



DETERMINANTS ASSOCIATED TO PERINATAL MORTALITY AND ASSOCIATED FACTORS

DETERMINANTES ASSOCIADOS À MORTALIDADE PERINATAL E FATORES ASSOCIADOS DETERMINANTES ASOCIADOS A LA MORTALIDAD PERINATAL Y FACTORES ASOCIADOS

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ABSTRACT

Objective: to evaluate the determinants associated to perinatal mortality. **Method:** a descriptive study using data from the Mortality and Live Birth Information Systems, in the city of Petrolina, Brazil, from 2008 to 2012. A baseline linkage technique and factors associated with perinatal mortality were estimated using logistic regression. Followed by analysis of the correlation between mother's schooling and child's weight. **Results:** there was no significant reduction in the perinatal mortality rate; Multivariate analysis showed that the low birth weight and the male sex of the child constituted factors associated with perinatal death; the correlation between maternal schooling and child weight was not statistically significant. **Conclusion:** the majority of perinatal deaths are considered avoidable and could be prevented with the improvement of maternal and child care, ensuring the timely access of pregnant and newborns to quality services. **Descriptors:** Perinatal Mortality; Determinants; Information Systems.

RESUMO

Objetivo: avaliar os determinantes associados à mortalidade perinatal. **Método:** estudo descritivo utilizando dados dos Sistemas de Informação sobre Mortalidade e Nascidos Vivos, no município de Petrolina (PE), Brasil, de 2008 a 2012. Foi realizada técnica de *linkage* das bases e os fatores associados à mortalidade perinatal estimados utilizando regressão logística. Em seguida, realizada a análise de correlação entre escolaridade da mãe e peso da criança. **Resultados:** não houve redução expressiva na taxa de mortalidade perinatal; a análise multivariada mostrou que o baixo peso ao nascer e o sexo masculino da criança constituíram-se fatores associados ao óbito perinatal; a correlação entre escolaridade materna e peso da criança não foi estatisticamente significativa. **Conclusão:** a maioria dos óbitos perinatais é considerada evitável e poderia ser prevenida com a melhoria da assistência materno-infantil, assegurando o acesso oportuno da gestante e neonato a serviços de qualidade. **Descritores:** Mortalidade Perinatal; Determinantes; Sistemas de Informação.

RESUMEN

Objetivo: evaluar los determinantes asociados a la mortalidad perinatal. **Método:** estudio descriptivo utilizando datos de los Sistemas de Información de Mortalidad y Nacidos Vivos, en la ciudad de Petrolina (PE), Brasil, de 2008 a 2012. Se realizó técnica de acoplamiento de las bases y los factores asociados a mortalidad perinatal estimados mediante la utilización de regresión logística. La continuación, se realizó la análisis de correlación entre el nivel educativo de la madre y peso del niño. **Resultados:** no hubo reducción significativa en la tasa de mortalidad perinatal; la análisis multivariados demostró que el bajo peso al nacer y el sexo del niño se convirtieron a factores asociados a muerte perinatal; la correlación entre educación materna y peso del niño no fue estadísticamente significativa. **Conclusión:** la mayoría de las muertes perinatales es considerada evitable y podría evitarse con la mejoría de la asistencia a la madre y su niño, garantizando el acceso oportuno de las mujeres embarazadas y los neonatos a servicios de calidad. **Descriptores:** Mortalidad Perinatal; Determinantes; Sistemas de Información.

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INTRODUCTION

Infant mortality is considered an important indicator of the health status of the population, especially, in relation to the quality of maternal and child care during prenatal, childbirth and puerperium periods. Despite the decline in the Infant Mortality Rate (IMR) in the country, the absolute number of deaths occurring in children under one year old persists as a serious public health problem, especially, in the first week of life.¹

Perinatal mortality is a category of infant mortality and comprises fetal deaths, represented by those with 22 weeks or more of gestation or weighing 500 grams or more, and early neonatal deaths, those occurring between zero and six full days of life.²

According to the Ministry of Health, deaths that occurred in the first week of life had the lowest reduction between 2000 and 2010 (34%), in relation to the other components of infant mortality; also, inequalities were revealed, pointing the North and Northeast as well as the regions with rates twice and high when compared to the South (11.5 and 11.6 / 1000 live births versus 5.9 / 1000 live births, respectively).³

This data reflects the complexity of reducing perinatal mortality, as these outcomes result from the interaction of proximal determinants that are triggered by intermediate and distal determinants.⁴

