Original Article

Determinants of Pre-eclampsia: A Case–control Study in a District Hospital in South India

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ABSTRACT

Objective: The objective was to study the determinants of pre-eclampsia among pregnant women admitted for delivery in a district hospital. **Materials and Methods:** A case–control study was conducted at District Lady Goschen Hospital, Dakshina Kannada district, Karnataka, South India. The group of pregnant women with pre-eclampsia comprised those with hypertension after the 20th week of gestation with associated proteinuria, and controls were pregnant women not diagnosed with pre-eclampsia. A total of 100 cases and 100 controls were selected for the year 2006. Study variables included mother's age, parity, body mass index, history of chronic hypertension, history of diabetes, history of renal disease, family history of hypertension, and history of pre-eclampsia in earlier pregnancy. **Statistical Analysis:** Chi-square test, and crude and adjusted odds ratio with 95% confidence intervals were used for statistical analysis. **Results:** Significant risk factors identified in univariate analysis included prepregnancy body mass index (BMI ≥ 25) (OR = 11.27), history of chronic hypertension (OR = 8.65), history of diabetes (OR = 11.0), history of renal disease (OR = 7.98), family history of hypertension (OR = 5.4), history of pre-eclampsia in earlier pregnancy (OR = 9.63), and multiple pregnancy (OR = 4.85). Multiple logistic regression analysis revealed that the prepregnancy BMI of >25 (OR = 7.56), history of chronic hypertension (OR = 6.69), history of diabetes (OR = 8.66), history of renal disease (OR = 5.6), family history of hypertension (OR = 5.48), and multiple pregnancy (OR = 5.73) are the significant risk factors of pre-eclampsia. **Conclusion:** Pregnant women at risk of pre-eclampsia should be identified and high-quality antenatal care should be given in order to minimize the complications of pre-eclampsia both for the mother and the fetus.

Keywords: Chi-square test, odds ratio, pre-eclampsia, risk factors

Introduction

Pre-eclampsia is pregnancy-induced hypertension (PIH) of unknown etiology. Pre-eclampsia can be quite serious as it can lead to various complications both for the mother and the baby. In fact, pre-eclampsia and eclampsia, severe forms of PIH, are the leading cause of infant and maternal death in the United States. Hypertension complicates an estimated 6–8% of all pregnancies. There are genuine differences in the incidence of hypertensive disorders of pregnancy in the populations of Southeast Asia and the fact that these are not caused by underlying differences in the baseline blood pressures in these populations.[1]

Though the cause for pre-eclampsia is unknown, there does appear to be certain risk factors associated with the condition. The factors that have been postulated to influence the risk of pre-eclampsia among the mothers include diabetes, renal disease, obesity, multiple pregnancy, primiparity, age above 30 years, personal or family history of pre-eclampsia, and chronic hypertension. In developing countries, evidence on the association between these factors and pre-eclampsia is scarce. There are many studies in developed and some developing countries to assess the association between these factors and pre-eclampsia.[2-5] Those that have been conducted have often had an inadequate control and lack

of statistical power, resulting in inconclusive evidence for determinants of pre-eclampsia in developing countries. Very few studies have been conducted in India to assess the determinants of pre-eclampsia. Studies of such nature will be a useful tool to take appropriate interventional measures. In this context, a case–control study was conducted to elucidate some of the major risk factors for pre-eclampsia.

Materials and Methods

This unmatched case–control study was conducted in the district government hospital attached to a medical institution in South India. This is a tertiary care hospital and its maternity service is a referral in the care of high-risk pregnant women throughout the district. The district covers a population of about 4.1 lakhs with 5 taluks in the coastal belt of Karnataka in South India. A total of 100 cases and 100 controls were selected for the year 2006. This is calculated by taking power at 80%, odds ratio of 3, two-sided significant level as 0.05, and proportion of controls with exposure as 0.1.

