Research Article

Comparison of Preeclampsia Risk Factors Regarding to Severity with Control Group

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Abstract

Background: Preeclampsia is a relatively common pregnancy disorder that originates in the placenta and causes variable maternal and fetal complications.

Objectives: The aim of the study was to investigate risk factors of preeclampsia based on severity.

Methods: This is a cross-sectional study which was conducted on 448 participants (330 normal pregnant, 77mild and 91severe preeclamptic women). Inclusion Criteria were age 15 - 44 years and 20 - 24 weeks of gestation. The data collection form consisted of the kind of pregnancy (normal, mild or sever preeclampsia), BP, U/A, other library tests, demo graphic information, history of obstetrics and diseases. The data were analyzed by ANOVA, POST HOC test (tukey HSD), Chi-square and logistic regression using SPSS version 16.

Results: Finding showed the mean age in the severe preeclampsia group and the mean BMI in mild and severe preeclamptic women were significantly higher than normal group. Also there was significant relationship between preeclampsia and age, BMI, RH, history of abortion, preeclampsia and chronic hypertension. Logistic regression analysis showed that respectively the negative RH and history of preeclampsia increased the risk of severe preeclampsia.

Conclusions: Based on results, chronic hypertension, history of abortion and BMI had been indicated as risk factors of mild preeclampsia and history of preeclampsia had been obtained as the risk factors of severe type. Also, negative RH was the common risk factor for mild and severe types. Therefore, our result support different risk factors for subtypes of preeclampsia.

Keywords: Preeclampsia, Risk Factors, High Risk, Abortion, Mild Preeclampsia, Severe Preeclampsia, Hypertension, Proteinuria

1. Background

Preeclampsia is a relatively common pregnancy disorder that originates in the placenta and causes variable maternal and fetal complications [1]. In developing countries, the prevalence of preeclampsia ranges between 1.8 to 16.7% [2] and it is the second leading cause of maternal mortality and morbidity which accounts for 18% of maternal deaths, worldwide [3]. According to the recent report from ministry of health (2012), 22 per 100000 maternal deaths occurred by preeclampsia in our country [4]. Preeclampsia can be clinically divided in mild and severe types. Since more/severe clinical symptoms, worse maternal and fetal complications, higher risk of eclampsia and development of disease are more associated with the sever type in comparison with mild type of this disorder, some investigators have suggested different pathogenesis and etiologic factors for mild and sever forms of preeclampsia [5]. Previous investigations demonstrated that preeclampsia is a multifactorial disease. They noted that history of preeclampsia; age, diabetes mellitus, chronic hypertension (HTN), nulli parity, previous abortion, increased BMI (body mass index) [6, 7], fetal gender [8], migraine [9] and negative maternal RH [10] could be considered as risk factors for preeclampsia.

Although, in the previous years, investigations have been performed in this field, but Majority of those studies have evaluated risk factors of preeclampsia without considering to severity of disease.

So investigators require to know more about the etiology and pathogenesis of this complicated and recognition weather risk factors of preeclampsia is different regarding to its severity. Because it is very important to prevent the adverse effects of disease and establish a purposeful planning and intervention. Therefore, we aimed to investigate risk factors of preeclampsia based on severity of disease.

2. Methods

This is an analytic cross-sectional study which was conducted on 498 pregnant women referred to Midwifery

