● **Original article**

# DEFINING CHARACTERISTICS AND FACTORS ASSOCIATED WITH THE OCCURRENCE OF GESTATIONAL HYPERTENSIVE SYNDROMES*

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**ABSTRACT: Objective:** to identify the defining characteristics and related factors of Gestational Hypertensive Syndromes. **Method:** longitudinal retrospective study performed at a high-risk prenatal health center in a city in the west of Santa Catarina in 2016. The inclusion criteria were singleton pregnancy that did not result in miscarriage of intrauterine fetal death, date of last menstrual period between January and December 2015 and diagnosis of Gestational Hypertensive Syndrome. SPSS software, version 20.0 was used in data analysis. **Results:** 90 medical records were analyzed, and the defining characteristics of the diagnoses were revealed by high blood pressure and the presence of proteinuria. The related factors were maternal age, weight gain, body mass index, history of hypertensive diseases, number of prenatal consultations and use of antihypertensive medication. **Conclusion:** the characteristics that more accurately predict the occurrence of the diagnosis investigated and the reduction of the severe forms of the disease were identified.
**KEYWORDS:** Women's health; Pregnancy-induced hypertension; Health profile; Prenatal care.

## CARACTERÍSTICAS DEFINIDORAS E FATORES ASSOCIADOS À OCORRÊNCIA DAS SÍNDROMES HIPERTENSIVAS GESTACIONAIS

**RESUMO: Objetivo:** identificar as características definidoras e os fatores relacionados em Síndromes Hipertensivas Gestacionais. **Método:** estudo longitudinal, retrospectivo, realizado no centro de saúde de pré-natal de alto risco, num município do oeste catarinense em 2016. Como critérios de inclusão adotou-se: gestação única, que não tenha resultado em aborto ou óbito fetal, a data da última menstruação entre janeiro a dezembro de 2015, e a presença de diagnóstico da síndrome. Para a análise dos dados foi utilizado o *software* SPSS, versão 20.0. **Resultados:** foram analisados 90 prontuários, sendo reveladas as características definidoras dos diagnósticos pela elevação da pressão arterial e a presença de proteinúria. Os fatores relacionados foram: idade materna, ganho de peso, índice de massa corporal, antecedentes de doenças hipertensivas, número de consultas pré-natal e o uso de medicação anti-hipertensiva. **Conclusão:** identificou quais características predizem com maior exatidão a ocorrência do diagnóstico investigado, e a redução das formas graves da doença.
**DESCRITORES:** Saúde da mulher; Hipertensão induzida pela gravidez; Perfil de saúde; Cuidado pré-natal.

## CARACTERÍSTICAS DEFINIDORAS Y FACTORES ASOCIADOS A LA OCURRENCIA DE LOS SÍNDROMES HIPERTENSIVOS GESTACIONALES

**RESUMEN: Objetivo:** identificar las características definidoras y los factores relacionados en Síndromes Hipertensivos Gestacionales. **Método:** estudio longitudinal, retrospectivo, realizado en el centro de salud de prenatal de alto riesgo, en un municipio del oeste de Santa Catarina en 2016. Como criterios de inclusión se adoptaron: gestación única que no tenga resultado en aborto u óbito fetal, la fecha de la última menstruación entre enero y diciembre de 2015, y la presencia de diagnóstico del síndrome. Para el análisis de los datos se utilizó el *software* SPSS, versión 20.0. **Resultados:** se analizaron 90 prontuarios, siendo reveladas las características definidoras de los diagnósticos por la elevación de la presión arterial y la presencia de proteinuria. Los factores asociados fueron: edad materna, aumento de peso, índice de masa corporal, antecedentes de enfermedades hipertensivas, número de consultas prenatal y uso de medicación anti hipertensiva. **Conclusión:** se identificaron cuales características apuntan con más exactitud la ocurrencia del diagnóstico investigado, y la reducción de las formas graves de la enfermedad.
**DESCRIPTORES:** Salud de la mujer; Hipertensión inducida por la gravidez; Perfil de salud; Cuidado prenatal.

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## INTRODUCTION

Gestational Hypertensive Syndromes (GHS) are considered one of the most important complications during the pregnancy cycle. The incidence ranges from 6% to 30% of pregnancies, contributing to high rates of maternal morbidity, and is the leading cause of death in the world[1].