The proximal determinants are related to the biological variables associated with the mother and the newborn, constituting the direct causes of the perinatal deaths. Intermediaries are linked to the care factors, which include pre and perinatal care, type of delivery, type of hospital, reproductive history, life habits and maternal diseases. The distal ones are represented by the socioeconomic factors, which make it difficult to have access to a qualified assistance, able to tend to the needs of the pregnant woman and of the newborn.⁴

Perinatal deaths are an important maternal and child health problems and their occurrence is closely associated with preventable causes. Knowledge of the situation of perinatal mortality implies a better understanding of its determinants and the basis of public policies regarding the adoption of appropriate measures of attention to pregnant, prenatal women and delivery, and newborns.

In this context, the objective of this study was to evaluate the determinants associated with perinatal mortality in the municipality of Petrolina-PE, from 2008 to 2012.

METHOD

Descriptive, quantitative approach on determinants associated with perinatal mortality of mothers residing in Petrolina, Brazil, from January 2008 to December 2012.

The municipality of Petrolina is located in the extreme west of the State of Pernambuco, in the northeastern region of the country, occupying an area of 4,561,872 km², with a population of approximately 326,017 inhabitants.⁵ Currently, it has as reference for maternal and child health care the Basic family health units responsible for prenatal and postnatal care, as well as public and private hospitals that provide care for childbirth, postpartum, and children.

The selection of variables was performed considering the theoretical references on determinants of perinatal mortality, with data from the Mortality Information System (MIS) and the Information System on Live Births (SINASC), made available by the Municipal Health Department of Petrolina.

The dependent variable included perinatal death. The independent variables included the three hierarchical levels of determinants of perinatal mortality: proximal (birth weight, duration of gestation, sex of the child, age of the mother and type of pregnancy); (type of hospital where the death occurred: public, private or contracted / UHS, and type of delivery) and distal (mother's schooling).

For the identification of the type of hospital, data from the National Registry of Health Establishments (CNES), of the Ministry of Health, were used.

The categorical variables were analyzed descriptively in their absolute and relative frequencies, with their respective 95% confidence intervals, according to the determinants of perinatal death.

For the *linkage* of the databases, the deterministic relationship method was applied using, the code of the Declaration of Live Birth (DL) that was included in the Declaration of Death (DD) as the key variable. Only pairs that presented the matching variables were considered pairs, and all the pairs identified were reviewed. For this technique, only early neonatal deaths were used, due to the need to identify the factors that led the child to death in the first week of life (Figure 1).

The binary logistic regression evaluated the determinants that influenced the chance of early neonatal death, by means of the adjusted Odds Ratio (OR). The independent variables were included, in the regression model, expressed as dummy variables and

were considered statistically significant those analyses whose value of $p < 0.05$, with a 95% confidence interval.

The correlation analysis was performed between the schooling of the mother and the child's weight, registered in the DD, using Spearman's Coefficient, being significant when p value < 0.05 . Stata software version 12.0, was used in the statistical analysis.

The Perinatal Mortality Rate (PMR), was calculated to estimate the risk of the fetus being born with no sign of life or, when born alive, to die in the first week. It is done by

dividing the number of deaths occurring in the perinatal period (fetal deaths plus early neonatal deaths) by total births (live births + fetal deaths of 22 weeks or more of gestation), multiplied by 1000.²

Considering the underreporting of fetal deaths and the precariousness of information on the duration of gestation, it is recommended to add to both the numerator, and the denominator the number of fetal deaths with untested or incomplete gestational age, with the intention of homogenizing the calculated values.²

