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Socio-demographic and reproductive risk factors of pre-eclampsia during the non-wet and cold season among women attending hospitals in Southern Ethiopia

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ABSTRACT

Background: Pre-eclampsia is a major complication of pregnancy and also one of the leading reason for maternal death in low resource setting including Ethiopia. To our knowledge, this has not been studied in the Omo district. Therefore, this study aimed to identify socio-demographic and reproductive risk factors of pre-eclampsia in a non-wet and cold season among pregnant women attending hospitals in Southern Ethiopia.

Methods: This hospital-based case-control study was conducted in Omo district hospitals between February and august 2018. The total sample size was 435 and divided into 145 cases and 290 controls. Pregnant women attending perinatal care services were selected systematically. Data were entered in Epi Info version seven window compatible software and exported to statistical package for social sciences (SPSS) version 26 for further analysis. Both the bivariable and a multivariable logistic regression model was computed to identify factors of pre-eclampsia.

Results: A total of 490 pregnant women have participated. Being a merchant (AOR 3.81, 95% CI: 1.02-14.20), multiparity(AOR 0.21; 95% CI: 0.06-0.78), and pregnancy interval of fewer than two years (AOR=0.31, 95%CI, 0.12-0.83) were found to have a significant statistical association with pre-eclampsia.

Conclusion: The study identified risk and protective factors of pre-eclampsia. To detection and treatment of pre-eclampsia timely, the clinician should give attention to women's parity and pregnancy interval. Also, women partner's characteristics should be emphasized.

Keywords: Pre-eclampsia, Hospitals, factors, Women, Southern Ethiopia

BACKGROUND

Pre-eclampsia is characterized by the occurrence of elevated diastolic blood pressure (at least 90 mmHg on two or more consecutive measurements of four hours apart or diastolic blood pressure to the extent of 110 mmHg on single measurement) plus protein in the urine after 20th week of gestation in women without a previous episode of hypertension or proteinuria[1,2].

The exact aetiology of pre-eclampsia is not clearly understood; however, immunological factors are the main predisposing to underlie abnormally implanted placenta. This abnormal placentation is believed to result in poor uterine oxygenation, which increases the release of anti-angiogenic proteins along with inflammatory mediators and results in oxidative stress and hypoxia(3). Also, parity, maternal age, ethnicity, environmental factors, and socio-demographic factors like low education level are risk factors of preeclampsia[4].

Preeclampsia has unpredictable disease progression and its complications may lead to vital organ failure, vascular coagulopathy, and neurologic abnormalities [5]. It is associated with fetal growth restriction, maternal and perinatal death. Pre-eclampsia accounts for nearly 12% of the annual maternal death and it is responsible for 25% of neonatal deaths worldwide [6].

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Nearly 98% of stillbirths, maternal and early neonatal death attributed to preeclampsia/eclampsia occurs in low-income countries [7]. Sub-Saharan African countries account for more than half of the overall maternal mortality. In the majority of cases, maternal death due to preeclampsia is preventable using an effective and timely provision of care [8].

In Ethiopia, severe preeclampsia or eclampsia is identified as one of the top five causes of maternal death. The country has been working on improvement interventions through on job training for clinicians involved in maternal healthcare. This capacity-building training believed to support healthcare providers clinical decision making to detect and manage preeclampsia inline with the national guideline. However, late perinatal health-seeking and paucity of the risk factor of preeclampsia made the management challenging [9]. So, the study of risk factors of pre-eclampsia can be used as evidence for clinicians to assess factors during women's prenatal attendance. As there is limited evidence of pre-eclampsia in Omo district, southern Ethiopia, this study was conducted to identify socio-demographic and reproductive risk factors of pre-eclampsia during the non-wet and cold season.

METHODS

Study area and period

This is facility-based case-control study design was conducted between February to May 2018 in Arbaminch General, Konso district, Sawla district, Chencha district, Jinka General, and Gidole district hospitals to identify socio-demographic and behavioural factors associated with pre-eclampsia among pregnant women. A case was defined as a pregnant woman attending the antenatal and delivery care who has diagnosed by a physician as being pre-eclamptic. Controls were defined as women visiting hospitals for antenatal, and delivery care that did not have the diagnosis of pre-eclampsia. Pre-eclampsia was defined as new onset of hypertension after 20 weeks of gestation along with protein in the urine that exceeds 300mg or more per 24h urine sample collection.

Sample size calculation and sampling technique

Double population proportion formula was used to estimate the sample size using Epi-Info version 7.2, after accounting the following assumptions: primary education level as a risk factor of with an odds ratio of (0.30) and the proportion of exposed group in controls 14.4% of controls exposed [10], 95% Confidence Interval(CI), and 80% power. The calculated sample size was 395, after adding 10% non-response rate, the final sample was 435(145 cases and 290 controls).

