Does anemia risk for pre-eclampsia? A multi-center, Case control study in Amhara region, Ethiopia.

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Research note

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Abstract

Objective This study aimed to identify determinants of preeclampsia among women visiting referral hospitals in Amhara region. A hospital-based unmatched case-control study was conducted from February 20, 2016 to May 18, 2016 among 871 women visiting West Amhara referral hospital for prenatal care.

Result Advanced age (>35 years) [AOR (95%CI), 3.09(1.80-3.35), being primigravidae [AOR (95%CI), 2.32 (1.61–3.35) family history of hypertension [AOR (95%CI), 4.31 (2.37–7.85)], twin pregnancy [AOR 95%CI, 3.53(1.77–7.06)], and Anemia [AOR (95%CI) = 1.49 (1.06– 2.1)] were determinants of preeclampsia.

Introduction

Preeclampsia, a life threatening complication of pregnancy, is a condition that typically starts after 20th week of pregnancy and is related to increased blood pressure (BP ≥140/90 mmHg) and protein in mother's urine (urinary albumin protein ≥ 300 mg/24 h) (1, 2).Preeclampsia and eclampsia are major cause of maternal deaths in the world(3). Although the incidence varies from region to region, eclampsia accounts for up to 40% of maternal mortality(4). Eclampsia which is a complication of preeclampsia accounts for 50,000 maternal deaths a year(5).

Maternal near-miss cases were eight times more frequent in women with preeclampsia, and increased up to 60 times in women with eclampsia compared with women without these conditions(6).Preeclampsia increases risk of fetal morbidity and mortality. It is a major cause of stillbirths, neonatal deaths, small for gestational age, lower birth weight, perinatal death and responsible for 15% of all preterm births(7).

Preeclampsia/eclampsia is responsible for 16% of direct cause of maternal death in Ethiopia & there is an increasing trend. Despite this, health centers don't have necessary drugs for the management of preeclampsia. Women may be referred to hospital without getting anticonvulsants. In addition to this, laboratory test for protein & organ function tests are not available for the management & follow up of women with preeclampsia. Due to this reason, most women with preeclampsia & eclampsia are referred to hospitals for better investigation, management & follow up(8, 9).Identifying the risk factors for preeclampsia is mandatory in order to prevent this high maternal mortality.

Although the exact etiology of preeclampsia is unidentified, many conditions are known as risk factors. Diabetes, renal disease, obesity, multiple pregnancy, primiparity, age above 30 years, personal or family history of preeclampsia and chronic hypertension are some of the risk factors identified for preeclampsia. In Ethiopia, there is no enough evidence on the risk factors of eclampsia and preeclampsia (10).Therefore, this study was done to identify determinants of preeclampsia in Amhara region, Northwestern Ethiopia.

Methods

Study setting

Amhara regional state is one of the nine regional states in Ethiopia.Amhara Region is the second largest and populous regions in Ethiopia where close 20 million people are living. This region has a population of 21,134,988 of whom about 4,897,566 are women and the region have 55 hospitals, 839 health centers, and 3336 health posts; among these 5 are referrals hospitals,4 general and 42 primary hospitals . The hospitals have a total of 1023 skilled birth attendants. These hospitals have 646 beds and around 84,440 deliveries per year (11).The health center have a total of 3023 skilled birth attendants and 12900 deliveries per year. All these government health institution provides care for the pregnant mothers widely in ANC, intrapartum and postpartum period.

Source population

All women who get perinatal service at west Amhara referral hospitals.

Cases were women diagnosed with pre-eclampsia by skilled provider. Preeclampsia is defined as high blood pressure (blood pressure of >140/90 mmHg)& excretion of 300mgor more protein in 24h urine sample after 20 weeks of pregnancy among previously normotensive pregnant women. This definition is used to diagnose preeclampsia in Ethiopia. Controls were all women who came for perinatal service who didn't have high blood pressure or proteinuria above the level mentioned above. Controls were interviewed after the hospital team ruled out preeclampsia using the above definition.

Study population

All women who get perinatal service at west Amhara referral hospitals during the study period

Inclusion and exclusion criteria

Exclusion criteria

Women who were critically ill at the time of survey.

Study design and sample size determination

An institution based, unmatched case control study was conducted among women who visited west Amhara referral hospitals. Sample size was determined using Epi Info stat calc by taking 80% power, 95% confidence level and a case to control ratio of 1: 2. Based on the above assumption and adding 10% non-response rate, the final sample size was 831(277 cases and 554 controls) women.

Sampling techniques and procedures

All cases in the study period were included in the study until the required sample size was obtained. Proportion to size allocation was used to determine the number of cases to be recruited from each hospital. For each case, two controls were selected using systematic random sampling technique.

Data collection tools and procedures

A pre- tested and structured questionnaire and document review were used for data collection. The questionnaire had socio-economic and demographic variables, obstetric and medical variables which were used to identify determinants of pre-eclampsia.

Training was given for one day for data collectors and supervisors. Clarity was made on all content of the formats and areas of difficulties. Besides, they were trained on overall procedures of data collection. Questionnaire was checked by data collectors & supervisors on daily base for completeness and consistency and fully completed with few missing items was coded.

