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Original research article

Risk Factors Associated with Preeclampsia: A Case Control Study

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Abstract

Introduction: Preeclampsia is linked to maternal morbidity and death, as well as short- and long-term effects on the unborn child. Preeclampsia has become more common, and the incidence of recurring preeclampsia has not decreased. The current study's objective was to determine risk variables for recurrent preeclampsia in women who had previously experienced the condition.

Materials and methods: Case control analytical study was conducted among 60 preeclampsia case and 60 control at tertiary care hospital of Gujarat.

Results: As per univariate analysis, preeclampsia was found to be substantially correlated with advance age and poor education of mother as well as family head, obesity, family history of preeclampsia, hypertension, and personal history of DM. Obstetric history such as early menarche age (11–12 years), primiparity, inter pregnancy interval less than 3 years were significantly associated with development of pre eclampsia. On multivariate analysis, it was found that obesity, primiparity, interpregnancy interval less than 3 years, personal history of DM, family history of pre eclampsia and hypertension were independent risk factors of Preeclampsia.

Conclusion: Obesity, primiparity, interpregnancy interval less than 3 years, personal history of DM, family history of preeclampsia and hypertension are significant predictor for development of Preeclampsia. Most of these factors are non-modifiable, but can be used to screen women dursing antenatal visits to identify those at higher risk of Preeclampsia.

Keywords: Diabetes melitus, interpregnancy interval, preeclampsia, primiparity, obesity

Introduction

Preeclampsia, which is diagnosed when a woman has proteinuria and hypertension after 20 weeks of pregnancy, can complicate up to 10% of pregnancies [1, 2] and is a significant contributor to perinatal maternal death [3]. Preeclampsia is also linked to maternal morbidities, such as sepsis and low Apgar scores for newborns, as well as short- and long-term maternal cardiovascular morbidities and death [4]. The severity of the preeclampsia, gestational age at onset, mother background health, socioeconomic level, and ethnicity are just a few of the variables that influence these heightened risks. Women with a history of preeclampsia are more likely to experience pregnancy difficulties in their current and subsequent pregnancies, such as preterm labour, gestational diabetes, and foetal growth restriction [5,6], Due to a shared aetiology. Null parity, advanced mother age, lifestyle variables, and a personal or family history of preeclampsia are some of the risk factors for preeclampsia [7-9]. About 10-15% of pregnancies experience recurrent preeclampsia, while greater percentages have also been seen. The recurrence of preeclampsia in certain women and within the same families shows that maternal chronic characteristics, such as long-term environmental exposures or genetic variables, are linked to preeclampsia and its recurrence. Women with recurrent preeclampsia are more likely to experience long-term morbidities than women with a single preeclampsia, even though it may appear during the subsequent pregnancy with fewer clinical symptoms [10]. The ability to use prophylactic techniques to reduce serious problems for both the mother and the child depends on the ability to identify early preeclampsia markers before the clinical symptoms. There are a number of first trimester screening techniques that have been suggested, however there are currently no reliable screening tests that are regularly utilised for the early identification of preeclampsia. Preeclampsia prevention and treatment strategies, like as aspirin administration and vitamin D supplementation, have been explored and put into practise. Options for prevention and treatment depend on the severity of the clinical symptom and the maternal history. Preeclampsia and recurrent preeclampsia rates have not decreased over the past 20 years despite substantial research on treatment and prevention methods. The rise in preeclampsia risk factors such diabetes mellitus, obesity, and chronic hypertension may be to blame for this. Obesity is one recurrent preeclampsia risk factor that may be avoided, and co-morbidities in the background can be managed. Identification of women at risk for recurrent preeclampsia is crucial since treatment is advised from the beginning of pregnancy, before preeclampsia ever manifests, and because repeated preeclampsia involves an even higher risk for maternal morbidities. The current study sought to discover prenatal factors connected to recurrent preeclampsia in later pregnancies [11-12].

Methodology

The Case control analytical study was conducted among 60 preeclampsia case and 60 control subjects. Study subjects were selected through convenient sampling method from post natal wards of after getting ethical clearance from research review board. Women fulfilling the criteria for Preeclampsia case were enrolled into the study till desired sample size achieved. Same number of controls was then selected each day by random selection of remaining beds. Case and control were enrolled within 2 days of delivery and informed consent was taken. Hospital case sheets and an interview with the study participant herself were used to gather information. When a patient became cognizant after giving birth or from accompanying family members, the patient's history was recorded. No matter the outcome, women who delivered before the 20th week of pregnancy were disqualified from the study. All the data were gathered utilising a predesigned, semi-structured research Performa. On the basis of a literature assessment and biological plausibility for a link with both the exposure and the outcome, potential risk variables for the study were chosen. Definition of Pre-eclampsia: As a diastolic blood pressure of at least 90 mmHg on two or more consecutive occasions 24 hours apart or a

diastolic blood pressure of at least 110 mmHg on any one occasion plus proteinuria (one 24-hour urine collection with a total protein excretion of at least 300 mg or two 1+ on a urine dipstick)[13].

