

Resuscitation of moderate and late preterm babies in the delivery room: associated factors

Reanimação de bebês prematuros moderados e tardios em sala de parto: fatores associados
Reanimación de bebés prematuros moderados y tardíos en sala de parto: factores relacionados

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Descriptores

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Abstract

Objective: To verify the obstetric and neonatal variables related to the need for resuscitation of moderate and late premature NBs in the delivery room.

Methods: A cross-sectional study that included 151 moderate and late preterm NBs from a university hospital in southern Brazil. All moderate and late NBs born from May 2016 to May 2017 participated in the study. The collection took place through the participants' medical records, using their own data collection instrument. Results were presented using frequencies, frequency comparison [Chi-Square] for analysis between the dependent variable [need for resuscitation] and the independent ones. The study followed ethical recommendations.

Results: The obstetric factors associated with the need for resuscitation in moderate and late NBs were risk pregnancy ($p=0.007$), complications during delivery ($p=0.031$), cesarean section ($p=0.005$) and premature amniorrhexis ($p=0.01$). Regarding the association of neonatal factors, we highlight the disproportion of weight for gestational age ($p<0.001$), lower gestational age ($p<0.001$) and fetal malformation ($p=0.047$) as factors related to the need for resuscitation.

Conclusion: For the population of moderate and late preterm NBs, factors such as premature amniorrhexis, early gestational age and gestational and delivery complications are factors related to the need for resuscitation. Recognizing these factors contributes to delivery room care management.

Resumo

Objetivo: Verificar as variáveis obstétricas e neonatais relacionadas à necessidade de reanimação de recém-nascidos (RN) prematuros moderados e tardios em sala de parto.

Métodos: Estudo transversal que incluiu 151 RN prematuros moderados e tardios de um hospital universitário do sul do Brasil. Participaram do estudo, todos os RN moderados e tardios, que nasceram no período de maio de 2016 a maio de 2017. A coleta aconteceu por meio dos prontuários dos participantes, utilizando instrumento próprio para coleta de dados. Os resultados foram apresentados por meio de frequências, comparação de frequência [Qui-Quadrado] para análise entre a variável dependente [necessidade de reanimação] e as independentes. O estudo seguiu as recomendações éticas.

Resultados: Os fatores obstétricos associados a necessidade de reanimação em RN moderados e tardios foram a gestação de risco ($p=0,007$), intercorrências durante o parto ($p=0,031$), cesariana ($p=0,005$) e amniorrexe prematura ($p=0,01$). Quanto a associação dos fatores neonatais, destaca-se as desproporções de peso para idade gestacional ($p<0,001$), a menor idade gestacional ($p<0,001$) e a malformação fetal ($p=0,047$), como fatores relacionados a necessidade de reanimação.

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Conflicts of interest: nothing to declare.

Conclusão: Para população de prematuros moderados e tardios, fatores como amniorrexe prematura, menor idade gestacional e intercorrências gestacionais e no parto são fatores relacionados a necessidade de reanimação. Reconhecer esses fatores contribui para a gestão do cuidado nas salas de parto.

Resumen

Objetivo: Verificar las variables obstétricas y neonatales relacionadas con la necesidad de reanimación de recién nacidos (RN) prematuros moderados y tardíos en sala de parto.

Métodos: Estudio transversal que incluyó 151 RN prematuros moderados y tardíos de un hospital universitario del sur de Brasil. En el estudio participaron todos los RN moderados y tardíos que nacieron en el período de mayo de 2016 a mayo de 2017. La recolección se realizó a través de las historias clínicas de los participantes, con un instrumento propio para la recolección de datos. Los resultados se presentaron por medio de frecuencias, comparación de frecuencia (ji cuadrado) para el análisis entre la variable dependiente (necesidad de reanimación) y las independientes. El estudio cumplió las recomendaciones éticas.

