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NEONATAL RESUSCITATION DETERMINED BY CONDITIONS IN NEWBORNS TREATED IN INTENSIVE AND INTERMEDIATE CARE UNITS

Reanimação neonatal determinada por afecções em recém-nascidos atendidos em unidades de cuidados intensivos e intermediários

Resucitación neonatal determinada por las condiciones en recién nacidos tratados en unidades de cuidados intensivos e intermedios

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RESUMO

OBJETIVO: verificar a associação entre a ocorrência de reanimação neonatal e a presença de afecções em Recém-Nascido atendidos em Unidade de Cuidados Intermediários e Intensivos Neonatais. **Metodologia:** estudo observacional transversal de abordagem quantitativa de dados secundários, realizado em março e abril de 2024. A população de estudo foi do público neonatal que foram atendidos em um hospital. O instrumento de onde foram extraídas as informações foi a ficha Qualineo, preenchida na rotina do cenário de estudo. Foi utilizada estatística descritiva para contemplar o objetivo do estudo e calculada a Odds Ratio para investigar possíveis fatores de risco das afecções para a reanimação. **Resultados:** a amostra total foi n=183.

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A reanimação foi identificada como fator de risco (ou vice-versa) para Síndrome do Desconforto Respiratório, Taquipneia Transitória do Recém-Nascido e infecção precoce. **Conclusão:** houve associação entre a ocorrência de reanimação e, principalmente as afecções respiratórias e de infecção precoce.

DESCRITORES: Reanimação cardiopulmonar; Neonatologia; Doenças do recém-nascido.

ABSTRACT

OBJECTIVE: to verify the association between the occurrence of neonatal resuscitation and the presence of conditions in newborns treated in Intermediate and Neonatal Intensive Care Units. **Methodology:** this was a cross-sectional observational study with a quantitative approach using secondary data, conducted in March and April 2024. The study population consisted of neonates who were treated at a hospital. The information was extracted from the Qualineo form, filled out as part of the routine in the study setting. Descriptive statistics were used to address the study objective, and the Odds Ratio was calculated to investigate possible risk factors for the conditions leading to resuscitation. **Results:** the total sample was n=183. Resuscitation was identified as a risk factor (or vice versa) for Respiratory Distress Syndrome, Transient Tachypnea of the Newborn, and early infection. **Conclusion:** there was an association between the occurrence of resuscitation and primarily respiratory conditions and early infection.

DESCRIPTORS: Cardiopulmonary resuscitation; Neonatology; Infant, newborn, diseases.

RESUMEN

OBJETIVO: verificar la asociación entre la ocurrencia de reanimación neonatal y la presencia de afecciones en recién nacidos atendidos en Unidades de Cuidados Intermedios e Intensivos Neonatales. **Metodo:** estudio observacional transversal cuantitativo de datos secundarios, en marzo y abril de 2024. La población de estudio incluyó al público neonatal atendido en un hospital. El instrumento de donde se extrajeron las informaciones fue la ficha Qualineo, completada en la rutina del escenario de estudio. Se utilizó estadística descriptiva para cumplir con el objetivo del estudio y se calculó el Odds Ratio para investigar posibles factores de riesgo de las afecciones para la reanimación. **Resultados:** la muestra total fue n=183. La reanimación fue identificada como un factor de riesgo (o viceversa) para el Síndrome de Dificultad Respiratoria, Taquipnea Transitoria del Recién Nacido e infección precoz. **Conclusión:** hubo asociación entre la ocurrencia de reanimación y, principalmente, las afecciones respiratorias y la infección precoz.

DESCRIPTORES: Reanimación cardiopulmonar; Neonatología; Enfermedades del recién nacido.

