35, 36-50 and >50 respectively. Besides, 146(75.3%) control and 84(86.6%) of case have Rh positive. Blood group A 25(25.8%) case and 35(18.04%) controls , Blood group B 25(25.8%) case and 60(30.9%)controls, Blood group AB13(13.4%) case and 45(23.19%) controls, Blood group O 34(35.05%) case and 53(27.3%) controls (Table 5).

Table 5:-Investigation on Hematocrit Level and RH Factors characteristics of women (mothers) who were attending delivery services in Debre Berhan referral hospitals, Debre Berhan, Ethiopia in 2019(2016-2018)

variables		Case	Control
		Number (%)	Number (%)
Blood group	A	25(25.8%)	35(18.04%)
	B	25(25.8%)	60(30.9%)
	AB	13(13.4%)	45(23.19%)
	O	34(35.05%)	53(27.3%)
Hematocrit label	<35	18(18.6 %)	32(16.5%)
	36-50	73(75.3%)	159(81.95%)
	>50	6(6.18%)	2(1.03%)
RH factors	Positive	84(86.6%)	146(75.3%)
	Negative	13(13.4%)	47(24.22%)

Past medical history of participants

With regards to medical characteristics of the study participants, 13 (13.4%) of cases and 27 (13.9%) of controls had history of DM. Similarly, 10 (10.3%) of cases and 29(14.94%) of controls have reported as they have family history of hypertension. 12 (12.37%) of case and 74(38.2%) controls Chronic HPT. 11(11.34%) of case and 13(6.7%) controls history of preeclampsia. (Table 6).

Table 6:-Past Medical history characteristics of women (mothers) who were attending delivery services in Debre Berhan referral hospitals, Debre Berhan, Ethiopia in 2019(2016-2018)

Variables		Case Number (%)	Control Number (%)
Paste medical history	Yes	93(95.87%)	83(42.78%)
	No	4(4.12%)	110(56.7%)
History of preeclampsia	Yes	11(11.34%)	13(6.7%)
	No	27(27.83%)	106(54.63%)
DM	Yes	13(13.4%)	27(13.9%)
	No	80(82.47%)	57(29.38%)
Family history of	Yes	10(10.3%)	29(14.94%)
hypertension	No	83(85.56%)	55(27.3%)
Chronic HPT	Yes	12(12.37%)	74(38.2%)
	No	81(83.5%)	10(5.15%)

5.3. Determinant of Preeclampsia among women attending delivery services at DBRH, Debre Berhan, Ethiopia

The result of bivariate logistic regression shown that: - Abortion, primi gravidity, occupation, (farmer, House wife) ,parity , ANC follow up ,gestational week, Hematocrit level, blood group AB , Positive RH, family history of hypertension, History of preeclampsia and history of DM were significantly associated with preeclampsia. During bivariate analysis Variables p-values < 0.05 were selected for multivariable analysis.

Table 7 :-Bi-variate analysis showing the determinants of preeclampsia women (mothers) who were attending delivery services in Debre Berhan referral hospitals, Debre Berhan, Ethiopia in 2019(2016-2018)

Variables		Cases	controls	Crude OR (95% CI)
		Number (%)	Number (%)	
Maternal age	<=24	34(35.05%)	77(39.69%)	0.509(0.219,1.186)
(n=291)	25-29	33(34.02%)	58(29.89%)	0.656 (0.279-1.547)
	30-34	17(17.52%)	44(22.68%)	.446 (0.176-1.130)
	>=35	13(13.40%)	15(7.73%)	1
Abortion	No	90(92.8%)	161(83.0%)	1
	Yes	7(7.2%)	33(17.0%)	0.379(0.161, 0.893)*.
Gravida	Primi gravidity	49(50.5%)	56(28.9%)	2.516(1.518, 4.168) **
	Multi gravidity	48(49.5)	138(71.1%)	1
Occupation	House wife	36(37.1%)	51(26.3%)	4.71(1.30-17.032)*
	Farmer	26(26.8%)	48(24.7%)	3.78(1.02-13.29)
	Government	35(36.08%)	95(48.9%)	1
Parity	Null Para	49(50.5%)	63(32.5%)	2.49(1.331-4.653)**
	Primi parity	28(28.9)	67(34.5%)	1.337(0.685-2.639)
	Multi parity	20(20.6%)	64(33.0%)	1
ANC follow up	Yes	79(30.9%)	177(69.1%)	2.37(1.162-4.844)**
	No	18(51.4%)	17(48.6%)	1
History of preeclampsia	Yes	11(28.95)	13(10.9)	13.32(1.340, 8.230)*
	No	27(71.05)	106(89.1)	1
Gestational week	20-34wk	25(25.8%)	9(4.6%)	8.5(3.737-19.651)**
	35-37wk	25(25.8%)	40(20.6%)	1.928(1.06-3.507)*
	>37wk	46(23.8%)	147(76.2%)	1
HX of DM	Yes	80(58.4%)	57(41.6%)	2.915(1.386,6.133)**

