Risk factors for neonatal mortality in the life of first week

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RESEARCH

Fatores de risco para a mortalidade neonatal na primeira semana de vida

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Factores de riesgo para la mortalidad neonatal en la primera semana de vida

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ABSTRACT

Objective: to analyze the risk factors for early neonatal mortality. **Method:** analytical study with secondary data, from 2003 to 2012 in the state of Rio Grande do Norte (RN). The data were collected from the Department of the Unified Health System (SUS) and analyzed using descriptive statistics, the chi-square test from Pearson. **Results:** it was noteworthy the ratio of prevalence of low birth weight with 43.70 and then immediately prematurity with 41.55. It features as protective factor, maternal education 8 to 11 years of study. The first week of life: low birth weight, preterm and post-term, mothers with no education, the black race, twin pregnancy, teenagers pregnant and advanced age were risk factors for infant mortality in the early neonatal period. **Conclusion:** therefore, health services should prioritize prenatal, childbirth and postpartum care. **Descriptors:** Risk factors, Infant mortality, Health evaluation, Maternal-child nursing.

RESUMO

Objetivo: analisar os fatores de risco para a mortalidade neonatal precoce. **Método:** estudo analítico de dados secundários, da série histórica de 2003 a 2012, do estado do Rio Grande do Norte (RN), os quais foram coletados através do Departamento de Informática do Sistema Único de Saúde. Os dados foram analisados por meio da estatística descritiva, teste do qui-quadrado de Pearson. **Resultados:** destaca-se a razão de prevalência do baixo peso ao nascer com 43,70 e a prematuridade com 41,55. Apresenta como fator protetor escolaridade da mãe de 8 a 11 anos de estudo. Na primeira semana de vida, o baixo peso ao nascer, a prematuridade e pós-termo, mães sem escolaridade, da raça negra, gestação gemelar, gestantes adolescentes e de idade avançada apresentaram-se como fatores de risco para mortalidade infantil no período neonatal precoce. **Conclusão:** Portanto, requer atenção especial dos serviços de saúde na assistência pré-natal, parto e puerpério. **Descritores:** Fatores de risco, Mortalidade infantil, Avaliação em saúde, Enfermagem materno-infantil.

RESUMEN

Objetivo: Analizar los factores de riesgo para la mortalidad neonatal precoz. **Método:** Estudio analítico con datos secundarios, de la serie histórica de 2003 a 2012, en el estado de Rio Grande do Norte (RN). Fueron recogidos a partir del Departamento de Informática del Sistema Único de Salud. Los datos se analizaron por medio de la estadística descriptiva, test de Chi-cuadrado de Pearson. **Resultados:** Se destaca la prevalencia del bajo peso al nacer con 43,70 y la prematuridad con 41,55. Presenta como factor protector la escolaridad de la madre de 8 a 11 años de estudio. En la primera semana de vida: el bajo peso al nacer, la prematuridad y post-término, madres sin escolaridad, de raza negra, gestación de gemelos, gestantes adolescentes y de edad avanzada se presentaron como factores de riesgo para mortalidad infantil en el período neonatal precoz. **Conclusión:** Por lo tanto, se requiere atención especial de los servicios de salud en la asistencia pre-natal, parto y puerperio. **Descriptores:** Factores de riesgo, Mortalidad infantil, Evaluación en salud, Enfermería materno infantil.

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INTRODUCTION

Neonatal mortality is a serious public health problem and it is an indicator of quality of neonatal care. Thus, the factors involved should be continuously evaluated to improve the quality of life of children and reducing child mortality.

