

Study on the Major Maternal Risk Factors in Hypertensive Syndromes

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Summary

Background: There are several risk factors for hypertensive syndromes in pregnancy (HSP), and these can be related to regional and ethnic factors. Studies on this issue are scarce in the State of Goiás.

Objective: To investigate maternal risk factors for HSP.

Methods: Case-control study based on the analysis of medical records of parturients from the Maternity Service of Hospital das Clínicas da Universidade Federal de Goiás (HC-UFG) in 2005. Risk factors were analyzed using Logistic Regression Analysis and Fisher's Exact Test.

Results: In 2005, there were 890 deliveries in the Maternity Service of HC-UFG, and 129 pregnant women were diagnosed with HSP (14.5%). The multivariate analysis identified obesity as a risk factor both for gestational hypertension – GH (OR: 17.636; 95% CI: 2.859 to 108.774) and for preeclampsia superimposed on chronic hypertension - PESCH (OR: 27.307; 95% CI: 4.453 to 167.440). Primiparity was a risk factor for GH (OR: 5.435; 95% CI: 1.923 to 15.385). Age above 30 years was a risk factor for PESCH (OR: 5.218; 95% CI: 1.873 to 14.536) and a protective factor against preeclampsia - PE (OR: 0.035; 95% CI: 0.003 to 0.364). Non-white race was an independent risk for PE (OR: 13.158; 95% CI: 1.672 to 100.000) and previous PE for PESCH (OR: 4.757; 95% CI: 1.261 to 17.938). Of the pregnant women with chronic hypertension (CH), 73.5% developed PESCH ($p < 0.001$).

Conclusion: The factors identified – obesity, non-white race, previous PE, age above 30 years and CH, were similar to those found in the majority of studies in the literature. (Arq Bras Cardiol 2008;91(1):11-16)

Key words: Risk factors; hypertension; pregnancy, high-risk; pregnancy complications.

Introduction

Gestational hypertension is considered one of the major complications of pregnancy and puerperium, affecting between 6% and 30% of the pregnant women, and resulting in a high maternal and perinatal morbidity and mortality risk¹⁻⁶. Its etiology remains unknown⁷.

The term “hypertension in pregnancy” is generically named hypertensive syndromes in pregnancy (HSP). These are characterized by pressure levels equal to or higher than 140mmHg for systolic pressure and 90mmHg for diastolic pressure, which is identified in Korotkoff phase V⁷. HSP are classified as chronic hypertension, preeclampsia superimposed on chronic hypertension, gestational hypertension, preeclampsia and eclampsia⁸.

Several factors such as diabetes, renal disease, obesity, multiple pregnancy, primiparity, age above 30 years, personal or family history of preeclampsia and/or chronic hypertension and black race^{7,8} increase the risk of developing HSP.

However, depending on the region analyzed, this risk may be specific, as for instance in a study conducted in Brazil which

showed that maternal age above 40 years, primiparity and chronic hypertension are the major risk factors for hypertension during pregnancy. Another study conducted in India showed a higher incidence of HSP among primiparae, young women, and those with preeclampsia in previous gestations^{9,10}.

Thus, we can observe that some factors are similar among different populations studied, whereas others are related to the geographic area and ethnicity of the population^{11,12}.

Therefore, it is relevant to study the major maternal risk factors for HSP in Goiás, since few data are published on this issue regarding this population, and also because HSP remains the major cause of maternal death and perinatal morbidity. The results may help improve preventive strategies.

Considering these aspects, we conducted the present study with the objective of investigating maternal risk factors for the development of HSP at the Maternity Service of Hospital das Clínicas da Universidade Federal de Goiás (UFG).

Methods

We conducted a case-control study in which we assessed the medical records of pregnant women who delivered in the Maternity Service of Hospital das Clínicas da UFG, city of Goiânia, State of Goiás. This is a tertiary care hospital and its maternity service is a referral in the care of high-risk pregnant women throughout the State of Goiás.

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The authors selected the medical records by consulting the admission book of the Obstetric Clinic and Nursery, filed in the Maternity Service. Later, a total of 890 medical records of pregnant women who delivered in the period from January 2005 to December 2005 were verified. Of these, 121 were included in the case group (pregnant women with HSP) and 102 in the control group (healthy pregnant women). Medical records of the control group were selected by their numbers, randomly drawn by lot using the Excel software program.

