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Fetal and neonatal deaths of children of patients classified as *near miss*

Óbitos fetais e neonatais de filhos de pacientes classificadas com near miss

Óbitos fetales y neonatales de hijos de pacientes clasificados con near miss

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ABSTRACT

Objective: identify the epidemiological aspects of early fetal and neonatal deaths in children of patients classified with near miss and the factors associated with this outcome. **Method**: a cross-sectional study of 79 women identified with near miss and their newborns. The variables were analyzed using Fisher's exact test. Risk factors were estimated based on unadjusted and adjusted odds ratios, and by means of multiple correspondence analysis, with significance for $p < 0.05$. **Results**: hypertensive disorders totaled 40.5%; Of these, 58.3% had *adverse fetal and neonatal outcome*. The newborns admitted to the Neonatal Intensive Care Unit proved to be significant for the outcome (70.8%), gestational age < 32 weeks (41.6%), birth weight < 2500 (66.7%), neonatal asphyxia (50%) and early respiratory discomfort (72.2%). **Conclusion**: prematurity, neonatal asphyxia, and early respiratory distress were significant characteristics for the outcome among newborns.

Descriptors: Pregnancy Complications; Near Miss; Fetal Death; Perinatal Death; Epidemiology.

RESUMO

Objetivo: identificar os aspectos epidemiológicos dos óbitos fetais e neonatais precoces em filhos de pacientes classificadas com *near miss* e os fatores associados a este desfecho. **Método**: estudo transversal realizado com 79 mulheres identificadas com *near miss* e seus recém-nascidos. As variáveis foram analisadas utilizando-se o teste Exato de Fisher. Os fatores de risco foram estimados com base nas razões de chances não ajustadas e ajustadas, e por meio de análise de correspondência múltipla, com significância para $p < 0,05$. **Resultados**: as desordens hipertensivas totalizaram 40,5%; destas, 58,3% tiveram *desfecho fetal e neonatal adverso*. Mostraram-se significantes para o desfecho os recém-nascidos admitidos na Unidade Terapia Intensiva Neonatal (70,8%), idade gestacional < 32 semanas (41,6%), peso ao nascer < 2500 (66,7%), asfixia neonatal (50%) e desconforto respiratório precoce (72,2%). **Conclusão**: prematuridade, asfixia neonatal e desconforto respiratório precoce constituíram características significantes para o desfecho entre os recém-nascidos.

Descritores: Complicações na Gravidez; Near Miss; Morte Fetal; Morte Perinatal; Epidemiologia.

RESUMEN

Objetivo: identificar los aspectos epidemiológicos de los óbitos fetales y neonatales precoces en hijos de pacientes clasificados con *near miss* y los factores asociados a este desenlace. **Método**: estudio transversal realizado con 79 mujeres identificadas con *near miss* y sus recién nacidos. Las variables fueron analizadas utilizando la prueba Exacta de Fisher. Los factores de riesgo fueron estimados con base en las razones de posibilidades no ajustadas y ajustadas, y por intermedio de análisis de correspondencia múltiple, con significación para $p < 0,05$. **Resultados**: los desórdenes hipertensivos totalizaron el 40,5%; de los cuales el 58,3% tuvieron *desenlace fetal y neonatal adverso*. Se han mostrado significativos para el desenlace los recién nacidos admitidos en la Unidad

de Terapia Intensiva Neonatal (70,8%), edad gestacional < 32 semanas (41,6%), peso al nacer < 2500 (66,7%), asfixia neonatal (50%) y dificultad respiratoria de inicio precoz (72,2%). **Conclusión**: prematuridad, asfixia neonatal y dificultad respiratoria de inicio precoz constituyeron características significativas para el desenlace entre los recién nacidos.
Descriptores: Complicaciones en el Embarazo; Near Miss; Muerte Fetal; Muerte Perinatal; Epidemiología.

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INTRODUCTION

The reduction of the absolute number of maternal deaths motivated the study of the levels and causes of severe maternal morbidity as well as the cases of maternal near miss (MNM), that is, "the woman who almost died but survived a complication that occurred in pregnancy, delivery or up to 42 days after gestation"[1]. It is a condition that is more frequent than maternal death and allows the patient to be the source of information about the illness, and it is useful to assess the quality of obstetric care[2-3].