Complications of hypertensive disorders such as preeclampsia and eclampsia account for 25% of all maternal deaths worldwide, and are the main causes of premature births, while in Brazil, they account for 20% of all maternal deaths[2-3].

These syndromes are defined by the National High Blood Pressure Education Program (NHBPEP) as Gestational Hypertension (GH), Chronic Hypertension (CH), Preeclampsia (PE) and Preeclampsia Superimposed on Chronic Hypertension (CH + PE)[4].

Maternal complications include thrombocytopenia, increased liver enzymes, hemolysis of the red blood cells, Hellp syndrome - hemolytic anemia, elevated liver enzymes, low platelet count and eclampsia; The fetus, in turn, is affected by the following impacts: impairment of its development, premature delivery, low birth weight and perinatal death[5-6].

Identification of patients at risk for the development of GHSs, either by factors related to their onset or by defining characteristics of GHS modalities, may improve the reliability of the diagnosis, preventing or delaying the clinical presentation of the most severe forms[7].

The defining characteristics are a body of evidence grouped as manifestations of the signs and symptoms that confirm a given diagnosis, while the related factors concern the etiology of this diagnosis, i.e., they determine the causes of the origin of a given phenomenon[8].

Based on these measures, it is possible to identify which characteristics more accurately predict the occurrence of the diagnosis investigated within the context of GHS. Studies aimed to improve the definition and application of these diagnoses can contribute to make the diagnostic inference process more reliable[5].

To date, there is no widely accepted predictive test for the gestational hypertensive syndrome. It is therefore important to take preventive measures to prolong pregnancy and reduce maternal and fetal risks[3]. Studies on GHS development related factors, which should be encouraged, are still incipient[5].

It is assumed that hypertensive pregnant women who receive better care are less likely to suffer complications caused by the onset of the disease. Thus, the present study aimed to identify the defining characteristics of GHS and the factors that may influence its onset.

## METHODOLOGY

Longitudinal and retrospective study based on the analysis of the electronic records of pregnant women with GHS transferred to the referral service for high-risk pregnancy monitoring in the city of Chapecó, Santa Catarina (SC), Brazil, a reference center for the region's highly complex services[9].

The records were selected according to inclusion criteria: singleton pregnancy that did not result in miscarriage or intrauterine death, day of last menstrual period (LMP) in 2015 and diagnosis of GHS. The medical records without confirmation of the diagnosis of GHS were excluded. The total sample included 90 medical records.

Data was collected from the electronic health records of the service through a semi-structured tool for information on sociodemographic characteristics, health conditions, personal and family history of hypertensive diseases, medications, laboratory clinical aspects (gestational age - GA), blood pressure levels (considered normal BP <140/90 mmHg), nutritional assessment (low weight, adequate, overweight, obesity), body mass index (BMI), mmHg), measurement of fundal height (FH) and auscultation of fetal heart rate (FHR).

Analysis also included the number of prenatal consultations, proteinuria (tested positive in dipstick

testing using Labstix strips, considering a 2+ level as the likely diagnosis), hematocrit, hemoglobin; neonatal outcome (type of delivery, age of birth – early term: 37 weeks to 38 weeks and six days; full term: 39 weeks to 40 weeks and six days; late term: 41 weeks to 41 weeks and 6 days; post-term: from 42 weeks); birth weight and Apgar score at 1 minute and 5 minutes after birth (without asphyxia: 8 to 10, mild asphyxia: 7 to 5, moderate asphyxia 4 and 3, severe asphyxia 2 to 0).

The dependent variables were those related to the outcome of GHS classified as follows: Gestational Hypertension (GH), high blood pressure occurring after 20 weeks of gestation without proteinuria, normalizing their blood pressure levels until the 12th week of the postpartum period; Chronic Hypertension (CH) defined as elevation of blood pressure identified before gestation or until the 20th week of gestation persisting after 12 weeks postpartum; Preeclampsia (PE) emerging after the 20th week, accompanied by proteinuria at a level equal to or greater than 0.3 g for up to 24 hours and CH + PE, which consists in the onset of PE in women who have already developed CH or renal disease and concomitantly proteinuria after the 20th gestational week[4].

The classification of GHS was defined only when diagnosed during gestation. The independent variables were those observed from the first consultation of the gestational trimester, at three moments-follow up (1st, 2nd and 3rd trimesters).