Data obtained from the medical records were transcribed in a form elaborated by the authors, based on the variables investigated: sociodemographic data, family history, personal history, lifestyle, current obstetric history and newborn data.

Pregnant women with HSP were defined as those with this clinical diagnosis reported in their medical records, and healthy pregnant women were those not diagnosed with HSP.

The medical records of the pregnant women were divided into four groups; the group of pregnant women with gestational hypertension (GH) was comprised of those diagnosed with hypertension manifested after the 20th week of gestation and without associated proteinuria. The group of pregnant women with preeclampsia (PE) was comprised of those with hypertension after the 20th week of gestation with associated proteinuria. The group of pregnant women with preeclampsia superimposed on chronic hypertension (PESCH) was comprised of those with hypertension prior to pregnancy or before the 20th week of gestation and associated proteinuria⁸. The control group (CG) was comprised of healthy pregnant women. Only eight pregnant women with chronic hypertension (CH) were identified who were not included in the HSP group, since this small prevalence of CH cases did not form a representative sample, thus making the use of statistical tests unfeasible.

The maternal risk factors for HSP evaluated were maternal age, family history of diabetes, family history of systemic hypertension or preeclampsia, personal history of preeclampsia or gestational hypertension, personal history of systemic hypertension, obesity, diabetes, renal disease, smoking, alcohol use, primiparity and gemelarity^{7,9}. CH was evaluated as a specific risk factor for PE¹⁰.

The presence or absence of the factors mentioned was defined by their being reported or not in the medical records. Only the maternal age factor was defined by the categories up to 30 years and above 30 years¹³.

The following sociodemographic factors were also analyzed: formal schooling – classified as none, elementary school (1st and 2nd phases), high school, or higher education; marital status – classified as single, married, divorced or widow; and family income categorized in up to one minimum wage, from one to three minimum wages, from three to five minimum wages, and from five to ten minimum wages.

The number of prenatal visits was also analyzed, and was categorized as none, from one to three, from four to six, and more than seven visits.

In the statistical analysis, the Excel spreadsheet was used to create the database with the SPSS 11 software.

To evaluate the contribution of each factor for the occurrence of HSP, the univariate logistic regression analysis was used to

evaluate the risk factors individually. Further, the multivariate logistic regression analysis was used to evaluate the risk factors collectively, by comparing the CG with each case group (GH, PE, and PESCH). In each case, the risk of each factor was calculated using odds ratio (OR) and the Wald test.

The factors that passed from the univariate to the multivariate analysis were those with $p \leq 0.20$; in the multivariate analysis p was significant when ≤ 0.05 . The confidence interval (CI) was set at 95%.

The Fisher's Exact Test was used to evaluate the CH variable as a risk factor for preeclampsia.

The study was approved by the Human and Animal Research Ethics Committee of *Hospital das Clínicas da UFG* and had no external sponsors.

Results

In 2005, there were 890 deliveries in the Maternity Service of *Hospital das Clínicas da UFG*, and 129 pregnant women were diagnosed with HSP (14.5%).

The most frequent type of HSP was preeclampsia in 63 cases (48.8%), followed by preeclampsia superimposed on chronic hypertension in 34 cases (26.4%), gestational hypertension in 24 cases (18.6%) and chronic hypertension in eight cases (6.2%).

The mean maternal age was 25.4 ± 5.7 years in the GH group, 23.3 ± 5.8 years in the PE group, 30.7 ± 7.0 years in the PESCH group, and 27.0 ± 5.0 years in the CG, with a difference between the mean ages in the PE ($p < 0.001$) and PESCH groups ($p = 0.002$).

According to the records on formal schooling of each group analyzed, 52.6% of the pregnant women in the GH group, 46.3% in the PE group, 50% in the PESCH group and 57.4% in the CG did not finish high school, and this was the highest level of educational attained by most of them.

As regards the marital status, in the GH group 54.5% of the women were single; in the PE group the proportion between single and married women was the same. In the CG and PESCH group, 52% and 66.7% were married, respectively.