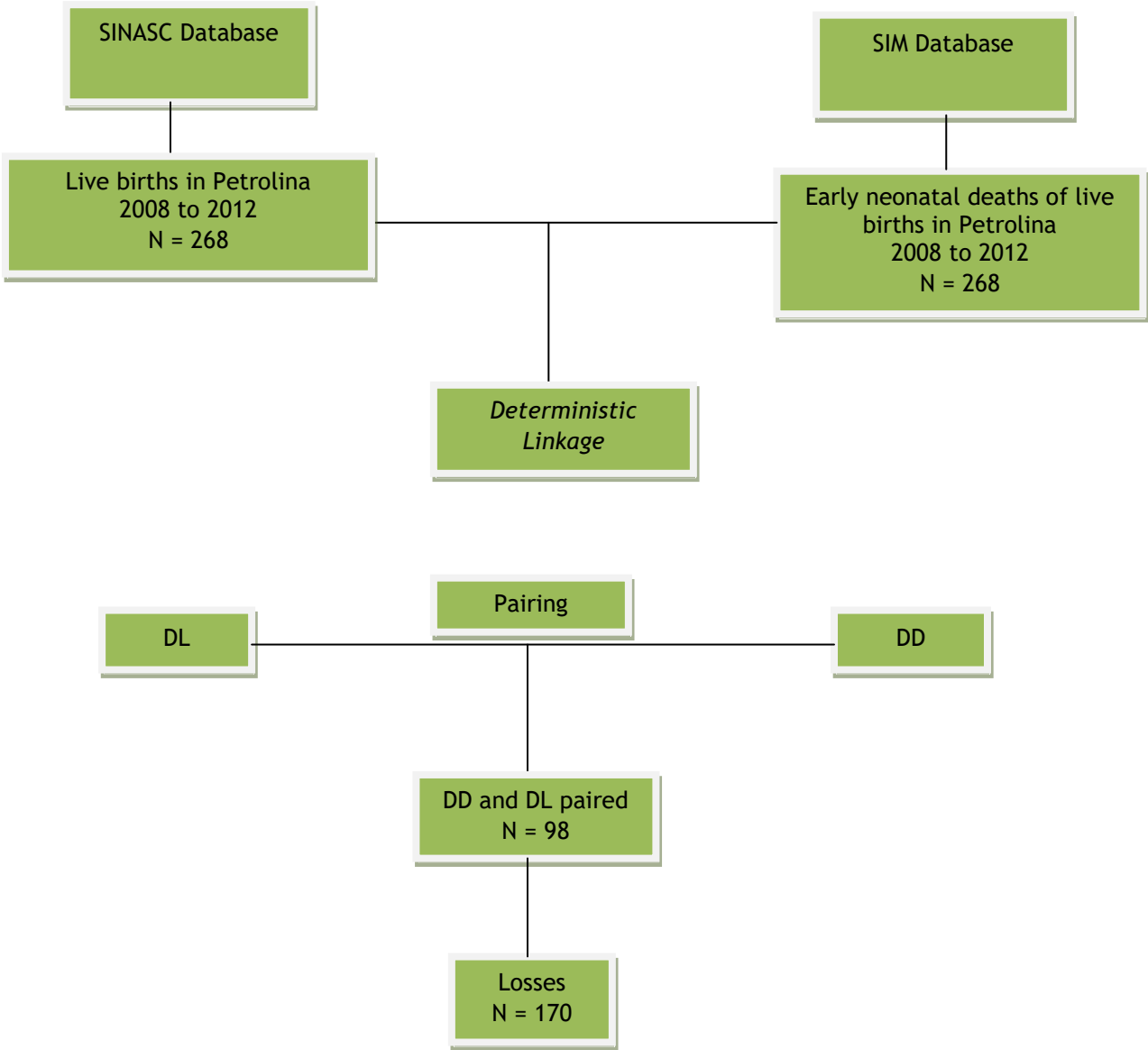


Figure 1. Flow diagram of linkage between SIM and SINASC databases. Petrolina (PE), Brazil, 2008 to 2012.

This study was approved by the Research Ethics Committee of the University of Pernambuco under the CAAE no. 47917715.1.0000.5207.

RESULTS

Between 2008 and 2012, 604 perinatal deaths were recorded, of which 336 (55.3%) were fetal deaths and 268 (44.4%) were premature neonatal deaths.

The PMR suffered a decline between 2008, 2009 and 2010 (26.9; 21.7 and 17.7 / 1000 live births, respectively), increasing in 2011 and suffering a slight reduction in 2012 (21.3% and 20.3 / 1000 live births, respectively) (Figure 2).