Resultados: Los factores obstétricos relacionados con la necesidad de reanimación de RN moderados y tardíos fueron embarazo de riesgo ($p=0,007$), complicaciones durante el parto ($p=0,031$), cesárea ($p=0,005$) y rotura prematura de membranas ($p=0,01$). Respecto a la relación de los factores neonatales, se destacan la desproporción de peso para la edad gestacional ($p<0,001$), la menor edad gestacional ($p<0,001$) y la malformación fetal ($p=0,047$), como factores relacionados con la necesidad de reanimación.

Conclusión: En la población de prematuros moderados y tardíos, factores como rotura prematura de membranas, menor edad gestacional y complicaciones gestacionales y en el parto están relacionados con la necesidad de reanimación. Reconocer esos factores contribuye para el manejo del cuidado en las salas de parto.

Introduction

High-risk newborns (NBs) are defined as those with a higher than average risk of morbidity and mortality associated with conditions of adaptation to extrauterine life. High-risk NBs include preterm NBs, considered those born with a gestational age (GA) of less than 37 weeks.⁽¹⁾ They may be subclassified into extremely premature (up to 28 weeks), very premature (28 to less than 32 weeks) and moderate to late preterm NBs (32 to 36 weeks and 6 days).⁽²⁾

It is estimated that each year 15 million premature babies are born worldwide, with up to 12% of these births in low-income countries, of which one million die from complications in childbirth. In addition, those who survive may suffer from some kind of neurological, auditory, visual, learning disability, and others that may accompany them throughout their lives.⁽²⁾

There is a worldwide concern regarding prematurity, especially extreme or very premature premature NBs, given their immediate clinical fragility as well as the survival sequelae of these within Intensive Care Units. However, a portion of premature NBs very present in health services and that has been growing in recent years, due to elective cesarean sections and obstetric complications, are moderate and late. Moderate preterm NBs are those with 32 to 33 weeks and 6 days of GA and late, 34 to 36 weeks and 6 days.⁽³⁾

These NBs represent about 10% of all live births in Brazil and are considered “near term” by some health professionals. However, they constitute an immature clientele in different aspects and sometimes have a greater need for hospitalization related to respiratory distress, apnea, hypoglycemia, hypothermia, feeding difficulties, jaundice, among others, as well as aspects related to immediate extrauterine adaptation.^(1,4,5)

This need for major extrauterine adaptation in preterm NBs is already known worldwide, and data from the Neonatal Resuscitation Program of the Brazilian Society of Pediatrics (*Programa de Reanimação Neonatal da Sociedade Brasileira de Pediatria*) confirm that the need for neonatal resuscitation is greater in preterm NBs.⁽⁶⁾ In Brazil, approximately 300,000 children are born each year who require support to start and maintain breathing, in addition to those premature who need delivery room oxygen therapy.⁽⁷⁾

Neonatal resuscitation or cardiopulmonary resuscitation (CPR) in the delivery room occurs with the reception of the NB and assessment of its vitality. In this case, it is recommended the action and decision making in the “golden minute”, that is, assessment of respiration and heart rate in the first 60 seconds of life, to define the need for neonatal resuscitation maneuvers.⁽⁶⁾ They are performed by a qualified doctor or nurse, with theoretical and practical training, as recommended by Ordinance 371, of May 7, 2014 of the Ministry of Health.⁽⁷⁾ Among

the neonatal resuscitation maneuvers in the delivery room, the following stand out: whereas about one in ten NBs need positive pressure ventilation to start breathing, one in one hundred needs intubation and/or cardiac compression, and one in a thousand requires intubation, cardiac compression, associated with of medicines.⁽⁸⁾

In this sense, this study is justified due to the great demand. This demand represents almost 90% of premature births⁽⁹⁾ attended at health services as well as the importance of proper identification of predisposing factors and decision-making in the delivery room, in order to minimize possible sequelae to the NB.⁽⁶⁾ Still, studies aimed at the population of moderate and late NBs are incipient and recent in the national and international literature, which eventually generates a gap in scientific knowledge.⁽¹⁰⁾

Thus, this study aimed to verify the obstetric and neonatal variables related to the need for resuscitation of moderate and late preterm NBs in the delivery room.