Most of the pregnant women had a family income of one to three minimum wages: 58.3% in the GH group, 64.9% in the PE group, 52.4% in the PESCH group, and 52.3% in the CG.

No association was found between marital status, formal schooling and family income and the occurrence of HSP, when compared to the CG ($p > 0.117$).

According to the records on the number of prenatal visits, most of the pregnant women in each group analyzed attended more than seven prenatal visits: 25% in the PE group, 15% in the GH group, 11.3% in the PESCH group, and 48.9% in the CG. However, no difference was observed between the groups ($p = 0.096$).

The univariate analysis of the risk factors for each group analyzed is shown in Tables 1, 2 and 3.

The variables that were risk factors for GH were primiparity and obesity (Table 1); non-white race, previous preeclampsia, obesity and primiparity for PE (Table 2); and age above 30

Table 1 - Univariate analysis of the risk factors for gestational hypertension (GH) in the Maternity Service of Hospital das Clínicas da UFG in 2005.

Variable	n	CA		CB		p	OR	CI (95%)	
		n	%	n	%			min	max
Parity									
GH	24	12	50.0	12	50.0	0.003	4.098	1.605	10.417
CG	102	20	19.6	82	80.4				
Age									
GH	24	19	79.2	5	20.8	0.453	0.663	0.226	1.941
CG	102	73	71.6	29	28.4				
Race									
GH	14	6	42.9	8	57.1	0.184	2.217	0.685	7.194
CG	24	5	20.8	19	79.2				
Previous PE									
GH	23	20	87.0	3	13.0	0.260	2.325	0.536	10.089
CG	99	93	93.9	6	6.1				
Obesity									
GH	23	18	78.3	5	21.7	0.003	13.472	2.424	74.879
CG	99	97	98.0	2	2.0				

Logistic Regression Analysis in the comparison of the CG with the GH group ($p < 0.05$); Parity: CA - Primipara; CB - Multipara; Age: CA - Up to 30 years; CB - Above 30 years; Race: CA - White; CB - Non-White; Previous PE: CA - No; CB - Yes; Obesity: CA - No; CB - Yes

Table 2 - Univariate analysis of the risk factors for preeclampsia (PE) in the Maternity Service of Hospital das Clínicas da UFG in 2005.

Variable	n	CA		CB		p	OR	CI (95%)	
		n	%	n	%			min	max
Parity									
PE	63	34	54.0	29	46.0	<0.001	4.808	2.398	9.615
CG	102	20	19.6	82	80.4				
Age									
PE	63	54	85.7	9	14.3	0.039	0.420	0.184	0.959
CG	102	73	71.6	29	28.4				
Race									
PE	30	13	43.3	17	56.7	0.029	3.425	1.135	10.309
CG	24	5	20.8	19	79.2				
Previous PE									
PE	61	51	83.6	10	16.4	0.041	3.039	1.044	8.844
CG	99	93	93.9	6	6.1				
Obesity									
PE	61	55	90.2	6	9.8	0.046	5.291	1.032	27.116
CG	99	97	98.0	2	2.0				

Logistic Regression Analysis in the comparison of the CG with the PE group ($p < 0.05$); Parity: CA - Primipara; CB - Multipara; Age: CA - Up to 30 years; CB - Above 30 years; Race: CA - White; CB - Non-White; Previous PE: CA - No; CB - Yes; Obesity: CA - No; CB - Yes

years, previous preeclampsia and obesity for PESCH (Table 3). Age above 30 years was a protective factor (OR: 0.420) for PE (Table 2).

The variables that were independent risk factors for each group analyzed using multivariate analysis are shown in Table 4.