Regarding data confidentiality, anonymity was ensured by a code "R" letter (R for "record") followed an ordinal number corresponding to the order of data collection (P1, P2, P3 ...).

Data analysis was performed with SPSS software, version 20.0. Descriptive statistics and bivariate analysis was performed with Pearson's Chi-square test and ANOVA test was used to evaluate the assertions of the means of the pregnancy trimesters. All inferential statistical tests had significance level $p < 0.05$ and the goodness of fit of the model was assessed by Hosmer-Lemeshow test.

The theoretical reference used for data interpretation was proposed by the international recommendations of the Executive Summary of the American Congress of Obstetrician and Gynecologists[10].

The present study was developed in compliance with all applicable ethical standards and guidelines, and was approved by the Ethics Committee on Research with Humans (CEP) of Universidade Federal da Fronteira Sul (UFFS), under protocol no 1.621.337.

## ● RESULTS

The characteristics of pregnant women with GHS according to sociodemographic conditions, reproductive history, risk factors for chronic hypertensive diseases and neonatal outcome are shown in Table 1.

**Table 1** - Characteristics of pregnant women with GHS according to sociodemographic conditions, reproductive history, risk factors for hypertensive diseases and neonatal outcome. Chapecó, SC, Brazil, 2016. (continues)

| | Variables | n = 90 pregnant women | |
|---|---|---|---|
| | | Frequency | % |
| **Age** | | | |
| | 15 - 19 | 01 | 1.1 |
| | 20 – 39 | 81 | 90 |
| | ≥ 40 | 08 | 8.9 |
| **Education** | | | |
| (years of schooling) | 1 – 4 | 42 | 46.7 |
| | 5 – 8 | 36 | 40 |
| | 9 – 12 | 04 | 4,4 |
| | ≥ 12 | 08 | 8.9 |

| | | | |
|---|---|---|---|
| **Marital status** | | | |
| | Single | 08 | 8.8 |
| | Married | 53 | 58.8 |
| | Separated | 01 | 1.1 |
| | Ignored | 28 | 31.1 |
| **Color (race)** | | | |
| | White | 72 | 80 |
| | Brown | 12 | 13.3 |
| | Ignored | 06 | 6.6 |
| **Occupational status** | | | |
| | Unemployed | 15 | 16.6 |
| | Employed | 27 | 30 |
| | Ignored | 48 | 53.3 |
| **Reproductive History** | | | |
| | Nulliparous | 22 | 24.4 |
| | Multiparous | 68 | 76.6 |
| | Miscarriage | 22 | 24.4 |
| | Stillborn | 04 | 4.4 |
| | Low weight at birth | 08 | 14.3 |
| **Smoking** | | | |
| | Yes | 05 | 5.5 |
| | No | 85 | 94.4 |
| **Mode of delivery** | | | |
| | Vaginal | 31 | 34.4 |
| | Surgical procedure | 59 | 65.6 |
| **Gestational age at birth** | | | |
| | Premature | 14 | 15.6 |
| | Early term | 24 | 26.7 |
| | Full term | 28 | 31.1 |
| | Late term | 24 | 26.7 |
| **Apgar Score** | | | |
| | No asphyxia (8 – 10) | 28 | 31.1 |
| | Mild asphyxia (7 – 5) | 06 | 6.6 |
| | Ignored | 56 | 62.2 |
| **Weight at birth** | | | |
| | ≤ 2.500 g | 08 | 8.8 |
| | > 2.500 g | 48 | 53.3 |
| | Ignored | 34 | 37.7 |
| Previous history of hypertensive diseases (personal) | | 42 | 46.7 |
| Previous history of hypertensive diseases (family) | | 12 | 13.3 |
| Use of oral anti-hypertensive drug | | 32 | 35.6 |

The mean age of the participants was 30.3 years (± 5.9 years), with most women aged 20-39 years old with low educational level, married, white and multiparous. The following neonatal outcomes prevailed: caesarian sections, no birth asphyxia and full-term infants with a birth weight > 2,500 g.

Table 2 shows the occurrence of an association between the clinical forms of GHS and the risk factors related to its diagnosis, according to the trimester. CH was more common in the first trimester: 32 (35.6%), while GH prevailed as the main diagnosis in the second trimester, with statistical significance for high blood pressure levels ≥ 140/90 mmHg.

