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Research Article
Published: 26 Jan, 2018

Journal of Family Medicine Forecast

Cesarean Delivery of Low-Birth Weight Infants and its Association with Maternal Variables

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Abstract

Introduction: The high prevalence of high-risk pregnancies, which can lead to premature delivery, contributes to an increase in the rates of preterm and low-birth weight (LBW) infants, with an increase in the number of cesarean deliveries.

Objective: To assess maternal variables and their associations with cesarean deliveries of LBW newborns. Material and Methods: We conducted a retrospective study by reviewing the medical records of pregnant women who underwent cesarean sections for the delivery of LBW infants (weight, ≥1500 and <2500g) at a tertiary public hospital in São Paulo. The maternal variables analyzed were age, parity, education level, marital status, gestational age, number of prenatal consultations, and indication of cesarean section, as well as Apgar birth score and sex of the newborn.

Results: Women aged between 21 and 25 years were predominant (26.9%), 32.8% of the women were primigravidas, 35.9% did not complete elementary school, 67.6% had partners, 34.8% had gestational age of >35 weeks at delivery, and 50.8% attended less than eight prenatal consultations. Hypertensive syndrome (23.8%) was the main indication for cesarean delivery. Among the newborns, 58.3% had an Apgar score of 7 in the first minute of life, 79.3% had a score of 9 in the fifth minute of life, and 54.3% were females.

Conclusions: Several maternal variables such as primiparity, education level, number of prenatal consultations, and presence of maternal hypertensive syndrome had a statistically significant association with the occurrence of cesarean sections for the delivery of LBW infants.

Keywords: High-Risk Pregnancy; Cesarean Section; Low-Birth Weight Newborns; Prenatal Care; Gestational Age; Hypertensive Syndrome

Introduction

Cesarean section is one of the most frequently performed surgical procedures worldwide. Despite recognition of its contribution to safe care, cesarean section should be essentially indicated with caution because the procedure in itself can pose additional risks to maternal and fetal health [1,2].

Fifteen million preterm births occur per year worldwide, and >1 million of these newborns (NBs) die within days after delivery. Brazil and the United States are among the countries with the highest number of preterm births (<37 completed gestation weeks). In Brazil, >250,000 occurrences are annually recorded [3,4]. In 2015, 348,910 cesareans were performed in public hospitals, 72,921 of which were high-risk pregnancies [5]. In Europe, the 2010 premature birth rate was between 5.2% and 5.9%, with 60% resulting in neonatal death [6].

Regarding birth weight, the World Health Organization (WHO) defines NBs with low birth weight (LBW) as those with birth weight of <2500g and ≥1500g, regardless of gestational age (GA). Birth weight is the factor that most influences infant survival, and because it represents only one final measurement, anticipating its diagnosis can contribute to decreased morbidity and mortality [7-10].

Prematurity and LBW incur social and financial costs that are difficult to measure, require technical capacity and equipment from the healthcare structure that are not always available,

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Received Date: *07 Dec 2017*
Accepted Date: *15 Jan 2018*
Published Date: *26 Jan 2018*

Citation: *Albuquerque Sala L, Gazi Lippi U, Ferrari Franciulli E. Cesarean Delivery of Low-Birth Weight Infants and its Association with Maternal Variables. J Fam Med Forecast. 2018; 1(1): 1003.*

ISSN 2643-7864

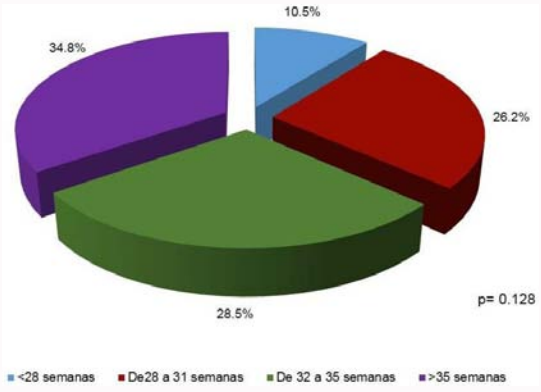

Figure 1: Distribution of pregnancies according to gestational age. GA: GA of >35 weeks (34.8%) was the more prevalent than other GAs.

directly affect the family structure, and change expectations and anxieties surrounding the perinatal period [7].