INTRODUCTION

The neonatal period, defined by the first 28 days of life of the Newborn (NB), is marked by a high susceptibility to disorders that can significantly affect infant health and development.[1] Different studies indicate that among the main conditions observed in this population in hospital environments are perinatal asphyxia, neonatal infections, disorders related to prematurity and congenital metabolic disorders, which can determine several serious outcomes, including cardiorespiratory arrest.[2,3]

The occurrence of these disorders is intrinsically related to a series of maternal factors, including sociodemographic aspects such as age, schooling and access to health services during pregnancy, as well as the health conditions of the mother, such as a diagnosis of gestational diabetes, hypertension and a history of infections.[4,5] The intersection of these factors contributes not only to the incidence of neonatal disorders, but also to the widening of health disparities between different social groups.[6]

Although the global number of newborn deaths has decreased from 5 million in 1990 to 2.4 million in 2019, infants face the greatest risk of death in the first 28 days.[7] In Brazil, neonatal disorders represent one of the leading causes of infant mortality. Between 2010 and 2020, the main causes of death were prematurity, diarrheal diseases, congenital anomalies, birth asphyxia and neonatal sepsis.[8]

Given this scenario and the risks to the life of newborns due to conditions prevalent in this age group, neonatal resuscitation has emerged as a technique used when there is organic failure of the patient, with algorithms particular to the neonatal public, different from older children or adults. These particularities include age, the presence of gestational

and obstetric risks, as well as any complications identified in the prenatal period.[9, 10] However, little has been studied about the potential risk of these conditions and other neonatal conditions for the occurrence of cardiopulmonary arrest and the consequent need for resuscitation in neonates.

Recognizing the risk and protective factors associated with the occurrence of neonatal disorders is crucial for developing effective interventions in the hospital environment. A Chinese study of 9,552 NBs showed a 95% survival rate in Neonatal Intensive Care Units (NICUs) when patients received adequate care.[11] Early identification of these factors allows for the implementation of preventive strategies and targeted care, minimizing the impact of these disorders on neonatal health and contributing to the well-being of NBs and their mothers.[12] This study is therefore justified by updating the situational diagnosis of the interrelations between the indication for neonatal resuscitation and its potential causes.

The aim of the study was to verify the association between the occurrence of neonatal resuscitation and the presence of conditions in NBs treated in the Neonatal Intermediate and Intensive Care Unit (NICU). The hypothesis was that cardiopulmonary arrest and/or resuscitation are risk factors for the occurrence of diseases in the neonatal period.

METHOD

This is an observational, cross-sectional study with a quantitative approach involving secondary data research carried out in March and April 2024. The study site was the Ana Bezerra University Hospital, located in the municipality of Santa Cruz, state of Rio Grande do Norte, Brazil.

The study population was made up of neonatal patients and their mothers who had been seen in the hospital's NICU sector within a period of up to one year prior to the start of the data collection. The sample consisted of these patients' medical records. According to data provided by the institution, there are an estimated 25 admissions per month to the sector, making up an estimated 300 admissions per year. The numerical estimate of these admissions was used to calculate the sample. Using a 95% confidence interval and a 5% margin of error to estimate the samples, we obtained a total estimated sample of 169 admissions. To do this, an online sample calculator was used, available at: https://calculareconverter.com.br/calculo-amostral/.

The following parameters were taken into account as inclusion criteria: medical records of patients seen in the department in the year prior to the start of the collections; having the Qualineo program form duly completed; medical records already in the hospital archives. Exclusion criteria were: medical records of patients transferred to other institutions before the end of hospitalization (discharge or death); medical records of patients that were incomplete or lacked the information needed for the study; medical records with significant erasures that made it impossible to understand the information.

The data was extracted from the medical records. In the case of clinical information and registration with the institution, the sociodemographic and health history variables of the mothers and NB were schooling, smoking, number of prenatal consultations, systemic arterial hypertension (SAH), multiple pregnancies, type of delivery, sex of the NB and its gestational age at birth. As for the variables related to the conditions identified in the NB, these were low birth weight, Respiratory Distress Syndrome (RDS), Transient Newborn Tachypnea (TTRN), pulmonary hypertension, pneumonia acquired after birth, early infection (with clinical manifestation <48h of life) and late infection (>48h). This information was obtained specifically from the Qualineo form, which is used to monitor neonatal care and is a strategy created by the Ministry of Health.[13]

In order to meet the research objectives, the sample was divided into two groups: those who underwent neonatal resuscitation maneuvers (Yes) and those who did not (No). All the analyses were carried out according to this sample division.

Data collection took place at the convenience of the researchers and the institution, on days and at times agreed between the two, between March and April 2024. They were carried out in the archive and medical records storage room. This process was carried out using an electronic form created using the Google Forms platform in order to better control the flow of information. The research team was made up of teachers, undergraduate and postgraduate students. All the researchers were trained in the process of interviewing and collecting data beforehand. The data was deposited in the Mendeley Data Repository, accessible via the link: https://data.mendeley.com/datasets/jhdjmvbw3f.