Emergencies and Obstetrics Department of Alzahra Hospital, in Rasht. Participants were 168 preeclamptic patients (77 mild and 91 severe) and 330 normal pregnant women. The criteria for the diagnosis of preeclampsia was blood pressure (BP) $\geq$ 140/90 mmHg on two occasions after 30 minutes of rest and proteinuria (300 mg of protein in a 24 hours urine sample)with no detectable infection in urine analysis (U/A). Severe and mild preeclampsia was defined based on ACOG (American college of obstetrics and gynecology) by the following criteria: BP $\geq$ 160/110 on two occasions of at least 6 hours apart, significant proteinuria and clinical symptoms. Inclusion criteria were indicated as maternal age (15 - 44 years old), gestational age $\geq$ 20 weeks based on LMP (last menstrual period) and ultrasound and normal fetus (by sonography). Also, exclusion criteria were fetal abnormalities, polyhydramnios, gestational trophoblastic diseases and pregnancy by assisted reproductive technologies such as invitro fertilization (IVF). Data were collected by interview and medical records by a form which consisted of the kind of pregnancy (normal, mild or sever preeclampsia), BP, U/A, other library tests, maternal age, parity, BMI, place of inhibitions, occupation, blood group and RH, fetal gender, multiple gestations, history of migraine, diabetes mellitus, chronic hypertension, consanguineous, preeclampsia and urinary tract infection.

2.1. Statistical Analysis

Mean, standard deviation, frequency and percentage were used for descriptive statistics and data were analyzed by ANOVA, POST HOC test (tukey HSD) and Chi-square using SPSS version 16. Also, logistic regression was used for probability of preeclampsia. Ninety five percent confidence interval indicated and P < 0.05 considered as significant difference.

3. Results

Results revealed that preeclamptic women were older than normal ones. Although, there were no significant differences regarding to age between mild preeclamptic group and normal women (P > 0.05), however, results noted significant difference between severe preeclampsia and normal pregnant (P = 0.003). Also, the the mean BMI was significantly different in mild and normal group (P = 0.001) and the severe and normal ones (P = 0.007).

Furthermore, there was no significant difference between groups regarding to nulliparity, occupation, and place of inhibitions, consanguineous, fetal gender, multiple gestations, diabetes mellitus, urinary tract infection and birth interval (Table 1).

More ever, results revealed significant relationship between preeclampsia and age (P= 0.008), BMI (P = 0.0001),

RH (P = 0.0001) history of abortion (P = 0.019), history of preeclampsia (P = 0.001) and chronic HTN (P = 0.0001).

Logistic regression demonstrated that the risk of preeclampsia in women with the personal history of HTN were more (OR = 12.33, 95% CI = 1.99 - 76.05) (and and it distinguishably showed that HTN could only increase the risk of mild preeclampsia (OR = 13.7, 95% CI = 3.6 - 52.14).

According to (Table 3), chronic HTN (13.7 times), negative RH (7.94 times) and history of abortion (2.72 times) could increase the risk of mild preeclampsia. Also, the risk of mild preeclampsia could be increased by BMI and there was a direct relationship between them.

In addition, the findings reported Negative RH and history of preeclampsia as the most important variables for developing severe preeclampsia (Table 4) and multi parity has a protective effect against developing mild (OR = 0/32 95% CI = 1.16 - 0.64) and severe (OR = 0.37, 95% CI = 0.16 - 0.89) types. Also, based on logistic regression test, the only risk factor for severe type compared with mild type of preeclampsia was BMI (OR = 1.20, 95% CI = 1.03 - 1.68).

4. Discussion

During the past two decades, little has been known about risk factors of preeclampsia and its severity and the limited existing information has suggested various patterns of risk factors for different types of preeclampsia. The findings of this study indicated that chronic hypertension is considered as the most powerful risk factor for the development of preeclampsia. However, based on the results of the logistic regression analysis, it seems chronic hypertension be a risk factor only for the mild type of this disease.

Catov and colleagues reported that chronic hypertension could increase the risk of severe preeclampsia up to 16.7% for the nullipara and 9.8% for the multipara. The risk of developing severe preeclampsia was (OR = 6.2 and CI = 4.2 - 9.1) for nullipara and (OR = 3.0 and CI=1.4 - 6.4) multipara. One of the diagnostic criteria of severe preeclampsia in Catov's study was , while in this study criteria was .What makes this difference was the different norm of severity rating [11].