	No	13(32.5%)	27(67.5%)	1
Family Hx of hypertension	No	83(60.1%)	55(39.9%)	1
	Yes	10(25.6%)	29(74.4%)	4.37(1.975-9.696)***
Blood group	A	25(41.7%)	35(58.3%)	1.113(.57-2.176)
	B	25(29.4%)	60(70.6%)	0.65(.344-1.226)
	AB	13(22.4%)	45(77.6%)	0.45(.212-.956)*
	O	34(39.1%)	53(60.9%)	1
RH factor	Negative	13(13.4%)	47(24.22%)	1
	Positive	84(86.59%)	146(75.3%)	.477(0.244,0.933)*
Hematocrit	<35	18(36%)	32(64%)	.188(.034-1.026)
	36-50	73(31.5%)	159(68.5)	.153(0.03-0.78)*
	>50	6(%75)	2(25.0%)	1

***p-value <0.05, **p-valve <0.01, ***p-value <0.001 statically significant**

This study employed binary logistic regression and multivariable logistic regression to evaluate the association of PE with other determinant using OR and 95% confidence intervals. The determinant variables with p-value less than 0.05 in the bivariate logistic regression analysis were entered into the multivariable logistic regression analysis to control potential confounding effect of variables.

The result of multivariate logistic regression indicated that referral, house wife, null pares, Primigravida, abortion, gestational week, RH positive, history of DM, family history of hypertension were determinants of preeclampsia.

The presence of primigravida is 2.68 times more likely to develop PE (AOR=2.68, 95%, CI=1.3-5.22) than multi gravida. whereas null para women were also 4.12 times more likely than compared to multi para to develop preeclampsia (AOR =4.12,95%CI 2.544,31.156). Primi para women were also 25.11 times more likely to develop preeclampsia than compared to multi para (AOR =25.11, 95%CI, 1.912, 32.658. Besides, being house wife is 8.39 times more likely to develop preeclampsia than government (AOR=8.39, 95%, CI=1.037-67.96). Besides, the history of DM patient having preeclampsia was 5.15 times more likely than those who have no history of DM (AOR=5.15, 95%, CI=1.544-17.18). Regarding to the family history of hypertension, 11.66 times more likely develop preeclampsia than no family history of hypertension (AOR=11.66, 95%, CI=1.778-76.55). Concerning to gestational weeks 20-34 weeks were 8.11 times more likely to develop preeclampsia than compared to gestational weeks greater than 37 weeks (AOR =8.11, 95%CI, 1.632, 55.066). The categorization of the gestational age were wade considering research done on similar topic.

Concerning Abortion, history of abortion 89% reduces the risk of preeclampsia than to no history of abortion (AOR=0.11, 95%CI, 0.017, 0.696). (Table 8).

Table 8:-Determinants of preeclampsia among women attended delivery services in DBRH, Debre Birhan, Ethiopia 2019

Variables		Cases	Controls	COR(95%: CI)	AOR(95%: CI)
		Number (%)	Number (%)		
Gravida	Primi gravida	58(60%)	73(37.37%)	2.50(1.520, 4.170)	2.68(1.380, 5.220)*
	Multi gravida	39(40%)	121(62.63)	1	1
Occupatio	House wife	37(37.4%)	62(62.6%)	4.71(1.300,17.032)	8.39(1.037,67.960)*
n	Farmer	28(32.9%)	57(67.1%)	3.78(1.020,13.290)	0.61(0.102,3.56)
	Government	32(29.9%)	75(70.1%)	1	1
History of	No	80(58.4%)	57(41.6%)	1	1
DM	Yes	13(32.5%)	27(67.5%)	2.92(1.386,6.133)	5.15(1.544,17.180)*
Abortion	No	90(92.78%)	163(84.5%)	1	1
	Yes	7(7.2%)	31(15.97%)	0.38(0.161,0.893)	0.11(0.017,0.696)*
Family Hx	No	83(85.56%)	55(28.35%)	1	1
of HTN	Yes	10(10.31%)	29(14.9%)	4.37(1.975,9.696)	11.66(1.778,6.550)*
RH factor	Negative	13(13.4%)	47(24.22%)	1	1
	Positive	84(36.5%)	146(75.3%)	0.477(0.244,0.933)	0.686(0.324,1.452)
Gestationa	20-34wk	25(25.8%)	9(4.6%)	8.50(3.737,19.651)	8.11(1.632-55.066)*
l week	35-37wk	25(25.8%)	40(20.6%)	1.93(1.06,3.507)	3.28(1.938-11.431)*
	>37wk	46(47.4%)	147(76.2%)	1	1
Parity	Null para	49(50.5%)	63(32.5%)	2.49(1.331,4.653)	4.12(2.54431.156)*
	Primipara	28(28.9)	67(34.5%)	1.337(.685,2.639)	25.11(1.91232.658)
	Multi para	20(20.6%)	64(33.0%)	1	1