The data collected was tabulated in spreadsheets using Microsoft® Excel 2016 software and analyzed using the Statistical Package for the Social Sciences, version 20.0. They were organized and presented using tables and textual descriptions. The study variables were subjected to the Kolmogorov-Smirnov normality test, which indicated a non-normal distribution. The scalar variables were presented as mean and Standard Deviation (SD). In order to test the

study hypothesis, Pearson's Chi-square test was used to verify the association between the variables of interest. The Odds Ratio (OR) was calculated to measure the odds ratio between the categorical variables, for which a value of OR> 1.00 was adopted as the positive odds ratio. For all the analyses, a 95% confidence interval and 5% margin of error were adopted, with a significance level determined when the p-value < 0.05.[14]

The project was appraised and approved by the Research Ethics Committee of the Federal University of Rio Grande do Norte, on the campus of the Trairi Faculty of Health Sciences (FACISA), under opinion no. 6.616.784 and Ethics Appraisal Certificate no. 76117823.5.0000.5568, following the precepts of Brazilian legislation.[15] The institution involved in the research scenario gave its express consent in an institutional document for the collection of data from medical records, and the identity of the patients was preserved.

RESULTS

The total sample consisted of n=183 medical records relating to the binomial (mother and NB), of which n=54 (29.5%) required neonatal resuscitation and n= 129 (70.5%) did not. No medical records were excluded.

With regard to the sociodemographic profile of the sample, Table 1 shows the cross-referencing between the categorical variables in this aspect and the study groups. In general, there was no significant difference between the profiles of the groups. However, there was a predominance of younger mothers between the ages of 26 and 35 with n=79 (43.2%/ p=0.406), of brown skin color with n=99 (54.1%/ p=0.498) and with more than 8 years of schooling with a total of n=135 (73.8%/ p=0.355). With regard to health data, although the majority had no significant risk factors, part of the sample had not had at least six prenatal consultations (n=43 (23.5%/ p=0.616)) and the majority of deliveries were cesarean sections, with a total of n=108 (59.0%/ p=0.779).

Table 1 - Sociodemographic and health characterization of participants (mother and NB). Santa Cruz-RN, Brazil, 2024.

Sociodemographic and health profile		Neonatal resuscitation						p *
		Yes (n=54)		No (n=129)		Total (n=183)		
		n	%	n	%	n	%	
Maternal Data								
Age range	15 to 25 years	16	29,6	53	41,1	69	37,7	0,406
	26 to 35 years	27	50,0	52	40,3	79	43,2	
	36 to 45 years	8	14,8	14	10,9	22	12,0	
	No information	3	5,6	10	7,8	13	7,1	
Race/skin color	Black	6	11,1	6	4,7	12	6,6	0,498
	White	10	18,5	19	14,7	29	15,8	
	Brown	26	48,1	73	56,6	99	54,1	
	Yellow	1	1,9	2	1,6	3	1,6	
	Not informed	11	20,4	29	22,5	40	21,9	
Schooling	< 8 years	9	16,7	15	11,6	24	13,1	0,355
	> 8 years	38	70,4	97	75,2	135	73,8	
Smoking	Yes	3	5,6	5	3,9	8	4,4	0,612
	No	51	94,4	124	96,1	175	95,6	

Sociodemographic and health profile		Neonatal resuscitation						p *
		Yes (n=54)		No (n=129)		Total (n=183)		
		n	%	n	%	n	%	
No. of prenatal consultations **	< 6	14	25,9	29	22,5	43	23,5	0,616
	6 or more	40	74,1	100	77,5	140	76,5	
SAH	Yes	6	11,1	22	17,1	28	15,3	0,308
	No	48	88,9	107	82,9	155	84,7	
Multiple pregnancy ***	Yes	7	13,0	10	7,8	17	9,3	0,268
	No	47	87,0	119	92,2	166	90,7	
Type of delivery	Cesarean	34	63,0	74	57,4	108	59,0	0,779
	Vaginal	19	35,2	52	40,3	71	38,8	
	Not informed	1	1,9	3	2,3	4	2,2	
DNB data								
Gender	Male	31	57,4	81	62,8	112	61,2	0,682
	Female	23	42,6	46	35,7	69	37,7	
	Undetermined	0	0,0	2	1,6	2	1,1	
Gestational age at birth	Preterm (<37 weeks)	32	59,3	46	35,7	78	42,6	**0,009**
	Full-term (37 a 41 weeks)	21	38,9	82	63,6	103	56,3	
	Not informed	1	1,9	1	0,8	2	1,1	