**Table 2 -** Association between the clinical forms of GHS and the variables studied according to the gestational trimester**.** Chapecó, SC, Brazil, 2016

| Variables | Trimester | | | | | | |
|---|---|---|---|---|---|---|---|
| | First | | Second | | Third | | P value |
| **Gestational Hypertensive Syndrome (GHS)** | **n** | **%** | **n** | **%** | **n** | **%** | |
| Chronic Hypertension (CH) | 32 | 35.6* | 29 | 32.2 | 13 | 14,4 | 0.023 |
| Gestational Hypertension (GH) | - | - | 53 | 58.9 | 25 | 27.8 | |
| Preeclampsia (PE) | - | - | 05 | 5.6 | 33 | 36.7* | |
| Preeclampsia Superimposed on Chronic Hypertension PE (CH+PE) | - | - | 03 | 3.3 | 19 | 21.1 | |
| **Blood Pressure Measurement** | | | | | | | |
| Normal value (< 140x90 mmHg) | 23 | 67.6 | 26 | 28.9 | 49 | 54.4 | < 0.001 |
| Abnormal values (≥ 140x90 mmHg) | 11 | 32.4 | 64 | 71.1* | 41 | 45.6 | |
| **Proteinuria** | | | | | | | < 0.001 |
| Negative (< 2+ reagent strip) | 81 | 90 | 80 | 90 | 38 | 42.2 | |
| Positive (≥ 2+ reagent strip) | 09 | 10 | 08 | 10 | 52 | 57.8* | |
| **Nutritional Status** | | | | | | | 0.042 |
| Low weight | 01 | 2.9 | 01 | 1.7 | 01 | 1.4 | |
| Adequate | 01 | 2.9 | 03 | 5.2 | 07 | 9.5 | |
| Overweight | 11 | 32.4 | 11 | 19 | 18 | 24,3 | |
| Obesity | 21 | 61.8 | 43 | 64.9 | 48 | 74.1* | |
| **Evaluation in prenatal consultation** | | | | | | | |
| FHR | - | - | 33 | 36.7 | 68 | 75.6 | |
| Fundal height | - | - | 44 | 48.9 | 67 | 74.4 | |

* Fischer's Exact test

Comparison of the evolution of the variables weight, BMI, systolic blood pressure (SBP) and diastolic blood pressure (DBP), according to the gestational trimesters showed statistical significance for the 3rd trimester related to weight gain and BMI (Table 3).

**Table 3** - Comparison of parametric variables of pregnant women with GHS according to the gestational trimester. Chapecó, SC, Brazil, 2016

| | 1st Trimester | | 2nd Trimester | | 3rdTrimester | | |
|---|---|---|---|---|---|---|---|
| **Variables** | **Mean** | **± SD** | **Mean** | **± SD** | **Mean** | **± SD** | **P value** |
| Weight (Kg) | 88.00[a] | 21.41 | 88.88[a] | 21.24 | 93.52[b] | 19.73 | < 0.001 |
| BMI (Kg/Alt²) | 33.16[a] | 7.43 | 33.48[a] | 7.33 | 35.20[b] | 6.73 | < 0.001 |
| SBP (mmHg) | 127.64 | 2.46 | 127.05 | 3.06 | 122.14 | 2.54 | 0.166 |
| DBP (mmHg) | 81.76 | 16.23 | 81.44 | 11.84 | 81.44 | 15.54 | 0.995 |

[ab] *Bonferroni Post Hoc test* means with statistically significant differences between the groups

Distribution of the characteristics investigated in this study in relation to the clinical forms of GHS are shown in Table 4. PE was related to an age group of 20-39 years, pressure levels ≥ 140/90 mmHg, positive proteinuria> 2+, and more than seven prenatal visits. In turn, CH + PE was related to history of hypertensive diseases and use of antihypertensive medication.