Data processing and analysis

The collected data was checked for completeness and consistency. It was entered, cleaned, coded and analyzed using SPSS version 20.0. Pearson Chi-Square statistics was used to identify variation among cases and controls. Bivariable and multivariable logistic regression model were used to identify the association between explanatory and outcome variables with95% CI. Variables with p-value of less than or equal to 0.2 at 95% CI in the bivariable analysis were included to the multivariable model p value of < 0.05 was used to express the statistical significance of the variables.

Results

Socio-demographic characteristics of study participants

A total of eight hundred thirty one women were enrolled in this study. The mean age of cases was 27 years with standard deviation (SD) of ±6.4 years. About 67.8% of the cases were in the age range of 20 and 34 years. The majority of controls (72.7%) were aged 20—34 years. Most of the cases (81.9%) and controls (91%) were married (Additional file 1: Table SD1).

Personal and family history of study participants

In this study 17(6.1%) of the cases and 12(2.1%) of the controls reported history of chronic hypertension. Similarly, 56(20%) of cases and 20(7.2%) controls reported family history of hypertension and 100(37.7%) of cases were anemic (Table 1).

Obstetric characteristic of the study participants

Almost half (49.4%) of the cases and 39% controls were primigravidae. Regarding type of pregnancy, 10% of cases and 3.1% controls had twin pregnancy (Table: 2).

Determinants of preeclampsia

In the bivariate analysis, maternal age, blood group, gravidity, type of pregnancy, history of diabetes mellitus, family history of hypertension and having new partner and being anemic were significant at <0.2 level of significance. But, only advanced age (>35 years) [AOR (95%CI), 3.09(1.80–3.35), being primigravidae [AOR (95%CI), 2.32 (1.61–3.35) family history of hypertension [AOR (95%CI), 4.31 (2.37–7.85)], twin pregnancy [AOR 95%CI, 3.53(1.77–7.06)], and anemia [AOR (95%CI) = 1.49 (1.06– 2.1)] were determinants of preeclampsia. remained significant in the multivariable model(Table: 3).

Discussion

The study identified increased maternal age as determinant of preeclampsia. Pregnant women aged 35 or above were more likely to develop preeclampsia compared to women aged 20–34 years. This result was in line with the study done in Dessie town, Ethiopia(12). The finding was also similar with studies done in developed countries. A study based on nationwide data from the USA showed that the risk of preeclampsia increases by 30% per year after age 35(17). The reason for increased risk of preeclampsia among women with advanced age is that increasing age is associated with glucose intolerance due to a reduction in insulin sensitivity and abnormal lipid profile with increased levels of triglycerides and cholesterol. This leads to increased villous reaction leading to preeclampsia in older women (18, 19).

In this study, primigravidae women were more likely to develop preeclampsia compared with women of gravid 2–4. This may be due to exposure to chorionic villi for the first time, which is fetal in origin and a consequence of maternal immune reaction against paternal antigens expressed in placenta (20). This result was in line with studies done in Uganda(13) and another study conducted in developed countries (14).

Women who had twin pregnancy were more likely to develop preeclampsia compared to those with singleton. This finding was supported by studies in India(15) and Cairo (16).Hyperplacentosis, a greater demand of blood and oxygen supply, and an increase in the maternal cardiac output have been proposed as underlying mechanisms to explain the increased incidence of preeclampsia among women with multiple pregnancies (24 - 26).

This study identified that women with family history of hypertension were four times more likely to develop preeclampsia compared with those without family history of hypertension. This finding was in line with studies conducted in Dessie town, Ethiopia(12)and Brazil (17).This might be due to genetic factors that contribute to the physiologic predisposition of preeclampsia (13).Family history of hypertension is also a proxy measure for hereditary factors as well as common environmental or behavioral exposures that may underlie preeclampsia risk (28).

In this analysis, women with history of preeclampsia had higher risk of preeclampsia at current pregnancy. This finding was in line with other studies. Women with preexisting renal disease were more likely to develop preeclampsia. This finding was inconsistent with a study done in India(15).Renal disease may alter the acid-base, electrolyte, and renal function which may be aggravated by pregnancy and lead to preeclampsia.

The main finding of this study has shown those women having anemia were more likely to have increased incidence of preeclampsia This finding is consistent with other studies (18).the study in Sudan showed that there is association between the degree of the anemia during pregnancy with increase risk of pre-eclampsia risk of preeclampsia(19).

Conclusions

Old maternal age, primigravidae, twin pregnancy, family history of hypertension, and anemia were determinant of preeclampsia. Avoiding pregnancy at an older age should be advocated to reduce preeclampsia. Prevention of renal disease can also help to reduce preeclampsia. Health care providers should give special attention when providing antenatal care for women who are aged, primigravidae, had twin pregnancy, family history of hypertension, and with the previous history of preeclampsia and renal disease to early diagnose and manage preeclampsia.

