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Persistent hypertension post-preeclampsia: a tertiary care centre-based study in China

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Summary

Purpose: To determine the predictors of persistent hypertension post-preeclampsia in a single center in Chinese patients. *Materials and Methods:* Clinical/demographic, obstetric, and biochemical data were collected during presentation and at six weeks' follow up period post-delivery from women with preeclampsia between October 2014 to September 2015. *Results:* Out of 198 patients enlisted, follow up (six weeks) data was accessible for 173 patients, out of which 143 (82.7%) and 30 (17.3%) patients had mild and severe preeclampsia, respectively. At the time of followup (six weeks), persistent hypertension was recorded in 61 (35.3%) patients. There was no significant association/difference noted for age, BMI, parity, and pregnancy duration in persistent hypertension group *vs.* normotensive group. Significantly low platelets count ($p = 0.001$) and low birth weights ($p < 0.001$) were noted in the persistent hypertension group. Patients encountering persistent hypertension at followup (six weeks) were observed to be mostly having severe preeclampsia earlier in contrast to normotensive group ($p < 0.001$). There was no association of variables with persistent hypertension; although, patients having severe preeclampsia were previously found to encounter persistent hypertension 7.1 times more compared to patients having mild/moderate preeclampsia (95% CI [confidence interval] 1.4–31.4; $p = 0.007$). *Conclusion:* Persistent hypertension was noted to be extremely frequent post six weeks of delivery in preeclampsia patients (particularly severe preeclampsia) in China, irrespective of parity as well as age.

Key words: Persistent hypertension; Preeclampsia; Pregnancy.

Introduction

Preeclampsia is distinguished by hypertension as well as proteinuria during pregnancy and is generally diagnosed in around 3% to 4% of pregnancies altogether. It is a main source of maternal as well as perinatal morbidity. The most serious manifestation (eclampsia) is linked with maternal morbidity globally [1-3]. Preeclampsia is a disorder with obscure etiology that might occur via various pathways, as demonstrated by fluctuating phenotypes which are delegated early or late, based on gestational age of onset and by preeclampsia severity [4, 5].

Preeclampsia exhibits long haul consequences on well-being of patients, like the existing hypertension progress, which poses a clinically significant challenge post-preeclampsia [6]. Despite the fact that hypertension and different complications, for example, kidney disorder might be due to prior issues, it was accounted for that preeclampsia is the major predictor if preeclampsia patients develop these complications post-pregnancy [7]. Hypertension is a noteworthy characteristic of preeclampsia. Ordinarily, hypertension occurs in three months of parturition; although, this does not generally occur and a few patients having preeclampsia then encounter persistent hypertension [8]. As a result, all preeclampsia patients need follow up post-delivery for detection and potential prevention of hypertension/sequelae. The initial postnatal check up is a perfect chance to guarantee that preeclampsia and any related systemic problems have been determined. Research of long haul preeclampsia outcomes is of specific significance for healthcare professionals.

Preeclampsia remains a major cause of maternal as well as perinatal mortality/morbidity, and causes complications in 2–8% of overall pregnancies. In China, the preeclampsia prevalence is approximately 5%. Globally the preeclampsia incidence seems to be rising, probably due to the greater prevalence of obesity and medical comorbidities, advancing maternal age, and the use of assisted reproductive techniques [9, 10]. Successful discovery and treatment of preeclampsia and eclampsia within any nation or health region ought to be at any rate impacted by knowledge of clinician and on the prevalence of the disease within their area of practice. Research related to preeclampsia/eclampsia may help clinicians and caregivers in decision-making.

As per the present authors' knowledge, none of the studies focused on the determination of the predictors of persistent hypertension in preeclampsia patients in China. The present study's objective were to determine the predictors of persistent hypertension post-preeclampsia in China.

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Table 1. — *Clinical/demographic characteristics.*