Table 3 - Univariate analysis of the risk factors for gestational hypertension (GH) in the Maternity Service of Hospital das Clínicas da UFG in 2005

Variable	n	CA		CB		p	OR	CI (95%)	
		n	%	n	%			min	max
Parity									
GH	24	12	50.0	12	50.0	0.003	4.098	1.605	10.417
CG	102	20	19.6	82	80.4				
Age									
GH	24	19	79.2	5	20.8	0.453	0.663	0.226	1.941
CG	102	73	71.6	29	28.4				
Race									
GH	14	6	42.9	8	57.1	0.184	2.217	0.685	7.194
CG	24	5	20.8	19	79.2				
Previous PE									
GH	23	20	87.0	3	13.0	0.260	2.325	0.536	10.089
CG	99	93	93.9	6	6.1				
Obesity									
GH	23	18	78.3	5	21.7	0.003	13.472	2.424	74.879
CG	99	97	98.0	2	2.0				

Logistic Regression Analysis in the comparison of the CG with the GH group ($p < 0.05$); Parity: CA - Primipara; CB - Multipara; Age: CA - Up to 30 years; CB - Above 30 years; Race: CA - White; CB - Non-White; Previous PE: CA - No; CB - Yes; Obesity: CA - No; CB - Yes

Table 4 - Multivariate analysis of the significant risk factors for each group with HSP in the Maternity Service of Hospital das Clínicas da UFG in 2005

Group	p*	OR	CI (95%)	
			min	max
GH				
Obesity	0.002	17.636	2.859	108.774
Primiparity	0.001	5.435	1.923	15.385
PE				
Age > 30 years	0.005	0.035	0.003	0.364
Non-white race	0.014	13.158	1.672	100.000
PESCH				
Previous PE	0.021	4.757	1.261	17.938
Age > 30 years	0.002	5.218	1.873	14.536
Obesity	< 0.001	27.307	4.453	167.440

* Multivariate Regression Analysis in the comparison of the CG with groups GH, PE and PESCH ($p < 0.05$)

Obesity was an independent risk factor for GH (OR 17.636; 95% CI: 2.859 to 108.774; $p = 0.002$) as well as for PESCH (OR: 27.307; 95% CI: 4.453 to 167.440; $p < 0.001$).

Age above 30 years was an independent risk for PESCH (OR 1.140; 95% CI: 1.049 to 1.238; $p = 0.002$) and a protective factor for PE (OR 0.035; 95% CI: 0.003 to 0.364; $p = 0.005$).

Non-white pregnant women presented an independent risk for PE (OR: 13.158; 95% CI: 1.672 to 100.000; $p = 0.008$)

and those with previous PE presented a risk for PESCH (OR: 4.757; 95% CI: 1.261 to 17.938; $p = 0.021$).

Primiparity was an independent risk for GH (OR: 5.435; 95% CI: 1.923 to 15.385; $p = 0.001$).

CH was a risk factor for superimposed PE; of the pregnant women who had CH, 73.5% developed superimposed PE ($p < 0.001$).

The following variables were not identified as risk factors: family history of diabetes, systemic hypertension or preeclampsia; personal history of gestational hypertension, diabetes and renal disease; smoking; alcohol use; multiple pregnancy and sociodemographic factors (formal schooling, marital status and family income).

Discussion

The objective of the present study was to investigate the risk factors for the development of HSP in the Maternity Service of Hospital das Clínicas da UFG in 2005.

In this case series, the prevalence of HSP was 14.5% and its most common type was PE. These results were possibly related to the place where the study was conducted – a tertiary care hospital and a referral for high-risk pregnancies. Similar prevalences of HSP were observed in other studies conducted in tertiary care hospitals^{9,14,15}. However, lower values were found in other reports^{10,11,16-19}.

Two studies conducted in Brazil^{17,18} and another conducted in India¹⁰ also found higher prevalences of PE. However, other studies found higher prevalences of chronic hypertension^{15,16,20,21}. These contradictory findings may result

from geographic and ethnic differences in the populations studied, as well as from diagnostic criteria used in each study and from diagnostic difficulties due, for instance, to a late prenatal care start^{12,22}.

As for the sociodemographic characteristics, most of the pregnant women included in this study were of low socioeconomic status, which did not prove to be a risk for the occurrence of HSP. This may have been due to the fact that the hospital is public and the population studied, both for case and control groups, was from a less privileged social class.

This result corroborated the statement from the National High Blood Pressure Education Program⁸ that says that the socioeconomic level does not predispose to HSP, unlike other reports stating that the socioeconomic level is a risk factor for HSP, since these are more frequent in developing than in developed countries^{11,23}.

