ORIGINAL ARTICLE

Role of nutrition in pre-eclampsia and eclampsia cases, a case control study

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Abstract

Background: Preeclampsia and eclampsia during pregnancy contribute to maternal and fetal morbidity as well as mortality. The identification of the role of maternal nutrition during pregnancy will help in reducing morbidity and mortality. **Aims & Objective:** The objective of this study is to find out the role of nutrition, in the form of total calorie, protein, fruits, iron, folic acid and calcium intake in the development of preeclampsia and eclampsia among pregnant women in a tertiary level hospital. **Material Methods:** After ethical approval and informed consent, 122 women who delivered beyond 22 weeks of gestation and diagnosed as preeclampsia or eclampsia were selected. Simultaneously, 122 controls with no diagnosis of preeclampsia or eclampsia were selected from the post natal ward. Cases and controls were administered the same pre-tested questionnaire containing questions related to food and micronutrient intake by cases and control. **Results:** Logistic regression was applied in the statistical analysis. The factors that were found to be significant predictors of risk for development of preeclampsia and eclampsia were higher calorie intake (adjusted Odds Ratio (OR) 14.12 [6.41-43.23] $P < 0.001$), less protein intake (adjusted OR 3.87 [1.97-8.01] $P < 0.001$) during pregnancy. Fruits intake in both cases and controls were similar. 77.9% of cases and 84.4% of controls had taken iron tablets during their antenatal period. 75.4% of cases and 82.8% of controls had taken calcium tablets during their antenatal period. Iron and calcium intake is not significantly associated with development of preeclampsia and eclampsia. **Conclusion:** Higher calorie intake and less protein intake during pregnancy were associated with development of preeclampsia and eclampsia. Fruits intake, iron and calcium intake were not associated with development of preeclampsia and eclampsia

Key Words

Maternal nutrition; preeclampsia and eclampsia; iron and calcium intake; calorie and protein intake

Introduction

Preeclampsia and eclampsia (PE) are major pregnancy related syndromes that contribute to maternal and fetal morbidity and mortality.(1,2) The incidence of PE ranges from 2% to 10%, depending on the population studied and criteria used for diagnosis.(3) PE are gestational hypertensive disorders develop after 22 weeks of pregnancy, in which there is an increase in blood pressure and proteinuria. Preeclampsia causes abortion, prematurity, intrauterine growth retardation and still birth. It is believed to be of multifactorial origin. Proper antenatal care remains the important part of prevention. The identification of the role of nutrition during pregnancy will help in reducing morbidity and mortality. The role of several nutritional elements with the pathophysiology of preeclampsia and eclampsia are studied. (4) In this study how macronutrient and micronutrient intake is associated with development of preeclampsia and eclampsia was studied.

Aims & Objectives

1. To determine the role of calorie, protein intake in development of PE and E.
2. To determine the role of micronutrient like iron, calcium and fruits intake in development of PE and E.

Material and Methods

The study was approved by Institutional Ethics Committee and informed consent was received from all the participants. The study was conducted in Obstetrics and Gynecology ward of a tertiary care hospital. It was designed as a case control study. **Sample size:** The sample size was calculated with the following assumptions, Type 1 error 5%, power of study 80%, prevalence of nulliparity (a risk factor) among control 20%, ratio of the case and control 1:1 and estimated odds ratio (OR) for nulliparity was 2.35.(5) Estimated sample size was 122 cases for uncorrected Chi-square test and equal numbers of controls.(6) This sample size was used for nutritional intake during pregnancy for association of PE & E as a part of the original study.

Cases: A preeclampsia case was defined as the presence of blood pressure ≥ 140/90 mm Hg and Proteinuria ≥ 0.3 g/24 h (≥1 + dipstick) after 22 weeks of gestation.(7) Eclampsia was diagnosed as the presence of convulsions that cannot be attributed to other causes in a woman with preeclampsia. From the postnatal ward case sheets of PE were collected. The women were interviewed using a pre-tested questionnaire. In case, an eclamptic patient was comatose after delivery, the history was taken when she regained consciousness. If consciousness could not be gained by her, the history was taken from relatives who accompanied her throughout the pregnancy period.

Controls: Women who delivered after 22 weeks of gestation and admitted to the post natal wards with no history of preeclampsia or eclampsia were recruited as controls. Controls were selected randomly within 24 hr of cases selection. The controls were administered the same questionnaire. Matching among cases and controls was not performed because most of the socio-demographic parameters are established risk factors for PE. **Data collection:** Data was gathered using a pre-tested questionnaire. The questionnaire was administered to both cases and controls by the first author. The questionnaire included demographic and socioeconomic information. Both cases and controls were asked about their food intake patterns during pregnancy (cereals, pulses, vegetables, egg, meat, fish, sugar, milk and dairy products and fruits) by using food frequency questionnaire. The data was entered in SPSS for window version 16 SPSS Inc. Chicago, IL 60606-6412, USA. Crude OR was calculated for all possible risk factors for PE by bivariate analysis using Chi-square test. Adjusted OR was also computed using multiple logistic regression analysis to control for influence of all the risk factors

Results

The mean age of cases and controls were 24.4 ± 4.2 years and 23.9 ± 3.6 years respectively. In this study period out of total deliveries 2.54% were preeclampsia cases and 0.79% was eclampsia cases found (total 3.34% of PE and eclampsia), in a tertiary level hospital. 77.9% of PE cases and 84.4% of controls had taken iron tablets during their antenatal period. Calcium tablet was received in 75.4% of PE cases and 82.8% of controls during their antenatal period. (Table 1) Proportion of cases (31.96%) taking higher calorie (≥2175 kcal/day) during pregnancy were 14.12 times more at risk for development of PE in comparison with controls (5.7%) [Adjusted OR = 14.12 [6.41-43.23] P < 0.001]. Low protein intake during pregnancy (<65 g/day) was more in cases (70.5%) compared with controls (40.98%). Cases were 3.61 times at risk for development of PE, [OR = 3.61 [2.05-6.45] P < 0.001]. Fruits intake during pregnancy was found to be similar in both groups. (Table 2)

Forward step wise logistic regression was applied to the data. Cut-off point was taken at P = 0.05. The variables, which were found to be a significant contributor in development of PE by bivariate analysis entered into logistic regression equation starting from highly significant to least significant variable. The variables that were found to be significant predictors of PE were: higher calorie intake and low protein intake during pregnancy. (Table 3). Micronutrient intake like Iron and calcium intake during pregnancy is not significantly associated with development of PE & E.

