Factors associated with Specific Hypertensive Gestation Syndrome (SHGS) in postpartum adolescent and young adult mothers in the Northeast of Brazil: a multiple analysis of hierarchical models

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Abstract

Objectives: to analyze possible associations between Specific Hypertensive Gestation Syndrome (SHGS) and socio-demographic, prenatal, and delivery characteristics of young adult and teenage mothers.

Methods: a hospital-based cross-sectional study and regional level, gathered from 54 municipalities in the Northeast region of Brazil from 2011-2012, using records from the National Survey, "Born in Brazil". A theoretical conceptual model with three-level hierarchy was established, with SHGS being the outcome variable. A multivariate analysis was performed from the bivariate analysis and p-value, with a significance of < 0.2 by the Wald test.

Results: of the 2,960 adolescents and young adults included in the study, 135 (4.6%) developed HSP. The mothers without a partner had 50% (OR=1.53) greater chance of presenting this pathology; while those without adequate schooling for age presented 90% higher chance (OR = 1.86) and those with a prior clinical risk factor, the chance of presenting the outcome was 21 times the chance of those without this antecedent (OR = 21.72).

Conclusions: significant associations were identified between SHGS and postpartum adolescents and young adults without a partner, with low schooling and prior clinical risk, signaling the importance of investments in the quality of prenatal care and labor of the most vulnerable groups.

Key words *Pregnancy-induced hypertension, Pregnancy in adolescence, Adolescent, Young adult*

Introduction

At the global level, Specific Hypertensive Gestation Syndrome (SGHS) is considered a major cause of maternal and neonatal death.[1] In developed countries, this incidence ranges from 2 to 8% of pregnancies, while in Brazil it may reach over 10%, being the first cause of maternal death, presenting a high rate of perinatal morbidity and mortality.[1,2]

Despite the many factors and theories suggested to explain the possible causes, the etiology of SGHS is not well-known.[3] Among the risk factors that contribute to its occurrence, the first pregnancy under the age of 17 stands out.[3]

Pregnant adolescents are more vulnerable to the occurrence of SGHS when compared to young adults because they present peculiar characteristics such as immaturity of organs and systems, as well as misinformation and difficulty of access to the Health System.[4] SGHS is more frequent among younger adolescents (< 16 years), since in this age group there are more nulliparous girls, with poor nutritional status and lack of prenatal care.[5]

Studies indicate that adolescents tend to present less adequacy of prenatal care, both for late beginning and fewer consultations,[6] factors that increase the risks of pregnancy, especially in the younger ones. This group has also shown to be less informed about referral maternity hospitals for delivery; consequently, they present a greater frequency of pilgrimage, at the time of delivery, circumstances that may contribute with a higher prevalence of SGHS in this group.[6]

The literature is consensual about the magnitude of SGHS among age groups at the extremes of reproductive age.[2] Thus, the objective of this study was to analyze possible associations between sociodemographic, prenatal and delivery characteristics with the Specific Hypertensive Gestation Syndrome among puerperae adolescents and young adults, attended in public and private maternity hospitals and other municipalities in the Northeast Region of Brazil.

Methods

This study corresponds to a subproject of the National Survey on Labor and Birth, entitled "Born in Brazil". A cross-sectional, hospital-based epidemiological study was carried out in 191 municipalities in all States and Regions of Brazil, from February 2011 to October 2012,[7,8] whose sample was composed of 23,940 puerperal women interviewed in 266 hospitals.[8]

In the national survey, the sample was selected in three stages: the first stage was composed of hospitals with 500 or more deliveries in 2007, stratified into five macroregions of the country, located in the capital of the state or interior, and type of hospital (private, public or mixed); the second stage consisted of the days of the week (minimum of seven days in each hospital), using the inverse sampling method to select as many days of research as necessary to reach 90 women interviewed at the hospital; the third stage was composed of the puerperae to be interviewed.