***P-value <0.05 statically significances**

6. Discussion

The study was intended to assess the determinant of preeclampsia among women who gave birth in Debre Berhan Referral Hospital from January 1, 2016 to December30, 2018. Unmatched case control study was employed to assess the association of preeclampsia with socio-demographic factor, gynecological and obstetric history and past medical history. To assess the association among variables bivariate and multivariate analysis method were employed.

Of 291 mothers in this study 68(70.1%) preeclampsia were referrals from other hospitals and health centers. Most 23(69.7 %) of the referral patients were transferred during the period of 20 to 34 weeks of gestation (AOR=8.108, 95% CI 1.63194-55.066). Other studies also support the result of this study. For example a comparison study done in Taiwan Tertiary hospital shows on Referral and Non-Referral Hypertensive Disorders during Pregnancy: 71(26.2%) patients were referrals from other hospitals and the majority 62 (87.3%) of referral patients were transferred during the period 21 to 37 weeks of gestation. Preeclampsia (adjusted odds ratio, 3.46; 95 percent confidence interval, 1.76 to 6.81; $P < 0.001$) (32). This may be skill gap of the health professionals to detect early and provide early intervention of preeclampsia. Gestational week difference between my study and other studies may be life styles of mothers.

Being house wife (AOR=8.39, 95%, CI=1.037-67.96), was 8.39 times more likely to determine preeclampsia than government. Similarly the study done in Addis Ababa house wife 1.72 time more likely developed preeclampsia compare to employ (AOR=1.72,95%CI,0.83,3.58)(31).This may be lack of sufficient information about pregnancy and related problems such as preeclampsia.

In this study woman who had Nulliparous are well known risk factors of were about 4.1 times at more risk of developing preeclampsia than their multiparous. From this study the result revealed that Nulliparous significant increased risk of preeclampsia 50.5% (AOR=4.11, 95%CI 2.544-31.156). in line with this other researchers also found similar result for example a case control study conducted in Egypt revealed that PE were 2.16 times likely higher to

develop PE among nulliparous compared with multiparous women (95%, CI: 1.18, 3.96, AOR:2.16) (1). Similarly a study conducted in Jerusalem also indicated that developing PE were 2.58 times higher among women with a first pregnancy compared to multiparous women (AOR: 2.58,95%, CI: 2.23,) (23) This is because nulliparous is due to trophoblastic invasion and hoe mothers react to it. The failure of normal invasion tromphplastic cells lead to maladaptation of superla arterioles, which are related to the causation of preeclampsia(8). Concerning gravida, Primigravida 2.68 time more likely develop than multiple gravida (AOR=2.68, 95%CI, 1.380, 5.220). This study is in agreement with studies conducted in Addis Ababa (31).Egypt (1), revealed that primigravida found to be risk factor for preeclampsia on the multivariable 3.18 times higher in women with primigravida comparing to the women with multigravida (AOR: 3.18,95% CI: 1.438, 6.521,). This is because Preeclampsia generally is considered a disease of the first pregnancy (59). Which is due to the immunological incompetence seen in first pregnancy between fetoplacental and maternal tissues (60).

Regarding Abortion ,history of abortion 89% reduces the risk of preeclampsia than to no history of abortion (AOR=0.11,95%CI, 0.017,0.696).similar result study done in Norway and Norwegian a single previous history of induced abortion reduces the risk of PE moderately (AOR 0.84, 95%, CI: 0.69–1.02,).Women with two or more induced abortions had a significantly lower risk of PE compared with women without abortion (95%, CI:0.18–0.73, AOR: 0.36) (33). This is because abortions be associated with other factors, such as infertility, that may increase the risk of preeclampsia. Normal pregnancies interrupted in early pregnancy may induce immunological changes that reduce the risk of preeclampsia in a subsequent pregnancy.