Maternal conditions during gestation and delivery may influence fetal and neonatal conditions, such that MNM may contribute to increased perinatal morbidity and mortality. The literature also describes an extremely strong association with adverse perinatal events that may lead to fetal and neonatal deaths[3-4].

Although studies on near miss (NM) are frequent in recent years, there are few studies on perinatal complications among these patients, as well as studies that relate MNM to early fetal and neonatal death. Recent research in Brazil and China on such a relation shows that mothers who have had obstetric complications have an increased risk for fetal and neonatal death as well as for neonatal prematurity and asphyxia[3,5].

In this context, fetal and neonatal adverse outcome (FNAO) among NM patients has yet to be explored. Newborns (NB) who were close to death due to extreme prematurity or neonatal asphyxia, whose mothers were MNM, also require special attention[3].

The term near miss neonatal (NMN) for these NBs was based on the MNM concept and refers to a newborn with a severe complication during the first days of life, who almost died but survived during the neonatal period. Although the criteria are not yet a consensus, the most used are those presenting any of the risk conditions at birth (Apgar lower than 7 at the 5th minute, gestational age lower than 30 weeks, weight lower than 1,500g) and no death until the sixth day of life[4].

This study aimed to identify the epidemiological aspects of early fetal and neonatal deaths in patients with MNM and the factors associated with this outcome.

METHOD

Ethical aspects

This study was approved by the Research Ethics Committee of Universidade Federal de Sergipe, on August 11, 2014.

Design, place of study and period

The research is characterized by being cross-sectional, whose population was composed of puerperas who met at least one of the NM criteria and their newborns (RN). The research was carried out in maternity hospitals in the city of Aracaju, capital of Sergipe State, Brazil, from September 2014 to September 2015.

Population or sample; Inclusion and exclusion criteria

The study population was composed of 79 puerpera and their newborns, who were born alive or who died, fetal and neonatal premature, i.e. up to 22 weeks of gestation or 7 days after birth. On the other hand, the mothers had at least one of the following criteria recommended by WHO[1]: clinical criteria (acute cyanosis, "gasping", respiratory rate > 40 or < 6 / ipm, shock, oliguria not responsive to fluids or diuretics, coagulation disorders, loss of consciousness for 12 hours or more, loss of consciousness and absence of pulse or heartbeat, stroke, uncontrolled convulsion, jaundice in the presence of pre-eclampsia); [SO2 < 90% for 60 minutes or more, PaO_2 / FiO_2 < 200MD Hg, creatinine ≥ 3.5mg / dL, bilirubin ≥ 6.0mg / dL, pH < 7.1, lactate > 5, acute thrombocytopenia (< 50,000), loss of consciousness and presence of glucose and ketone in the urine]; and management (use of vasoactive drugs, hysterectomy by infection or hemorrhage, transfusion ≥ 5 units of red blood cells, intubation and ventilation for ≥ 60 minutes unrelated to anesthesia, dialysis for acute renal failure, cardiorespiratory arrest).

Women from other states of the federation, or cases of maternal death (mothers who died within 42 days of delivery) were excluded, as well as fetuses with gestational ages below 20 weeks, considered non-viable.

Study Protocol

One researcher performed daily data collection in the morning and afternoon shifts, seven days a week, on a pre-established scale and with the help of previously trained undergraduate scholarship recipients. Initially, an analysis was made of all the medical records of women admitted to the study sites in search of cases characterized as near miss and, when the inclusion criteria were met, the NB medical record was also analyzed and an interview was performed to complement the information. Adverse fetal and neonatal outcome (AFNO) were considered both early fetal and neonatal death cases as well NMN.

The variables studied were: MNM criteria (clinical, laboratory and management criteria), characteristics of obstetric disorders of MNM (preexisting disease, hemorrhagic disorders, hypertensive disorders, other systemic or associated disorders, use of medication for the identified disease), sociodemographic variables (MNM age, color / race, marital status, education, family income) variables related to pregnancy and delivery (prenatal, number of visits, type of delivery, parity, previous stillbirths, RN intake site) and characteristics of the

RN (gestational age in weeks, RN sex, birth weight, 5 min Apgar, RN size, neonatal asphyxia, early respiratory distress).

Analysis of results and statistics

We chose to analyze the data in the *R Core Team* 2015 Statistical Program. We calculated the central measures for the continuous variables and frequency measures for the categorical variables. Fisher's exact test was used to verify the association of the variables and, in the assessment of the intensities of the risk factors, the unadjusted odds ratios were estimated and adjusted with their respective confidence intervals. The values with $p < 0.05$ were considered significant. For the construction of the percent map, the multiple correspondence analysis was used between the variables, whose significance level associated with the AFNO was less than 20%. This margin was chosen to better visualize possible associations.

