Study on the prevalence of arterial hypertension in mothers of low birth weight newborns

Estudo da prevalência de hipertensão arterial em mães com recém-nascidos de baixo peso

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ABSTRACT

Objective: To estimate the prevalence of hypertension in mothers of low birth weight newborns at the Maternidade Climério de Oliveira - Universidade Federal da Bahia, from October 2004 to March 2005. Methods: Seventy-seven women with newborns weighing under 2500g were interviewed and accounted for 5.44% of 1415 deliveries. Nineteen subjects were excluded from the analysis for not fulfilling the inclusion criteria. Results: Low birth weight newborns: 44.8% were premature and 53.4% presented intrauterine growth restriction. Mothers: 10.3% had no prenatal care follow-up, 36.2% attended less than 5 visits; 63.8% presented previous unfavorable outcomes; 1.7% were aged under 17 years; 6.9% were smokers; 41.4% primiparous, 6.9% > 4 partus. The prevalence of hypertension was 39.7%, in that, 8.7% presented chronic hypertension associated with pre-eclampsia, 82.6% with pregnancy-induced hypertension and two (8.7%) with chronic hypertension. There was no statistical significance between type of hypertension and prematurity or intrauterine growth restriction. The rate of prematurity and intrauterine growth restriction was 52.2% each; four of them (17.4%) were premature and had intrauterine growth restriction. Four (6.9%) mothers did not present any risk factor for low birth weight analyzed in this study. Conclusions: The prevalence of hypertension in mothers with low birth weight newborns was 39.7% and could be considered important for formulation of health policies, particularly for prenatal care. These rates may also be used to calculate the minimum sample in future studies.

Keywords: Infant, low birth weight; Fetal growth retardation; Hypertension; Pregnancy complications; Premature infant

RESUMO

Objetivo: Estimar a prevalência de hipertensão em mães de recém-nascidos de baixo peso na Maternidade Climério de Oliveira da Universidade Federal da Bahia no período de outubro de 2004 a março de 2005. Métodos: Setenta e sete mulheres com nascituros de peso abaixo de 2.500 g foram entrevistadas - 5,44% de 1.415 partos. Dezessete não preencheram os critérios de inclusão. Resultados: Recém-nascidos de baixo peso: 44,8% prematuros e 53,4% com restrição de crescimento intra-uterino. Mães: 10,3% sem pré-natal, 36,2% < 5 consultas; 63,8% desfechos desfavoráveis prévios. 1,7% com idade < 17 anos e 6,9% tabagistas. 41,4% primíparas, 6,9% > 4 partos. A prevalência de hipertensão foi de 39,7%, sendo 8,7% hipertensão crônica associada à pré-eclâmpsia; 82,6% com doença hipertensiva específica da gravidez e duas mães com hipertensão crônica. Não houve significância estatística entre o tipo de hipertensão e prematuridade ou restrição de crescimento intra-uterino. A proporção de prematuridade e de restrição de crescimento intra-uterino foi de 52,2% cada, sendo quatro (17,4%) recém-nascidos prematuros e com restrição de crescimento intra-uterino. Quatro (6,9%) das mães não apresentaram nenhum dos fatores de risco para baixo peso analisados neste estudo. Conclusões: A prevalência de hipertensão entre mães com recém-nascidos de baixo peso de 39,7% pode ser considerada importante para realização de políticas de saúde direcionadas, particularmente ao pré-natal. Taxas encontradas também poderão ser úteis para cálculo de número mínimo amostral em trabalhos futuros.

Descritores: Recém-nascido de baixo peso; Retardo do crescimento fetal; Hipertensão; Complicações na gravidez; Prematuro

INTRODUCTION

Hypertensive disease is the most common disorder during gestation¹, affecting 10% to 15% of pregnant women². Maternal hypertension is a serious complication that increases maternal and perinatal morbidity and mortal-
ity rates and is significantly associated to high rates of low birth weight (LBW) newborns, very low birth weight (VLBW) newborns and perinatal death\(^{(1-4)}\). These rates are similar to those of chronic arterial hypertension (chronic AH), gestational hypertension and pre-eclampsia/eclampsia\(^{(6)}\), and are higher in cases of pre-eclampsia associated to chronic hypertension\(^{(2,5)}\). Generally, hypertension may lead to LBW and VLBW, either due to prematurity or intrauterine growth restriction (IUGR), the latter being the most common etiology\(^{(6)}\). Superimposed pre-eclampsia is responsible for more severe fetal growth disorders\(^{(5)}\). Maternal complications are related to placenta previa, infarctions and retroplacental hematoma\(^{(1-3)}\). Gestational period in women with severe pre-eclampsia is 0.6 weeks shorter than in normotensive women\(^{(5)}\).