The study subjects were women admitted to maternity units selected at the time of delivery, as well as their newborns (regardless of gestational age or weight) or stillborns and / or gestational age ≥ 22 weeks of gestation and / or birth weight ≥ 500 g. Women whose delivery took place outside the selected Health Unit, those who did not speak Portuguese (foreign), and those with severe mental disorders or deaf-mutes were excluded from the study.[7,8]

For this research, a secondary analysis was performed by adolescents and young adults, who were attended at maternity hospitals selected in the Northeast Region, which were part of the National Survey, composed of 68 Health Units distributed in 54 municipalities. In this sense, the studied population totaled 2,960 women, of which 1,299 were teenage puerperal women and 1,661 young adults. The sample complied with the sampling criteria calculated in the National Project, where the size of each stratum was calculated based on the general cesarean rate in 2007 (46.6%), to detect differences of 14% between the types of Health Service. The significance level of 5%, a study power of 95% and design effect of 1.3 were considered, totaling a sample size of 450 women per stratum.[8] Those that declared themselves yellow or indigenous were excluded because of the small proportion in the population.

Were considered adolescents those aged between ten and 19 years and young adults, those between 20 and 24 years of age, according to the criteria established by the World Health Organization.[9] The adolescents were subdivided into two groups: ten to 16 year olds (early and intermediate adolescence) and 17 to 19 year olds (late adolescence).[10]

The variables studied sought to contemplate the research objectives, whose independent variables (predictors) were organized in a theoretical conceptual model with three levels of hierarchy (distal, intermediate and proximal)[10-12] (Figure 1).

The dependent variable (outcome) of the study was SGHS, being considered, the occurrence of any of the types of hypertensive syndrome, during pregnancy and / or labor: chronic hypertension, preeclampsia, eclampsia (convulsions) or the HELLP syndrome (presence of hemolysis, elevated liver enzymes and low platelet count).

The independent variables that comprised the distal, intermediate and proximal levels were established based on the questions of the hospital questionnaire applied to the puerperal woman, except for the variable "clinical risk antecedents " (intermediate level).

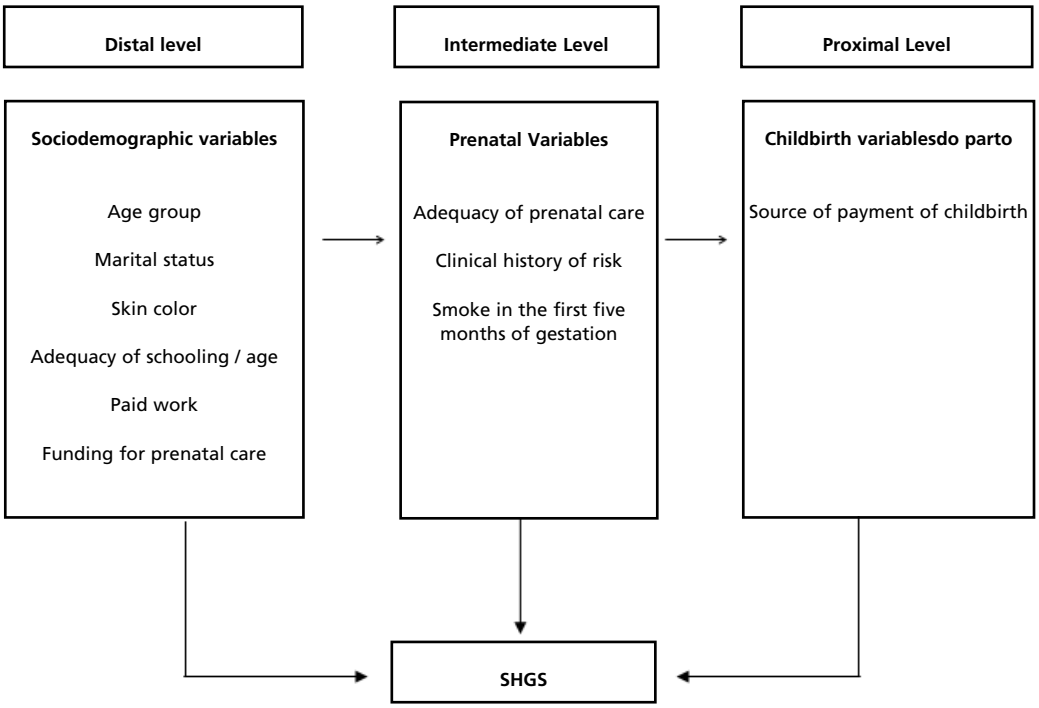
At the distal level, the sociodemographic aspects were included: Age group (ten to 16 years, 17 to 19 years and 20 to 24 years); marital status (without partner and companion); skin color (white, brown and black); adequacy of schooling with age (inadequate and adequate); paid work (yes and no) and funding for prenatal care (public and private). The variable "adequacy of schooling for the age" was calculated, considering the number of years of study expected for the age, as recommended by the Law of Guidelines and Bases of National Education.[13]