**Table 4** - Distribution of sociodemographic, clinical, laboratory and neonatal characteristics according to the clinical forms of GHS in pregnant women in the third trimester.Chapecó, SC, Brazil, 2016. (continues)

| | Total | | CH | | GH | | PE | | CH + PE | | P valor |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variables** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | |
| Color | | | | | | | | | | | 1.000* |
| White | 72 | 80 | 11 | 15,3 | 20 | 27,8 | 26 | 36.1 | 15 | 20,8 | |
| Brown | 18 | 20 | 2 | 11.1 | 5 | 27.8 | 7 | 38.9 | 4 | 22.2 | |
| Age range | | | | | | | | | | | **0.034*** |
| 15-19 years | 1 | 1.1 | - | - | 1 | 100 | - | - | - | - | |
| 20-39 years | 81 | 90 | 9 | 11,1 | 23 | 28,4 | 32 | 39,5 | 17 | 21 | |
| > 40 years | 8 | 8.9 | 4 | 50 | 1 | 12.5 | 1 | 12.5 | 2 | 25 | |
| Education (years of schooling) | | | | | | | | | | | 0,377* |
| 1-4 years | 42 | 46,7 | 9 | 21,4 | 10 | 23,8 | 11 | 28,6 | 12 | 28,6 | |
| 5-8 years | 36 | 40 | 3 | 8,3 | 11 | 30,6 | 16 | 44,4 | 6 | 16,7 | |
| 9-12 years | 4 | 4,4 | 1 | 25 | 1 | 25 | 2 | 50 | - | - | |
| > 12 years | 8 | 8.9 | - | - | 3 | 37.5 | 4 | 50 | 1 | 12,5 | |
| Marital status | | | | | | | | | | | 0,444* |
| ** | 7 | 11,3 | 1 | 14,3 | 1 | 14,3 | 2 | 28,6 | 3 | 42,9 | |
| With a companion | 55 | 88,7 | 7 | 12,7 | 16 | 29,1 | 23 | 41,8 | 9 | 16,4 | |
| Occupation | | | | | | | | | | | 0.305* |
| Unemployed | 15 | 35,7 | 3 | 20 | 3 | 20 | 5 | 33,3 | 4 | 26,7 | |
| Employed | 27 | 64.3 | 1 | 3.7 | 7 | 25.9 | 14 | 51.9 | 5 | 18.5 | |
| Parity | | | | | | | | | | | 0.289* |
| Multiparous | 68 | 75.6 | 12 | 17.6 | 18 | 26.5 | 26 | 38.2 | 12 | 17.6 | |
| Primiparous | 22 | 24.4 | 1 | 4.5 | 7 | 31.8 | 7 | 31.8 | 7 | 31.8 | |
| Previous Family history of hypertensive disease | | | | | | | | | | | 0.922* |
| No | 78 | 86,7 | 12 | 15,4 | 22 | 28,2 | 28 | 35,9 | 16 | 20,5 | |
| Yes | 12 | 13,3 | 1 | 8,3 | 3 | 25 | 5 | 41,7 | 3 | 25 | |
| Previous personal history of hypertensive disease | | | | | | | | | | | **< 0.001*** |
| No | 47 | 52,2 | 2 | 4,3 | 19 | 40,4 | 23 | 48,9 | 3 | 6,4 | |
| Yes | 42 | 46,7 | 11 | 26,2 | 6 | 14,3 | 10 | 23,8 | 15 | 35,7 | |
| Previous use of anti-hypertensive medication | | | | | | | | | | | **< 0.001*** |
| No | 58 | 64,4 | - | - | 25 | 43,1 | 33 | 56,9 | - | - | |
| Yes | 32 | 35,6 | 13 | 40,6 | - | - | - | - | 19 | 59,4 | |
| BP (mmHg) | | | | | | | | | | | **0.007*** |
| Normal (<140/90) | 49 | 54,4 | 11 | 22,4 | 9 | 18,4 | 15 | 30,6 | 14 | 28,6 | |
| Abnormal (≥140/90) | 41 | 45.6 | 2 | 4.9 | 16 | 39 | 18 | 43.9 | 5 | 12.2 | |
| BMI | | | | | | | | | | | 0.213* |
| Low weight | 1 | 1.4 | - | - | - | - | - | - | 1 | 6.2 | |
| Adequate | 7 | 9.5 | 2 | 28.6 | 3 | 42.9 | 2 | 28.6 | - | - | |
| Overweight | 18 | 24.3 | - | - | 4 | 22.2 | 10 | 55.6 | 4 | 22.2 | |
| Obesity | 48 | 64.9 | 6 | 12.5 | 13 | 27.1 | 18 | 37.5 | 11 | 22.9 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Proteinuria | | | | | | | | | | | **< 0.001** |
| Negative | 38 | 42 | 13 | 34.2 | 25 | 65.8 | - | - | - | - | |
| Positive | 52 | 57,8 | - | - | - | - | 33 | 63,5 | 19 | 36,5 | |
| Type of delivery | | | | | | | | | | | 0.590* |
| Cesarean section | 59 | 65,6 | 10 | 16,9 | 14 | 23,7 | 23 | 39 | 12 | 20,3 | |
| Normal | 31 | 34.4 | 3 | 9.7 | 11 | 35.5 | 10 | 32.3 | 7 | 22.6 | |
| Gestational age | | | | | | | | | | | 0.414* |
| Preterm | 14 | 15.6 | 2 | 14.3 | 6 | 42.9 | 4 | 28.6 | 2 | 14.3 | |
| Early term | 24 | 26,7 | 4 | 16,7 | 2 | 8,3 | 12 | 50 | 6 | 25 | |
| Full term | 28 | 31,1 | 3 | 10,7 | 9 | 32,1 | 11 | 39,3 | 5 | 17,9 | |
| Late term | 24 | 26,7 | 4 | 16,7 | 8 | 33,3 | 6 | 25 | 6 | 25 | |
| Apgar | | | | | | | | | | | 0.225* |
| No asphyxia (8-10) | 28 | 82,4 | 6 | 21,4 | 5 | 17,9 | 11 | 39,3 | 6 | 21,4 | |
| Mild asphyxia (7-5) | 6 | 17,6 | - | - | 3 | 50 | 1 | 16,7 | 2 | 33,3 | |
| Low weight < 2.500kg | | | | | | | | | | | 0.414* |
| No | 48 | 85,7 | 8 | 16,7 | 10 | 20,8 | 16 | 33,3 | 14 | 29,2 | |
| Yes | 8 | 14,3 | - | - | 3 | 37,5 | 4 | 50 | 1 | 12,5 | |
| Prenatal consultations | | | | | | | | | | | **< 0.001*** |
| ≥ 7 consultations | 58 | 64.4 | 5 | 8.6 | 20 | 34.5 | 28 | 48.3 | 5 | 8.6 | |
| < 7 consultations | 32 | 35.6 | 8 | 25 | 5 | 15.6 | 5 | 15.6 | 14 | 43.8 | |

