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Original Article

FATORES PERINATAIS ASSOCIADOS AO DESCONFORTO RESPIRATÓRIO DO RECÉM-NASCIDO

PERINATAL FACTORS ASSOCIATED WITH RESPIRATORY DISCOMFORT IN THE NEWBORN

FACTORES PERINATALES ASOCIADOS CON MALESTAR RESPIRATORIO EN EL RECIÉN NACIDO

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RESUMO

Objetivo: Analisar a prevalência e fatores perinatais associados ao desconforto respiratório em neonatos internados em uma Unidade de Terapia Intensiva Neonatal em Cuiabá, Mato Grosso. **Método:** Estudo transversal, analítico, retrospectivo, com coleta dos dados entre os meses de outubro e dezembro de 2019, em 844 prontuários de recém-nascidos internados entre 2014 e 2018. Utilizou-se a Regressão de Poisson, considerando significância de 0,05 (p<0,05). **Resultados:** do total de neonatos, 49,05% foram diagnosticados com desconforto respiratório. A prevalência da doença foi 60% maior entre os pré-termos, 36% maior entre os que apresentaram histórico de uso materno de esteroide antenatal e 25% maior entre os de baixo peso ao nascer. Observou-se, ainda, que a prevalência do uso de capacete de oxigênio, pressão positiva contínua nas vias aéreas e dieta parenteral foi 91%, 89% e 18% maior entre os neonatos com a doença. No entanto, o uso de fórmulas e leite materno em neonatos com desconforto respiratório foi 85% e 62% menor do que os neonatos que não apresentavam tal condição. **Conclusão:** Indica-se maior atenção da equipe de saúde e gestores, uma vez que o conhecimento desses fatores poderá auxiliá-los no planejamento de ações para consolidação da rede de atenção perinatal, com reestruturação e qualificação dos processos assistenciais no pré-natal, parto e nascimento.

Descritores: Unidade de Terapia Intensiva Neonatal; Assistência Perinatal; Síndrome do Desconforto Respiratório do Recém-nascido; Morbidade; Enfermagem.

ABSTRACT

Objective: To analyze the prevalence of perinatal factors associated with respiratory distress in neonates admitted to a Neonatal Intensive Care Unit in Cuiabá, Mato Grosso. **Method:** A cross-sectional, analytical, retrospective study, with data collection between the months of October and December 2019, in 844 medical records of newborns hospitalized between 2014 and 2018. Poisson Regression was used, considering a significance of 0.05 (p <0.05). **Results:** Of the total number of neonates, 49.05% were diagnosed with respiratory distress. The prevalence of the disease was 60% higher among premature infants, 36% higher among those who had a history of maternal use of antenatal steroids, and 25% higher among those with low weight. It was also observed that the prevalence of use of an oxygen helmet, the continuous positive airway pressure and the parenteral diet was 91%, 89% and 18% higher among neonates with the disease, respectively. However, the use of formulas and breast milk in infants with discomfort was 85% and 62% lower than that of infants who did not have this condition. **Conclusion:** Greater attention by the health team and managers is necessary as knowledge of these factors may assist them in planning actions to consolidate the perinatal network, with restructuring and qualification of care processes in prenatal aid, delivery and birth.

Descriptors: Intensive Care Units, Neonatal; Perinatal Care; Respiratory Distress Syndrome, Newborn; Morbidity; Nursing.

RESUMEN

Objetivo: Analizar el predominio y los factores perinatales asociados a la dificultad respiratoria en neonatos ingresados en una Unidad de Cuidados Intensivos Neonatales de Cuiabá, Mato Grosso. **Método:** Estudio transversal, analítico y retrospectivo, con recolección de datos entre los meses de octubre a diciembre de 2019, en 844 historias clínicas de recién nacidos hospitalizados entre 2014 y 2018. Se utilizó Regresión de Poisson, considerando una significancia de 0.05 (p <0,05). **Resultados:** Del total de neonatos, el 49,05% fueron diagnosticados de dificultad respiratoria. El predominio de la enfermedad fue un 60% más alto entre los bebés prematuros, un 36% más alto entre los que tenían antecedentes de uso materno de esteroides prenatales y un 25% más alto entre los que tenían bajo peso. También se observó que el predominio del casco de oxígeno, presión positiva continua en las vías respiratorias y dieta parenteral fue 91%, 89% y 18% mayor entre los recién nacidos con la enfermedad. Sin embargo, el uso de fórmulas y leche materna en lactantes con malestar fue 85% y 62% menor que el de lactantes que no padecían esta afección. **Conclusión:** Se indica una mayor atención por parte del equipo de salud y los gestores, ya que el conocimiento de estos factores puede ayudarlos a planificar acciones para consolidar la red perinatal, con reestructuración y calificación de los procesos de atención en el prenatal, parto y nacimiento.