At the intermediate level, variables that represent prenatal characteristics were included: Adequacy of care (adequate, partially adequate and inadequate); clinical history of risk (yes and no) considering the presence of some situations (heart disease, hypertension with continued treatment, non-gestational diabetes and epilepsy); and smoking in the first five months of gestation (yes and no).

The variable adequacy of prenatal care was built according to some criteria, based on literature[4] in this area: the gestational trimester in which prenatal care started; the total number of consultations received, corrected for gestational age, at the time of delivery; the routine examinations performed; the guidance provided on referral motherhood for childbirth care.[4] Based on these criteria, a minimum prenatal care adequacy indicator was developed that considered some items for prenatal adequacy, such as: 1) initiation of follow-up prenatal care, when performed until the 12th gestational week, as recommended by the Stork Network[14]; 2) adequate number of consultations for gestational age at delivery, with a minimum schedule of six consultations, recommended by the Brazilian Ministry of Health, which recommends at least one consultation in the first trimester of pregnancy, two in the second and three in the last trimester[15] ; 3) the registration of at least one result of each of the exams recommended in a

Figure 1

Theoretical-conceptual model of the predictive factors of the Specific Hypertensive Gestation Syndrome (SHGS) in puerperal adolescents and young adults in the Northeast Region of Brazil.



prenatal routine (blood glucose, urine, syphilis serology, HIV serology and ultrasonography); 4) guidance on referral motherhood for childbirth care.

For the analysis of the proximal level, the variable referring to the characteristics of childbirth was used: birth payment source (public and private). This variable was constructed based on a previous study on the theme,[10] being classified as proximal because it reflects the model of assistance that currently predominates in Brazil. Thus, the births occurred in Public Units and Mixed Units and which were not financed by health insurance, were classified as a source of public payment; the births financed by health plan, occurring in Mixed or Private Units, as well as, the births occurred in Private Units, regardless of whether they were financed by health insurance, were classified as having private source of payment.

For the analysis of the data, the univariate analysis was used to estimate the absolute and relative frequencies of the predictor variables (description of sociodemographic, prenatal and childbirth characteristics). The bivariate analysis was then performed using the Pearson chi-square test, with a significance level of 5%, to verify possible associations between SGHS (dependent variable) and independent variables.[10]

The multivariate analysis in hierarchical models was performed from the results of the bivariate analyzes and respective *p* values, with significance level <0.20, by the Wald test. The variables were organized by level of proximity to the outcome, first entering those of the distal level. Significant variables ($p \leq 0.05$) were conserved in the model and entered intermediate level adjustment. The same procedure was used until the proximal variables were adjusted with the intermediate and distal variables, and those selected by the level of statistical significance at a given level remained in the subsequent models, even if the inclusion of hierarchically lower variables modified their level of significance.[10]

The results were expressed by *odds ratio* (OR) values, with their respective confidence intervals (95%). For the accomplishment of these procedures, the program SPSS version 17.0 was used, for univariate and bivariate analysis; and the STATA 10.0 program for multivariate analysis and logistic regression. The ComplexSample module was used to correct the effect of the drawing because it was a complex sample.

This study was approved by the Research Ethics Committee (REC) of the UEFS, according to Resolution 466/12 of the CNS, under protocol 39148014.4.0000.0053.

Results

Of the 6,094 puerperal women in the Northeast Region of Brazil, 48.6% (2960) belonged to adolescents and youth age range. Of this group, 4.6% (135) presented SGHS, and 59.3% (80) were young adults. According to the classification, 97.8% (132) had chronic arterial hypertension, pre-eclampsia and HELLP syndrome and 8.2% (11) presented with eclampsia.