Characteristics	Patients having persistent hypertension (n=61)	Normotensive patients (n=112)	Univariate analyses	
			OR (95% CI)	*p*-value
Age (years)	27.6 ± 4.9	28.4 ± 5.1	0.9 (0.8-1.0)	0.182
Pregnancy duration (weeks)	37.3 ± 1.9	37.6 ± 1.5	0.8 (0.7-1.0)	0.536
Parity	3.2 ± 1.9	3.1 ± 1.6	1.0 (0.7-1.1)	0.322
BMI (kg/m^2)	24.7 ± 2.4	24.6 ± 2.1	1.0 (0.8-1.2)	0.404
Hemoglobin (g/L)	103 ± 13	102 ± 1.9	1.0 (0.7-1.4)	0.722
White blood cell count (x10^6/mm^3)	6.67 ± 2.2	7.22 ± 2.6	0.9 (0.8-1.0)	0.121
Red blood cell count (x10^3/mm^3)	4.54 ± 0.79	4.92 ± 0.93	0.9 (0.7-1.4)	0.742
Platelets count (x10^3/mm^3)	187.6 ± 92.9	237.6 ± 98.9	0.9 (0.97-0.99)	0.001
Uric acid (mg/L)	41 ± 13	38 ± 6	1.2 (0.8-1.6)	0.142
Creatinine (mg/dL)	8 ± 4	6 ± 3	1.8 (0.7-5.6)	0.232
Alanine aminotransferase (IU)	17.1 ± 9.6	17.6 ± 13.2	0.9 (0.8-1.0)	0.852
Aspartate aminotransferase (IU)	23.6 ± 9.4	29.1 ± 11.2	0.9 (0.8-1.0)	0.846
Spontaneous abortion history	16 (26.2)	21 (18.8)	1.2 (0.8-2.1)	0.334
Severe preeclampsia	22 (36.1)	8 (7.1)	7.1 (2.4-15.4)	<0.001
Birth weight (grams)	2697.6 ± 4622.9	2986.6 ± 3940.9	0.2 (0.07-0.5)	<0.001
Cesarean delivery	35 (57.4)	39 (34.8)	1.3 (0.8-1.6)	0.007
Male neonate	26 (42.6)	45 (40.2)	0.7 (0.6-1.7)	0.356

BMI = body mass index; CI = confidence interval; OR = odds ratio. Values are expressed as numbers and percentage/mean with standard deviation.

Table 2. — *Risk factors.*

Variables	Multivariate analyses	
	OR (95% CI)	*p*-value
Age (years)	1.0 (0.8-1.1)	0.782
Pregnancy duration (weeks)	1.0 (0.7-1.4)	0.336
Parity	1.1 (0.7-1.5)	0.322
BMI (kg/m^2)	0.8 (0.7-1.1)	0.404
Hemoglobin (g/L)	1.1 (0.7-1.4)	0.722
White blood cell count (x10^6/mm^3)	0.9 (0.8-1.1)	0.121
Red blood cell count (x10^3/mm^3)	0.9 (0.5-1.4)	0.542
Platelets count (x10^3/mm^3)	0.9 (0.8-1.0)	0.141
Uric acid (mg/L)	0.8 (0.5-1.4)	0.742
Creatinine (mg/dL)	3.2 (0.6-18)	0.232
Alanine aminotransferase (IU)	0.9 (0.7-1.0)	0.252
Aspartate aminotransferase (IU)	1.0 (0.8-1.0)	0.846
Spontaneous abortion history	1.2 (0.5-4.1)	0.634
Severe preeclampsia	7.1 (1.4-31.4)	0.007
Cesarean delivery	0.8 (0.5-1.5)	0.621
Male neonate	0.7 (0.3-1.8)	0.557

BMI = body mass index; CI = confidence interval; OR = odds ratio.

Materials and Methods

This single center prospective study was performed in a tertiary hospital, China from October 2014 to September 2015.

The study target population included women with preeclampsia. Preeclampsia was considered as blood pressure of minimum 140 mmHg systolic or minimum 90 mmHg diastolic post 20th week of pregnancy in prior normotensive women and proteinuria (minimum 300 mg protein in a 24-hour urine sample/dipstick test result of minimum 2+) [11]. Patients were also categorized into groups of mild as well as severe preeclampsia, as per blood pressure (diastolic) of lower than 110 mmHg and minimum 110 mmHg, respectively. Exclusion criteria included patients with hypertension, diabetes, thyroid or liver disease. The study achieved the approval from the Ethics Committee and patient confidentiality was strictly maintained. Written informed consent was provided by patents. A questionnaire was utilized for the collection of the data regarding medical as well as obstetric history. The demographics and clinical variables obtained are noted below: age, pregnancy duration, parity, body mass index (BMI obtained by dividing weight in kilograms by square of height in meters), hemoglobin, red blood cell / white blood cell / platelet counts, creatinine / uric acid / aspartate aminotransferase/alanine aminotransferase levels, spontaneous abortion history, birth weights, and cesarean deliveries etc.

In accordance with standard therapy procedures at referral center, antihypertensives (hydralazine/nifedipine/methyldopa) as well as magnesium sulfate were utilized for treatment of severe preeclampsia. Patients who returned at six weeks post-delivery as follow up were assessed to encounter persistent hypertension when patients were utilizing any antihypertensive that they did not utilize beforehand or when the baseline criterion for hypertension was met.