In this case series, no difference was observed between the groups as regards the number of prenatal visits reported in the medical records. Most of the pregnant women attended seven or more visits. This fact is relevant for the obstetric care, considering that the manual of the Ministry of Health and the Administrative Rules 569 and 570 recommend that all pregnant women should attend at least six visits during pregnancy, preferably in the first trimester, to allow timely interventions during this period¹³.

Although the majority of the pregnant women had attended more than seven visits, they presented complications resulting from blood pressure elevation. This shows that not only the number but also the quality of the prenatal visits should be considered, thus enabling a proper identification of risk factors for HSP and its early diagnosis, which are fundamental in the secondary prevention^{11,13,23,24}. As regards the risk factors, in this study, age above 30 years was a risk factor for PESCH, independently of obesity and previous preeclampsia; it was also a protective factor for PE. In the population studied, this demonstrates the presence of pregestational chronic hypertension (CH), which was a significant risk factor for superimposed preeclampsia in this study, thus corroborating the findings from other studies^{10,13,15,22}. This is an important finding, since in the current social setting a growing number of women who become pregnant after 30 years of age is observed, which increases the probability of their having CH or developing PESCH during pregnancy²⁴. In these cases, preconceptional advice and a high quality prenatal care are essential¹³.

Other studies also showed that women older than 30 years are more subject to diseases such as chronic hypertension prior to pregnancy^{9,13,15,17,22,23}.

In this study, the non-white race was a risk factor for PE, independently of age, previous preeclampsia, obesity, and parity. The risk of PE in non-white pregnant women was 14.085 times that of white pregnant women. This likely occurred because the black race presents a higher prevalence of hypertension when compared to the white race in the general population²⁴.

One study showed an upward trend of the risk of PE in black pregnant women²⁴ and another study conducted in Florida also verified an increased risk of PE in non-white

women²⁵. Other studies, in turn, did not find any correlation of race with the occurrence of HSP^{13,21}.

In the present study, obesity was observed to be an independent risk factor both for GH and for PESCH. The risk of PESCH and of GH among obese pregnant women was 23.94 and 17.63 times that of non-obese pregnant women, respectively. This is a disturbing finding, since obesity is currently a growing public health problem, thus contributing to an increase in the incidence of HSP. Therefore, public health programs aiming to tackle obesity are necessary for the prevention of HSP^{19,26}.

Other studies also showed that overweight and obesity prior to and/or during pregnancy are associated with the occurrence of GH, PE and CH, and that the risk for PE doubles for every five to seven kg/m² increase in the body mass index as measured before pregnancy^{19,27}. However, in some studies, obesity was not identified as an independent risk factor but was rather associated with race, showing that non-Hispanic white obese women had a higher risk for PE when compared to black, Asian and white Hispanic obese women^{28,29}.

In this case series, the univariate analysis identified primiparity as a risk factor for GH and PE. However, in the multivariate analysis, primiparity represented a risk factor for GH but not for PE. The risk for GH among primigravidae was 5.435 times that of multigravidae. Despite the association between primiparity and PE described by various authors^{10,24,30-32}, these results were not observed in the present study, possibly because data were obtained from medical record notes, which may have limited the identification of primiparity as an independent risk factor for PE.

Other authors also showed that GH is common among younger women who are more frequently primipara^{9,15,17,18}.

In this study, previous PE represented an independent risk for PESCH, which corroborated other findings of the literature^{22,31,32}.

It is important to point out that the data collected depended on whether or not the medical records had been completely filled out previously. This is one of the major limitations of retrospective studies.

Based on the results found, we conclude that the risk factors identified for HSP were similar to the majority of the factors already reported in the literature, such as obesity, non-white race, previous PE, age above 30 years and CH as a factor increasing the risk for superimposed PE. Primiparity as an independent risk factor only for GH but not for PE was a finding not consistent with the literature.

In light of these findings, a high quality prenatal care is fundamental, so that the pregnant women at risk are identified as of history taking and clinical examination and, if necessary, interventions are made to minimize the complications of HSP both for the mother and the fetus.

Corrective therapeutic interventions are suggested in relation to overweight and obesity, by means of the practice of physical activities and nutrition advice for the prevention and/or reduction of body weight gain.

Further investigations, including other variables and

prospective studies with a more accurate collection of data on the potential risk factors for HSP are recommended.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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