The group of pregnant women with pre-eclampsia comprised those with hypertension after the 20th week of gestation with associated proteinuria, and controls were pregnant women not diagnosed with pre-eclampsia. After the selection of each case as defined above, the next available pregnant women who had fulfilled the criteria for controls given above were selected and included in the control group. This ensured a case and control ratio of 1:1.

Antenatal records of the mothers who delivered in the hospital from January to December 2006 were scrutinized for completeness of history and case write-up. In the first step, the records with pre-eclampsia were scrutinized and separated. Then cases were selected from the separated pre-eclampsia records by simple random technique. Controls were selected in the same manner. Information relating to maternal and obstetric factors was obtained from the case records, which included age, parity, body mass index (BMI), multiple pregnancy, history of chronic hypertension, history of diabetes, history of renal disease, family history of hypertension, and history of PIH in earlier pregnancy.

Data were analyzed by the use of SPSS version 12. Crude and adjusted odds ratios with 95% confidence intervals were calculated. Since PIH is a multifactorial condition, we used a multiple logistic regression analysis to assess independent effects of each variable.

Results

Majority of the cases and controls belonged to the 20–29-year age group (76% and 85%, respectively). BMI was normal among the majority of the cases and controls (82% and 84%, respectively). Around 15% of cases and 2% of controls had history of chronic hypertension. The proportion of multigravida was high among cases as compared to controls but the difference was not statistically significant. On univariate analysis it was found that BMI ≥25) (OR = 11.27), history of chronic hypertension (OR = 8.65), history of diabetes (OR = 11.0), history of renal disease (OR = 7.98), family history of hypertension (OR = 5.4), history of PIH in earlier pregnancy (9.63), and multiple pregnancy (OR = 4.85) were significantly associated with pre-eclampsia. But age group was not found to be significantly associated with pre-eclampsia [Table 1].

Six variables were significantly associated with pre-eclampsia in multivariate logistic regression analysis after adjustment for confounding variables. The significant determinants identified for pre-eclampsia were prepregnancy BMI of ≥25 (OR = 7.56), history of chronic hypertension (OR = 6.69), history of diabetes (OR = 8.66), history of renal disease (OR = 5.6), family history of hypertension (OR = 5.48), and multiple pregnancy (OR = 5.73). The analysis revealed that BMI, diabetes, and history of chronic hypertension are the most dominating associated factors in the occurrence of pre-eclampsia [Table 2].

Table 1: Univariate analysis showing the determinants for pre-eclampsia

Determinants	Cases	Control	Crude OR	95% CI
Age				
20-29	76	85	0.56	0.27-1.14
≥30	24	15	-	-
Body mass index				
≥25	13	3	11.27	2.22-57.20
18.5-24.9	82	84	2.54	0.86-7.44
<18.5	5	13	-	-
Parity				
Multigravida	37	27	1.59	0.87-2.89
Primigravida	63	73	-	-
Multiple pregnancy				
Present	9	2	4.85	1.02-23.03
Absent	91	98	-	-
Chronic hypertension				
Present	15	2	8.65	1.92-38.90
Absent	85	98	-	
h/oDiabetes				
Present	10	1	11.0	1.38-87.64
Absent	90	99	-	-
Renal disease				
Present	14	2	7.98	1.76-36.09
Absent	86	98	-	-
Family h/o hypertension				
Present	10	2	5.4	1.16-25.52
Absent	90	98	-	-
H/o PIH in earlier pregnancy				
Present	10	1	9.63	1.15-80.63
absent	27	26	-	-

Table 2: Correlates of pre-eclampsia: Multiple logistic regression analysis

Determinants	Adjusted OR	95% CI	*P* value
Body mass index			
≥25	7.56	1.32-43.37	0.02*
18.5-24.9	1.86	0.6-5.77	0.29
<18.5	-	-	-
Parity			
Multigravida	1.89	0.96-3.70	0.07
Primigravida	-	-	-
Multiple pregnancy			
Present	5.73	1.13-29.10	0.04*
Absent	-	-	-
H/o Chronic hypertension			
Present	6.69	1.37-32.75	0.02*
Absent	-	-	-
H/o Diabetes			
Present	8.66	1.01-76.26	0.05*
Absent	-	-	-
H/oRenal disease			
Present	5.6	1.12-28.04	0.04*
Absent	-	-	-
Family h/o hypertension			
Present	5.48	1.09-27.55	0.04*
Absent	-	-	-

*P value less than 0.05 is considered as significant.