Methods

This is a cross-sectional study, developed from the matrix project database, entitled “*Condições de saúde de prematuros moderados e tardios no primeiro ano de vida*”. This study aimed to analyze the health conditions of these preterm NBs in the first year of life through a mixed study.

The setting was a medium-sized and highly complex hospital in southern Brazil. The data collection of the matrix project took place from May 15, 2016 to May 14, 2017. All moderate and late preterm NBs were included in the study, that is, with gestational age between 32 to 33 weeks and 6 days and 34 to 36 weeks and 6 days⁽³⁾, in which the guardians resided in the municipality where the hospital was located.

Data collection was performed by the researcher and properly trained research assistants through a daily visit to the Obstetric Center (OC) to identify the research participants. Then, they were searched in the inpatient unit or intensive care unit to fill out the form with data from the NB's medical record.

We used our own form, prepared for this study and duly tested, including obstetric and neonatal variables, which were completed through access to medical records. The maternal variables studied were prenatal care, risk pregnancy and the conditions associated with it, complications at delivery and type of delivery. While the neonatal variables consisted of gestational age, weight-to-gestational age ratio, gender, first and fifth minute Apgar score, need for admission to the Neonatal Intensive Care Unit (NICU), days of hospitalization, need for resuscitation, and description of CPR maneuvers used in the delivery room.

Data were entered and categorized in a database using Epi-info[®] (version 6.0), with independent double entry. After checking for errors and typing inconsistencies, data analysis was performed using the Predictive Analytics Software (PASW Statistics[®], SPSS Inc., Chicago, USA) version 18.0. Chi-square and Fisher's Exact tests were used to associate variables with outcomes, yes or no for the need for resuscitation. It was considered as significance level when $p < 0.05$. The database consists of 151 moderate and late preterm NBs.

For database use, an authorization was requested from the researcher responsible and an amendment to the matrix project was sent to the institution's Research Ethics Committee. It was approved under Certificate of Presentation for Ethical Consideration (CAAE - *Certificado de Apresentação para Apreciação Ética*) 53898916.9.0000.5346 and Opinion 2.167.071. In the matrix project, ethical recommendations were followed and informed consent was given to the guardians at the time of hospitalization.

Results

The study included 151 moderate and late preterm NBs, of whom 28 (18.5%) were moderate and 123 (81.5%) late. Of the 151 NBs participating in the study, 41 (27.2%) required CPR in the delivery room. Table 1 presents the obstetric factors associated with the need for neonatal resuscitation in the delivery room.

Regarding obstetric variables, it is noteworthy that it is significantly more frequent to revive mod-

Table 1. Obstetric variables associated with the need for resuscitation of moderate and late NBs in the delivery room

Variables	Need for resuscitation			p-value
	Yes n(%)	No n(%)	Total n(%)	
Childbirth				0.031*
Yes	7(50.0)	7(50.0)	14(9.3)	
No	34(24.8)	103(75.2)	137(90.7)	
Prenatal				0.642*
Yes	27(27.3)	72(72.7)	99(65.6)	
No	14(26.9)	38(73.1)	52(34.4)	
Risk management				0.007*
Yes	31(35.2)	57(64.8)	88(58.3)	
No	10(15.9)	53(84.1)	63(41.7)	
Cervical Insufficiency				0.481**
Yes	1(16.7)	5(83.3)	6(4.0)	
No	40(27.6)	105(72.4)	145(96.0)	
Bleeding in the 1 st and/or 2 nd trimester				0.190**
Yes	0(0.0)	6(100.0)	6(4.0)	
No	41(28.3)	104(71.7)	145(96.0)	
Placenta abruption				0.073*
Yes	7(46.7)	8(53.3)	15(9.9)	
No	34(25.0)	102(75.0)	136(90.1)	
Premature amniorrhexis				0.01*
Yes	7(14.3)	42(85.7)	49(32.5)	
No	34(33.3)	68(66.7)	102(67.5)	
Polydramnios/Oligohydramnios				0.593**
Yes	2(22.2)	7(77.8)	9(6.0)	
No	39(27.5)	103(72.5)	142(94.0)	
Twinning				0.427**
Yes	4(22.2)	14(77.8)	18(11.9)	
No	37(27.8)	96(72.2)	133(88.1)	
Pre eclampsia				0.227*
Yes	12(33.3)	24(66.7)	36(23.8)	
No	29(25.2)	86(74.8)	115(76.2)	
Fetal malformation				0.047**
Yes	4(66.6)	2(33.3)	6(4.0)	
No	37(25.5)	108(74.5)	145(96.0)	
IUGR				0.500**
Yes	2(33.3)	4(66.6)	6(4.0)	
No	39(26.9)	106(73.1)	145(96.0)	
Preterm births				0.319*
Yes	5(35.7)	9(64.3)	14(9.3)	
No	36(26.3)	101(73.7)	137(90.7)	
Maternal disease				0.102*
Yes	6(46.2)	7(53.8)	13(8.6)	
No	35(25.4)	103(74.6)	138(91.4)	