Statistical analysis included values that were expressed as numbers and percentage, as well as mean with standard deviation (SD). Comparison of continuous as well as categorical variables was performed with Student *t*-tests or Chi square tests. Patients having routine blood pressure (at six-week follow up period) *vs.* those having persistent hypertension were compared. Multivariable regression analysis was conducted with persistent hypertension as dependent variable and clinical, as well as demographic variables as independent variables. Analysis of all data collected was done using SPSS version 16.0. *P*-value ≤0.05 was regarded as significant statistically.

Results

Altogether, 198 patients were enlisted and follow up (six weeks) data was accessible for 173 patients out of which 143 (82.7%) and 30 (17.3%) patients had mild and severe preeclampsia, respectively. At the time of followup (six weeks), persistent hypertension was recorded in 61 (35.3%)

patients, whereas 112 (64.7%) patients were normotensive. There was no significant association/difference noted for age, BMI, parity, and pregnancy duration in persistent hypertension group *vs.* normotensive group (Table 1). Significantly low platelets count ($p = 0.001$) and significantly low birth weights ($p < 0.001$) were noted in the group of patients with persistent hypertension. Patients encountering persistent hypertension at follow up (six weeks) were observed to be mostly having severe preeclampsia earlier in contrast to normotensive group ($p < 0.001$).

The outcomes based on logistic regression analysis showed no association of variables with persistent hypertension; although, patients having severe preeclampsia previously were found to encounter persistent hypertension 7.1 times more compared to patients having mild/moderate preeclampsia (95% CI [confidence interval] 1.4–31.4; $p = 0.007$) (Table 2)

Discussion

In the current study, around one-third of the preeclamptic patients proceeded to develop persistent hypertension which included no variables with statistical significance with severe preeclampsia.

The occurrence of persistent hypertension in preeclampsia patients in the current study was comparable to the demonstrated in Nakimuli *et al.* study [12], where, 34 % of patients developed persistent hypertension post three months of parturition. In any case, lowest persistent hypertension rates are accounted for in Uganda (28%) [13] and in the Limaye *et al.* study in America [14] where 21% of severe preeclampsia patients developed persistent hypertension post six weeks of parturition. In contrast, Kaze *et al.* study in Cameroon recorded 42.6% severe preeclamptic patients having persistent hypertension post six weeks of parturition [15].

The outcomes of current study should to be contrasted with those of past studies, carefully attributable to the incorporation (seriousness of the ailment), as well as to exclusion criteria, and follow up period variations. There is a great possibility of overestimation of persistent hypertension occurrence due to shorter six-week follow up post delivery. The rate of persistent hypertension after preeclampsia was exhibited to reduce over the long haul; in a past study [15] the rates of persistent hypertension noted at six-week, three- and six-month follow up post-delivery were 43%, 28%, and 15%, respectively. Preeclampsia followed by persistent hypertension might not be representative of the more extensive group on the grounds that the patients incorporated into these studies (pregnant women) experience general health check ups, and comparative hypertension rates might not be detected in groups who were not examined closely, for example men and non-pregnant females. In a study conducted by Bushara *et al.* [16] in Sudan, the undiscovered hypertension prevalence was recorded to be 38%, with a frequency being somewhat greater in women (39%) compared to men (37%).

In the current study, none of the biochemical (creatinine /uric acid/aspartate aminotransferase/alanine aminotransferase levels) or demographic (age, pregnancy duration, parity, and BMI) variables studied showed an association with persistent hypertension post preeclampsia. A study by Fadalallah *et al.* [17] in Sudan demonstrated similar findings of non-association. This appears differently in relation to past studies that showed various predictive variables (age, pregnancy duration, age, creatinine, and severe preeclampsia/early onset preeclampsia) for the persistent hypertension post-preeclampsia [12-15].

The physiopathology or causes of persistent hypertension and/or another ailments post-preeclampsia are not completely understood. It is conceivable that either the persistent hypertension emerges as a result of preeclampsia or it might be that the hypertension has similar risk factors/physiopathology as preeclampsia [18].

Certain inherent limitations need to be considered during interpretation of the results of the current study. This single-centre study has a restricted number of patients hence the generalization of results should be made with care. Others were moderately brief follow ups and no re-investigation of biochemical profiles post six weeks of delivery. The authors were unable to evaluate all variables and were restricted by treating physicians with respect to completeness of proper documentation. Limited information was gathered on the preeclampsia severity and on patient management.

Conclusion

Persistent hypertension was noted to be extremely frequent post six weeks of delivery in preeclampsia patients (particularly severe preeclampsia) in China, irrespective of parity as well as age. Follow up of pregnant women having preeclampsia will assist in identification and prevent associated events.

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