Statistical analysis:
Data was entered into MS Excel version 10. Mean and standard deviation were used to summarise continuous values, whereas proportion (%) was used to summarise categorical variables. Multiple Logistic Regression analysis was carried out to identify the preeclampsia predictors. All factors that were shown to be significantly linked to preeclampsia were added to the regression model. Regression model's probability of keeping an independent variable was kept at 0.05, while the probability of removing it was set at 0.10. MS Excel was used for all statistical computations. P value less than 0.05 was considered to be significant.

Results
Table shows socio demographic characteristics of case and controls. Age more than 30 years, education of mother and head of the family were significantly associated with development of preeclampsia.

Table 1: Distribution of Study population according to Socio-demographic characteristics

Socio-demographic characteristics		Case	%	Control	%	Total	%	p value
Age Group (years)	≤ 30	45	75.0	55	91.7	100	83.3	**0.01**
	>30	15	25.0	5	8.3	20	16.7	
Religion	Hindu	46	76.7	46	76.7	92	76.7	0.91
	Muslim	10	16.7	9	15.0	19	15.8	
	Others	4	6.7	5	8.3	9	7.5	
Residence	Urban	19	31.7	27	45.0	46	38.3	0.32
	Rural	37	61.7	30	50.0	67	55.8	
	Slum	4	6.7	3	5.0	7	5.8	
Family Type	Nuclear	6	10.0	12	20.0	18	15.0	0.26
	Joint	49	81.7	42	70.0	91	75.8	
	Three generation	5	8.3	6	10.0	11	9.2	
Education of mother	≤ Primary	41	68.3	30	50.0	71	59.2	**0.04**
	≥ Secondary	19	31.7	30	50.0	49	40.8	
Occupation	House Wife	53	88.3	54	90.0	107	89.2	0.76
	Working	7	11.7	6	10.0	13	10.8	
Education Head of family	≤ Primary	33	55.0	25	41.7	58	48.3	**0.02**
	≥ Secondary	47	78.3	45	75.0	92	76.7	
Socio-economic status	I	1	1.7	1	1.7	2	1.7	0.58
	II	28	46.7	25	41.7	53	44.2	
	III	15	25.0	16	26.7	31	25.8	
	IV	16	26.7	18	30.0	34	28.3	

Women having early age of menarche (≤12 years) was significantly higher in case group (45.0%) as compared to control group (23.4%, p -0.03). Primipara and inter pregnancy interval less than 3 years were significantly associated with development of pre eclampsia (Table 2).

Table 2: Distribution of Study population according to obstetric characteristics

Obstetric characteristics		Case	%	Control	%	Total	%	p value
Age at Menarche (years)	11	3	5.0	1	1.7	4	3.3	**0.03**
	12	24	40.0	13	21.7	37	30.8	
	13	26	43.3	33	55.0	59	49.2	
	14	5	8.3	13	21.7	18	15.0	
	15	2	3.3	0	0.0	2	1.7	
Parity	Primipara	39	65.0	19	31.7	58	43.3	**<0.001**
	Multipara	21	35.0	31	68.3	62	56.7	
Age at first parity (years)	≤ 20	34	56.7	39	65.0	73	60.8	0.28
	21-25	24	40.0	21	35.0	45	37.5	
	> 25	2	3.3	0	0.0	2	1.7	
History of previous Abortion	No	12	20.0	10	16.7	22	18.3	0.63
	Yes	48	80.0	50	83.3	98	81.7	
Inter pregnancy period	< 3 years	17	81.0	21	51.2	38	61.3	**0.02**
	≥3 years	4	19.0	20	48.8	24	38.7	
Gender of last Child	Male	9	42.9	18	43.9	27	43.5	0.93
	Female	12	57.1	23	56.1	35	56.5	

About 35% of women were pre obese or obese in case group which was significantly higher than control group 23.4%, p - 0.03). As shown in table 3, history of diabetes mellitus and family history of pre eclampsia and hypertension was significantly higher in case group as compared control group.

Table 3: Distribution of Study population according to Clinical characteristic

Characteristics		Case no	Case %	Control no.	Control %	Total no.	Total %	P value
BMI	Under weight	5	8.3	7	11.7	12	10.0	**0.03**
	Normal	34	56.7	45	75.0	79	65.8	
	Preobese	14	23.3	7	11.7	21	17.5	
	Obese	7	11.7	1	1.7	8	6.7	
Blood Group	A	12	20.0	13	21.7	25	20.8	0.81
	AB	14	23.3	10	16.7	24	20.0	
	B	18	30.0	21	35.0	39	32.5	
	O	16	26.7	16	26.7	32	26.7	
Rh factor	Positive	54	90.0	45	75.0	99	82.5	0.77
	Negative	16	26.7	15	25.0	31	25.8	
Personal History	Diabetes Mellitus	6	10.0	0	0.0	6	5.0	**<0.001**
	Hypertension	0	0.0	0	0.0	0	0.0	NA
	Renal Disease	0	0.0	0	0.0	0	0.0	NA
	CVD	0	0.0	0	0.0	0	0.0	NA
	Hypertension	0	0.0	0	0.0	0	0.0	NA
Family History	Preeclampsia	8	13.3	1	1.7	9	7.5	**0.01**
	Hypertension	16	26.7	7	11.7	23	19.2	**0.03**
Diet	Non Vegetarian	22	36.7	16	26.7	38	31.7	0.23
	Vegetarian	38	63.3	44	73.3	82	68.3	