Hypertension causes early changes in placenta and alterations in placentation\(^{(2,7)}\). Arterial segments in the myometrium and decidua present no evidence of physiological distension induced by trophoblasts, as seen in the placenta of normotensive mothers. This contributes to reducing total placental volume, to insufficient vascu- larization and to rise of many infarction areas, affecting fetal development\(^{(2,7)}\).

Low birth weight may result in problems for the baby, social and emotional issues for the family and economic burden ones for the State. LBW - both term and preterm newborns - run a much higher risk of mortality than those with normal birth weight\(^{(8-10)}\). At neonatal period, when infant mortality rate is higher, the number of LBW newborns, especially the VLBW newborns, is the most important determining factor of mortality rate magnitude \(^{(8-9)}\). These children present higher incidence of low Apgar score at 5 minutes, asphyxia, seizures in the first 24 hours of life, sepsis and neonatal death\(^{(10)}\).

In addition to complications in the neonatal period, LBW neonates may have problems during their development. Low birth weight or very low birth weight newborns may present reduced cognitive function and lower academic achievement, as compared with normal birth weight babies. Learning difficulties at school persist up to adolescence and may occur even in children presenting normal intelligence and no neurological disorders\(^{(11-12)}\). Geva et al. followed up 123 children with history of IUGR and observed an important association of neuropsychological difficulties and low intelligence quotient (IQ) score\(^{(13)}\).

Recent studies have shown an association of low weight and dyslipidemia in infancy and a greater prevalence of chronic diseases in adulthood, such as hypertension and diabetes. The data suggest that, in addition to delayed intrauterine growth, the abrupt interruption of neonatal development and accelerated early postnatal growth must also be part of the pathogenesis of chronic diseases related to low birth weight\(^{(14)}\).

Several complications observed during development of LBW newborns lead to (a) crowded public healthcare services, (b) greater need of investments on special education and (c) reduced population with higher education, implying in more costs for public authorities and society as a whole.

The incidence of hypertension in women in the State of Bahia is high and represents an important risk factor for pregnancy complications. Several studies show close relation between maternal hypertension and low birth weight children, as well as low birth weight newborns and increased infant morbidity and mortality rates, which justify the need to estimate the incidence of this relation in the community of Bahia.

In addition to this observation, the possibility of better understanding the relation between prematurity and intrauterine growth restriction and the true impact of maternal chronic hypertension or pregnancy-induced hypertension, will provide consistent subsidies to implement preventive measures designed to control blood pressure levels of pregnant population. Such preventive policies help public services reduce expenses, besides improving the life conditions of the population.

**OBJECTIVES**

The main objective of this study is to estimate the prevalence of hypertension in mothers of low birth weight newborns at the Maternidade Climério de Oliveira (MCO), in the period from October 2004 to March 2005. Moreover, it aimed to evaluate the relations between LBW newborns due to IUGR and gestational hypertension; premature LBW neonates and maternal hypertension; chronic maternal hypertension and LBW neonates; and pregnancy-induced hypertension and LBW newborns.

**METHODS**

This research was conducted at the MCO, a teaching maternity hospital of the Universidade Federal da Bahia, in the neighborhood of Nazaré, in the city of Salvador, Bahia. The maternity cares for low risk pregnant women and has an average of 230 deliveries per month.

In this series all women who delivered newborns weighing less than 2500 g in the period from October 2004 to March 2005 were interviewed. The total number of live births in this period was 1415, and 77 were low birth weight neonates. Multiple deliveries, birth weight lower than 500 g and/or gestational age less than 22 weeks were excluded from this analysis.
Information on the newborn state was collected from the neonate medical record during hospitalization. And data on prenatal care, reproductive history, smoking and other maternal variables were collected through interviews with mothers.

Gestational age (GA) was obtained by the somatic Capurro method, calculated by neonatologists in the delivery room and/or last menstrual period. Live newborns with a GA less than 37 weeks were considered preterm babies. The newborns presenting weight for gestational age below the 10th percentile were considered as intrauterine growth restriction (IUGR).

The variables studied, other than maternal hypertension and its respective modalities were as follows: number of prenatal care visits (≥5 and less than 5), mode of delivery (vaginal and C-section), sex of newborn, maternal age (up to 16 years and ≥17 years), parity (zero, one to four and over 4), gestational age (term or preterm), presence of IUGR and history of smoking during pregnancy. The variable “absence of unfavorable outcome” was established for non-occurrence of spontaneous abortion, past history of LBW newborns and stillbirth; and the variable “presence of unfavorable outcome” for when one of these variables was observed. Duration of ruptured membranes was also studied, and a variable was determined as “present” for prolonged latency period, when the interval between premature rupture of membranes and delivery was greater than 18 hours; and “absent” in case of no premature rupture of membranes or when the duration was equal or lower than 18 hours.