RESULTS

During the study period, a total of 16,549 births were recorded in the city of Aracaju, all from women living in the state of Sergipe. 79 cases of MNM were identified, with 17 maternal deaths recorded in this period. The rates found were: maternal mortality, 102.7 cases / 100,000 live births (LB); prevalence of MNM, 4.7 cases / 1,000 NV; MNM ratio: MD of 4.5: 1 - indicating that the number of MNM cases was 4.5 times greater than MD. Twenty four AFNO were identified, with seven fetal deaths, one early neonatal death and 16 NMN.

Table 1 shows the distribution of MNM cases, according to WHO criteria, as well as the relationship with AFNO. Among MNM criteria, clinicians had a higher prevalence, with 62 cases (78.5%); The AFNO of these mothers were 19 (31%). Mothers who presented management criteria totaled 46 (58.2%); For the AFNO, 15 cases (33%). The laboratory criteria were present in 18 cases (22.8%) and, of these, seven (39%) were AFNO.

Table 1 – Distribution of maternal near miss criteria according to adverse neonatal outcome, Aracaju, Sergipe, Brazil, 2014-2015

	MNM*	Fetal outcome adverse neonatal		*p* value
		Yes	No	
	n %	n %	n %	
Clinic				
Yes	62 (78.5)	19 (31)	43 (69)	1.000
No	17 (21.5)	5 (29)	12 (71)	
Laboratorial				
Yes	18 (22.8)	7 (39)	11 (61)	0.392
No	61 (77.2)	17 (28)	44 (72)	
Management				
Yes	46 (58.2)	15 (33)	31 (67)	0.399
No	33 (41.8)	9 (14)	55 (86)	

*Note: * Maternal Near Miss*

Regarding the obstetric disorders of NM cases (Table 2), 20 women (25.3%) had preexisting diseases, and nine (37.5%) had AFNO. Hemorrhagic disorders (premature placental abruption, uterine rupture, coagulation disorder) were present in 29 (36.7%) women and, of these, seven (29.2%) with AFNO. Hypertensive disorders (severe pre-eclampsia, eclampsia, hypertension) totaled 32 cases (40.5%) and, of these, 14 (58.3%) were AFNO, with *p*-value significance = 0.046. Other systemic or associated disorders (sickle-cell anemia, syphilis, diabetes, heart disease, aplasia of the spinal cord, lupus, urinary tract infection) accounted for 27 women (34.2%) and of these, five (10.8%) with AFNO.

The sociodemographic and gestational and childbirth aspects are presented in Table 3. Of the cases of maternal near miss identified, 49 (62.0%) were in the age range of 20 to 35 years, but 18 (22.8%) occurred in adolescent mothers. It was verified that 12 (50.0%) cases of AFNO were among women between 20 and 35 years of age. The highest frequency of AFNO was identified in non-white women (19, 79.2%); In conjugal situation with partner (22, 91.7%); Schooling > 8 years (12, 52.2%); And bearers of family income < 3 minimum wages (22, 91.7%).

It was observed that 22 (91.7%) cases of AFNO were from women who had prenatal care, with a number of consultations < 6 (13, 54.2%). The highest prevalence of AFNO was due to cesarean delivery 20 (83.3%), of women with two to three children (11, 45.8%) and without previous stillbirths (17, 70.8%), having been found statistical significance for this last variable p 0.038, RP 0.43 (.23 to .82). The NB admitted with AFNO in the NICU were 17 (70.8%) and had significance p < 0.001 RP 0.51 (0.36-0.72).

Table 4 shows that 30 (38.0%) of the women classified as NM had preterm birth; Female RN accounted for 41 (51.9%); Children with birth weight < 2500 grams added 29 (36.7%); APGAR < 7 in the fifth minute, nine (12.5%); And NB PIG and GIG, six (7.6%) and nine (11.4%), respectively. It was found that 28 (38.4%) of the children of these women had early respiratory distress.