Luealon [12] also confirmed the importance of chronic hypertension as a major risk factor for preeclampsia; however his analysis was not based on severity. One explanation for this relation is that endothelial dysfunction plays an important role in pathogenesis of both of them [13]. Yet, in a study carried out by Kashanian and colleagues, chronic hypertension was considered as a cause of increase in the risk of preeclampsia which was not statistically significant [14]. The relation between RH factor and preeclampsia was another finding of this study, whereas no significant re-

Table 1. Distribution of Basic Characteristics of the Study Population[a]

Variables	Healthy Pregnant, N = 330	Mild Preeclampsia, N = 77	Severe Preeclampsia, N = 91	P Value1[b]	P Value2[c]	P Value3[d]
Age[b], y	27.93 ± 5.83	29.03 ± 6.24	30.07 ± 6.22	0.008	0.14	0.003
Lodging	175 (53.0)	38 (52.8)	43 (50.6)	0.922	0.96	0.68
City						
Village	155 (47.0)	34 (47.2)	42 (49.4)			
missing	0	5	6			
Employment				0.059	0.23	0.065
Housekeeper	318 (96.4)	70 (93.3)	91 (100)			
Employed	12 (3.6)	5 (6.7)	0 (0.0)			
missing	0	2	0			
BMI[b]	25.91 ± 5.9	28.99 ± 6.1	26.29 ± 4.77	0.001	0.007	0.84
Parity				0.146	0.18	0.093
Multi parity	156 (47.3)	30 (39.0)	34 (37.4)			
Null parity	174 (52.7)	47 (61.0)	57 (62.6)			
Blood group						
A						
B	84 (26.2)	25 (33.3)	26 (29.9)			
AB	94 (29.4)	17 (22.7)	20 (23.0)	0.271	0.14	0.26
O	20 (6.2)	9 (12.0)	10 (11.5)			
missing	122 (38.1)	24 (32.0)	31 (35.6)			
	10	2	4			
Rh				0.001	0.001	0.001
Positive	267 (83.4)	33 (44.0)	40 (46.0)			
Negative	53 (16.6)	42 (56.0)	47 (54.0)			
Missing	10	2	4			
Consanguinity	24 (7.3)	4 (5.2)	6 (6.6)	0.805	0.52	0.82
Number of marriages						
First marriage						
Second marriages	318 (96.4)	76 (98.7)	90 (98.9)			
	12 (3.6)	1 (1.3)	1 (1.1)	0.295	0.65	0.50
Prior to birth spacing[b]	3.28 ± 4.5	3.75 ± 5.02	3.59 ± 5.1	0.94	0.43	0.57
Abortion	55 (16.7)	23 (29.9)	22 (24.2)	0.019	0.008	0.10
History of preeclampsia	33 (10.0)	19 (24.7)	18 (19.8)	0.001	0.001	0.011
The current twin pregnancy	15 (4.5)	7 (9.1)	9 (9.9)	0.092	0.001	0.052
Sex						
Boy	173 (53.1)	36 (46.8)	52 (57.1)	0.401	0.37	0.45
Girl	153 (46.9)	41 (53.2)	39 (42.9)			
missing	4	0	0			
Diabetes	51 (15.5)	19 (24.7)	15 (16.5)	0.151	0.054	0.81
Chronic hypertension	7 (2.1)	10 (13.0)	9 (9.9)	0.001	0.001	0.001
Migraine	12 (3.7)	4 (5.2)	9 (9.9)	0.055	0.53	0.026
Urinary Tract Infection	78 (23.6)	25 (32.9)	26 (28.6)	0.207	0.094	0.33

[a] Value are expressed as No. (%).
[b] ANOVA (Post Hoc); For other comparisons used chi-square test; Comparison between healthy pregnant and mild preeclampsia.
[c] Comparison between mild preeclampsia and severe preeclampsia.
[d] Comparison between healthy pregnant and severe preeclampsia.

lationship between ABO blood groups and mild or severe preeclampsia was observed.