Data were inputted and analyzed in the SPSS version 11.0 database. The statistical analysis used common procedures of descriptive statistics (frequency calculations, central tendency measures and dispersion measures). The prevalence rates and respective 95% confidence intervals were calculated.

RESULTS

In the period from October 2004 to March 2005, 1415 live newborns were delivered at the MCO, and 77 (5.44%) of neonates weighed under 2500 g. Out of LBW newborns, 19 were excluded from analyses due to twin pregnancy, weight below 500g or lack of essential data for analysis.

Figure 1 shows the profile of the sample studied. Out of 58 LBW deliveries analyzed, 56.9% were vaginal deliveries and 43.1% were cesarean sections; 59.9% were female newborns, 26 premature (44.8%) and 53.4% presented IUGR. Among the mothers studied, 10.3% had no prenatal care and 36.2% attended less than five medical visits. Only one of them (1.7%) was aged under 17 years, and 6.9% smoked sometime during pregnancy; 63.8% of mothers had already presented previous unfavorable outcome and 17.2% presented prolonged latency period. The primipara accounted for 41.4% (24) in this population, 51.7% (30) had two to five deliveries, and 6.9% (4) had had six or more deliveries.

The prevalence of hypertension in mothers with LBW newborns was of 39.7% (23), and 2 (8.7%) presented chronic hypertension associated to pre-eclampsia, 19 (82.6%) presented only pre-eclampsia (PE), and 2 with chronic AH and no PE. The proportion of premature babies was 52.2% (12), and newborns presenting IUGR accounted for 52.2%; in that, four (17.4%) newborns presented prematurity and IUGR. Figure 2 shows the prevalence of PE among the types of hypertension studied and also the similar proportion between two main mechanisms of low birth weight newborns. Prevalence rates and their respective 95% confidence intervals were calculated, but no statistically significant associations between maternal hypertension and low birth weight due to prematurity, and between maternal hypertension and low birth weight due to IUGR were observed. Moreover, no significant association between chronic AH and prematurity, or chronic AH and IUGR were demonstrated. And the associations between PE and prematurity and PE and IUGR were not significant. The prevalence rates and their respective confidence intervals of the associations are shown on table 1.

Four (6.9%) mothers with LBW newborns did not present any risk factor for low birth weight that were analyzed in this study.
DISCUSSION

The incidence of low birth weight is estimated in several studies, presenting variations among different cities, states and regions of Brazil. A study conducted in São Paulo-SP, in 1996, estimated a 7.6% incidence\(^{(15)}\); in the city of Pelotas-RS, in 1982, a rate of 8.1% was found\(^{(19)}\). Nascimento et al., conducted two studies in Guaratinguetá-SP, in the same year, with different sources of collection, and presented diverse rates: 8.2% and 10.2%\(^{(9,17)}\). In Salvador-BA, an 8.9% rate was found in 1987 and 1988\(^{(19)}\). A 5% frequency of LBW newborns in Florianópolis-SC, in 1987, is reported in some studies\(^{(9)}\). Rates equivalent to or lower than 5.44% found in this study must be analyzed along with the socioeconomic conditions of the population assessed, since the occurrence of LBW newborns is inversely proportional to these conditions\(^{(9)}\). Under this analysis, the occurrence reported in this study is lower than most works found in literature. This is probably due to the fact that the MCO cares for low risk pregnant women, unlike other studies cited.

The variables considered were chosen after analysis of several studies that aimed to establish the risk factors most often associated to LBW newborns. Many factors are listed, although a selection was made based primarily on frequency of each one. Mode of delivery, prenatal care visits and quality, maternal parity, smoking during pregnancy, previous unfavorable outcomes, prolonged latency period and maternal hypertension were considered important since they were studied in most researches, presenting statistical relevance as a risk factor for LBW neonates. Maternal use of alcohol, although not evaluated in the articles studied, was considered relevant for the analysis, for being historically related to low birth weight. Urinary tract infection during pregnancy was assessed in only one of the articles assessed and was considered a not statistically significant factor for low birth weight\(^{(17)}\). Unstable marital status was studied in three articles\(^{(14,16,18)}\), and was considered a statistically significant risk factor in two of them\(^{(14,18)}\).

Insufficient maternal weight gain was considered a risk factor by some authors, although there were discrepancies in establishing the limit of weight gain considered as risk\(^{(16-17)}\). Maternal height under 1.50 m appeared as a statistically significant factor in a low percentage of articles\(^{(15-16)}\). Maternal race and weight before pregnancy were studied by Barros et al., and non-Caucasians and maternal weight below 49 kg were considered statistically relevant risk factors\(^{(10)}\). Socioeconomic variables were analyzed and related to LBW newborns in several studies\(^{(9,15-17,19)}\), but they were not assessed in this study since the women see at the MCO presented basically the same socioeconomic profile.