In the AFNO analysis, statistical significance was identified for children from gestational age < 32 weeks (10, 41.6%), p < 0.001, RP, 7.00 (3.52-13.9); Birth weight < 2500 (16, 66.7%), p 0.001, PR 3.45 (1.69-7.05); P < 0.001, RP (7.87 (4.12-15.0), neonatal asphyxia p < 0.001, RP 5.08 (2.56 - 10.1) and early respiratory distress p = 0.002, RP 4.18 (1.67-10.5).

In the multiple correspondence analysis, we used the variables selected by the significance p < 0.2 contained in Tables 1, 2, 3 and 4. The variables that were grouped in four distinct axes (Figure 1) and the corresponding results that had greater associations were divided into sets for better visualization.

It was found a relationship between pregnant women who presented hypertensive disorders and preexisting diseases, such as cesarean delivery and medication use during pregnancy. AFNO had a greater association with preterm and low birth weight NB < 2500. Women diagnosed with other systemic disorders performed more than six prenatal visits.

Table 2 – Distribution of maternal near miss obstetric disorders and second adverse neonatal outcome, Aracaju, Sergipe, Brazil, 2014-2015

		Fetal outcome adverse neonatal			
	MNM*	Yes	No	*p* value	PR** (CI 95%)
	n %	n %	n %		
Preexisting disease					
Yes	20 (25.3)	9 (37.5)	11 (20)	0.158	1.77 (0.92-3.40)
No	59 (74.7)	15 (62.5)	44 (80)		
Hemorrhagic disorders					
Yes	29 (36.7)	7 (29.2)	22 (40)	0.450	0.71 (0.33-1.51)
No	50 (63.3)	17 (70.8)	33 (60)		
Hypertensive disorders					
Yes	32 (40.5)	14 (58.3)	18 (32.7)	0.046	2.06 (1.05-4.04)
No	47 (59.5)	10 (41.7)	37 (76.3)		
Other systemic or associated disorders					
Yes	27 (34.2)	5 (10.8)	22 (40)	0.125	0.51 (0.21-1.21)
No	52 (65.8)	19 (79.2)	33 (60)		
Used medication for the identified disease					
Yes	27 (34.2)	11 (45.8)	16 (29.1)	0.198	1.63 (0.85-3.14)
No	52 (65.8)	13 (54.2)	39 (70.9)		

*Note: *MNM: *Maternal Near Miss; **PR: Prevalence ratio.*

Table 3 – Distribution of the sociodemographic and gestational aspects of the maternal near miss cases according to the adverse neonatal outcome, Aracaju, Sergipe, Brazil, 2014-2015

		Adverse neonatal fetal outcome			
	MNM*	Yes	No	*p* value	PR** (CI 95%)
	n %	n %	n %		
MNM Age*					
<20	18 (22.8)	7 (29.2)	11 (20.0)	0.343	0.93 (0.38-2.26)
20-35	49 (62.0)	12 (50.0)	37 (67.3)		0.59 (0.26-1.35)
>35	12 (15.2)	5 (20.8)	7 (12.7)		
Color / Race					
White	11 (13.9)	5 (20.8)	6 (10.9)	0.295	1.63 (0.77-3.45)
Not White	68 (86.1)	19 (79.2)	49 (89.1)		
Marital status					
With partner	70 (88.6)	22 (91.7)	48 (87.3)	0.715	1.41 (0.40-5.04)
Without partner	9 (11.4)	2 (8.3)	7 (12.7)		
Education					
≤8 years	37 (50)	11 (47.8)	26 (51)	1.000	0.92 (0.46-1.81)
>8 years	37 (50)	12 (52.2)	25 (49)		
Family income in minimum salary					
<3 Minimum wages	71 (89.9)	22 (91.7)	49 (89.1)	1.000	1.24 (0.35-4.32)
≥3 Minimum wages	8 (10.1)	2 (8.3)	6 (10.9)		
Prenatal					
Yes	75 (94.9)	22 (91.7)	53 (96.4)	0.581	0.59 (0.21-1.66)
No	4 (5.1)	2 (8.3)	2 (3.6)		
Number of consultations					
<6	33 (41.8)	13 (54.2)	20 (36.4)	0.214	1.65 (0.85-3.21)
≥6	46 (58.2)	11 (45.8)	35 (63.6)		
Type of delivery					
Normal	22 (27.8)	4 (16.7)	18 (32.7)	0.179	0.52 (0.20-1.34)
Caesarean	57 (72.2)	20 (83.3)	37 (67.3)		
Parity					
Primiparous woman	32 (40.5)	9 (37.5)	23 (41.8)	0.493	1.26 (0.45-3.53)
2-3	29 (36.7)	11 (45.8)	18 (32.7)		1.71 (0.64-4.55)
>3	18 (22.8)	4 (16.7)	14 (25.5)		
Previous stillbirths					
Yes	12 (15.2)	7 (29.2)	5 (9.1)	0.038	2.30 (1.22-4.32)
No	67 (84.8)	17 (70.8)	50 (90.9)		
Place of admission of the newborn					
NICU***	33 (41.8)	17 (70.8)	16 (29.1)	**<0.001**	0.51 (0.36-0.72)
Joint Accommodation	21 (26.6)	0 (0)	21 (38.2)		-
Intermediate Unit	18 (22.8)	0 (0)	18 (32.7)		-
Dead fetus	7 (8.9)	7 (29.2)	0 (0)		