Discussion

This study has been conducted in a district government hospital attached to a medical institution. Majority of the deliveries in the district are institutional deliveries conducted in private hospital/clinics. There is no proper system that can record the history at home, majority of private hospital/clinics, and public sectors like primary health centers and community health centers. Due to the nonavailability of databases, this study has been conducted in a district hospital attached to a medical institution. This necessarily excludes births in private hospitals, clinics, and at home.

Our study demonstrated that the prepregnancy BMI of ≥25, history of chronic hypertension, history of diabetes, history of renal disease, family history of hypertension, and multiple pregnancy were significant independent determinants of pre-eclampsia. Well-documented studies to assess the determinants of pre-eclampsia are few in India.[6] Various studies found that prepregnancy BMI is an important determinant of pre-eclampsia.[2,3,6,7] Chronic hypertension is a common problem in developing countries in nonpregnant women and increases the incidence of pre-eclampsia. We found that chronic hypertension is one of the main determinants of pre-eclampsia in this area. It is also found to be a risk factor for pre-eclampsia in other studies.[5,8] Family history of hypertension was also independently associated with pre-eclampsia in comparison to other studies.[9,10]

Diabetes and renal disease are well-known for adverse pregnancy outcomes. However, in this study both of these factors were independently associated with pre-eclampsia. The likelihood of pre-eclampsia nearly increases by 8.7 times if diabetes is present before pregnancy. The predicted probability of pre-eclampsia was estimated to be <0.05 for those with a history of diabetic mothers. Other studies also showed similar findings.[5,9,11] The presence of renal disease is found to be a risk factor for pre-eclampsia in other studies.[5,12] Our study found that multiple pregnancy increases the risk of pre-eclampsia by 5.7 times. But other studies showed the risk to increase by 3.5 times.[2,13]

In the present study, age and parity were not found to be associated with pre-eclampsia in contrast to other studies.[3,5,14] A study done in Saudi Arabia showed that women at extremes of maternal age, the nulliparous women, and high-parity women are at an increased risk of developing pre-eclampsia.[14] The variation in the present study and other studies could be due to the differences in the population-based and hospital-based study. Another reason could be the inclusion of mothers from the lower and middle socioeconomic status group who came to this hospital. These mothers were found to be at lower risk compared to mothers from the higher socioeconomic status group.

This study provides baseline information and a start to a debate on pre-eclampsia, from a district hospital in a region, which could help with possible early intervention measures regarding pre-eclampsia in the future. We could not take more information because of lack of available data from the records. Since this was a hospital-based unmatched case control study, it can be biased to a certain extent. Majority of cases and controls admitted will be from the lower and middle socioeconomic group. But in other private hospitals, selection bias may be more where more affluent urban population comes for delivery. In spite of the constraints, the study provides interesting information, which can be helpful in planning maternal health services at a district level in order to prevent the complications both for the mother and the baby during antenatal and postnatal period. In view of the above findings, it is concluded that pregnant women at risk of pre-eclampsia should be identified and high-quality antenatal care should be given in order to minimize the complications of pre-eclampsia both for the mother and the fetus. We recommend the health authorities to strengthen the maternal health programs focusing on the prevention and control of the risk factors during the prepregnancy period. Also, corrective therapeutic interventions are advised for the mothers at risk by means of the practice of physical activity and nutrition modification for the reduction of body weight.

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