In the present study women who had family history of hypertensive disorders are well known risk factors of preeclampsia were about 11.695 times at more risk of developing preeclampsia than no family history of hypertension. From this study the result revealed that family history of hypertensive disorders significantly increased risk of preeclampsia 74.4% (AOR=11.6, 95%CI (1.778-76.55) than who haven't. In line with this a study conducted by Tessema et.al (2015) in Dessie revealed that PE was 7.19 higher among women who had family history of hypertension (95%, CI: 3.4, 15.2). Similarly study in Bahir Dar by Endeshaw M. et.al(2016)

also indicate that the risk of acquiring PE was found to be 11.16 (95%, CI: 5.41, 41.43) times higher among women who had a family history of hypertension (3). (50).this might have occurred due to genetic factors that contribute to the physiologic predisposition of preeclampsia.

In the present study women who had History of DM are well known risk factors of preeclampsia were about 5.15 times at more risk of developing preeclampsia than no history of DM, 32.5% (AOR=5.15, 95%CI 1.544-17.18). The result of this study showing the relation between preeclampsia and diabetes was also consistent with previous findings. For example a study conducted in Pakistani showing a relationship between preeclampsia and diabetes among women is also consistent (34). Accordance with previous studies; In women with preeclampsia increase with increased severity of diabetes(53). The results of the study showing a relationship between preeclampsia and diabetes among Pakistani women is also consistent with other studies' findings(54). Likewise another study conducted by Tesema `in Dessie referral hospital show family history of diabetes mellitus (AOR = 2.4 (95% CI 1.09-5.6) were found to be associated with preeclampsia(6). this might have occurred due to genetic factors that contribute to the physiologic predisposition of preeclampsia

The result of this study is biologically plausible for several reasons. First, epidemiological and clinical data document a close association between insulin resistance, type 2 diabetes, and hypertension(55). In addition hyper insulinemia has been shown to stimulate the proliferation of vascular smooth muscle cells, enhance acute sympathetic nervous system activity and modify transmembrane caption transport, as well as renal sodium retention, release of the potent vasoconstrictor angiotensin II, and associated endothelial dysfunction. All of these alterations may contribute to blood pressure elevation and thus preeclampsia(56).

Second, evidence from diverse settings suggests that family history of hypertension and diabetes are strongly and consistently related to bio physiological markers of vascular disorders. In women with a family history of hypertension, endothelial changes also appear to involve a relative deficiency in the production of nitric oxide, a vasodilator and inhibitor of platelet aggregation, along with increased production of endothelia-I, which is an extremely potent vasoconstrictor and activator of platelets. This shift in the production of locally acting

vasoactive substances could enhance vasoconstriction in response to circulating pressor hormones. The net effect would be to cause widespread arteriolar constriction leading to hypoxic/ischemic damage in different vascular beds, systemic hypertension, and worsening placental ischemia (38) these reports, when taken together with results from this study, suggest that women's family history of hypertension and diabetes is an important risk factor for preeclampsia.

In this study finding age have no association with preeclampsia. Based on this there are conflicting data on the association of age with preeclampsia. Some studies have reported association between age and preeclampsia especially in elderly women above the age of 35 years. A study done was observed by Gaym A Maternal mortality studies in Ethiopia-magnitude(57). Similar revealed that age above 30 years was associated with a risk for preeclampsia (95% CI: 1.873 to 14.536 AOR: 5.218). Similarly, a cross-sectional study conducted in Dessie referral hospital shows that the risk of developing PE was found to be higher with age of 35 plus (95%, CI: 1.56, 12.8 AOR: 4.5) (28). In other study conducted in Bahir Dar, also revealed that developing PE were found to be 4.79 times higher among older women compared with the younger one (95%, CI: 1.031, 22.18, AOR=4.79) (29). While others have shown an association of preeclampsia with younger age group (25,26). This variation in my study and other studies could be due to the difference population based and hospital based study. 0.22 (0.052, 0.907).

7. Strength and limitation of the study

7.1 Strength of the study

Employing case control study design may be appropriate to assess the determinant of preeclampsia. Although case controls would not show temporal relationship unlike cohort studies, this study could show better association between determinants of preeclampsia compared with few simple cross sectional studies conducted in Ethiopia. Therefore, case control is choice of design to study rare determinants of preeclampsia

Selection and information bias which are feared in most of case control studies have been minimized through sticking to protocol in selection of cases and controls. Therefore, this study paves a way and expected to generate valid baseline information.

7.2 Limitation of the study

Secondary data same cards incomplete data

Hospital based case control study not represented population.

8. Conclusions

Based on the finding of study

More preeclampsia mothers were came from different health center and hospital to DBRH

Housewife, Primigravida, nulliparous, Abortion, Rh factors positive, Gestational week**,** family history of hypertension, history of DM, are the risk factor of preeclampsia

9. Recommendations

Health care providers: Health professionals shall increase referral by taking training on counseling and early examine at health center level. Similarly, community-based education shall be given to new spouses to delay pregnancy to prevent PE due to a short pre-pregnancy period with the biological father of the recent pregnancy.