Descriptores: Unidades de Cuidado Intensivo Neonatal; Atención Perinatal; Síndrome de Dificultad Respiratoria del Recién Nacido; Morbilidad; Enfermería.

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INTRODUCTION

Newborn Respiratory Distress Syndrome (NRDS) is one of the most common problems among neonates and is subdivided into respiratory distress syndrome and transient tachypnea of the newborn[1].

Newborns affected by NRDS main symptoms are flaring nostrils, thoracic retractions, tachypnea, apnea, grunting sound when breathing and central and peripheral cyanosis. Its etiology is related to alveolar immaturity, decrease of endogenous surfactant production, low maturity of lung muscles and delay in the removal of fetal pulmonary fluid[1-2], related to intrauterine neonate and in response to birth. Therefore, the perinatal period, which goes from the 20th gestational week to the 28th day after birth, is important in the disease onset.

Studies show a significant association between perinatal factors and NRDS, such as preterm delivery; cesarean section; birth weight under 2,500g; insufficient use of antenatal corticosteroids during pregnancy and surfactant in the immediate neonatal period; Apgar index under 7; premature rupture of membrane and male sex[2-5].

In addition, newborns with NRDS also have a more need for resuscitation, endotracheal intubation, oxygen therapy, early invasive ventilation, parenteral nutrition and longer hospitalization in the Neonatal Intensive Care Unit (NICU) after birth[3].

In addition to the close association with the factors mentioned, NRDS is an important variable in perinatal morbidity and mortality increase[5], representing the second major cause of early neonatal mortality[6] and the main cause of NICU hospitalization in Brazil[7], which causes expenses and losses to public health[5].

Despite the relevance of this disease, there are a few studies that research perinatal factors associated with this condition. Therefore, identifying these factors may support the preventive measures in health and actions that may contribute to the reduction of morbidity and mortality related to this disease. In this sense, this study aimed to analyze the prevalence and perinatal factors associated with respiratory distress in neonates in a NICU in Cuiabá, Mato Grosso.

METHOD

This is a cross-sectional, analytical, retrospective study, conducted from a secondary data source (medical records), in a public university hospital in Cuiabá, Mato Grosso, which has a NICU with 10 beds and a reference in maternal and child healthcare, especially high-risk pregnancy. All neonates admitted to the NICU of the hospital from 2014 to 2018 were included. Data were collected between October and November 2019.

The variable of interest was the NRDS (yes and no). The neonates classified as “yes” for NRDS were those diagnosed according to the 10th International Classification of Diseases (ICD) Revision, which classifies it as respiratory distress syndrome of the newborn (P22.0), respiratory tachypnea of the newborn (P22.1), other respiratory discomfort of the newborn (P22.8) and unspecified respiratory discomfort of the newborn (P22.9).

The other variables were perinatal and those related to clinical interventions, namely: gender (male and female); cesarean delivery (yes and no); gestational age (preterm<37 weeks, term 37 to 42 weeks and post term ≥ 42 weeks); low birth weight (< 2,500g) (yes and no); Apgar in the 1st minute (low <7 and adequate ≥7); Apgar in the 5th minute (low <7 and adequate ≥7); resuscitation at birth (yes and no); antenatal steroid use (yes or no); use of surfactant (yes and no); use of ventilatory support: oxygen helmet (HOOD) (yes and no); Continuous Positive Airway Pressure (CPAP) (yes and no) and mechanical ventilation (yes and no); and type of nutrition after birth (breast milk (BM), pasteurized human milk (PHM), formula and parenteral nutrition).

The database was structured through the Microsoft Office Excel® spreadsheet editor with independent double typing. The data from both bases were compared using the Data Compare tool to identify possible inconsistencies in typing, later corrected by referring physical data collection documents.

Absolute and relative frequency calculations were used in descriptive analysis. The Prevalence Ratio was calculated using Poisson Regression with robust variance to compare prevalence among the variables, considering a significance level of 0.05 ($p<0.05$). Data analysis was performed by STATA software®, version 11.1.

