near miss

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Near miss neonatal morbidity in a perinatology service

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RESUMO | OBJETIVO: identificar os casos de morbidade neonatal near miss em um serviço de Perinatologia do estado do Maranhão. MÉTODO: pesquisa descritiva e transversal de abordagem quantitativa, realizada a partir da análise dos dados de recém-nascidos internados na Unidade Neonatal de um Serviço de Perinatologia no período de 2017 a 2018. As análises estatísticas foram processadas no programa estatístico STATA versão 14.0. RESULTADOS: o peso ao nascer <1500g foi a variável que mais classificou casos de near miss neonatal, seguido pela variável de idade gestacional <34 semanas. Os resultados obtidos demonstraram associação entre hipertensão gestacional e peso ao nascer; hipertensão gestacional e idade gestacional ao nascer; parto cesáreo e Apgar no 5º minuto ≥ 7; parto cesáreo e sexo masculino. CONCLUSÃO: observou-se a importância da abordagem near miss neonatal para a compreensão ampliada da morbimortalidade neonatal e fatores associados.
Descritores: Morbidade; Near miss; Indicadores de morbimortalidade; Enfermagem neonatal; Saúde da criança.

ABSTRACT | OBJECTIVE: to identify cases of neonatal near miss morbidity in a Perinatology service in the state of Maranhão. METHOD: descriptive and cross-sectional research with a quantitative approach, based on the analysis of data from newborns admitted to the Neonatal Unit of a Perinatology Service from 2017 to 2018. Statistical analyzes were processed in the statistical program STATA version 14.0. RESULTS: birth weight <1500g was the variable that most classified cases of neonatal near miss, followed by the variable of gestational age <34 weeks. The results obtained demonstrated an association between gestational hypertension and birth weight; gestational hypertension and gestational age at birth; cesarean delivery and Apgar at the 5th minute ≥ 7; Cesarean delivery and male. CONCLUSION: the importance of the neonatal near miss approach for a broader understanding of neonatal morbidity and mortality and associated factors was observed.
Keywords: Morbidity; Near miss; Morbimortality indicators; neonatal nursing; Child health.

RESUMEN | OBJETIVO: identificar casos de morbilidad neonatal near miss en un servicio de Perinatología en el estado de Maranhão. MÉTODO: investigación descriptiva y transversal con enfoque cuantitativo, basada en el análisis de datos de recién nacidos ingresados en la Unidad Neonatal de un Servicio de Perinatología de 2017 a 2018. La estadística se procesó en el programa estadístico STATA versión 14.0. RESULTADOS: el peso al nacer <1500g fue la variable que más clasificó los casos de cuasi-miss neonatal, seguida de la variable edad gestacional <34 semanas. Los resultados obtenidos demostraron una asociación entre la hipertensión gestacional y el peso al nacer; hipertensión gestacional y actos gestacionales al nacer; parto por cesárea y Apgar al quinto minuto ≥ 7; Parto por cesárea y masculino. CONCLUSIÓN: Se observó la importancia del enfoque de cuasi accidente neonatal para una comprensión más amplia de la morbilidad y mortalidad neonatal y los factores asociados.
Palabras claves: Morbosidad; Casi fallar; Indicadores de morbimortalidad; enfermería neonatal; Salud de los niños.

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INTRODUCTION

Infant mortality is traditionally considered an indicator of health for populations, and is a reflection of biological, social, cultural factors and health system failures. 1 According to data from the Brazilian Institute of Geography and Statistics (IBGE - Instituto Brasileiro de Geografia e Estatística) in 2018, Brazil presented a mortality rate of 12.35 deaths per thousand live births, while the state of Maranhão reached a mark above the national average. 2

In 2011, Brazil reached the goal of reducing infant mortality by two thirds, contemplated in the Millennium Development Goals and planned for 2015 by the United Nations. 3 In recent decades, the world infant mortality rate has

more than halved the number of deaths among children under five years of age, however, the number of newborn (NB) deaths remains high, especially in the most disadvantaged countries, 4 since the reduction in mortality did not occur homogeneously between age groups, configuring neonatal deaths as the main component of infant mortality. 5