Family history of hypertension and history of DM is concluded that these factors can be used as a screening tool for preeclampsia prediction and early diagnosis, allowing timely interventions to minimize complication with preeclampsia.

The relevance of frequent and timely ANC visits shall be advocated to screen women who are at high risk to PE. Since family history of hypertension & DM was the dominant risk factor of preeclampsia health care provider can be used as screening tool for preeclampsia prediction and early diagnoses to provide timely intervention.

Health workers should give special attention to women with primigravida and provide awareness for house wife. Besides government give due attention quality health services.

Culture tailored health education and counselling on health extension program package. Provide trained on how manage PE at different health center give due attention to quality health services. Provide appropriate and sufficient equipment and medication

There are several risk factors that were significantly associated with determinants of preeclampsia. The results have implications for clinical practice and are helpful for devising health policy regarding preeclampsia strategies in DBRH. The researcher also recommend the use of standard protocol and the availability of appropriate intensive care facilities for the treatment of preeclampsia. Physicians referring patients should consult with physicians at a peripheral center before transportation, the patient's blood pressure should be stabilized and convulsion controlled before transportation. Additionally, others studies of preeclampsia should be undertaken to address this issue directly so that public health recommendations can be made.

10. Reference

1. El-Moselhy EA, Khalifa HO, Soliman ;, Amer M, Khadra ;, Mohammad I, et al. Risk Factors and Impacts of Pre-Eclampsia: An Epidemiological Study among Pregnant Mothers in Cairo. Egypt J Am Sci. 2011;7(5):1545–1003.

2. Hirpara S, Ghevariya R, Ghadia P, Hada T, Pandit N. Study of Risk Factors for Pregnancy Induced Hypertension - A Hospital Based Case Control Study. Natl J Integr Res Med. 2017;8(4):41–4.

3. Endeshaw M, Abebe F, Bedimo M, Asrat A, Gebeyehu A, Keno A. Family history of hypertension increases risk of preeclampsia in pregnant women: a case-control study. Universa Med [Internet]. 2016;35(3):181. Available from: https://univmed.org/ejurnal/index.php/medicina/article/view/365

4. Zozumi M, Nakai M, Matsuda I, Hao H, Ueda Y, Nojima M, et al. Primary carcinoid tumor of the urinary bladder with prominent subnuclear eosinophilic granules. Pathol Res Pract. 2012;208(2):109–12.

5. Roberts James M, Druzin Maurice, August Phyllis A, Gaiser Robert R, Bakris George, Granger Joey P, Barton John R, Jeyabalan Aurun, Bernstein Ira M JDD. Hype Rte N Sion. American college; 2013.

6. Tessema GA, Tekeste A, Ayele TA. Preeclampsia and associated factors among pregnant women attending antenatal care in Dessie referral hospital, Northeast Ethiopia: A hospital-based study. BMC Pregnancy Childbirth. 2015;15(1).

7. Suzannah Bennett, MHSc Cheryllee Bourgeois, RM Andrea Cassidy, RM Kim Cloutier-Holtz, RM Abigail Corbin R. CLINICAL PRACTICE GUIDELINE HYPERTENSIVE DISORDERS OF PREGNANCY. 4th ed. Ontario: College of Midwives of Ontario's new Consultation and; 2012. 273-277 p.

8. Shamsi S, Saleem S, Nishter N. Epidemiology and Risk factors of Preeclampsia ; An Overview of Observational Studies. Al Ameen J Med Sci. 2013;6(4):292–300.

9. ETHIOPIAN Emergency Obstetric and Newborn Care (EmONC) Assessment 2016 Final

Report 1. Ethiopian Public Health Institute Addis Ababa, Ethiopia Federal; 2016.

10. Mohammedseid SI, Megersa TN, Kumbi S, Ayalew MB. Maternal Outcomes of Pre-eclampsia in an Ethiopian Gynecologic Hospital. Ann Med Health Sci Res. 2017;7(3):16–21.

11. Hutcheon JA, Lisonkova S, Joseph KS. Epidemiology of pre-eclampsia and the other hypertensive disorders of pregnancy. Best Pract Res Clin Obstet Gynaecol. 2011 Aug;25(4):391–403.

12. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller A, Daniels J, et al. Articles Global causes of maternal death : a WHO systematic analysis. Lancet Glob Heal 2014 Publ. 2014;(14):1–11.

13. Duley L. The Global Impact of Pre-eclampsia and Eclampsia. Semin Perinatol. 2009;33(3):130–7.

14. Honegger P, Richelson E. Biochemical differentiation of mechanically dissociated mammalian brain in aggregating cell culture. Brain Res. 1976 Jun;109(2):335–54.