The research was approved by the Research Ethics Committee, obtaining a substantiated opinion no. 2,788,928. Considering the characteristics of the research, the Free and Informed Consent (FIC) was not necessary, but all

the recommendations of Resolution 466/2012 of the National Health Council were respected.

RESULTS

We analyzed 844 medical records of newborns (NB) hospitalized in the NICU, from 2014 to 2018, of these 414 (49.05%) presented the diagnosis of NRDS. Among the NB, the majority were male (n=462; 56.20%), premature (n=533; 64.92%), born by cesarean section (n=596; 71.46%), with low weight (n=468; 56.12%) and had a history of maternal use of antenatal steroid (n=511; 81.37%).

Also, it is noteworthy that 237 (29.77%) newborns had low Apgar in the 1st minute, 56 (7.04%) in the 5th minute, 179 (25.35%) required resuscitation, 481 (58.66%) ventilatory support with HOOD and 262 (32.59%) used mechanical ventilation. Still, most NB did not use surfactant (n=610; 85.67%). Regarding the first feeding, most newborns received parenteral nutrition (n=444; 54.41%), followed by pasteurized human milk (n=250; 30.64%), according to Table 1.

Table 1 - Characterization of newborns according to perinatal variables. Cuiabá, Mato Grosso, Brazil, 2019.

Variables	n	%
Respiratory distress of the newborn (n= 844)		
No	430	50.95
Yes	414	49.05
Sex (n=822)		
Female	360	43.80
Male	462	56.20
Caesarean section (n=834)		
No	238	28.54
Yes	596	71.46
Gestational age (n=821)		
Preterm	533	64.92
Term	284	34.59
Post term	4	0.49
Low weight (n=834)		
No	366	43.88
Yes	468	56.12
1st minute Apgar (n=796)		
Low	237	29.77
Adequate	559	70,23
5th minute Apgar (n=796)		
Low	56	7.04
Adequate	740	92.96
Use of Antenatal Steroid (n=628)		
No	511	81.37
Yes	117	18.63
Neonatal resuscitation (n=706)		
No	527	74.65
Yes	179	25.35
Use of surfactant (n=712)		
No	610	85.67
≤ 2 hours	41	5.76
2- 4 hours	15	2.11
> 4 hours	46	6.46
Ventilatory support with HOOD * (n=820)		
No	339	41.34
Yes	481	58.66
Ventilatory support with CPAP † (n=795)		
No	554	69.69
Yes	241	30.31
Mechanical ventilation (n=804)		
No	542	67.41
Yes	262	32.59
1st Food (n=816)		
Breast Milk	107	13.11

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Variables	n	%
Pasteurized Human Milk	250	30.64
Formula	15	1.84
Parenteral	444	54.41

Source: elaborated by the authors based on the research data.
Note: *Oxygen helmet; † Continuous Positive Airway Pressure.

It was found that the prevalence of NRDS was 60% higher among preterm newborns, 36% higher among those with a history of maternal antenatal steroid use and 25% higher among newborns with low birth weight (p<0.01). The other perinatal variables did not have statistically significant difference as can be seen in Table 2.

Table 2 - Perinatal factors associated with respiratory distress of the newborn. Cuiabá, Mato Grosso, Brazil, 2019.

Variables	Respiratory distress of the newborn				Simple Poisson Regression	
	No		Yes		PR ($CI_{95\%}$)	p-value
	n	%*	n	%*		
Sex						
Female	179	43.45	181	44.15	1	
Male	233	56.55	229	55.85	0.98(0.86-1.13)	0.84
Caesarean section						
No	134	31.60	104	25.37	1	
Yes	290	68.40	306	74.63	1.17(0.99-1.38)	0.05
Prematurity						
No	186	44.71	102	25.19	1	
Yes	230	55.29	303	74.81	1.60(1.35-1.90)	<0.01
Low weight						
No	208	49.29	158	38.25	1	
Yes	214	50.71	254	61.65	1.25(1.09-1.45)	<0.01
1st minute Apgar						
Low	283	71.28	276	69.17	1	
Adequate	114	28.72	123	30.83	1.05(0.91-1.22)	0.51
5th minute Apgar						
Low	364	91.69	376	94.24	1	
Adequate	33	8.31	23	5.76	0.81(0.59-1.15)	0.19
Use of Antenatal Steroid						
No	275	86.48	236	76.13	1	
Yes	43	13.52	74	23.87	1.36(1.15-1.61)	<0.01

Source: elaborated by the authors based on the research data.
Note: *Percentage in column.