Concerning the sociodemographic characteristics, it was observed that, 15.4% were in the age group between ten and 16 years (early adolescence) and 28.5% in the age group between 17 and 19 years (late adolescence), making up 43.9% adolescents and 56.1% young adults. Regarding the marital situation, 77.4% reported having a partner; 72.9% declared themselves as brown; 61.0% had inadequate schooling for their age; 83.2% did not work and 90.1% performed prenatal care in the public sector. According to the bivariate analysis, in this block of variables, skin color and adequacy of schooling in relation to age had a statistically significant association with the endpoint studied (SGHS) (Table 1).

When analyzing prenatal characteristics, 76.5% (2,265) of the puerperas who participated in the study in the Northeast Region had inadequate prenatal care; the vast majority reported not having a clinical history of risk, as well as not having smoked in the first five months of pregnancy, 98.3% and 94.7%, respectively. It should be noted that there was a significant association between the variable clinical history of risk and SGHS (Table 1).

In the analysis of the variables related to the characteristics of the delivery, it was identified that 95.3% occurred in the public sector and 59% were of normal delivery. Of the 135 women who developed SGHS, 76.3% underwent cesarean section, and a significant association was found between the variables of delivery (public) and type of delivery (cesarean section) with SGHS. (Table 1). In the hierarchical model, in the distal block (Model I), it was verified that the variable without companion (p=0.029) and inadequacy of schooling for age (p=0.002) had a significant association with the study outcome and were maintained in intermediate-level analyzes. At this level (Model II), there was a significant association between clinical history of risk and SGHS (p<0.001). It should be noted that, at the intermediate level, single women (p=0.022) and low education (p=0.001) maintained

Table 1

Sociodemographic characteristics, prenatal, delivery and bivariate analysis, according to the SHGS, among adolescents and young adults, in municipalities of the Northeast Region, Brazil, 2011-2012.

Sociodemographic characteristics	N	%	Hypertensive syndrome[a]		*p*
			n	%	
Age group (years)					0.739
10-16	456	15.4	20	4.4	
17-19	843	28.5	35	4.2	
20-24	1661	56.1	80	4.8	
Marital status					0.063
Without partner	667	22.6	39	5.8	
With partner	2290	77.4	95	4.1	
Skin color					0.048
White	495	16.7	33	6.7	
Brown	2159	72.9	89	4.1	
Black	306	10.3	13	4.2	
Adequacy of schooling / age					<0.001
Inadequate	1777	61.0	61	3.4	
Proper	1136	39.0	71	6.3	
Paid work					0.288
Yes	497	16.8	27	5.4	
No	2462	83.2	107	4.3	
Funding for prenatal care					0.088
Public	2618	90.1	115	4.4	
Private	287	9.9	19	6.6	
Prenatal characteristics					
Adequacy of prenatal care[b]					0.101
Suitable	252	8.5	15	6.0	
Partially suitable	443	15.0	27	6.1	
Inappropriate	2265	76.5	93	4.1	
Clinical history of risk[c]					<0.001
Yes	49	1.7	22	44.9	
No	2911	98.3	113	3.9	
Smoke in the first five months of gestation					0.951
Yes	158	5.3	7	4.4	
No	2800	94.7	127	4.5	
Characteristics of childbirth					
Source of payment of childbirth					0.052
Public	2821	95.3	124	4.4	
Private	139	4.7	11	7.9	
Type of birth					<0.001
Normal	1746	59.0	32	1.8	
Caesarean	1214	41.0	103	8.5	

[a] gestational hypertensive syndrome = chronic hypertension or pre-eclampsia (seizures) or HELLP syndrome;
[b] Adequacy of prenatal care = beginning of prenatal care until the 12th gestational week; adequate number of consultations for gestational age at delivery, considering a schedule of six consultations; at least one of each of the prenatal routine exams, orientation on referral motherhood for delivery assistance;
[c] Clinical history of risk = heart disease or high blood pressure with continued treatment or non-gestational diabetes or epilepsy.

significant results (Table 2).