IUGR - Intrauterine Growth Restriction; * Chi square; ** Fisher's Exact Test

erate and late preterm infants when there are any complications in childbirth ($p=0.031$). Among the complications, the most recurrent were maternal hemorrhage (30.8%), followed by hypertension (15.4%) and hypotension (15.4%). Also, neonatal resuscitation in the delivery room was significantly more frequent in children born to at-risk pregnancies ($p=0.007$) and who had premature placental amniorrhexis ($p=0.01$). The most frequent risk mo-

tives for pregnancy were pregnancy specific hypertensive disease, twin pregnancy, gestational diabetes mellitus, twin pregnancy associated with pregnancy specific hypertensive disease and previous premature births. The other obstetric variables showed no significant difference between those requiring resuscitation and those not resuscitated. Regarding the neonatal variables that were related to the need for resuscitation, Table 2 stands out.

Table 2. Neonatal variables associated with the need for resuscitation of late and moderate NBs in the delivery room

Variables	Need for resuscitation			p-value
	Yes n(%)	No n(%)	Total n(%)	
Gestational Age				<0.001*
Moderate	20(71.4)	8(28.6)	28(18.5)	
Late	21(17.1)	102(82.9)	123(81.5)	
Weight X GA relation				<0.001*
AGA	22(19.8)	89(80.2)	111(73.5)	
SGA or GGA	19(47.5)	21(52.5)	40(26.5)	
Sex				0.570*
Male	18(25.0)	54(75.0)	72(47.7)	
Female	23(29.1)	56(70.9)	79(52.3)	
Delivery				0.005*
Vaginal	5(11.4)	39(88.6)	44(29.1)	
Cesarean	36(33.6)	71(66.4)	107(70.9)	
1 st minute Apgar				<0.001**
≥ 7	15(12.3)	107(87.7)	122(80.8)	
<7	26(89.7)	3(10.3)	29(19.2)	
5 th minute Apgar				<0.001**
≥ 7	34(23.8)	109(76.2)	143(94.7)	
<7	8(100.0)	0(0.0)	8(5.3)	
Need for hospitalization at NICU				<0.0001*
Yes	33(53.2)	29(46.8)	62(41.1)	
No	8(9.0)	81(91.0)	89(58.9)	
NICU hospitalization days (n=62)				0.042*
1-3 days	8(38.1)	13(61.9)	21(33.9)	
4-10 days	7(41.2)	10(58.8)	17(27.4)	
>10 days	18(75.0)	6(25.0)	24(38.7)	
Hospitalization days				<0.0001*
1-3 days	8(13.3)	52(86.7)	60(39.7)	
4-10 days	9(18.0)	41(82.0)	50(33.1)	
>10 days	24(58.5)	17(41.5)	41(27.2)	

GA - Gestational Age; SGA - Small for Gestational Age; AGA - Adequate for Gestational Age; GGA - Great for Gestational Age; NICU - Neonatal Intensive Care Unit. *Chi-Square; ** Fisher's Exact Test.