All cases that confirmed with the diagnosis of pre-eclampsia were included in the study consecutively. Regarding the selection of controls, the study used an incidence density sampling approach, where two controls were selected by simple random sampling technique immediately following the diagnosis of cases. This was made using the delivery register as sampling frame list. The sample size was distributed between the six hospitals proportional to their antenatal and delivery caseload.

Data collection instrument and Personnel

Structured and pretested data collection tool was used to collect data by face-to-face interview. The instrument was primarily prepared in English and translated to the national official working language(Amharic). The questionnaire encompasses different parts of questions related to socio-demographic variables, obstetric, medical, and behavioural-related variables. The questionnaire was prepared by referring to different works of literature [11-15]. Socio-demographic and reproductive related variables were gathered using this instrument. Twelve diploma and degree level midwives were involved during the data collection period. Six physicians supervised the data collection process while the investigators had a coordination role. Supervisors had a regular check on the clarity and completeness of the data.

Data Quality Management

To assure data quality, the questionnaire was pre-tested, two-days training was provided to the data collectors and supervisors, and strict daily follow-up was done. During the data collection process, supervisors checked the data collection tool for any missing values, its completeness, and consistency. This supervisors coordinate with the data collectors and had informed them to correct any inconsistency issues of the tool before the discharge of study subject from the hospital. The pairwise statistical technique was used to deal with missing values.

Data management, analysis, and interpretation

Data were entered into Epi-Info version 7.2 and transferred to SPSS version 26.0 for cleaning and further analysis. Descriptive statistics were summarized using tables. Both bivariable and multivariable logistic regression analysis was done to identify factors associated with socio-demographic, behavioural, and dietary-related factors with pre-eclampsia. In the bivariate regression model, variables with a p-value of less than 0.25 were agreed between investigators to fit variables into the final multivariable analysis model. Finally, a p-value of less than 0.05 in the multivariable analysis was considered to declare factors as statistically significant. The strength of association was determined according to the adjusted odds ratio at 95% confidence interval (CI).

RESULTS

Socio-demographic characteristics of the study participants

A total of 435pregnant women, 145(33.3%) of cases and 290(66.7%) controls were enrolled in this gives a 100% response rate. The mean ages of the study subjects in both groups were 25.91 with a with an SD of ±5.63). The majority of 95 (65.5%) of cases were between 20 and 29 years of age, followed by 55 (19.0%) of cases whose ages were between 30 to 34 years. The majority of 165(56.9%) of the control groups fell between 20 and 29 years of age. More than 140(96.6%) of cases and 266(91.7%) of controls were married. Regarding educational status, the majority of 43(29.7%) cases and 87(30.0%) of

controls had completed primary education level. Eighty (55.2%) of cases were housewives compared to one hundred fifty controls, on which they had a similar duty in their house (Table 1).

Table 1: Socio-demographic characteristics women enrolled for a case-control study on risk factors of pre-eclampsia among pregnant women, Omo district hospitals, southern Ethiopia.

Variable	Outcome Variable		X^2	Crude Odds Ratio (95% CI)	P-value
	Pre-eclampsia, n (%)	Controls, n (%)			
Participant age					
< 20 years	17(11.7%)	36(12.4%)	4.5	1(ref)	
< 20 to 29 years	95 (65.5%)	165(56.9%)		0.82(0.44-1.54)	0.54
30 to 34	55 (19.0%)	24(16.6%)		1.08(0.51-2.29)	0.84
35 and Above	9(6.2%)	34(11.7%)		1.78(0.70-4.54)	0.23
Residence					
Urban	83(57.2%)	174(60%)	0.34	1.12(0.78 - 1.68)	0.58
Rural	62 (42.8%)	116(40%)		Ref	
Women's Occupation					
Housewife	80 (55.2%)	150(51.7%)	2.04	0.88(0.37 - 2.13)	0.78
Merchant	21(14.5%)	39(13.4%)		0.87(0.32 - 2.36)	0.79
Government employee	15(10.3%)	41(14.1%)		1.29(0.46 - 3.59)	0.63
Private worker	7(4.8%)	19(6.6%)		1.28(0.38 - 4.27)	0.69
Students	14(9.7%)	24(8.3%)		0.81(0.28 - 2.35)	0.69
Others	8(5.5%)	17(5.9%)		Ref	
Husband's Occupation					
Government employee	41(28.3%)	81(27.9%)	5.75	1.37(0.54 - 3.46)	0.51
Private employee	38(26.2%)	95(32.8%)		1.73(0.68 - 4.38)	0.25
Farmer	51(35.2%)	79(27.2%)		1.07(0.43 - 2.69)	0.88
Merchant	6(4.1%)	22(7.6%		2.54(0.74 - 8.77)	0.14
Others	9(6.2%)	13(4.5%)		Ref	
Marital status					
Unmarried	5(3.4%)	24(8.3%)	0.39	Ref	0.07
Married	140(96.6%)	266(91.7%)		0.396(0.15 -1.06)	
Educational level					
No formal education	32(22.1%)	61(21.0%)	3.48		
Primary level	43(29.7%)	87(30.0%)		1.06(0.61-1.86)	0.84
Secondary level	33(22.8%)	86(29.7%)		1.37(0.76 - 2.46)	0.29
College and Above	37(25.5%)	56(19.3%)		0.79(0.44- 1.44)	0.45