* Pearson's Chi-square test
** Minimum number of prenatal consultations established by the Brazilian Ministry of Health: 6 consultations.
*** When two or more fetuses develop in the uterus during the same pregnancy

As for the NB data, there was an association between gestational age and the groups studied. Despite identifying that the majority were considered full-term, preterm infants predominated in the group of those who were resuscitated (Yes), with n=32 (59.3%/ p=0.009).

In addition to the data in Table 1, the analysis of the scalar variables showed a maternal age of 27.6 years on average (Minimum: 15/ Maximum: 45/ SD= 6.8); an average of 8.6 prenatal consultations during pregnancy (Minimum: 0/ Maximum: 18/ SD= 3.6) and a gestational age at birth of 36.2 weeks on average (Minimum: 22/ Maximum: 41/ SD= 3.4).

Table 2 describes the association between the presence of conditions and the occurrence of neonatal resuscitation. The OR between the variables was also analyzed in order to identify whether cardiopulmonary arrest and/or neonatal resuscitation acted as a risk factor for the occurrence of these conditions. In this analysis, neonatal resuscitation was found to be a risk factor for RDS (OR= 7.48/ CI 95%= 3.15-17.79/ p<0.001), TTRN (OR= 2.60/ CI 95%= 1.30-5.17/ p=0.006), and early infection was found to be a risk factor for neonatal resuscitation (OR= 3.09/ CI 95%= 1.54-6.18/ p=0.001).

Table 2 - Characterization of the main ailments identified in the sample according to the research groups. Santa Cruz-RN, Brazil, 2024.

NB disorders		Neonatal resuscitation						OR	CI (95%)	p *
		Yes (n=54)		No (n=129)		Total (n=183)				
		n	%	n	%	n	%			
Low Weight	Sim	15	27,8	52	40,3	67	36,6	0,57	0,28-1,14	0,108
	Não	39	72,2	77	59,7	116	63,4			
SDR	Sim	47	87,0	61	47,3	108	59,0	7,48	3,15-17,79	**<0,001**
	Não	7	13,0	68	52,7	75	41,0			
TTRN	Sim	22	40,7	27	20,9	49	26,8	2,60	1,30-5,17	**0,006**
	Não	32	59,3	102	79,1	134	73,2			
Pulmonary hypertension	Sim	3	5,6	2	1,6	5	2,7	3,73	0,61-23,02	0,154
	Não	51	94,4	127	98,4	178	97,3			
Acquired pneumonia	Sim	0	0,0	5	3,9	5	2,7	1,43	1,30-1,58	0,324
	Não	54	100,0	124	96,1	178	97,3			
Early infection **	Sim	23	42,6	25	19,4	48	26,2	3,09	1,54-6,18	**0,001**
	Não	31	57,4	104	80,6	135	73,8			
Late infection ***	Sim	3	5,6	17	13,2	20	10,9	0,39	0,11-1,38	0,194
	Não	51	94,4	112	86,8	163	89,1			

* Pearson's chi-square test;
** When the infection manifests less than 48 hours after birth;
*** When the infection manifests itself more than 48 hours after birth.

DISCUSSION

The results of this study mainly revealed that the occurrence of resuscitation was associated with prematurity, as well as indicating a greater chance of the NB developing RDS, TTRN and being influenced by an intrauterine infection. It is believed that these data are important and can contribute to understanding the implications of neonatal resuscitation on the health status of these individuals.

Previous studies have shown that pre-existing factors determine the risk of needing neonatal resuscitation. Among these factors, there are mainly those related to events and alterations observed during pregnancy, such as prematurity, fetal growth restriction and gestational diabetes.[16] Sociodemographic aspects such as mothers' level of education and family ties with the NB have also been shown to influence the length of hospitalization and growth disorders.[17, 18] However, little has been investigated about the direct relationship with resuscitation.