The first days of a newborn's life are considered the most vulnerable, making the reduction of mortality in the neonatal period difficult and slow. 6 The cause of infant deaths is associated with different reasons, depending on the age group in which it occurs. Deaths that occur between 0 and 27 days of life represent the neonatal component of infant mortality, and are closely related to the quality of care and service provided. 7

Considering that in Brazil there are about four cases of near miss for a neonatal death, the concept of near miss has been increasingly used in health for the discussion of morbidity and associated factors, as a tool for investigating care indicators and evaluating perinatal cares that contribute to the prevention of undesirable outcomes. 8,9

The term near miss began to be used in neonatology from 1970 onwards, associated with adverse events in intensive care units, such as severe jaundice, encephalopathy, or "sudden near death syndrome". 10 Although there is no international standardization regarding the definition or criteria of neonatal near miss (NNM), a definition similar to maternal near miss is used, applying to cases in which newborns presented severity markers at birth, but survived the neonatal period. 9

The present study aimed to identify cases of neonatal near miss morbidity in a Perinatology service in the state of Maranhão, to characterize the profile of neonatal near miss morbidity of newborns in the neonatal unit of the Perinatology service and to make an association between the profile of newborns with neonatal near miss morbidity and maternal indicators.

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METHOD

This is a descriptive and cross-sectional study with a quantitative approach carried out from the analysis of data from newborns admitted to the Neonatal Unit of the University Hospital of the Federal University of Maranhão (HUUFMA). The period considered for the research comprised the years 2017 and 2018. The population comprised newborns from the database of the Brazilian Neonatal Research Network (RBPN) of the Perinatology Service. Newborns who met at least one of the following criteria were classified as neonatal near miss: birth weight <1500g, gestational age <34 weeks, Apgar at the 5th minute < 7 and use of mechanical ventilation. Data from newborns and their mothers for the years 2017 and 2018 were included. Records with filling errors were not included in the research. For the sample, 259 records were identified, with 141 records from the year 2017 and 118 records from the year 2018. However, 10 records were excluded due to incomplete data, leaving 249 records for the analysis of the study. Of the total, 160 were considered neonatal near miss, 89 died. The newborn variables studied were: birth weight in grams; Apgar at 5 minutes, gestational age in completed weeks, sex of the newborn; use of mechanical ventilation. The maternal variables selected were: prenatal care, hypertension in this pregnancy, peripartum hemorrhage, type of delivery.

The collection was carried out from November 2020 to February 2021 from the database organized in a table in Microsoft Excel, fed with information from the records of newborns during the years 2017 and 2018 in the Perinatology Service. In compliance with the ethical principles of Resolution CNS/MS n° 466/12 of the National Health Council, this research was approved under opinion n° 4.042.517.

In the descriptive analysis, the variables were presented by means of frequency and percentage. The association between cases of neonatal near miss morbidity and maternal indicators was verified by multinomial logistic regression. The significance level adopted was 5%. Statistical analyzes were processed in the statistical program STATA version 14.0. The analysis method for this study hides one of the categories, using it as a reference, to verify how much the others deviate from it.

RESULTS

Regarding the classification criteria for neonatal near miss morbidity, in the variable birth weight, 160 (100%) were obtained, that is, all NBs who remained alive had birth weight <1500g. 143 (89.37%) were classified for gestational age < 34 weeks. Regarding mechanical ventilation, 98 (61.25%) of the neonates used it during the hospitalization period and the Apgar index < 7 presented the least expressive values, of 15 (9.35%).

Regarding the type of delivery, there was a predominance of cesarean deliveries 114 (71.25%) compared to vaginal deliveries 46 (28.75%).

Multinomial logistic regression, table 3, found a lower expected risk in the associations between: cesarean delivery and male sex (coefficient = -0.8835), hypertension in pregnancy and very low birth weight (coef. = -1.4175) . The highest expected risk was evidenced in the associations between hypertension in pregnancy with a gestational age between 28 and 34 weeks (coef.= 2.1649), and cesarean delivery at 5th minute Apgar ≥ 7 (coef.=1.1084). All other associations did not show statistical significance.