Discussion

The proportion of women with calorie intake ≥ 2175 kcal/day was a risk for development of PE in this study. This may be explained that the women with higher calorie intake may have higher pre-pregnancy maternal weight that predisposes to increase the incidence of PE. Over the years preeclampsia has

variably been proposed to secondary to under or over nutrition with no meaningful data to support either hypothesis.(8) Increased and reduced dietary protein, fats or carbohydrates and sodium were proposed as possible etiological factors.(8) In one study it was found that women with preeclampsia had a lower intake of energy, protein and fats than did control women.(9) The investigators found no difference in energy intake in cases and controls. Atkinson JO et al found that energy intake was higher in women with preeclampsia and highest in early onset preeclampsia.(10) Low protein intake during pregnancy (<65 g/day) was 3.61 times at risk for development of PE in comparison to high protein (≥ 65 g/day) intake found in our study. This is supported by study of Brewer T.(11)

Clausen et al in a study with more appropriate diagnostic criteria for preeclampsia found an increased intake of polyunsaturated fatty acids in women who later developed preeclampsia.(12) Calcium is the micronutrient that has been best studied in relationship to preeclampsia in many studies. In the present study 75.4% of PE cases and 82.8% of controls had taken calcium tablets during antenatal period. But calcium intake was not significantly associated with the development of preeclampsia and eclampsia in our study. Several epidemiological studies in developing nations indicate an association between reduced calcium intake and preeclampsia.(13,14) These observations led to the hypothesis that the incidence of preeclampsia can be reduced in populations of low calcium intake by calcium supplementation.(15)

The administration of low daily doses of linoleic acid and calcium during the third trimester of pregnancy reduced the incidence of preeclampsia significantly in women at high risk, possibly by correcting the PGE2 (prostaglandin E2) levels (16)

During antenatal period 77.9% of PE cases and 84.4% of controls had taken iron tablets in our study. Intake of iron was not statistically associated with development of pre eclampsia and eclampsia. Iron and markers of iron status have been reported as abnormal in preeclampsia. Entman et al reported increased free iron in preeclampsia. (17)

Conclusion

Higher calorie intake and less protein intake during pregnancy were associated with development of preeclampsia and eclampsia. Fruit, iron and calcium intake were not associated with development of preeclampsia and eclampsia

Recommendation

The study recommends sufficient protein and normal calorie nutrition during pregnancy to prevent the development of preeclampsia and eclampsia.

Limitation of the study

The chance of recall bias might be present because of questionnaire based data collection.

Relevance of the study

During pregnancy the intake of food and nutrition should be rich in sufficient protein and balanced in calorie and micronutrients.

Authors Contribution

PB: Concept, design, manuscript writing, data collection and statistical analysis, PC: Supervise the study and editing the manuscript, AKS: Supervise the study, statistical analysis and editing the manuscript, KG: Supervise the study.

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Tables

TABLE 1 INTAKE OF IRON AND CALCIUM TABLETS DURING PREGNANCY AMONG PE CASES AND CONTROLS

	Cases N (%)	Controls N (%)
Iron tablets taken during pregnancy		
Yes	95 (77.9)	103 (84.4)
No	27 (22.1)	19 (15.6)
Calcium tablets taken during pregnancy		
Yes	92 (75.4)	101 (82.8)
No	30 (24.6)	21 (17.2)

TABLE 2 BIVARIATE ANALYSIS SHOWING NUTRITIONAL INTAKE RISK FACTORS FOR PE

Nutritional parameters	Case n (%)	Control n (%)	OR (95% CI)	P value
Calorie intake				
<2175 kcal	83 (68.03)	115 (94.2)	0.099 (0.04-0.22)	<0.001
≥2175 kcal	39 (31.96)	7 (5.7)	1.00	
Protein intake				
<65 g/day	86 (70.5)	50 (40.98)	3.61 (2.03-6.42)	<0.001
≥65 g/day	36 (29.5)	72 (59.01)	1.00	
Iron tablet intake				
Yes	95 (77.9)	103 (84.4)	0.599 (0.23-1.43)	0.16
No	27 (22.1)	19 (15.6)	1.00	
Calcium tablet intake				
Yes	92 (75.4)	101 (82.2)	0.566 (0.27-1.33)	0.27
No	30 (24.6)	21 (17.2)		

PE: Preeclampsia and eclampsia; OR: Odds ratio; CI: Confidence interval

TABLE 3 LOGISTIC REGRESSION ANALYSIS FOR RISK FACTORS OF PE

Risk factors categories	Category group	Adjusted OR (95% CI)	P value
Calorie intake	≥2175 kcal/day	14.12 (6.41-43.23)	<0.001
	<2175 kcal/day	1	
Protein intake	<65 g/day	3.87 (1.97-8.01)	<0.001
	≥65 g/day	1	

PE: Preeclampsia and eclampsia; OR: Odds ratio; CI: Confidence interval