Among the 58 LBW newborn deliveries analyzed, most were vaginal deliveries. The maternity studied presents an average of 233 deliveries per month, and approximately 32% are cesarean deliveries\(^{(19)}\), which is lower than what was found in this study. This higher percentage of cesarean delivery, as compared to overall data of the maternity hospital, is probably due to sample profile. LBW neonates are usually born from risk pregnancies, in which cesarean delivery is mostly a formal indication.

Among the articles analyzed in this study, only Solla et al., provided a prevalence of hypertension in mothers of LBW neonates of the studied sample, that is, 14.5%\(^{(18)}\), a rate dramatically lower than that found in this study, which is likely to be related to the sample size.

Maternal hypertensive disease is widely considered as an important risk factor for IUGR, which may lead to LBW newborns\(^{(2)}\). Some studies show that low birth weight resulting from this maternal condition is also related to shortening of pregnancies, caused by both the pathophysiology of hypertension itself and by the therapy established for specific cases (interruption of pregnancy). The present study shows in the series analyzed that the prevalence of two potential mechanisms involved in the relation between LBW newborn and maternal hypertension, as well as between IUGR and prematurity, was the same. It was expected to find a higher prevalence of IUGR, since Brazil is a developing country. On the other hand, in developed countries, most LBW newborns are premature. However, distinguishing the causal mechanisms is often difficult, and both events often occur simultaneously. In addition, as already mentioned, the MCO is a maternity for care of low risk pregnancies, leading to a lower frequency of IUGR cases\(^{(20)}\).

In a study conducted with Canadian women with blood pressure alterations, Xiong et al. found that the risk of low birth weight was higher than that of small for gestational age (SGA), independently of severity of disorder\(^{(6)}\). Sanhua et al. reported that this finding may be due to the fact that the criterion of low birth weight overestimates that of SGA; and suggested that the risk of weight disorders at birth may be attributed to prematurity and not to intrauterine growth restriction\(^{(21)}\).

| Table 1. Prevalence rates and their respective 95% confidence intervals |
|-------------------------|-------------------------|-------------------------|
|                         | PREMATURITY             | IUGR                    |
| Maternal hypertension   | OR = 1.393; CI = 0.732 – 2.530 | OR = 0.945; CI = 0.505 – 1.770 |
| PE                      | OR = 1.127; CI = 0.574 – 2.214 | OR = 2.530; CI = 0.485 – 1.875 |
| Chronic AH              | OR = 1.353; CI = 0.723 – 2.530 | OR = 0.900; CI = 0.136 – 5.956 |

\(OR = \text{odds ratio} \quad CI = \text{Confidence interval} \quad IUGR = \text{Intrauterine growth restriction}\)
The fact that the prevalence of PE among LBW newborns was higher than that of chronic AH without superimposition may be explained by a higher prevalence of PE in the pregnant population assisted at the MCO. Some authors discuss the value of chronic AH alone in the incidence of LBW newborn deliveries, and they state that the pathophysiology of this association remains unclear, unlike that of the PE-LBW newborn association.

Four (6.9%) LBW newborn mothers presented no risk factors for low birth weight analyzed in this study. Other risk factors not assessed here have been proposed in other studies, such as insufficient maternal weight gain\(^{16-17}\), low maternal height\(^{16-17}\), and maternal unstable marital status\(^{15,19}\). These factors may be involved in the etiology of low birth weight of these four neonates. Moreover, infections of the STORCH group (syphilis, toxoplasmosis, rubella, CMV and herpes virus) may also be responsible for the percentage of LBW neonates apparently with no risk factors. Some syndromes with malformation represent another important etiology of LBW and were not considered in this study, since none of the LBW newborns in the sample presented any signs suggesting genetic disease.

**CONCLUSIONS**

This case series study showed the profile of a sample of LBW newborns at the MCO, providing the percentage of low birth weight and the prevalence of hypertension in mothers who delivered LBW newborns. These data may be used as subsidies for implementing health policies addressed to maternal hypertensive disease in institutions that offer prenatal care to women both at high and low risk. A 39.7% prevalence of hypertension among mothers of LBW newborns may be considered important for this policy. Some factors, such as PE in previous pregnancies should draw attention of the assistant physician for the possibility of a new risk pregnancy and the need of closer follow-up to prevent severe conditions that may affect a low weight neonate. Mid- and long-term disorders of children, as well as psychosocial problems of the family and socioeconomic issues for the State should all be prevented.

Rates such as these estimated in this study are often difficult to find. These data may be useful at the MCO context, and also for future investigations on LBW newborns at hospitals with characteristics similar to those of the MCO, particularly to calculate the minimal sample size.

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**REFERENCES**