Table 4: Multiple Logistic Regression analysis

Variable	Odds ratio	95% CI	P value
Age group			
Age<30 years	-	-	-
Age>30 years	0.98	0.74-2.34	0.68
Education of mother			
≤ Primary	-		0.06
≥ Secondary	0.89	0.64 – 3.45	
Education of head of the family			
≤ Primary	-		
≥ Secondary	0.63	0.23-1.23	0.74
BMI			
Normal & Underweight	-		
Pre obese & Obese	3.23	1.65 - 6.29	**0.02**
Age of menarche			
≥13 years	-		
≤ 12 years	0.59	0.16 – 1.37	0.23
Parity			
Multiparity	-	-	-
Primiparity	4.53	2.78-7.37	**<0.001**
Inter pregnancy period			
≥3 years	-		
< 3 years	2.85	1.23-6.75	**0.01**
Personal history of DM			
Absent			
Present	2.59	1.59-4.38	**<0.001**
Family history of Pre eclampsia			
Absent	-	-	-
Present	1.67	1.04-2.72	**0.04**
Family history of Hypertension			
Absent	-	-	-
Present	0.57	0.23 – 1.10	**0.45**
Constant			

In multivariable regression analysis, odds ratio (OR) were calculated to see the strength of the association between the outcome and explanatory variable. Odds of developing pre eclampsia was 3.23 times higher in pre obese or obese women as compared to normal or underweight women. Similarly, odds of developing pre eclampsia in primipara women, women with less than 3 years inter pregnancy interval, women having personal history of DM, family history of pre eclampsia were 4.53, 2.85, 2.59, 1.67 times higher than corresponding groups respectively.

Discussion

Preeclampsia (PE) continues to constitute a significant hazard to public health in both industrialised and developing nations, its effects are more severe in the latter, where late cases may make therapy ineffective. Pre-eclampsia cannot be completely prevented, but early detection and appropriate treatment might lessen its severity. The problem is made worse by the disease's unpredictable nature and unclear etiologies [14]. Incidence of preeclampsia complication itself was not raised, preeclampsia in women exacerbated by advanced Maternal Age was associated with a higher risk of poor pregnancy outcomes, caesarean delivery, and postpartum haemorrhage. According to a study by Latha K. et al., [15] maternal age >30 years

was observed to increase the incidence of preeclampsia in Chennai. According to Ishag Adam et al., [16], advanced maternal age (>30/35 years) is also linked to preeclampsia. According to a study conducted by Agrawal S et al. [17], older women are at a greater risk of pre-eclampsia due to increased villous response. One of the risk factors for preeclampsia is living in a rural area. In this study, it was discovered that living in a rural area significantly increased the risk of developing preeclampsia. The results of Agrawal S. et al. corroborated this. [17]. However, advance age and rural residency were not significantly associated with pre eclampsia.

Premature menarche, delayed menarche, irregular menstruation, age at menarche, and menstrual features may all be linked to preeclampsia risk factors, which also include maternal obesity, insulin resistance, and other hormonal variables. Similar to the findings of the study by Ramesh et al., the age of menarche at 12 years was discovered to be a major risk factor for Preeclampsia [18]. In other research, early menarche (12 y) has been linked to an increased risk of CVD events, which may be mediated by an increase in adiposity. However, these factors were not significantly associated with pre eclampsia.
Pre-eclampsia risk is enhanced by about 2.4 times in women who have primi parity. This is so because the early trophoblastic invasion causes primi parity. The spiral arterioles become maladapted as a result of the usual invasion of trophoblastic cells failing, which is related to the pre-eclampsia cause. According to the current study, primi parity is a separate risk factor for the development of preeclampsia. Similar findings have been observed in several investigations, including the multi-country study by Ver Luanni Bilano et al. [19]. Similar results were observed in the study by North RA et al., [20] as well.
In the current study, it was discovered that BMI 25–29.9 kg/m2 and BMI 30 kg/m2 were separate risk factors for preeclampsia. Kartasurya MI et al. study. [21] In Indonesia reported that being overweight and obese was a major risk factor, while Anderson NH et al study.'s made a similar observation [22].

Conclusion:

Obesity, primiparity, interpregnancy interval less than 3 years, personal history of DM, family history of pre eclampsia and hypertension are significant predictor for development of Preeclampsia. Most of these factors are non-modifiable, but can be used to screen women dursing antenatal visits to identify those at higher risk of Preeclampsia.

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