Regarding neonatal variables, 71.4% of moderate preterm NBs and 17.1% of late preterm NBs required resuscitation, this difference was significantly greater for the moderate population ($p < 0.001$) when compared to late ones. NBs who were born by cesarean section (70.9%) had a higher need for resuscitation when compared to those born by vaginal delivery ($p=0.005$). Regarding the need for re-

suscitation and the relationship between weight and gestational age, neonatal resuscitation prevailed between SGA or GGA NBs, when compared to those born with AGA weight ($p < 0.001$). Also, the lower the Apgar score in the first and fifth minute of life, the greater the need for delivery room resuscitation ($p < 0.001$), the lower Apgar score than 7 at the first and fifth minute confirmed the need for resuscitation. In addition, all NBs with Apgar less than 7 at the fifth minute of life needed specialized support for extrauterine adaptation.

Of the NBs resuscitated in the delivery room, 53.2% needed to be admitted to the NICU, and most of them remained in the NICU for more than ten days (75%) and hospitalized (58.5%). The need for neonatal resuscitation is directly associated with the need for NICU admission.

Table 3 presents the resuscitation maneuvers used in the delivery room.

Table 3. Resuscitation maneuvers used in moderate and late preterm NBs in the delivery room

Resuscitation maneuvers	n(%)
Face mask + oxygen therapy	13(31.7)
Positive Pressure Lung Ventilation	7(17.1)
Lung Ventilation w/Positive Pressure + oxygen	16(39.0)
Orotracheal intubation	2(4.9)
Orotracheal intubation + cardiac compression	1(2.4)
Orotracheal intubation + vasoactive drug use	2(4.9)

The most used resuscitation maneuvers in the delivery room were positive pressure pulmonary ventilation plus oxygen, followed by oxygen delivery by face mask.

Discussion

Obstetric risks during pregnancy represent greater risks for the need for neonatal resuscitation in the delivery room. Study that listed gestational risks similar to this study (hypertensive disorders, gestational diabetes, amniorrhesis, placenta abruption, intrauterine growth restriction, polyhydramnios/oligohydramnios) concluded that with the exception of advanced maternal age, the other risks represented a greater chance of resuscitation in the delivery room between term and premature NBs.

⁽¹¹⁾ In this study, with the population of moderate and late preterm NBs, at-risk pregnancies and those with premature amniorrhesis were more frequently required for resuscitation.

One third of premature births is associated with premature membrane amniorrhesis. Although this causes an increase in neonatal morbidity and the need for NICU admission, especially for neonatal infections, it has not been associated with the need for CPR.⁽¹²⁾ In the term population, it was not a risk factor for the need for resuscitation,⁽¹³⁾ which may be a specific characteristic of this moderate and late population. In contrast to the findings of this study, Brazilian researchers who analyzed the risk of resuscitation in preterm and full-term NBs point out that only 4.2% of NBs of mothers with amniorrhesis needed specialized support for extrauterine adaptation.⁽¹⁴⁾ Thus, more studies need to be developed with the theme, in order to identify if the need for resuscitation may have as one of the causes premature amniorrhesis.

However, cases of premature placental abruption represented 46.7% of cases requiring resuscitation in the delivery room. In a study conducted in the State of Santa Catarina, it was found that 85.7% and 80% of NBs with low Apgar score at the first and fifth minutes of life, respectively, were premature born of pregnancies where there was premature placenta abruption, which resembles this research.⁽¹⁵⁾

Among the types of delivery, cesarean section is associated with increased need for advanced neonatal resuscitation.⁽¹⁶⁾ While the World Health Organization points to cesarean section as a positive factor in saving maternal and neonatal lives, surgery rates are higher than expected (more than 10%). Thus, unnecessary caesarean sections are performed, which can cause damage to both the mother and the NB.^(17,18)

Regarding neonatal factors, the authors corroborate that low weight and prematurity are directly related to the outcome of the NB's vitality assessment at delivery. The close relationship of prematurity and low birth weight highlight the vulnerability of the premature and its possible subsequent complications. There are low evaluations of Apgar

at the first and fifth minute of life and the need for delivery room resuscitation.^(13,18)