Reproductive-related characteristics

Sixty per cent of the cases had a normal body mass index comparable to 189(65.2%) of controls. Most of the 37.2% of cases and 31.7% of the controls had no previous childbirth history or they are nully parous. The number of having had ANC follow-up at least ones during the last pregnancy was 15(10.3%) among cases with new ANC follow-up, while it became 20(6.9%) in controls (Table 2).

Table 2: Reproductive related characteristics of women enrolled for a case-control study on risk factors of pre-eclampsia among pregnant women, Omo district hospitals, southern Ethiopia.

Variable	Outcome Variable		X^2	Crude Odds Ratio (95% CI)	P-value
	Pre-eclampsia, n(%)	Controls, n(%)			
Body mass index					
Low	14(9.7%)	19(6.6%)	3.64	1(ref)	
Normal	87 (60%)	189(65.2%)		0.63(0.30 - 1.30)	0.21
Overweight	39 (26.9%)	78(26.9%)		0.68(0.31- 1.50)	0.34
Obese	5(3.4%)	4(1.4%)		1.70(0.38-7.49)	0.49

Parity					
Primiparous	54(37.2%)	92(31.7%)	4.76	Ref	
Multiparous	35 (24.1%)	55(19%)		1.86(0.70-4.94)	0.21
Grandmultiparous	50(34.5%)	124(42.8%)		2.02(0.73-5.54)	0.17
Nully parous	6(4.1%)	19(6.6%)		1.28(0.48-3.39)	0.62
Pregnancy interval					
No prior childbirth	49 (33.8%)	106(36.6%)	0.77	Ref	
Less than 2 years	27(18.6%)	45(15.5%)		1.30(0.72-2.33)	0.38
Two to five years	69(47.6%)	139(47.9%)		1.07(0.68-1.68)	0.75
Pregnancy desire					
Wanted and supported	13(4.5%)	9(6.2%)	0.44	1.41(0.58 - 3.38)	0.44
Unwanted	277(95.5%)	136(93.8%)		ref	
ANC follow up status					
Yes	15(10.3%)	20(6.9%)	0.63	1.19(0.78 -1.83)	0.43
No	130(89.7%)	270(93.1%)		ref	0.07
Nutritional counseling					
Yes	15(10.3%)	20(6.9%)	1.6	1.56(0.77 – 3.14)	0.22
No	130(89.7%)	270(93.1%)		ref	
Hematologic status					
Low hemoglobin	56(38.6%)	89(30.7%)	2.74	1.42(0.94-2.16)	0.09
Normal hemoglobin	89(61.4%)	201(69.3%)		ref	
Contraceptive use					
No contraceptive use	79(54.5%)	148(51.5%)			
Injectable	47(32.4%)	85(29.3%)	3.99	1.04(0.66-1.62)	0.88
Implants	11(7.6%)	41(14.1%)		0.50(0.25- 1.03)	0.06
Oral pills	8(5.5%)	16(5.5%)		0.94(0.38- 2.29)	0.89

The identified factors of pre-eclampsia

Private employee, nully parity, and less extended interpregnancy duration have a significant statistical association with pre-eclampsia.

The probability of pre-eclampsia occurrence among women living with merchant occupant husband has increased approximately by four times (AOR=3.81, 95% CI: 1.02-14.20). On the other hand, the risk of pre-eclampsia among multiparous women was decreased by 79% compared to women with a history of childbirth (AOR=0.21; 95% CI: 0.06-0.78).

Considering the interval between pregnancies, women who had a less extended period between pregnancies have decreased probability of developing pre-eclampsia. In this study, the odds of pre-eclampsia occurrence was decreased by 69% among women who had less than 2 years interval between subsequent conceptions (AOR=0.31, 95%CI, 0.12-0.83).