DISCUSSION

Regarding the criteria selected to compose the neonatal near miss mor-

bidity indicator, weight is an important health marker used to measure neonatal morbidity and mortality rates and living conditions at birth. When below adequate (<2500g), it may be related to different maternal factors. 11

Results found in research carried out in a maternity hospital in Mato Grosso do Sul showed birth weight below 1500 g as a risk factor for prolonged periods of hospitalization in the neonatal intensive care unit, due to gre-

Table 1 - Characterization of neonatal near miss cases in terms of NB variables. Perinatology Service. São Luís, Maranhão, Brazil, 2021.

NB Variables	Neonatal Near miss n (%)
Birth weight < 1500 g	160 (100,00%)
Gestational age < 34 weeks	143 (89,37%)
Apgar at 5th minute < 7	15 (9,37%)
Mechanical ventilation	98 (61,25)

Source: Survey data, 2021.

Table 2 – Characterization of the type of delivery of newborns classified as neonatal near miss in a Perinatology Unit. São Luís, Maranhao, Brazil 2021.

Type of delivery	n (%)
Vaginal	46 (28,75)
Cesarean	114 (71,25)

Source: Survey data, 2021.

TABLE 3 – Multinomial logistic regression. Maternal and newborn indicators. Perinatology Service – HUUFMA. São Luís, Maranhão, Brazil, 2021.

Variables	Maternal indicators			
RN indicators	Prenatal	Gestational hypertension	Peripartum hemorrhage	Cesarean delivery
Gender	-	Relative Risk Rate (RRR)		
Female	Reference	Reference	Reference	Reference
Male	1,64x10-8	0,7213	1,2267	0,4133*
Birth weight	-	-	-	-
Under 1000g	Reference	Reference	Reference	Reference
Between 1000 and 1500g	8,04x10-8	0,2423*	1,7860	1,7423
Gestational age	-	-	-	-
Under 28	Reference	Reference	Reference	Reference
Between 28 and 34	9,55x10-8	8,7139*	0,6792	2,5752
Between 34 and 37	0,3836	3,9033	1,16x10-7	2,0702
Above 37	5,1336	7,0342	2,73x10-7	4,36x106
Apgar at 5th minute	-	-	-	-
< 7	Reference	Reference	Reference	Reference
≥ 7	5,41x10-8	1,1444	0,5648	3,0295*
Mechanical ventilation	-	-	-	-

Not informed	Reference	Reference	Reference	Reference
No	$6,05 \times 10^{-8}$	1,0655	0,3578	1,0806
Yes	$7,17 \times 10^{-8}$	0,4642	1,9525	0,9012

Source: Survey data, 2021.

ater vulnerability due to the immaturity of organs and systems of the NB. 12

Data from a survey carried out in Vitória - ES showed that women diagnosed with any complications during pregnancy were approximately two to three times more likely to have a newborn with low birth weight. 11 Figueiro-Filho 12 highlights other significant factors for very low birth weight, such as delivery at a gestational age of less than 33 weeks, low Apgar scores in the first and fifth minutes, in addition to maternal factors such as gestational hypertension, and bleeding in any trimester during pregnancy.

The results obtained in this research, table 3, showed statistical significance in the association between gestational hypertension and very low birth weight, corroborating the findings of the described literature. 11,12 Birth weight stood out as the variable with the highest frequency of neonatal near miss cases. It should be noted that this was one of the basic criteria for entering the database where the data were collected, therefore, there would be no way to present records that weighed more than 1500g.

It was observed in the works carried out by Nardello et al. 13 and Pereira et al.14 strong association between gestational hypertension and adverse neonatal outcomes, such as prematurity. The present study showed statistical significance in the association between women who had gestational hypertension and births between 28 and 34 weeks of gestational age, table 4, confirming the relationship found in the literature. Furthermore, in the study carried out by Pereira et al. 14 it was observed that women with hypertensive syndrome of pregnancy had twice the risk of neonatal near miss.