*Nota: *MNM: Near Miss Materno; **PR: Prevalence ratio; *** NICU: Neonatal intensive care unit.*

Table 4 – Distribution of characteristics and medical diagnoses of newborns according to the cases of near miss maternal and adverse neonatal outcome, Aracaju, Sergipe, Brazil, 2014-2015

		Fetal outcome adverse neonatal			
	MNM* n %	Yes n %	No n %	*p* value	PR** (CI 95%)
Gestational age in weeks					
< 32 weeks	10 (12.7)	10 (41.6)	0 (0)	**<0.001**	7.00 (3.52-13.9)
33-36 weeks	20 (25.3)	7 (29.2)	13 (23.6)		2.45 (0.99-6.08)
≥37 weeks	49 (62)	7 (29.2)	42 (76.4)		
Newborn sex					
Female	41 (51.9)	12 (50)	29 (52.7)	1.000	0.93 (0.47-1.81)
Male	38 (48.1)	12 (50)	26 (47.3)		
Weight at birth					
<2500	29 (36.7)	16 (66.7)	13 (23.6)	0.001	3.45 (1.69-7.05)
≥2500	50 (63.3)	8 (33.3)	42 (76.4)		
APGAR of 5 min					
<7	9 (12.5)	9 (52.9)	0 (0)	**<0.001**	7.87 (4.12-15.0)
≥7	63 (87.5)	8 (47.1)	55 (100)		
Size of the newborn					
Great for GA ***	6 (7.6)	0 (0)	6 (10.9)	0.402	-
Small for GA ***	9 (11.4)	2 (8.3)	7 (12.7)		0.65 (0.18-2.30)
Suitable for GA ***	64 (81)	22 (91.7)	42 (76.4)		
Neonatal asphyxia					
Yes	12 (16.4)	9 (50)	3 (5.5)	**<0.001**	5.08 (2.56-10.1)
No	61 (83.6)	9 (50)	52 (94.5)		
Early respiratory distress					
Yes	28 (38.4)	13 (72.2)	15 (27.3)	0.002	4.18 (1.67-10.5)
No	45 (61.6)	5 (27.8)	40 (72.7)		