Neonate is every newborn who is in his first twenty-eight days, period known of adjustments in extra-uterine environment, and therefore susceptible to death by several factors resulting from a complex chain of biological determinants, socioeconomic and related to health care in the prenatal, delivery and postpartum.[1]

In 2012, Brazil occupied the 94th position in the world ranking of Infant Mortality Rate (IMR) in children under one year old children, with 20.5 deaths every one thousand live births. The first places were from nations with very high mortality rates as Afghanistan (1st place) with 121.63 IMR; Niger (2nd place) with 109.98 IMR and Mali (3rd place) with 109.08 IMR. The countries with lower IMR were Monaco (1.8), Japan (2.21) and Bermuda (2.47).[2]

In Brazil, as in most other countries, IMR is decreasing since the 80s. Between 2000 and 2010 it fell from 26.6 to 16.2 every one thousand live births respectively, but continuing with major regional differences.[3]

In 2010, the highest risk period was for the neonatal (0-28 days old) with 69% of infant deaths, because the decreasing is greater in the post-neonatal in all regions of the country. In the same period, the IMR in the Northeast decreased from 38.4 to 20.1 every one thousand live births, neonatal mortality rate was 22.7 reducing to 14.3. In this way, the post-neonatal period shows the mortality rate of 5.8 while the neonatal is 14.3.[3]

In Rio Grande do Norte State, according to MIS data, in 2011 there were 441 neonatal deaths, with 365 occurring between 0-6 days of life (early neonate), and 76 in the period from 7 to 27 days after birth (late neonate). Thus, the early neonatal deaths are the largest ones in children deaths under one year old.[4]

In actions to reduce infant deaths, there are the Commitments Agenda for the Comprehensive Child Health in order to reduce Infant Mortality, BRAZIL, 2004 in the First Week of Life must investigate the child´s record and discharge conditions and the unit that he was attended; general evaluation of the child and postpartum women; risk children identification at birth (low birth weight, severe asphyxia: Apgar score <7 at 5th minute of life, premature); guidelines on breastfeeding, newborn screening and hearing, immunization.[5]

In this context, the interest in this study was from the importance of knowledge and analysis of risk factors for neonatal death in the first week of life. Thus, the following question was created: What are the main risk factors associated with early neonatal mortality?

Given the importance of policies for control and child mortality and improving the quality of life of children, this study could generate subsidies for the development and adaptation of effective public policies for the elucidation of risk factors for early neonatal mortality in Rio Grande do Norte State.

Therefore, the study aims to analyze the risk factors for early neonatal mortality based on data available at DATASUS in Rio Grande do Norte State.

METHOD

This is an analytical study with secondary data collected from the Department of Health System Informatics. Data from this system are routinely collected as official sources of the Ministry of Health, registered in the Mortality Information System (MIS).[4]

The study population were all deaths occurring in the first six days of life, from to 2012, corresponding to the last 10 years available on the website (www.datasus.gov.br) data collection in June 2014. There were a total of 4,158 neonatal infant deaths during the study period. Deaths without records information relating to study variables were not included in the analysis.

Data collection was performed in MIS database, through the following independent variables: birth weight, race/color, type of pregnancy, gestational age, type of delivery, maternal age and maternal education. Early neonatal mortality was considered as the dependent variable.

All records registered in the database as ignored or not informed at the time of filling data were excluded from the analysis. First, a descriptive analysis of the data related to deaths was performed, to then proceed to the Pearson chi-square test to evaluate the similarity of the categories.

The relative risk for each category of all independent variables was also calculated, with their respective confidence intervals. Finally, the simple linear regression was performed to evaluate the behavior of neonatal Infant Mortality Rate over the years.

SPSS© Statistics were used (Version 20) and Microsoft Excel® (2010) to carry out data analysis.

Due to be secondary data available collectively, there is no identification of individuals, and therefore, is in line with the ethical aspects of Resolution Number 466/2012

of the National Health Council.[6] In this way, this research dismissed the approval of the ethics committee with human beings research.

RESULTS AND DISCUSSION

In Figure 1, the infant mortality rate every one thousand live births in Rio Grande do Norte State, from 2003 to 2012, was 15.22 concentrating in the neonatal period with 10.53; being predominant in the early neonatal with 8.43. The post-neonatal mortality rate is 4.67.

Figure 1: Infant mortality in Rio Grande do Norte by age group, Brazil, 2003-2012.