Epidemiological studies revealed that LBW is a risk factor for increased neonatal morbidity and mortality and for the later development of obesity, diabetes mellitus, and particularly cardiovascular illnesses [7,8].

Maternal risk factors associated with LBW mainly include three large groups of comorbidities: hypertensive, hemorrhagic, and infectious [9]. Risk behaviors during pregnancy, non-adherence to prenatal care, history of prematurity, and use of fertilization methods also influence the final birth weight [8,9,11,12]. The identification and control of risk factors contribute in reducing perinatal morbidity and mortality and enabling a better future health status of the individual.

Considering high-risk pregnancies and existing complications, premature interruption of pregnancy may be an alternative [3,13].

Given the significant increase in prematurity rates associated with LBW and cesarean deliveries, identifying maternal characteristics and variables and their risk factors is important.

Objective

To study maternal variables and confirm any associations with cesarean deliveries of NBs with LBW.

Material and Methods

Case series

A retrospective cohort study was conducted by analyzing the medical records of 7070 pregnant women who received care during the period from January 2014 to September 2016 for assisted deliveries at a tertiary public hospital in São Paulo. Data relative to maternal variables, cesarean deliveries, and NBs weighing between 1500 and 2500 g were considered, totaling to 256 women and 266 NBs (20 multiple births).

The analyzed maternal variables were as follows: age; parity (primipara, first delivery; secundipara, second delivery; and tertipara, two previous deliveries, and multipara–three or more previous deliveries); education level, classified as: never attended school, education level unknown, and incomplete and complete elementary and secondary levels; current marital status, with or without a partner, as reported at the time the obstetric form was filled out; GA at delivery, classified as: <28 weeks, from 28 to 31 weeks, from 32 to 35 weeks, or >35 weeks; number of prenatal consultations, using the number of eight consultations as the minimum recommended by the Ministry of Health and proposed by WHO; indication of cesarean section, and categorization of the term hypertensive syndrome, which includes chronic high blood pressure, preeclampsia, eclampsia, and superimposed hypertension, which were obtained from the medical records. The evaluated perinatal variables were Apgar scores for the first and fifth minutes of life, data provided by the neonatologist, and the prevalence of the sex of NBs.

Table 1: Distribution of pregnant women according to parity.

Parity	N	RF (%)	P
1	84	**32.8**	
2	47	18.4	<0.001
3	49	19.1	
>4	76	29.7	0.446

RF%, percentage of relative frequency.

Statistical analysis was performed using Fisher's exact test or X 2 test to measure the degree of association between some variables and the Yates correction to indicate whether there was an association between the variables. The test of equality of proportions was used to characterize the frequency of the qualitative variables. For rejecting the null hypothesis, we adopted a significance level of 0.05 or 5%. The study was conducted after obtaining the approval of the Research Ethics Committee of the institution.

Results

Age: Of all the women, 0.8% were aged ≤14 years, 22.6% were between 15 and 20 years; 21% were between 26 and 30 years,19.5% were between 31 and 35 years, 7.4% were between 36 and 40 years, and 1.5% were >40 years. Women aged between 21 and 25 years were predominant (26.9%), and no statistical difference was observed with regard to the age of the women assessed.

Parity: primiparas (N = 84; 32.8%) were statistically significant compared with secundiparas and tertiparas.

Education level: Seventeen (6.6%) women were illiterate, 92 (35.9%) did not complete elementary school, and 29 (11.3%) completed elementary school, 46 (18%) did not complete secondary school, 27 (10.5%) completed secondary school, and 45 (17.6%) had education levels that were unknown.