15. Gaym A. Maternal mortality studies in Ethiopia-magnitude, causes and trends. Ethiop Med J. 2009;47(2):95–108.

16. Wallis AB, Saftlas AF, Hsia J, Atrash HK. Secular trends in the rates of preeclampsia, eclampsia, and gestational hypertension, United States, 1987-2004. Am J Hypertens. 2008 May;21(5):521–6.

17. Singhal savita rani, Deepika, Anshu, Nanda S. Maternal and Perinatal Outcome in Severe Pre-eclampsia and Eclampsia. J SAFOG with DVD. 2009;1(3):25–8.

18. Vinet L, Zhedanov A. A “missing” family of classical orthogonal polynomials. Intergovernmental Panel on Climate Change, editor. Clim Chang 2013 - Phys Sci Basis. 2010 Nov;53(9):1–30.

19. CSA [Ethiopia] and ICF International. FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA ETHIOPIA Demographic and Health Survey 2016 Key Indicators Report. Ethiopians Water Sector Development Program. Addis Ababa, Ethiopia; 2016.

20. WHO, UNFPA, UNICEF. AMDD: Monitoring emergency obstetric care: a handbook. Geneva WHO [Internet]. 2009;152(4):430. Available from: http://informahealthcare.com/doi/abs/10.3109/01443611003791730

21. Ramesh K, Gandhi S, Rao V. Socio-Demographic and other risk factors of pre eclampsia at a tertiary care hospital, Karnataka: Case control study. J Clin Diagnostic Res. 2014;8(9):JC01-JC04.

22. Article O, Gandhi S, Rao V. Socio-Demographic and Other Risk Factors of Pre Eclampsia at a Tertiary Care Hospital , Karnataka : Case Control Study. 2014;10–3.

23. Funai EF, Paltiel OB, Malaspina D, Friedlander Y, Deutsch L, Harlap S. Risk factors for pre-eclampsia in nulliparous and parous women: the Jerusalem Perinatal Study. Vol. 19, Paediatric and Perinatal Epidemiology. Yale University School of Medicine; 2005.

24. Chang C, Lin H, Liu J, Liu Y. Hypertensive Disorders in Pregnancy and Preterm Delivery A Retrospective Cohort Study. 2011;

25. Sharma C. Maternal & Perinatal outcome in Hypertensive Disorders of Pregnancy in a Tertiary Care Hospital in Northern India. Obstet Gynecol Int J. 2017;6(6):1–5.

26. T F, G M, G N, A G, S T. Maternal and perinatal outcome in nulliparious women complicated with pregnancy hypertension. J Pak Med Assoc. 2010;60(9):707–10.

27. Muti M, Tshimanga M, Notion GT, Bangure D, Chonzi P. Prevalence of pregnancy induced hypertension and pregnancy outcomes among women seeking maternity services in Harare, Zimbabwe. BMC Cardiovasc Disord [Internet]. 2015;15(1):1–8. Available from: http://dx.doi.org/10.1186/s12872-015-0110-5

28. M. L, M.P. J, P.E. M, W. A, R.-C. H, T.A. M, et al. Preeclampsia and cardiovascular disease share genetic risk factors on chromosome 2q22. Pregnancy Hypertens. 2014;4(2):178–85.

29. Endeshaw M, Abebe FE, Bedimo M, Asrat A, Gebeyehu A, Keno A. Family history of hypertension increases risk of preeclampsia in pregnant women: a case-control study [Internet]. Vol. 35, Universa Medicina. 2016. p. 181–91. Available from:

https://www.univmed.org/ejurnal/index.php/medicina/article/

30. Berhe AK, Kassa GM, Fekadu GA, Muche AA. Prevalence of hypertensive disorders of pregnancy in Ethiopia: A systemic review and meta-analysis. BMC Pregnancy Childbirth. 2018;18(1):1–11.

31. Grum T, Seifu A, Abay M, Angesom T, Tsegay L. Determinants of pre-eclampsia / Eclampsia among women attending delivery Services in Selected Public Hospitals of Addis Ababa , Ethiopia : a case control study. 2017;1–7.

32. Liu C, Chang S, Cheng P. Cases at a Tertiary Hospital Methods : Results : 2005;(5):326–34.

33. Trogstad L, Magnus P, Skjaerven R, Stoltenberg C. Previous abortions and risk of pre-eclampsia. Int J Epidemiol. 2008 Dec;37(6):1333–40.

34. Shamsi U, Saleem S, Nishter N. Epidemiology and Risk Factors of Preeclampsia ; An Overview of Observational Studies. Al Ameen J Med Sci. 2013;6(4):292–300.