In the last stage of the logistic regression analysis - proximal level (Model III), the variables that showed a significant association with the outcome (SGHS) at the distal and intermediate levels were maintained, however, no significant association was found between SGHS and significant variables in models I and II. (Table 2).

It is worth noting that in the final model, some variables were associated with the occurrence of SGHS: marital status without a partner with a 50% higher chance of this outcome (OR = 1.53); b) inadequate schooling with 90% greater chance (OR=1.86); c) some clinical disease prior to gestation, whose chance of occurrence was 21.7 times, compared to those without this antecedent (OR = 21.72).

Discussion

SGHS is a frequent complication and an etiological factor of maternal and neonatal morbidity and mortality, responsible for 37% of deaths due to direct obstetric causes and is considered a challenge for obstetrics.[16] The results of this study identified as risk factors for the occurrence of SGHS, the absence of a partner, the inadequacy of schooling for the age and the presence of a clinical history of risk.

The proportion of SGHS found in this study for the group of adolescents (4.3%) and young adults (4.8%) was similar to the results observed in a study carried out with puerperal adolescents in Ceará (3.5%),[17] although, other studies with adolescent pregnant women showed higher proportions, such as Recife[18] (40.4%), Maceió[19] (22.5%) and Taubaté[20] (14%).

Studies with pregnant women of all ages in São Paulo,[21] Maranhão[22] in the Southeast Region of Brazil[23] and in Ethiopia[24] observed, respectively, the presence of SGHS in 45.45% of the adolescents and 13.53% among the young adults; in 69% of adolescents and young adults; in 19.7% of adolescents between ten and 14 years of age and in 12.2% of adolescents between 15 and 19 anose in 5.7% of adolescents and 27.5% among young adults.[21,22,23,24] These studies identified possible associations between early maternal mortality and SGHS, pointing out the essential importance of prenatal care in relation to the impact of the disease on the health of adolescent women.

In this study, bivariate analyzes indicated the presence of an association between SGHS and other factors, already discussed in the literature, such as: white skin color, adequate schooling, presence of a clinical history of risk (pre-gestational diabetes mellitus, lupus erythematosus, hypertension) and cesarean delivery.[1,3,25]

In the multivariate analyzes of the present study, adolescents and young adults with inadequate schooling presented a higher chance of SGHS (OR=1.86), a finding that ratified low schooling as an explanation factor for this pathology, probably due to the lower understanding of pregnant women about the importance and necessity of professional

Table 2

Multivariate logistic regression, with outcome as SHGS, between adolescent mothers and young adults, in municipalities of the Northeast Region, Brazil, 2011-2012.

Models	Model I			Model II			Model III		
	OR	CI95%	*p*	OR	CI95%	*p*	OR	CI95%	*p*
Distal model									
Marital status			0.029			0.022			0.040
Without partner	1.5	1.1-2.3		1.6	1.1-2.4		1.5	1.1-2.3	
With partner	1.0	-		1.0	-		1.0	-	
Adequacy of schooling/ age			0.002			0.001			0.001
Inadequate	1.8	1.2-2.6		1.9	1.3-2.7		1.9	1.3-2.7	
Proper	1.0	-		1.0	-		1.0	-	
Intermediate model									
Clinical history of risk[a]			-			<0.001			<0.001
Yes	-	-		21.5	11.7-39.5		21.7	11.8-39.9	
No	-	-		1.0	-		1.0	-	

[a] Clinical history of risk = heart disease or high blood pressure with continued treatment or non-gestational diabetes or epilepsy.

care and self-care during pregnancy, as well as the possible difficulties of access to health services. These findings corroborate a study carried out among women with a varied context[26] (Swedish, Norwegian, Danish, Finnish and Icelandic), where those with lower formal schooling presented a 20% higher chance of occurrence of SGHS (OR = 1.18).

Regarding the marital situation, studies suggest a relationship between this variable and self-care, where the complications of gestation are more frequent among single women. It is known that the support of the family is essential for the good evolution of gestation, as well as the problems that result from it.[21] In this study, the marital situation was one of the risk factors for SGHS, where adolescents and young adults without partner, presented a 50% greater chance of developing SGHS (OR = 1.5). A study conducted by Oliveira and Graciliano[19] when evaluating the factors associated with the SGHS outcome in women between the ages of 13 and 43 at the Maceió Public Maternity in 2013 showed divergent results, in which the single women had a lower risk of developing any of the categories of SGHS (OR = 0.66, CI95%= 0.37-1.15), acting as a protection factor.