Among the clinical interventions performed in newborns, there was a prevalence of ventilatory support with HOOD, use of CPAP and parenteral nutrition of 91%, 89% and 18% higher among those diagnosed with respiratory distress (p<0.01), in this order. In turn, the prevalence of the use of formulas and breast milk in newborns with NRDS was 85% and 62% lower (p≤0.01) than newborns without such a condition, respectively. The other variables related to clinical interventions did not have statistically significant difference (Table 3).

Table 3 - Clinical interventions associated with the diagnosis of respiratory distress of the newborn. Cuiabá, Mato Grosso, Brazil, 2019.

Variables	Respiratory distress of the newborn				Simple Poisson Regression	
	No		Yes		PR ($CI_{95\%}$)	p-value
	n	%*	n	%*		
Resuscitation						
No	261	49.53	266	50.47	1	
Yes	89	49.72	90	50.28	0.99(0.77-1.28)	0.96
Use of surfactant						
No	312	51.15	298	48.85	1	
Yes	44	43.14	58	56.86	1.31(0.91-1.89)	0.14

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Variables	Respiratory distress of the newborn				Simple Poisson Regression	
	No		Yes		PR ($CI_{95\%}$)	p-value
	n	%*	n	%*		
Ventilatory support with HOOD						
No	247	57.58	92	27.14	1	
Yes	167	34.72	314	65.28	1.91(1.68-2.18)	<0.01
Ventilatory support with CPAP						
No	319	57,58	235	42.42	1	
Yes	85	32.27	156	64.74	1.89(1.51-2.37)	<0.01
Mechanical ventilation						
No	272	50.18	270	49.82	1	
Yes	141	53.82	121	46.18	0.91(0.74-1.11)	0.33
Breast Milk						
No	335	47.25	374	52.75	1	
Yes	78	72.90	29	27.10	0.38(0.25-0.57)	<0.01
PHM**						
No	297	52.47	269	47.53	1	
Yes	116	46.40	134	53.60	1.18(096-1.45)	1.60
Formula						
No	400	49.94	401	50.06	1	
Yes	13	86.67	2	13.33	0.15(0.35-0.69)	<0.01
Parenteral nutrition						
No	207	55.65	165	44.35	1	
Yes	206	46.40	238	53.60	1.18(1.04-1.34)	<0.01

Source: elaborated by the authors based on the research data.
Note: *Percentage in line ** Pasteurized human milk.

DISCUSSION

The results of the study showed that, among the newborns in the NICU studied, 49.05% were diagnosed with NRDS, and the prevalence of this morbidity was higher among preterm newborns with low birth weight and with a history of maternal antenatal steroid use.

The relationship found between NRDS with prematurity and low birth weight is similar to other studies, which justify that this association is due to pulmonary immaturity, especially birth before time and the fragility of the newborn when performing respiratory efforts[7-9].

Although not identified in this study, the literature reveals an association between NRDS and cesarean section due to the absence of mechanical compression that the delivery canal triggers in the newborn's chest that helps to expel intrauterine pulmonary fluid[2-5]. Other factors discussed in the literature are low Apgar, due to its connection with respiratory function, and male gender, which is associated with late lung maturation[8-9].

Maternal use of antenatal corticosteroids is highly recommended and encouraged to prevent complications of preterm delivery. According to the European Consensus Guidelines on the Management of Respiratory Distress Syndrome, when the mother uses this medicine, before or during labor, the prevalence of the disease decreases, in addition to other morbidities, such as intraventricular hemorrhage and necrotizing enterocolitis[10]. Another benefit of its use is low health care costs since the need for specialized neonatal support is reduced[11].

In this study, only 43 mothers (13.52%) used antenatal corticosteroids. However, the prevalence of NRDS was higher among the newborns of mothers who used it. It is known that the use of corticosteroids by the mother alone does not guarantee the prevention of NRDS and, if administered late, its action may be impaired[12]. This research did not investigate the gestational age in which the steroid was administered, since this information was not included in the medical records. Therefore, other combined therapeutic interventions may ensure more satisfactory results.

The treatment of NRDS consists of lung recruitment maneuver, applying positive airway pressure, through noninvasive or invasive ventilation, associated or not with the use of exogenous surfactant[13]. In this study, the prevalence of ventilatory support with HOOD and CPAP was higher among newborns diagnosed with NRDS, as expected. The literature evidences the efficiency of noninvasive ventilation in NB and the increasing tendency of its use in neonatal units[14]. Studies show that CPAP decreases the need for tracheostomy and mechanical ventilation, and is associated with decreased bronchopulmonary dysplasia and neonatal mortality[15-16]. Despite the

consensus on the benefits of using positive airway pressure in newborns, its excessive and undue use causes adverse effects, such as increased pulmonary vascular resistance, reduced pulmonary perfusion, decreased venous return and low cardiac output[17]. Therefore, health professionals, especially the nursing team, need to be attentive to ensure the practical success of this procedure.