Preterm birth < 34 weeks, combined with very low birth weight, is a risk factor that makes up the main causes of early neonatal deaths. In work published by França 15 gestational age

was the variable that, in isolation, most classified cases of neonatal near miss. However, in this research, it obtained the second highest frequency for NNM, according to table 1.

As for the type of delivery, Nardello et al. 13, Silva 16, Pereira et al.14 show that, among near miss NBs, those born by cesarean section predominate, also confirmed by this study (Table 2) in which there was a predominance of cesarean deliveries in relation to vaginal deliveries, which may be related to the fact that this study was carried out in a reference unit for high-risk pregnancy and, therefore, there is a tendency to present a higher percentage of cesarean sections when compared to maternity hospitals with usual risk, for example.

The study carried out by Pereira et al.14 considered that cesarean delivery predisposes the NB to an increased chance of having a neonatal near miss. They also state that maternal-fetal complications are justified by the causes of the clinical indications for cesarean delivery and, not necessarily, due to the mode of delivery as the main factor, however this discussion still needs to be better investigated and elucidated in the literature.

In the present study, cesarean delivery showed statistical significance in the associations between Apgar ≥ 7 and male sex (Table 3), however, the literature states that there is no relationship between the type of delivery and Apgar scores in the first and fifth minutes, because they show no significant differences 16, 17 and are not eligible criteria for neonatal near miss morbidity.

In the study carried out at a university hospital in Presidente Prudente, São Paulo, Apgar scores at the 5th minute were significant to compose the

neonatal near miss rate together with weight < 1,750 g and gestational age < 33 weeks. 18 However, it was observed in this research (Table 1) that the Apgar score < 7 in the 5th minute of life was the criterion that classified the lowest number of cases of neonatal near miss morbidity, corroborating the results found in the studies carried out by Silva et al. 19 and França 15, in which the Apgar score was the criterion that least classified cases of neonatal morbidity, and proved to be the least sensitive factor. Therefore, it is recommended that this variable not be evaluated in isolation, as the NB may be at risk of morbidity and mortality even having obtained an adequate Apgar score. 18

Regarding the use of mechanical ventilation, a variable tested and inserted by Silva et al. 19 for the classification of NNM cases, used to support severe respiratory diseases, was the one that presented the largest number of cases that met the criteria for neonatal near miss morbidity, being able to increase the sensitivity, although slightly decreasing the specificity of the indicator. However, in the present study, of the cases classified as near miss, mechanical ventilation was the variable with the third highest percentage (Table 1), demonstrating divergence with the cited literature.

CONCLUSION

The importance of the neonatal near miss approach helps in the expanded understanding of neonatal morbidity and mortality indicators and associated factors that contribute to undesirable outcomes. Focusing on the quality of care throughout the prenatal and perinatal period is essential for the

prevention of diseases, the institution of treatments in a timely and consequential time, the minimization of invasive interventions, in addition to the reduction of the newborn's hospitalization time.

The results obtained showed that the variables that most classified near miss events were birth weight less than 1500g, followed by gestational age < 34 weeks, mechanical ventilation and Apgar < 7 at the 5th minute, respectively. A close relationship was observed between morbidity factors, which, when combined, potentiate health problems and the chances of adverse outcomes.

Multivariate statistical analysis showed an association between neonatal near miss cases and the maternal indicator of gestational hypertension. However, some associations were statistically significant, but did not meet the eligible criteria for neonatal near miss, such as cesarean delivery that was associated with male sex and Apgar at the 5th minute ≥ 7.

The absence of an internationally established definition and criteria for neonatal near miss made it difficult to compare them with the literature because they used different variables and cut-off points. A limitation considered was the selection bias of newborns, as

all newborns included in the database were weighing less than 1500g, thus, all the data collected were already cases of neonatal near miss, not representing a faithful profile of the newborns born in the unit.

Furthermore, we suggest the conceptual validation and criteria for operationalization in health services, aiming at standardization in data collection, identification of weaknesses and characterization of the profile of newborns, in order to promote actions and public policies aimed at maternal and child health and the development of new works on the subject.

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