There was no significant association between the study outcome and the skin color / race, diverging from other studies[16,25,27,28] which observed statistical significance among black women. For the use of tobacco during gestation, the results of the present study ratify researches carried out at the national level, in Maternities of the States of the Northeast,[19] Southeast[23] and Southern Regions of Brazil,[23] as well as with research data from other countries with women of Nordic countries[26] (Sweden, Norway, Denmark, Finland and Iceland), since no significant associations were found.

In this study, only 8.5% of adolescents and young adults performed prenatal care adequately, in agreement with the results of the study conducted by Domingues *et al*.,[6] who verified the adequacy of prenatal care according to the maternal characteristics in Brazil, identified a lower adequacy among adolescents (15.4%). However, it is important to note that in this study there was no statistically significant association between adequacy of prenatal care and SGHS.

According to a consensus of scholars, the presence of SGHS is associated with a higher risk of cesarean delivery, since this type of delivery is indicated in emergency situations, where gestation should be interrupted in order to minimize possible complications fetal vitality, thus preserving the life of the mother and fetus.[29] In the present study, the type of delivery (cesarean section) was significantly associated with SGHS, a result that was different from the study performed at a Maternity School in Maceió, where it was not observed significant association between the type of delivery and the prevalence of SGHS.[30]

The bivariate analysis of the present study verified the statistical association of this variable with SGHS, which diverges from the findings of Queiroz *et al*.,[23] in assessing the frequency of hypertensive syndromes in pregnancy and associated factors in the pregnancy region of Southeast Brazil.

Regarding the clinical history of gestation considered as a risk factor for SGHS, the findings of the present study showed a strong association of this variable with SGHS. It was verified that the women who had some disease before the pregnancy presented a 21 times higher chance to develop some type of SGHS when compared to those that did not present previous disease. These findings agree with a study conducted in the Southern Region of Brazil by Dalmáz *et al*., [25] who found, in the multivariate analysis, an association between SGHS and chronic hypertension and non-gestational diabetes, showing that chronic hypertension and non-gestational diabetes, increases in seven times and in three times, respectively, the chance to develop (OR = 7.05, CI95%= 1.99 - 24.93, OR = 3.87, CI95%= 1.22 - 12.27).

One of the limitations of this study is the fact that some variables related to the previous obstetric history of puerperal women, such as the number of pregnancies and parity, were not included in the models. However, these variables will be analyzed in the next studies in order to deepen knowledge in the factors that involve this important outcome.

According to the findings of the present study, multiple determinants may be associated with SGHS, since risk factors of social scope (marital status, schooling) and biological (clinical antecedents of risk) were identified. The absence of a partner, inadequate schooling and the presence of a clinical history of risk showed a significant association with SGHS, suggesting strong interference of social and biological factors in the occurrence of the syndrome.

The literature is consensual regarding the higher prevalence of SGHS among adolescents, when compared to young adults, due to the inherent characteristics of age. However, in this study, that investigated a representative sample of adolescent and young adult pregnant women attending maternity hospitals in the Northeast Region, the highest proportion of SGHS was identified among

young adults.

SGHS represents one of the main complications of gestation, so it is fundamental that the authorities commit themselves to Maternal and Child Health Policies, enabling effective strategies to prevent and control this occurrence, as well as favoring and guaranteeing access to Care Services (primary, secondary and tertiary) throughout the pregnancy-puerperal cycle, preventing and minimizing perinatal risks, thus ensuring that society and future generations will be born healthy.

It is important to note the importance of the development of new studies on this subject among adolescents and young adults from other regions of the country in order to identify the risk factors, as well as to elucidate mechanisms that allow the implementation of the expansion and implementation of quality prenatal care services for the follow-up and referral to the Reference service in the Unified Health System (UHS) network at local, regional and national level, in order to carry out effective health care.

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