*Note: *MNM: Near Miss Materno; **PR: Prevalence ratio; ***GA: Gestational Age*

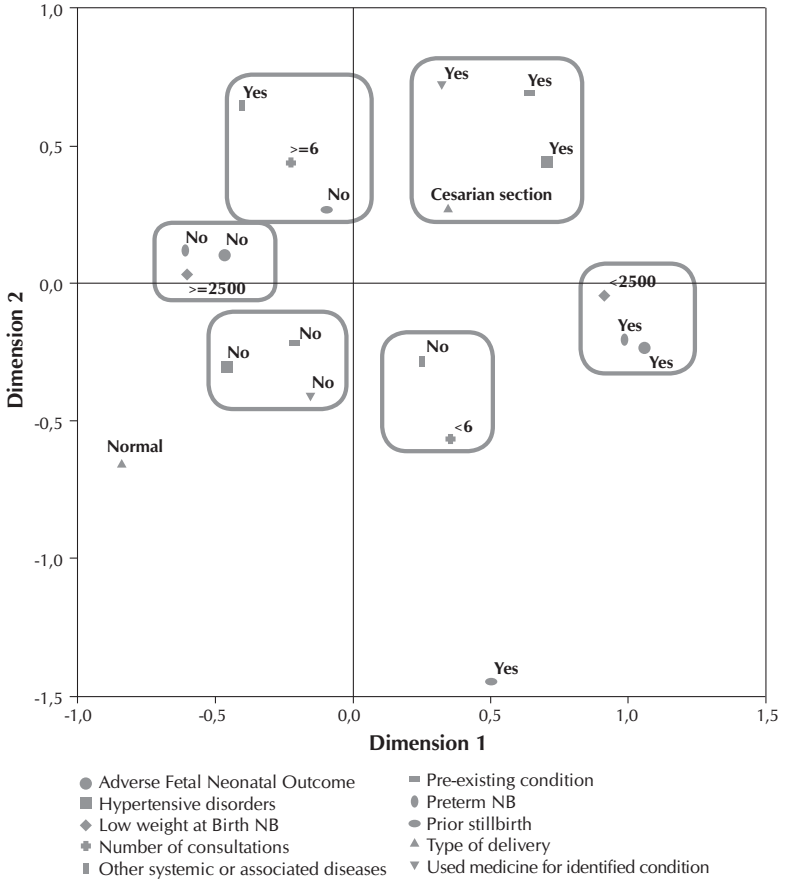

Figure 1 – Percentage map constructed based on the Multiple Correspondence Analysis using the variables that were significant at 20%

DISCUSSION

In this study, the maternal mortality rate, the incidence rate of MNM and the ratio of MNM: MD were similar to those identified in a study carried out two years ago in Sergipe[6], which indicates that the reduction in the number of maternal deaths and NM is a slow process, requiring consistent and active public policies, coupled with constant quality surveillance. However, although the results are lower than those recommended by the WHO, they are better compared to those of some countries such as Palestine, Lebanon, Egypt and Syria, in which one study observed a higher prevalence of MNM and MD[7].

Among AFNO, the proportion of fetal, early neonatal, and NMN cases was similar to that found in a study conducted in Recife, Brazil, with a prevalence of fetal deaths in relation to neonates[3]. A research conducted in France concluded that perinatal mortality occurs mainly in the uterus, which may be related to obstetric complications[8].

Among the MNM criteria, clinicians had a higher prevalence; identical results were evidenced in a multicentric study in Brazil[9]. The laboratory criteria were lower in number of cases (18 women, 22.8%), but were responsible for the higher percentage of AFNO

(39%). In two other studies developed in the Northeast Region of Brazil, the laboratory criteria were also highlighted, as they showed a positive association with the recorded deaths[3,10].

Of the mothers who had preexisting diseases, 37.5% had AFNO (sickle cell anemia, syphilis, diabetes, heart disease, aplasia of the spinal cord, lupus). A study performed in 29 countries showed significantly higher perinatal mortality when the patient had severe anemia[11].

Hemorrhagic disorders (premature placental abruption, uterine rupture, coagulation disorder) were present 36.7% women and, of these, seven 29.2% with AFNO. Complications related to hemorrhage were the most frequent conditions among maternal near miss cases in other studies[7,12]. In intravenous hemorrhage, only 8% of the women were found to have intrapartum hemorrhage. However, it was responsible for 18.2% of MNM and 10% of cases of maternal death. This indicates that the most severe cases of NM are related to hemorrhagic disorders[13].

Hypertensive disorders (severe pre-eclampsia, eclampsia, hypertension) totaled 40.5%, and of these, 58.3% had AFNO, with statistical significance. Hypertensive disorders were prevalent in cases of MNM in other studies conducted in the country[3,14-15], presenting a strong relation with prematurity. The same occurred in this study, since hypertension presented statistical significance for the AFNO. A similar result was found by Oliveira and Costa, who reported that MNM overlap and severe pre-eclampsia resulted in a strong association with AFNO, which is three times higher than in mothers without pre-eclampsia[3].

This higher frequency of hypertensive disorders among MNM cases and its association with AFNO suggests the need for improvements in prenatal care, aiming at the early identification and adoption of measures that prevent progression to complications and minimize repercussions on the fetus. This is considered feasible, since has already been observed in developed countries a reduction in the cases of hypertensive disorders (and they are not the main maternal condition associated with NM, but the hemorrhagic disorders)[16].

Of the MNM cases identified, the majority were in the age group of 20 to 35 years, as well as the AFNO - which differs from other studies conducted in Brazil and Nordic countries, in which MNM was associated with the maternal age of 35 years or more[9,17]. In this study, there was prevalence of NM cases related to parity of primigravidae, which may be related to the fact that hypertensive disorders are more frequent in the first gestation or to divergences in relation to parity in different countries. In a study carried out in Recife, 44.7% of the cases occurred in primiparous and hypertensive disorders were prevalent[10]; In the Nordic countries, the parity rate was higher and there was a higher frequency of hemorrhagic disorders[17].