* Fischer's Exact test

** No companion, with a companion

## ● DISCUSSION

Among the factors related to the occurrence of GHS identified in this study, maternal age showed correlation with the occurrence of PE. Pregnant women aged 20-39 years were the most affected by the disease because extreme ages are risks factors for hypertension. Similar data was also found in other studies that showed a predominance of this age group[11-12].

Although extreme ages of reproductive years represent a potential risk for GHS, this factor was not statistically significant in the present study. There is controversy whether pregnancy at extreme ages of reproductive years raises the risks of hypertensive syndromes[13].

Regarding education, most pregnant women had low levels of schooling, but this variable was not statistically related to the occurrence of the syndrome. An individual's level of education may be related to his/her ability to obtain information about his/her own health, and so individuals with low educational attainment may be more likely to be vulnerable to certain diseases.

Our findings corroborate the claim of the National High Blood Pressure Education Program (NHBPEP) that the socioeconomic status does not predispose the population to the various clinical forms of GHS[4]. The context of each pregnancy is determinant for its development, and healthcare teams must be aware of the multiple risk factors for maternal health.

The other sociodemographic factors also showed no association with the clinical forms of GHS. These factors did not constitute a risk factor for the occurrence of the outcome because the study sample was composed by individuals of a low-income population who use public health services[13]. Another explanation may be the racial diversity of the Brazilian population that makes it difficult to provide an accurate stratification of racial status.

Although the literature reports the prevalence of GH in primiparous women, in this study with multiparous women parity was not significantly associated with GHS. A similar result was found in other studies[12, 14]. It is possible that the pregnant women in this study had different particularities, such as their ages at first pregnancies.

Regarding the clinical forms of GHS, chronic hypertension (CH) was related to the onset of the syndrome in the first trimester of gestation, reinforcing the characteristic that defines the diagnosis of the syndrome, and is an important risk factor for superimposed preeclampsia. Today women are more likely to have chronic hypertension during pregnancy because they are choosing to become pregnant after 30 years of age. Thus, preconceptional guidance and proper prenatal care are needed[15].