In this study, the sociodemographic and health data of the mothers and NB showed a predominance of young, brown mothers with more than 8 years of schooling, with no significant differences between the groups that did or did not require neonatal resuscitation. Most of the mothers had no major risk factors, although a significant proportion had not completed the minimum number of prenatal consultations recommended by the Brazilian Ministry of Health (at least six consultations).[19]

One of the most relevant findings was the association between gestational age and the need for neonatal resuscitation. Although the majority of NBs were born at term, there was a

significant predominance of premature babies among those who required resuscitation. This finding is consistent with the literature, which identifies prematurity as a significant risk factor for neonatal complications that may require immediate interventions after birth.[16]

Previous studies corroborate these findings, highlighting that prematurity is strongly associated with a series of respiratory and systemic complications that often require resuscitation at birth.[20, 21] Lung immaturity, characterized by surfactant deficiency, contributes significantly to RDS and other respiratory dysfunctions, requiring immediate interventions for stabilization.[22]

Analysis of neonatal conditions has revealed that neonatal resuscitation is significantly associated with various adverse conditions. In particular, RDS, TTRN and early infection were more prevalent in NBs who required resuscitation. The ORs obtained in the analyses indicate a strong association between resuscitation and these conditions, suggesting that neonatal resuscitation may be both a consequence and a risk factor for these conditions.

The study showed a strong association between its presence and the need for neonatal resuscitation. This finding is consistent with the literature, which points to RDS as one of the main causes of morbidity and mortality in premature newborns, constituting a common complication in premature NB due to surfactant deficiency, resulting in pulmonary atelectasis, hypoxemia and acidosis.23 The literature describes that TTRN is characterized by rapid and superficial breathing shortly after birth. NBs who require resuscitation are more likely to develop TTRN, possibly due to an inadequate transition from fetal lung fluid to respiratory air.[24] In the present study, it was one of the conditions that was associated with resuscitation and exhibited a high odds ratio, which classified it as an important risk factor in the context of the research.

Early infection was significantly more common among NBs who required resuscitation. This finding suggests that the need for resuscitation may be associated with greater vulnerability to infections, possibly due to factors such as premature rupture of membranes and immaturity of the immune system.[25] Rapid and effective intervention during resuscitation can, however, reduce the impact of these infections. However, measures such as the use of antibiotics, laboratory tests and admission to a neonatal unit are strongly recommended in different studies.[26] The incidence of early infection found in our data was also higher than that found in the literature.[27]

The findings of this study have important clinical implications. Early identification of NBs who may need resuscitation is crucial for immediate preparation and intervention, minimizing the associated risks. Furthermore, recognizing that neonatal resuscitation is associated with certain conditions can guide more rigorous monitoring and post-resuscitation care practices, with the aim of reducing the incidence and severity of these conditions.

Neonatal resuscitation protocols, such as those developed by the American Heart Association (AHA) and the American Academy of Pediatrics (AAP), emphasize the importance of rapid and efficient intervention to improve neonatal outcomes.[28] In the Brazilian context, the care protocols of the Brazilian Society of Pediatrics follow the same algorithms.[9, 10] However, these protocols and new clinical practices must be continuously updated and rigorously implemented to ensure the best evidence-based practice.

NBs undergoing resuscitation should be closely monitored for early detection of complications. This includes continuous surveillance for signs of RDS, TTRN and neonatal infections.[29] The implementation of well-equipped NICU units is essential to provide the necessary support to these vulnerable NBs, but despite this, the national context has shown significant deficiencies in the infrastructure for this level of care.[30]

A limitation of the study is that the sample was restricted to a single institution, which may limit the generalizability of the results. The cross-sectional design limits the generalizability of the results, to the point of not clearly establishing the causal link.

CONCLUSION

This study concluded that there was an association between the occurrence of resuscitation and the presence of neonatal conditions. In this sense, it was found that RDS, TTRN and early infections were the conditions with the highest odds ratios in newborns who were resuscitated, findings that allow the hypothesis of the initial study to be accepted. Future research should seek to expand the sample and include multicenter analyses to confirm these findings and explore other associated variables. Further research could also examine specific interventions during resuscitation that may reduce the incidence of neonatal complications.

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