Marital status: Of all women, 173 (67.6%) had a stable partner and 83 (32.4%) reported to not have a partner, which was a statistically significant difference.

Prenatal care: Attendance of <8 prenatal consultations (N = 130; 50.8%) was statistically significant.

Indication of cesarean section: Maternal hypertensive syndrome was the most frequent indication of cesarean delivery, accounting for 43.8% of cases and was statistically significant. Hemorrhagic comorbidities such as premature separation of the placenta and placenta previa accounted for 13.6% of cases, preterm labor for 13.2%, oligoamnios for 12.4%, and multiple births for 7.0%. Other indications such as anomalous presentation, previous cesarean sections, and changes in baseline fetal cardiotocography are other indications that account for <10% of cases.

Apgar score: Collected data indicated that more than half of NBs had good first minute of life indicator (58.3% with Apgar scores of 7 and 9 and 0.4% with Apgar score of 10) and fifth minute of life

Table 2: Number of prenatal consultations.

Number of prenatal consultations	N	RF (%)	p
<8	130	50.8	<0.001
≥8	65	25.4	
No prenatal consultations	61	23.8	

RF%, percentage of relative frequency.

Table 3: Association between the number of prenatal consultations and gestational age.

GA	Prenatal consultations		
	(N = 256)		
	<8	>8	p
	N (%)	N (%)	0.067
<28	14 (6)	0	
From 28 to 31	28 (12)	0	
From 32 to 35	81 (36)	9 (29)	
>35	102 (45)	22 (71)	

indicator (79.3% with Apgar scores of 7 and 9 and 6.2% with Apgar score of 10). Respiratory depression and/or acidosis in the first minutes of life occurred in 41.3% of NBs (17.4% with scores from 0 to 3 and 23.9% with scores from 4 to 6).

Sex of NBs: Of all NBs, 126 (47.4%) were males and 140 (52.6%) were females. There was no significant association in the study of sex of NBs (p = 0.04).

The association between the number of prenatal consultations and GA was analyzed. A sizable number of pregnant women with GA of >35 weeks attended <8 prenatal consultations (N = 102; 45%). A statistically significant association between these variables was not confirmed.

Discussion

The prevalence of NBs with LBW in developed countries is approximately 6% [14]. In this study, considering only NBs born via cesarean section, 16.6% had LBW. The causes for the increase in the frequency of LBW infants are multifactorial and influenced by fundamental human relationships such as access to food, education, work, income, leisure, and adequate environments [15-17].

Regarding parity, a higher frequency of LBW deliveries was observed among primiparas (32.8%). According to Figueiró-Filho et al. [12] a significant association existed between primiparity and LBW, and a significant association with maternal hypertensive syndromes was also observed. The association between primiparity and maternal hypertensive syndromes are frequent in clinical practice and are described in the medical literature [18].

With respect to education level, 35.9% of women did not complete elementary school and 18% did not complete secondary school; these data corroborate other studies that also observed the association [19] between a low education level and the birth of infants with LBW via cesarean section. The Brazilian Ministry of Education establishes the age range for elementary school education to be 7–14 years and that for high school to be 15–19 years. Early motherhood is a factor that results in dropping out of school and that causes difficulty in studies; pregnancy can be a social problem when it eliminates the possibilities of social mobility offered by schooling [20]. Women with up to 3 years of study on an average have more than twice the number of children compared with those with ≥8 years of study [20]. Education can have interdependent effects, and mothers with a higher education level can better understand family planning and healthy behavior during pregnancy.

In the United States and Taiwan, Studies related to high-risk pregnancy showed that the rate of children with LBW was higher among single mothers than among married women [21,22]. Similarly, they showed that women without partners are considered to be at risk for having children with LBW. This may be owing to a higher risk for emotional and financial instabilities, which may end up compromising their well-being and consequently, compromise a healthy pregnancy [20]. The opposite was observed in the current case series, which identified that the presence of a partner was statistically significant (67.6%) for the cesarean delivery of NBs with LBW. This disagreement with the literature may be explained by the presence of other risk factors that may have been more "challenging" in this study population.