It is noteworthy that the need for resuscitation in the delivery room was significantly more frequent in moderates when compared to late ones. Studies corroborate the findings and highlight that the need for resuscitation is inversely proportional to gestational age and/or birth weight, and that in Brazil about 300,000 NBs need to be resuscitated in the delivery room annually. In the term population, 10% of NBs need resuscitation, related to the main maternal/obstetric causes, such as previous maternal diseases and maternal age, as well as fetal reasons, such as malformations or polyoligodramia.^(19,20)

Similarly, in the United Kingdom, in a case-control study with moderate, late and term preterm NBs, a higher prevalence of need for neonatal resuscitation among moderate preterm NBs (36.9%) when compared to late preterm NBs and term NBs (14.5% and 7.4% consecutively) was observed.⁽¹⁸⁾ Similarly, moderate premature NBs needed more respiratory support, such as mechanical ventilation and positive pressure ventilation, which corroborates this study.

Also, just as a study conducted in Portugal, this one evidenced a greater need for resuscitation among premature SGA and/or GGA NBs. Demonstrating that late preterm NBs are twice as likely to require advanced resuscitation when they are SGA or GGA.⁽²¹⁾

Another factor associated with resuscitation of moderate and late preterm NBs was the presence of neonatal malformations. As pointed out by the resuscitation guidelines developed by the Brazilian Society of Pediatrics (*Associação Brasileira de Pediatria*), this research shows the prevalence of resuscitation in premature NBs when they present some type of malformation, whether antenatal discovery or not, emphasizing the necessary prenatal care.⁽⁶⁾

The importance of the development of an appropriate prenatal care is emphasized for the purpose of early identification of possible neonatal risks and other problems at the time of birth/reception of the NB in the delivery room. From this perspective, it should be noted that in this study, although not presenting significant difference, about 34% of pregnant wom-

en had not had adequate number of prenatal consultations, which confers risk for premature birth.⁽²²⁾

Regarding the need for NICU hospitalization and days of stay, there was a higher incidence of hospitalization in the moderate and late preterm NBs who required some type of resuscitation in the delivery room (53.2%). Most of these children had a long stay in intensive care (75%). This finding corroborates a cohort study, which found that moderate preterm NBs who needed delivery room CPR remain longer in the hospital, had a greater need for respiratory support at 28 days of age, and had delayed initiation of oral feeding.⁽¹⁶⁾ In this study, 58.5% of NBs were hospitalized for more than 10 days. In addition, it is noted that NBs who presented Apgar less than 7 at the fifth minute of life 100% of the time required neonatal resuscitation in the delivery room. Consequently, the high numbers of intensive care hospitalization are warranted, although the value of the Apgar report does not indicate neonatal resuscitation alone.⁽¹³⁾

Therefore, recognizing the actors and factors related to the need for resuscitation in the delivery room enables the qualification of health teams so that resuscitation and systematic maneuvers occur as quickly as possible and data/risks can be minimized to the NB. Recognizing in the practice of nursing in the delivery room, the factors associated with resuscitation as well as the most used maneuvers in the population of moderate and late preterm NBs allows the management of care effectively and singularly, given the rise of this population in health services.

This study had as a limitation the fact that it analyzed the neonatal resuscitation in the delivery room of moderate and late preterm NBs only from the city where the hospital is located. The research setting was a reference hospital in midwifery for the central region of the state.

Conclusion

Regarding the obstetric and neonatal variables related to the need for resuscitation of moderate and

late preterm NBs in the delivery room, it can be concluded that moderate NBs, SGA or GGA and who presented Apgar score less than 7 at the first and fifth minute of life are more likely to have been revived. Of these, most of them required hospitalization in neonatal intensive care and were hospitalized longer than those who were not resuscitated. Regarding obstetric factors, it is important to highlight that premature amniorrhexis was a peculiar feature of this study, for this population, which requires further research to relate neonatal resuscitation to this risk factor.

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Colaborations

Descovi MHM, Jantsch LB, Rosa N, Kegler JJ, and Neves ET declare that they contributed to the study design, analysis and interpretation data, writing of the article, relevant critical review of the intellectual content and approval of the final version to be published.

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