Age group	n	Mortality rate
0 to 6 days	4158	8,43
07 to 27 days	1037	2,10
28 to 364 days	2301	4,67
Ignored	8	0,02
Less than 1 year old	7504	15,22

Source: MIS/MH

Figure 2 shows that the variables significantly highlighted were low birth weight, the black race, and twin pregnancy: double or triple and more, preterm and post-term, the extremes of maternal reproductive age as the pregnant teenagers or advanced age and without education.

Figure 2: Similarity test between the independent variables to infant death in Rio Grande do Norte, Brazil, 2003-2012.

Variables	N	p value
Birth weight		
Normal weight (2500-3999g)	661	-
Low weight (<2500g)	2616	<0,001
Overweight (>4000g)	56	0,777
Race/color		
White	1267	-
Black	1404	<0,001
Other	4	0,034
Type of pregnancy		
Single	3310	-
Twins	345	<0,001
Triple or more	18	<0,001
Gestational duration		
Term (37 to 41 weeks)	795	-
Pre-term (<37 weeks)	2670	<0,001
Post-term (>41 weeks)	38	<0,001
Type of delivery		

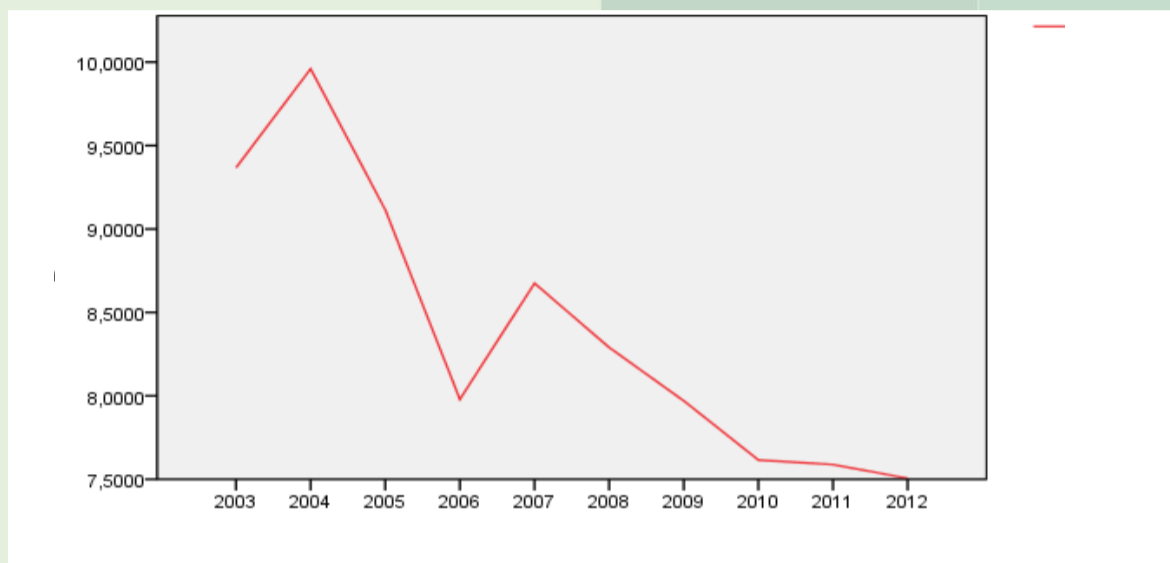|		
Vaginal	2351	-
Cesarean	1262	<0,001
Mother´s age		
Adult (20-39 years old)	2403	-
Adolescent (<20 years old)	869	<0,001
Advanced (40 years old or more)	98	<0,001
Mother´s education		
12 or more years of study	316	-
None	219	<0,001
1 to 3 years of study	328	0,753
4 to 7 years of study	1024	0,655
8 to 11 years of study	1002	0,333

Chi-square test
Source: DATASUS

In Figure 3, the birth weight is observed with a prevalence of 43.70 and then immediately prematurity with 41.55 as influences for neonatal mortality and a protective factor be the black race, cesarean delivery and the level of maternal education higher to 8 years of study.

Figure 3: Relative risk of the independent variables of infant death in Rio Grande do Norte, Brazil, 2003-2010.