In terms of GA, a higher frequency of cesarean sections was observed in women with GA of >35 weeks (34.8%). In 2011, Universidade de Maringá-PR identified prematurity as the factor most associated with the occurrence of LBW and observed that children born at <37 weeks had a probability of weighing <2500 g that was 20.8 times higher than that of those born at >37 weeks [23]. Similarly, other studies have shown that LBW is often associated with premature deliveries [8,9]. A study in 2013 presented prematurity rates that were much higher than those considered acceptable and concluded that prematurity and LBW had a significant influence on the cesarean delivery approach [24]. Moreover, studies revealed that cases in which pregnancies had to be interrupted at <32 weeks had a higher probability of progressing to cesarean section because this delivery method is considered to have a protection factor for these NBs [3,13].

The number of prenatal consultations and the quality of pregnancy monitoring can have a direct effect on the incidence of perinatal complications. According to the Ministry of Health, prenatal care is essential for ensuring a healthy pregnancy and a safe delivery [25]. In this study, we found a significant association between the number of prenatal consultations (<8 consultations) and the occurrence of cesarean delivery of NBs with LBW. Studies show that an insufficient number of consultations are directly related to LBW, prematurity, and early death [26], reinforcing the importance of providing adequate prenatal care to all pregnant women [9,27]. Early identification of pregnant women who have trouble making it to scheduled appointments (whether owing to lack of transportation, forgetfulness [28], difficulty of access, or poor quality of services) enables the improvement of prenatal care, positively impacting obstetric outcomes, particularly birth weight.

Among the indications of cesarean section, hypertensive syndrome was the main clinical cause for therapeutic preterm delivery and had a statistically significant association with LBW. Consistent with our study, the literature indicates that women with hypertensive syndromes are the principal risk group, demonstrating the seriousness of maternal–fetal diseases in this population [7]. Operative delivery was identified as the most frequent approach in these cases and was associated with improved neonatal survival [7,9]. As with hypertensive syndrome, hemorrhagic comorbidities (premature separation of the placenta and placenta previa) were also associated with cesarean delivery of NBs with LBW, a fact confirmed

by our study data (in this study, we did not specifically focus on each cause but rather on the maternal variables in general, and thus, we only mention them).

Regarding the Apgar score, scores of 7–9 were observed in the first (58.3%) and fifth (79.3%) minutes of life. Even with good first-minute birth indications, NBs with a score of <7 (41.3%) and a higher risk for developing metabolic disorders, infectious, and neurological conditions, in addition to serious respiratory conditions such as acute respiratory distress syndrome, were observed. These NBs were more likely to progress to neonatal death [29] and sudden infant death syndrome [9].

With respect to sex, female NBs were predominant, but no significant association between the sex of NBs and the occurrence of cesarean delivery of NBs with LBW was observed. The literature indicates that among LBW infants, higher mortality is observed in males than in females [29].

Conclusion

We observed significant associations between some of the maternal variables assessed and the occurrence of cesarean deliveries of LBW infants. The results presented may contribute to the body of evidence in question, revealing that primipara women with a stable partner, who attended <8 prenatal consultations, who did not complete elementary school, and who were indicated for delivery owing to hypertensive syndrome had a higher chance of their babies being born with LBW via cesarean section. Thus, considering possible explanations for the LBW/prematurity rates is essential. Knowing and identifying these variables makes it possible to effect changes, whether related to living habits such as hygiene, education, and awareness or at the administrative level, in conjunction with public agencies, particularly in the socioeconomic cultural environment. Moreover, understanding these variables before conception enables the prevention of possible complications that can be corrected, further reducing complications in the puerperal pregnancy cycle, which may contribute to a decrease in the prematurity rate and the proportion of NBs with LBW.

Prospective studies are required to better define additional risks associated with the occurrence of NBs with LBW and especially to better understand and follow-up these children who have experienced prematurity, particularly with regard to psychomotor development.

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