In one study by Mahaba and colleges, the incidence of developing preeclampsia in RH negative women was higher than RH positive ones which were similar with our results [15]. However, Lee et al. observed that the risk of developing preeclampsia in RH positive women was a little higher than RH negatives. (OR=1.07, 95% CI=1.03-1.10) [16].

Table 2. Estimated Adjusted Odds Ratio for the Variable Preeclampsia (Mild and Severe) Compared with Healthy Pregnant Women[a]

Variable	(OR)	CI (%95)	P Value
hypertension	12.33	(1.99 - 76.05)	0.007
Negative Rh	6.99	(3.43 - 14.24)	0.001
History of preeclampsia	3.22	(1.23 - 8.46)	0.017
BMI	1.09	(1.02 - 1.17)	0.007

[a] Logistic regression model.

Table 3. Estimated Adjusted Odds Ratio for the Variable Mild Preeclampsia Compared with Healthy Pregnant Women[a]

Variable	(OR)	CI (%95)	P Value
BMI	1.09	(1.04 - 1.14)	0.001
Negative Rh	7.94	(4.18 - 15.11)	0.001
Multi parity	0.32	(0.16 - 0.64)	0.001
abortion	2.72	(1.33 - 1.56)	0.006
History of preeclampsia	3.93	(1.69 - 9.14)	0.001
Chronic hypertension	13.7	(3.6 - 52.14)	0.001

[a] Logistic regression model.

Table 4. Estimated Adjusted Odds Ratio for the Variable Severe Preeclampsia Compared with Healthy Pregnant Women[a]

Variable	(OR)	CI (%95)	P Value
Negative Rh	5.14	(2.4 - 11.07)	0.001
Multi parity	0.37	(0.16 - 0.89)	0.03
History of preeclampsia	4.2	(1.58 - 11.3)	0.004

[a] Logistic regression model.

According to results, it seems that the relation between RH and preeclampsia has been occurred as a result of immunological maladaptation hypothesis of mother and fetus.

Previous studies have shown positive history of preeclampsia as a valuable clinical indicator to determine the risk of preeclampsia during pregnancy [12, 16, 17].

The reported risk of developing preeclampsia in Luealon et al. was (OR=17.0, 95% CI=3.3-87.6) [12] and in González et al. [18] was (OR= 23.7) also, in our study, the history of preeclampsia increased the risk of developing mild (OR = 3.93 95% CI = 1.69 - 9.14) and severe types (OR = 4.2 95% CI = 1.58 - 11.3). Garovic and colleagues supported the association between preeclampsia and the future development of hypertension and coronary heart diseases by metabolic and vascular abnormalities which could be a probable explanation for this disorder [13].

In this study, there was a positive association between pre-pregnancy BMI and risk of preeclampsia which was similar with Odegard and colleagues which demonstrated that increased weight was more associated with the mild preeclampsia [19] and the same result was reinforced by Sohlberg et al. [20].

In previous studies, types of abortion(induced vs. spontaneous), number of abortion (two induced abortion or more vs. one abortion), gestational age at the time of abortion(over 13 weeks vs under 13 weeks) could significantly increase the protection rate and new sexual partner could decrease it [6].

One limitation of our study was a part of our data collection extract from medical records of patients.

Although, another noticeable fact in this study was the effect of history of abortion on increasing risk of mild preeclampsia (OR = 2.72, 95% CI = 1.33 - 5.56).However, in a review, done by Trogstad et al. it was indicated as a protecting factor in the following pregnancies [6].

since mother's clinical features are mostly used in prediction of preeclampsia because of limited diagnostic instruments and lack of easier and more convenient methods to detect, it is strongly recommended that the risk factors of this disorder and its severity by further investigations to develop new models for its prediction.

4.1. Conclusion

Based on results, chronic hypertension, history of abortion and BMI had been indicated as risk factors of mild preeclampsia and history of preeclampsia had been obtained as the risk factors of severe type. Also, negative RH was the common risk factor for mild and severe types. Therefore, our result supported different risk factors of preeclampsia.

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Footnotes

Authors' Contribution: All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of interest: None declared.

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