In this context, the importance of nursing care for preventing complications of oxygen therapy is of paramount importance to evaluate and determine the newborn's needs for a safe, humanized practice based on scientific evidence, with the objective of promoting adequate tissue oxygenation. During routine clinical care, the team's most common response to hypoxemia episodes is to increase the concentration of inspired oxygen. However, the correct intervention requires the nurse to evaluate these patients and perform the most effective measures based on physiology. These measures may include changes in ventilator parameters, airway aspiration, child repositioning, among other types of care. To this end, nursing professionals must be prepared to intervene quickly and efficiently in the complications, to prevent probable complications and provide adequate care to the newborn[2].

Surfactant appears in neonatal intensive care scenario as a preventive measure for respiratory complications. Studies indicate that its use is effective for the improvement of respiratory function when administered in NB at risk, such as preterm and low weight, and when indicated early, up to 2 hours after birth. In addition, the new practice of less invasive administration of surfactant has been widespread worldwide and presents positive results in relation to invasive use[18].

In this study, there was no significant association between NRDS and the use of surfactant. However, studies show that CPAP, used as a form of stabilization in the delivery room, associated with early administration of surfactant (>2 hours of life) demonstrates high efficacy, increasing the positive results of treatment[15-16].

Regarding nutritional support, newborns with respiratory distress used fewer formula and breast milk. Here, it is worth mentioning that most of the population that presented NRDS was preterm and, therefore, has a delayed diet introduction, depending on the severity of their clinical picture and gestational age. In addition, nutrition of those newborns begins with parenteral nutrition and then with breast milk, most often pasteurized, which would justify this finding.

The gold standard of neonatal nutrition is breast milk, which helps in the development, prevention of infection, in the microbiota, in pain relief, besides containing inositol and omega 3 and 6 that are linked to the prevention of bronchopulmonary dysplasia and help to reduce the effects of oxidation[19]. However, due to multifactorial factors, in certain circumstances, breastfeeding cannot start early. In these situations, PHM is the best option, because it promotes microbiota formation in a similar way to fresh breast milk and, in the long run, it brings benefits for intestinal functioning, strengthens the immune system and assists in metabolic processes[20].

There are cases in which the newborn presents intolerance to enteral nutrition, especially among the preterm ones, in which the cardiorespiratory system is compromised, due to abdominal distension. In these circumstances, parenteral nutrition is essential for newborns to achieve adequate postnatal growth[21].

Considering that PTNB have higher risks of developing respiratory disorders than those born at term, due to pulmonary immaturity, the results of this study confirm the importance of advances in high-risk pregnant women care and in the treatment of newborns for the reduction of neonatal morbidity and mortality, mainly due to the use of exogenous substances such as surfactant, CPAP and mechanical ventilation, among other therapeutic measures, which have played an important role in increasing survival rates of newborns with respiratory disabilities[12,22-23].

Regarding the limitations of the study, it is known that the review of medical records depends on the quality of the information contained therein, the incompleteness and absence of data substantially affect the reliable analysis of the data studied. Although the research was carried out in a university hospital, the use of electronic medical records in this NICU is still recent and did not cover the medical records analyzed. Nevertheless, the results presented here portray the healthcare context of this theme and may contribute to improving clinical practice and developing new research.

CONCLUSION

The results showed that half of the newborns in the NICU were diagnosed with NRDS, and the main factors associated with the event were prematurity and low birth weight.

Considering that these factors directly interfere with the morbidity, health team and managers need to pay greater attention to this profile. This knowledge can help them in actions planning to consolidate the perinatal network, restructuring and qualifying care processes in the prenatal care of high-risk pregnant women, childbirth, and NB care, in addition to human resources training to manage this neonatal disease.

Moreover, the results found contribute to the area of health and nursing, bringing to light elements that deepen the knowledge about NRDS and the main associated perinatal factors, helping in a better understanding of this event and its consequences for the newborn. Such knowledge is essential to guide health actions and policies aim at planning preventive interventions, besides contributing to the advance in the theoretical field on the subject.

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