The higher prevalence of AFNO was due to cesarean delivery, as reported in other studies on NM [3,18], a fact that may be related to pregnancy complications and interventions necessary to prevent death. A study carried out in the Netherlands has challenged the premise that cesarean section increases five times the chance of a woman becoming a near miss case, since in that country this association may be influenced by confounding factors, and it is questionable whether cesarean section is in fact a risk factor for near miss, or if it actually is a consequence of this condition [19], becoming, in some cases, a factor of protection to AFNO.

It was found that most AFNOs came from women who had prenatal care, with a number of visits <6. This result may be justified by prematurity, as there may not be enough time for the mother to have more consultations. A study conducted in Latin America and the Caribbean with women in prenatal care and a number of consultations of less than six due to pregnancy complications and interruption of pregnancy found higher mortality rates and greater frequency of NM cases and fetal and neonatal deaths [15]. In other studies in China and Brazil, it has been shown that complications in pregnancy result in higher rates of fetal and neonatal death, prematurity and death at birth[5,20].

In this study, the history of previous stillbirths was a risk factor for AFNO, with a statistically significant result. In a study in Nigeria, this risk factor was also found[21], which may allow us to infer that the previous occurrence of a stillbirth case in women's reproductive history increases twice the chance of AFNO in a next pregnancy.

The NB admitted with AFNO in the NICU had statistically significant results. Existing studies on admission to ICUs identified the main reasons for admission [22-23], but those who assessed the place of admission of the newborns of mothers with NM are insufficient. In Joinville, Santa Catarina, the risk factors for admission to the NICU were: low birth weight, Apgar with 5 minutes <7 and prematurity[22]. In Paraná, the most frequent diagnosis was prematurity (49.5%)[23]. All these characteristics are related to the AFNO and had significant results for this research.

It is found that 38.0% of women with preterm labor had NM; The AFNO of these mothers presented statistically significant results for children of gestational age <32 weeks (41.6%) and birth weight <2500 (66.7%). The relationship between these variables is referred to as extremely strong, since a premature NB will also be underweight. Prematurity is cited as the main feature in studies linking MNM with NB[3,23].

Among the children of women with MNM, there was also a considerable frequency of newborns with severe hypoxia (Apgar in the fifth min <7) and neonatal asphyxia[3]. In Nigeria, early neonatal deaths were mainly related to suffocation during delivery[21]. In Finland, a study found that the main neonatal outcome due to maternal complications was the high number of deaths, 80% of which were related to uterine rupture, which resulted in an increased risk of severe perinatal asphyxia[24]. In this study, neonatal asphyxia also presented significance for AFNO.

It was found that the early respiratory discomfort presented significant results for the AFNO. In a research developed in Chile, the respiratory distress syndrome was reported as the main cause of death. The use of corticosteroids and surfactant resulted in reduced mortality[25]. A study carried out in Belo Horizonte, Brazil, identified the death rates due to asphyxia / hypoxia and unspecified fetal death were increasing with the increase in the risk area, i.e., it was verified that the perinatal deaths were distributed differently regarding space and social vulnerabilities and that, therefore, tackling this complex problem requires the establishment of intersectional partnerships[26].

Limitations of the study

The limitations of this study are sometimes the incomplete recording of patient records and failure to perform examinations in cases of obstetric complications, which could make it difficult to identify the NM criteria. However, since data collection was performed daily and at all shifts, criteria that contemplated the inclusion of the puerperal woman in the study were observed in loco, even if this information was not reported in the medical record.

Contributions to the nursing, health or public policy area

As a contribution, the research raises a reflection about the assistance given to pregnant women with near miss, which may support the implementation of strategies to reduce the number of fetal and neonatal deaths. It is noteworthy that this research is unprecedented in the state of Sergipe, since there is no other study that addresses this issue.

CONCLUSION

The characteristics of early fetal and neonatal deaths in patients with MNM were strongly associated with fetal outcome and adverse neonatal. In mothers with hypertensive disorders, the significant characteristics for the outcome among the newborns were prematurity, neonatal asphyxia and early respiratory discomfort.

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