Limitations

The findings of this study should be viewed in light of the following limitations. There might be introduced selection bias given that cases were selected consecutively as they appear for diagnosis additionally the study subjects were not followed after discharge from health institutions, Preeclampsia can be developed later on the postpartum period beside this there might be also introduced recall bias for some information acquired using the memory of participants.

List Of Abbreviations

ANC

Antenatal care

AOR

Adjusted odds ratio

BP

Blood Pressure

DMRH

Debremarkos Referral Hospital

DM

Diabetes mellitus

FHRH

Felege Hiwot Referral Hospital

GUH

Gondor University Hospital

HTN

Hypertension

IUGR

Intra Uterine Growth Restriction

SPSS

Statistical Package for Social Science

Declarations

Acknowledgement

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Authors' contribution

AA wrote the proposal, analyzed the data and drafted the paper. GA and MA assisted the proposal development, participated in data analysis and revised subsequent drafts of the paper. SA revised the last manuscript.All authors read and approved the final manuscript.

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BahirDar University has funded this study. BahirDar University had no role in the design, data collection, analysis and interpretation of data.

Availability of data and materials

All data are included in the manuscript. Additional data can be obtained from the corresponding author with a formal request.

Ethical approval and consent to participate

Ethical clearance was obtained from BahirDar University, College of Medicine and Health Sciences Research Ethics Review Committee. Written consent was obtained from the study participants. The participants were informed about the objective of the study and their participation was on voluntary basis. The information obtained from the participants was kept confidential and secured.

Consent for publication

Not applicable

Competing interest

The authors declared no competing interest.

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Tables

Table 1: Personal and family characteristics of women visiting referral hospitals for perinatal service in west Amhara, 2016.

Variables	Cases		Controls		P value
	No	%	No	%	
History of chronic HTN					
Yes	17	6.1	12	2.16	0.003
No	260	93.8	542	97.83	
History of renal disease					
Yes	13	4.9	12	2.16	0.001
No	264	95.3	542	97.8	
History of DM					
Yes	13	4.69	9	1.62	0.009
No	264	95.3	545	98.37	
Anemia					
Yes	100	37.3	168	62.7	0.125
No	177	31.4	386	68.6	
Family history of HTN					
Yes	56	20.2	20	7.2	0.000
No	534	79.7	534	96.3	
History of preeclampsia					
Yes	43	15.5	7	1.26	0.000
No	234	84.4	547	98.7	

Table 2: Obstetric characteristics of women visiting referral hospitals for perinatal service in west Amhara, 2016

Variable	Cases		Controls		P - value
	No	%	No	%	
Gravidity					
Primigravidae	137	49.4	217	39.2	0.012
Gravid 2-4	108	38.9	273	49.3	
Gravid 5^{+}	32	11.6	64	11.5	
Type of pregnancy					
Single	249	89.9	537	96.9	0.012
Twin	28	10.1	17	3.1	
ANC for current pregnancy					
Yes	255	92.1	538	97.1	0.000
No	22	7.9	16	2.9	
Time of first ANC visit					
1st triminister	124	44.8	172	31	0.000
2nd triminister	120	43.3	349	65	
3rd triminister	14	5	17	3.1	
Gestational age in weeks					
20-28	8	2.9	3	0.5	
28-36	85	30.7	50	9	0.000
36-40	152	54.8	366	66.1	
$\geq$40	32	11.5	135	24.4	
Partner change					
Yes	36	13	47	8.5	0.041
No	241	87	507	91.5	
Blood group					
A	65	23.7	129	23.3	
B	78	28	171	30.9	0.022
O	108	39	180	32.5	
AB	26	9.4	74	13.4	

Table 3: Bivariate and multivariate logistic regression analysis of factors associated with preeclampsia among women visiting west Amhara referral hospitals for perinatal service, 2016 (n = 831)

	preeclampsia			
Variables	**Yes n=277**	**No n=554**	**COR 95%CI**	**AOR 95%CI**
Age in year				
20-34	202	458	1	
<20	28	50	1.27(0.77-2.07)	0.99(0.57-1.71)
35 and above	47	46	2.3(1.49-3.59)	3.09(1.80-5.29)
Gravidity				
Primigravidae	137	217	1.59(1.17-2.18)	2.32(1.61-3.35)
Gravid 5 and above	32	64	1.26(.78-2.04)	0.86(0.47-1.57)
Gravid 2-4	108	273	1	
Types of pregnancy				
Twin	28	17	3.55(1.90-6.61)	3.53(1.77-7.06)
Single	249	537	1	
Renal diseases				
Yes	13	12	2.22(1.0-6.95)	1.76(0.71-4.36)
No	264	542	1	
Family history of HTN				
Yes	56	20	6.76(3.97-11.5)	4.31(2.37-7.85)
No	221	534	1	
Blood group				
A	65	129	1.302(.757-2.240)	1.256(.676-2.334)
B	78	171	1.185(.656-2.140)	1.185(.656-2.140)
O	108	180	1.882(1.13-3.112)	1.86(1.058-3.269)
AB	26	74	1	
Anemia				
Yes	100	168	1.29(0.95-1.76)	1.49(1.06-2.1)
No	177	386		

Supplementary Files

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