35. Duckitt K, Harrington D. Risk factors for pre-eclampsia at antenatal booking: systematic review of controlled studies. BMJ. 2005 Mar;330(7491):565.

36. Hernandez-Diaz S, Toh S, Cnattingius S. Risk of pre-eclampsia in first and subsequent pregnancies: prospective cohort study. BMJ. 2009 Jun;338(jun18 1):b2255–b2255.

37. Liyew EF, Yalew AW, Afework MF, Essén B. Distant and proximate factors associated with maternal near-miss: A nested case-control study in selected public hospitals of Addis Ababa, Ethiopia. BMC Womens Health. 2018;18(1):1–9.

38. Bej P, Chhabra P, Sharma A, Guleria K. Determination of risk factors for pre-eclampsia and eclampsia in a tertiary hospital of India: A case control study. J Fam Med Prim Care. 2013;2(4):371.

39. Duckitt K, Harrington D. Risk factors for pre-eclampsia at antenatal booking: Systematic review of controlled studies. Br Med J. 2005;330(7491):565–7.

40. Schalekamp-Timmermans S, Arends LR, Alsaker E, Chappell L, Hansson S, Harsem NK, et al. Fetal sex-specific differences in gestational age at delivery in pre-eclampsia: a meta-

analysis. Int J Epidemiol. 2016 Sep;46(2):dyw178.

41. Ali AA, Rayis DA, Abdallah TM, Elbashir MI, Adam I. Severe anaemia is associated with a higher risk for preeclampsia and poor perinatal outcomes in Kassala hospital, eastern Sudan. BMC Res Notes. 2011;4:2–6.

42. Herrera JA, Chaudhuri G, López-Jaramillo P. Is infection a major risk factor for preeclampsia? Med Hypotheses. 2001 Sep;57(3):393–7.

43. Sibai BM, El-Nazer A, Gonzalez-Ruiz A. Severe preeclampsia-eclampsia in young primigravid women: subsequent pregnancy outcome and remote prognosis. Am J Obstet Gynecol. 1986 Nov;155(5):1011–6.

44. Kachikis A, Eckert LO, Walker C, Oteng-Ntim E, Guggilla R, Gupta M, et al. Gestational diabetes mellitus: Case definition & guidelines for data collection, analysis, and presentation of immunization safety data. Vaccine. 2017;35(48):6555–62.

45. Combs CA, Rosenn B, Kitzmiller JL, Khoury JC, Wheeler BC, Miodovnik M. Early-pregnancy proteinuria in diabetes related to preeclampsia. Obstet Gynecol. 1993 Nov;82(5):802–7.

46. Lee CJ, Hsieh TT, Chiu TH, Chen KC, Lo LM, Hung TH. Risk factors for pre-eclampsia in an Asian population. Int J Gynaecol Obstet. 2000 Sep;70(3):327–33.

47. Ødegård RA. Preeclampsia - maternal risk factors and fetal growth. 2000;96(6).

48. Ali AA, Rayis DA, Abdallah TM, Elbashir MI, Adam I. Severe anaemia is associated with a higher risk for preeclampsia and poor perinatal outcomes in Kassala hospital, eastern Sudan. BMC Res Notes. 2011;4(1):311.

49. Yücesoy G, Ozkan S, Bodur H, Tan T, Calişkan E, Vural B, et al. Maternal and perinatal outcome in pregnancies complicated with hypertensive disorder of pregnancy: a seven year experience of a tertiary care center. Arch Gynecol Obstet. 2005;273(1):43–9.

50. Tessema G, Tekeste A, Ayele T. Preeclampsia and associated factors among pregnant women attending antenatal care in Dessie referral hospital, Northeast Ethiopia: a hospital-

based study. BMC Pregnancy Childbirth [Internet]. 2015;15(1):73. Available from: http://www.biomedcentral.com/1471-2393/15/73

51. Hospital debre berhan. Debre Berhan Referal Hospital Delivery Report. Debre berhan; 2010.

52. Endeshaw M, Abebe F, Bedimo M, Asrat A, Gebeyehu A, Keno A. Family history of hypertension increases risk of preeclampsia in pregnant women: a case-control study. Universa Med [Internet]. 2016 Dec 1;35(3):181. Available from: https://univmed.org/ejurnal/index.php/medicina/article/view/365

53. Yayla M, Api O, Gül E, Eyi Y, Ülkümen BA. Diabates in pregnancy : diagnosis and treatment . Practice Guidelines of Turkish Perinatology Society Gebelikte diyabet : Tan › ve tedavi . Türk Perinatoloji Derne ¤ i Uygulama Rehberi. 2016;(August).

54. Mex GO. Implicaciones clínicas de la investigación básica de la preeclampsia : tolerancia inmunológica Clinical implications of basic research in preeclampsia : immunological tolerance. 2015;505–14.