Use of antihypertensives and personal history were other factors related to the onset of GHS with statistical significance for CH + PE. Such findings were already expected, as preeclampsia was the most frequent diagnosis, and previous associated diseases are risk factors for the occurrence of hypertensive syndromes. Pregnant women with hypertension in pregnancy should be advised of the risk of developing hypertension in a subsequent pregnancy.

On the other hand, the occurrence of GH showed association with GHS from the second trimester of gestation with elevation of pressure levels, which was also found in other studies[5, 8]. The risks arising from higher blood pressure levels are circulatory disorders, as well as a risk factor for neonatal survival[16].

PE was related to the third trimester of gestation, confirmed by a significant increase in BP accompanied by proteinuria, and diagnosed by the presence of 2+ in the reagent strip. Although dipstick testing does not quantify the level of proteinuria, this fact did not make it impossible to verify the association with the outcome, as there was no relation between the exact amount of protein in the urine, but rather with its absence or presence[17].

Weight gain and obesity were significant in the third trimester of pregnancy. Weight gain during the different trimesters of gestation may be associated with fetal growth or the onset of gestational hypertension. Another study also corroborates the increase in weight gain in hypertensive pregnant women, stressing the impairment of gestational evolution in obese women[13].

Regarding the neonatal outcome, the average Apgar score at one minute after birth was 8.2 (± 1.0), and at five minutes after birth was 9.1 (± 0.6), corroborating other studies where the levels were above the cut-off point proposed by the literature[9]. Newborn weight was also in average 3,085 kg (± 458.6), which is satisfactory, and the average gestational age at birth was 38.8 weeks (± 1.7).

Prematurity diverged from the findings of the literature reporting the association of these factors with GHS[18]. Although GHS is a stressful factor for the newborn, the findings related to extrauterine fetal vitality were satisfactory.

Although this study did not show an association between GHS and the mode of delivery, cesarean section was the most prevalent (65.6%) Regardless of the clinical form of GHS, the mode of delivery recommended by national and international guidelines is vaginal delivery[19].

Finally, the number of prenatal consultations was related to the occurrence of GHS, with statistical significance for PE. This reinforces the need for frequent monitoring of pregnant women at risk, with an increase in the number of consultations.

Prenatal care reached considerable coverage, starting early in the first trimester of gestation and with more consultations than the recommended minimum number. However, weaknesses were detected in the follow-up of these pregnant women, since some of the clinical and laboratory information necessary for GHS monitoring was not recorded.

Non-completion of the medical record is a cause for concern, as such completion is part of the process of delivery of high quality care to pregnant women, and this tool is intended to ensure the flow of information between the health services and the monitoring of the evolution of pregnancy, delivery and postpartum[2].

## CONCLUSION

In the scope of this study it was possible to identify the complexity of GHS and find out that some factors are related to the occurrence of its clinical forms throughout the gestational trimesters. The defining characteristics of each diagnosis were revealed by the body of evidence expressed in the high blood pressure and presence of proteinuria.

On the other hand, the related factors were maternal age, weight gain, BMI, personal history of hypertensive diseases, number of prenatal consultations and use of antihypertensive medication, contributing to the etiology of the outcome.

Regarding the clinical forms of GHS, CH showed a statistically significant association with occurrence in the first trimester, followed by GH in the second trimester and PE in the third trimester. It is associated with the presence of proteinuria, weight gain and obesity. However, socioeconomic status, education, race/color, occupational status, parity, delivery and prematurity did not show significant association with GHS.

The identification of patients at risk for the development of GHSs may subsidize actions to prevent or delay the clinical presentation of the most severe forms of the syndrome, corroborating the initial hypotheses of this study. These observations are still the main predictors of hypertensive disorders during pregnancy.

Early access to pregnant women during prenatal care allowed early identification of the gestation of risk, as well as timely referral to the referral service.

However, incomplete information in medical records did not allow conducting analyzes of association with greater impact on causality, such as relative risk, for example, which was one limitation of this study. Also, monitoring of these women in the postpartum period was not possible, and GHS may occur in this period.

Although prenatal care is in the scope of the actions performed by nurses in health services, quality of care provided deserves greater consideration. Thus, it is necessary to reflect on the clinical practice and identify what can be done to minimize the incidence of GHS in the community of pregnant women in the region where the study was conducted.

Although GHS is a complex and challenging disorder, the results of this study provided knowledge on the defining characteristics of this syndrome and the evolution of its clinical forms throughout the trimesters of pregnancy**.**

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