Variables	Prevalence ratio	Confidence Interval
Race/color		
White	1	
Black	0,73	(0,67;0,78)
Other	0,19	(0,04; 0,88)
Type of pregnancy		
Single	1	
Twins	6,21	(5,64; 6,84)
Triple or more	10,66	(7,08; 16,06)
Gestational duration		
Term	1	
Pre-term	41,55	(39,65; 43,55)
Post-term	2,31	(1,68; 3,17)
Birth weight		
Normal weight	1	
Low weight	43,70	(41,58; 45,94)
Overweight	1,05	(0,75; 1,46)
Mother´s age		
Adult	1	
Adolescent	1,21	(1,12;1,31)
Advanced age	1,49	(1,22;1,83)
Type of delivery		
Vaginal	1	
Cesarean	0,71	(0,67; 0,76)
Mother´s education		
12 or more	1	
None	3,12	(3,07; 3,18)
1 to 3	1,02	(0,89; 1,17)
4 to 7	1,03	(0,97; 1,09)
8 to 11	0,94	(0,82; 1,07)

Source: MIS/MH

Figure 4: Early neonatal mortality rate in Rio Grande do Norte, Brazil, 2003-2012.

*R^2=0,804 R^2aj= 0,779 p-valor = 0,001 Y= 23,1 – 2,2·x

In the linear regression function of IMR of the studied years, the early neonatal period of the State of Rio Grande do Norte shown in the chart that there was significant reduction over the years, showing an adjusted R^2 of 0.779. It should be noted the increase occurred between 2006 and 2007 and later the record of the decrease happened until 2012.

The early neonatal mortality is a serious public health problem, especially in developing countries such as Brazil, since the Infant Mortality Rate (IMR) in the country is concentrated in the first week of the child´s life (early neonatal).[3] In this study, the IMR in Rio Grande do Norte State, northeastern Brazil, in the period from 2003 to 2012, the IMR was in the neonatal period with a rate of 10.53 every one thousand live births; predominant in the early neonatal with 8.43 and late neonatal with only 2.10. The post-neonatal mortality rate was 4.67, totaling the infant mortality rate at 15.22. This concentration in the early neonatal period occurs in other regions of Brazil; however, with significant regional differences.[7-8]

The significant reduction in early neonatal mortality rate from 2003 to 2012, reaching 7.5/1000 LB. In Rio Grande do Norte contributed to achieving ahead of schedule, the fifth millennium goal to reduce the IMR to 15.7 every one thousand LB until 2015. However, it appears far from developed countries, such as Japan in 2012, presented IMR every one thousand live births to 2.21; Spain 3.37 and the United States of 5.98.[2]

Despite Rio Grande do Norte State have reached in advance the goal set for 2015, the persistence of neonatal mortality in Brazil reveals that the social and health situation of the country, and the need for intervention by a qualified health care and timely prenatal, delivery and postpartum, preventing neonatal mortality and increasingly reduce this IMR.[1,9]

The Ministry of Health released programs and strategies in order to improve access, coverage and quality of care to women and newborns, as the Humanization Program of Prenatal and Birth (PHPN), released in 2000 establishing that least six visits have to be done,

where in all of them their blood pressure, uterine height, weight of the mother and the cardio-fetal heartbeat have to be checked, and in 2012, the Cegonha Network representing a set of changes in the care process to pregnancy, labor and birth; with reception to the mother and the baby, risk classification at all points of care; the pregnant link to the maternity; not pilgrim pregnant women; conducting routine tests with results on time.[9]

Analyzing data from this research, the main risk factors of early neonatal mortality were low birth weight and preterm birth that showed high prevalence ratio for early neonatal death, with respectively 43.70 and 41.55 showing that these findings are corroborated by other studies.[7,10-1]

It should be noted that in this study 76.2% of deaths that occurred in the first week of life were premature. In the world today, prematurity is the leading cause of neonatal mortality with a percentage of 75%.[12-3] Prematurity is a complex health problem due to its interrelationship with the triggering of this event.[14] It can also be considered that inadequate gestational age is able to reflect on the birth weight and Apgar score, on the risk of neonatal mortality.[1] In addition to the deaths there are clinical implications that demand more complex care sometimes even for life, due to the sequels caused by prematurity.[15]

According to OTRIZ; OUSHIRO, 2008, the probability of neonatal death decreases significantly when increasing pregnancy duration: among preterm live births, neonatal mortality was 28 times higher than among live birth pregnancies to term. The post-term child (42 weeks and over) have 1.7 times greater death probability than the child born at term.[16] Thus, we can see in Table 2 significant statistics for post-term delivery.