DISCUSSION

This study aimed to assess the socio-demographic and reproductive factors of pre-eclampsia. We found that women living with merchant occupant husband are a risk factor for pre-eclampsia. This inline different studies [10, 16-18], which can be explained by the presence of stress during work. It was indicated that work-related to psychological strain increases the risk of pre-eclampsia. This can also be explained by the joint effect of work-related stress and life stress which brings the risk of chronic alcohol consumption and overweight among men(19), the double burden of work balance and family increases the risk of pre-eclampsia, due to the release of cortisol men are at increased risk of physical strain [17]. Moreover, studies on physiologic stress markers are often indicated that men have greater blood pressure and job strain than do women. In the study area, people are influenced by traditional ideology, in which men are superior while women are subordinates and are not often independent, mainly in rural areas. About occupational status, recent studies depicted that there was a significant association between perceived stress and occupation, in which men from low socio-economic status are at increased risk of hypertension [18, 20, 21].

In this study, multiparity was independently associated with pre-eclampsia in the multivariable analysis. Recent studies have suggested that the risk of pre-eclampsia decrease in multiparous women because of their repeated exposure and adaptation to the specific antigen of the partner as long as she used to have a new partner [22]. However, this works only when their pregnancy interval is shorter. In this regard, women with an extended birth interval loss the benefit of being protected from pre-eclampsia, this is because the protective effect only works until the women change partner into a new one [23]. In this study, this is further explained in this study that women with an inter-pregnancy interval of fewer than two years had a 69% decreased probability of developing pre-eclampsia. The

shorter interbirth interval may be due to miscarriage, which reduces the risk of pre-eclampsia in a subsequent pregnancy [24]. A review on pregnancy interval reported that shorter interpregnancy interval does not increase the risk of pre-eclampsia [25]. Further evidence indicated that the risk of having recurrent pre-eclampsia was decreased with an interpregnancy interval of fewer than 10 years [26-28]. The extent of immunological exposure is the reason for an increase or decreased risk of pre-eclampsia in subsequent pregnancies [29]. However, the influence of the time since previous pregnancy should not be taken as a recommendation at glance, like many other adverse outcomes of pregnancy including preterm birth are more likely to happen in shorter intervals.

LIMITATIONS OF THE STUDY

First, selection bias is unlikely, because we have included all cases that appeared to Omo district hospitals during the study period. However, there may be a risk of recall bias due to the retrospective nature of the study we have tried to lower the risk by limiting the time laps within 12 months. Despite the multicenter nature of the study, where the study population could be heterogeneous, we didn't consider the health facility type as a factor. Given a wide range of geographic condition, interested researchers may consider as a basis for future work.

Lastly, due to the difficulty of tracing women after discharge, we did not consider postpartum occurring pre-eclampsia.

CONCLUSIONS

Women living merchant occupant husbands were considered a risk factor for pre-eclampsia while the multi-parous and interbirth interval of fewer than two years was protective factors that decrease the risk of pre-eclampsia.

Systematic clinical identification of merchant occupant husbands during their visit for perinatal care may benefit the women by reducing the overall pre-eclampsia occurrence. It also is helpful in the diagnosis and management of women at risk for pre-eclampsia. Healthcare providers need to prompt mothers to discuss interbirth interval along with the desire of childbirth. Nevertheless, scholars should have the insight to conduct further studies on the link between interpregnancy interval and pre-eclampsia.

LIST OF ABBREVIATIONS

- ANC Antenatal Care
- AOR Adjusted Odds Ratio
- BMI Body Mass Index
- COD Crude Odds Ratio
- CI Confidence Interval
- WHO World Health Organization

DECLARATIONS

We, the undersigned, agree to accept responsibility for the scientific, ethical, and technical conduct of the research project mentioned below and for the provision of required progress reports and financial settlements as per the terms and conditions of the University if the grant is awarded as the result of this application.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the ethical review committee of the College of Medicine and Health Sciences, Arbaminch University. An official letter of cooperation was written to each hospital to get permission. Formal written consent was also obtained from the study participants. Similarly, the participants were informed about the purpose of the study, privacy, and confidentiality issues. Participation was involved only if she said so, she had the right to be off any time she wants to. If she did, the study assures that she had nothing to lose from the service she expected to receive. As if all information gained during data collection was kept confidential and any personal identification was not recorded on the questionnaire.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

On presumable requests, the data sets used for analysis during the current study are available from the corresponding author.

COMPETING INTERESTS

The author declares that there are no competing interests.

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AUTHOR'S CONTRIBUTIONS

KF has a role in the conception, planning, carrying out data collection, analyzing and writing up of the work, and manuscript development.

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