55. Hailemariam Segni1 TDD* and EA. Incidence, Maternal and Perinatal Outcome of Premature Rupture of Fetal Membrane Cases in Jimma University Teaching Hospital, South West Ethiopia. EC Gynaecol Res Artic. 2017;5(September 2017):163–72.

56. Zavos A, Valachis A, Mauri D, Papanikolaou EG, Tzioras S, Weber D, et al. during pregnancy : systematic review and meta-analysis. BMJ. :1–10.

57. Berhan Y, Berhan A. Causes of Maternal Mortality in Ethiopia: A Significant Decline in Abortion Related Death. Ethiop J Health Sci [Internet]. 2014;24(0):15. Available from: http://www.ajol.info/index.php/ejhs/article/view/107625

11. Annexes

11.1 Checklist English Version

This check list is prepared to assess the determinants of preeclampsia and its maternal and prenatal adverse outcomes among women who gave birth from January 1, 2016 to December 30, 2018. The purpose of the study is for partial fulfillment of degree of master in general public science. The checklist 26 main questions with some items in it that should be filled based on delivery registration book and patient cards. The quality of the research and its validity partly depends on the possibility of getting accurate data from DBRH and care of the data collectors. Hence the researcher sincerely request you to do as expected and I witness that all the data obtained should be kept confidential.

Thank you in advance

Compilation Sheet/Check List

Collector Name _____ MRN----------

REFERRAL: 1. Y☐ 2. ☐ If Yes, from? _____

CHECK LIST

Section one: Socio demographic information

No	Questi1onaire	Categories	code
1	How old are you?	Age in complete years----------	
2	What is your resident?	----------	
3	What is your ethnicity?	Amhara Oromo Afar Other----------	
4	What is your marital status now?	Single Married Divorced Others	
5	What is your Educational level?	----------	
6	What is Occupation?	----------	

Section two;-Obstetric History

NO.	Question	Possible response	Code
7	What is current preeclampsia?	Yes No	
8	What is Current pregnancy?	Gravidity_____ Parity _____ Abortion_____	
9	What is gestational age?	----------	
10	What is attended antenatal follow up?	Yes NO	
11	If yes	How many? _____	
12	What is Prior history of PIH	yes No	

13	What is onset of labor	Spontaneous Induction Caesarean section	Code
14	If not spontaneous, Indications	Intrauterine Fetal Death Decreased fetal movement. Eclampsia Sever Preeclampsia Others, specify---------	
15	What is mode of delivery	Spontaneous Vaginal delivery Instrumental /shorten second stage Caesarean section	
16	If caesarean section what was the indication	1. Fetal distress 2. Abruption placenta 3. Eclampsia 4. Previous caesarean scar 5. Failed induction 6. Others Specify.....	
17	What is number of fetus	1. Single 2. Twin (multiple)	

Section three; - Drugs given during current pregnancy

RN	Drug given	At health center		At hospital	
18		1.yes	2. no	1.yes	2.no
	Methyldopa				
	Nifedipine				
	Hydralazine				
	$MgSO_4$				
	Diazepam				
	Other----------				

Section Four past Medical History

RN	Past medical history of pregnant mother	1.yes	2.no
19	Chronic Hypertension		
	Pregnant induced hypertension		
	Diabetes Mellitus		
	Chronic renal disease		
	Heart disease		
	Hematological disorder (Chronic anemia)		
	Hepatitis		
	Seizure disorder/epilepsy		
	HIV/AIDS positive		
	Family history of hypertension		
	Family history of preeclampsia		
	Others specify----------		

Section five; - Clinical Features on Admission

RN	Chief complain (other than pregnancy/labor)	yes	no	Duration of illness	
20	Headache				
	Dizziness				
	Epigastric pain				
	Visual disturbance				
	Nausea and or Vomiting				
	Convulsions				
	Decreased fetal movement				
	Others----------				
21	What is Blood pressure at admission?	----------			

Section six; - Investigations

	Type of Investigation done	Possible response	Code
22	Blood group (BG)	_____	
23	Rhesus factor(RH)	_____	
24	Hematocrit	_____	
25	Dipstick urine protein	_____	
26	Platelet count	_____	
27	Renal function test (RFT)	_____	
28	Liver function test (LFT)	_____	

12. Declaration sheet

I, the undersigned, declare that this is my original Research work and has never been presented in this or any other university and that all sources of materials used for the thesis and individuals contributed to it have been fully acknowledged.

Name of Principal Investigator: _____

Signature: _____

Date of Submission: _____

This Research has been submitted for technical review with my approval as university advisor:

Name: _____

Signature: _____

Date: _____