In this investigation, twins also were statistically significant, because as studies show multiple pregnancy increases the chances of children born preterm when compared to single mothers´ pregnancy, but also enhancing the risks of pregnancy complications such as high blood pressure, premature rupture membranes, intrauterine fetal death and indications of cesarean section.[17-8]

Some cohort studies show the variable cesarean section with a protective effect for newly born preterm.[19-20] According to Figure 3, the Cesarean are highlighted as protection factor indicators for reducing the number of deaths in the early neonatal period, it is considered that the anticipation of the birth with the precise cesarean section may decrease the risk of death for those newborns at risk, because the risk of waiting for the natural birth can overcome the cesarean section.[19,21-22]

It is believed that caesareans are increasing due to risks of morbidity and mortality that pregnant women and/or women in labor are vulnerable as a result of the various maternal and fetal complications such as suspected fetal bradycardia or tachycardia diagnosed by cardiotocography, increased maternal age at first pregnancy, twin pregnancies, previous cesarean; bleeding and complications of decompensated hypertensive disorders, among other factors, overcoming then, 15% of cesareans that are recommended by the World Health Organization (WHO).[23-4]

In the case of adolescents' pregnancy, 25.7% of early neonatal deaths were from them. According to OILVEIRA; GAMA; SILVA, 2010, biological risks of pregnancy in adolescents become more severe by psychological, socioeconomic and cultural conditions of the adolescent, because they are usually pregnant women in disadvantaged socioeconomic

conditions, where there is malnutrition, low levels of education and limited access to health care.[25]

Other studies also show that in adolescents, prematurity could be considered as a way of adaptive response to physical immaturity of these women, while in older women prematurity is associated with clinical complications (hypertension, diabetes, heart disease, urinary tract infection) and obstetric (premature rupture of membranes and placenta previa),[25-8] corroborating the statistical significance of adolescent pregnancy and the elderly pregnant women presented in Table 2.

In some studies, the level of education is considered an important factor for the mother-child health care and have significant effect in reducing child mortality.[29-30] Based on this, it was observed that a variable considered protective for that study was the level of maternal education more than 8 years of study, which is a positive effect factor in reducing child mortality. The mother without education showed a significant statistic for the risk of early neonatal mortality, supported by other studies.[31]

By establishing the association between race and child mortality, the research shows that the black race was also considered a protective factor, but this finding differs from other studies that demonstrate this type of race as a risk factor for infant mortality, given that neonatal mortality is associated with black race, because of the relationship of social context and contributing factors for difficult access to services and health care.[1,7,25,32]

CONCLUSION

Low birth weight, prematurity and post-term, mothers with no education, the black race, twin pregnancy and extremes of gestational age were found as risk factors for early neonatal mortality. Therefore, these factors deserve special attention in prenatal health, childbirth and postpartum services, with quality and timely interventions, preventing complications, sequels and death in the first week of life from preventable causes.

Studies using secondary data may have limitations arising from lack of registration, and in situations of deaths incomplete filling of declarations, as also research only about risk factors and categories available on death certificates. This situation does not invalidate the importance of analysis of risk factors associated with deaths in the first week of the child´s life, as a marker of quality of neonatal care, to managers and professionals to perform strategic health planning, considering the peculiarities of each region.

Finally, we highlight that besides the importance of this research as a tool for the planning of public health surveillance activities relating to risk factors for neonatal mortality

in the First Week of Life, other key studies are suggested to address, for example, relationship of risk factors with access to prenatal services, delivery and postpartum.

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