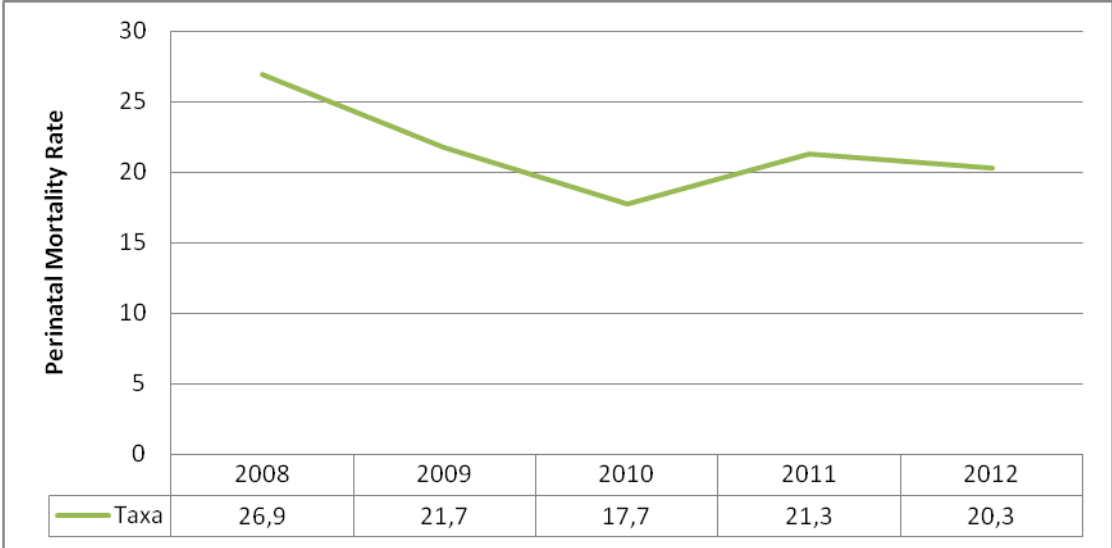


Figure 2. Evolution of the perinatal mortality rate. Petrolina (PE), Brazil, 2008 to 2012.

Of the proximal determinants evaluated, perinatal deaths, weighing less than 2,500 g, had a higher frequency (72.8%) than deaths with a weight greater than or equal to 2,500 g (27.2%). Considering the duration of gestation, the percentage of deaths with gestational age less than 37 weeks was higher (72%) than deaths with gestational age greater than or equal to 37 weeks (28%) (Table 1).

In Table 1, when evaluating the sex of the child, the males obtained a higher percentage (53.9%) than the females (46.1%). Maternal age of less than 35 years presented a higher number of cases of perinatal deaths (90%), when related to maternal age above 35 years (10%). Regarding the type of pregnancy, the highest percentage of deaths was due to

single gestation (94.2%), followed by double gestations or more (5.8%).

It was verified that, in the group of intermediate determinants, the highest percentage of perinatal deaths occurred in public hospitals (90.4%), compared to private hospitals (2%) and hospitals with health plans / UHS (7.6%). The highest proportion of deaths occurred in children whose mothers had vaginal delivery (71.9%), compared to mothers who underwent cesarean delivery (28.1%) (Table 1).

As for the distal determinants, the schooling of the mother of four or more years presented a higher percentage (83.4%), than schooling of less than four years (16.6%) (Table 1).

Table 1. Proportional distribution of perinatal mortality according to proximal, intermediate and distal determinants. Petrolina (PE), Brazil, 2008 to 2012.

Type of determinant	Variables	N	%	IC _{95%}
Proximal determinants	Weight at birth			
	<2500g	414	72.8	69.1 - 76.4
	≥2500g	155	27.2	23.6 - 30.9
	Duration of gestation			
	<37 weeks	398	72	68.2 - 75.7
	≥ 37 weeks	155	28	24.3 - 31.8
	Gender			
	Male	321	53.9	49.8 - 57.9
	Female	275	46.1	42.1 - 50.2
	Mother's age			
Intermediate determinants	<35 years	506	90	87.5 - 92.5
	≥ 35 years	56	10	7.4 - 12.4
	Type of pregnancy			
	Unique	553	94.2	92.3 - 96.1
	Double or more	34	5.8	3.8 - 7.6
	Type of hospital			
	Public	546	90.4	88 - 92.7
	Private	12	2	0.9 - 3.1
	Health plan / UHS	46	7.6	5.5 - 9.7
	Type of birth			
Distal determinants	Vaginal	421	71.9	68.2 - 75.5
	Cesarean	165	28.1	24.5 - 31.8
	Mother's education			
	<4 years	77	16.6	13.2 - 20
	≥ 4 years	387	83.4	80 - 86.8

Source: Own elaboration based on data from SIM and SINASC

Of the 268 premature neonatal deaths, 98 were identified in SINASC, and 170 deaths were discarded from the analysis due to the impossibility of forming true pairs using the *linkage* technique. This loss occurred due to problems in the quality of the information, because, in those cases, the DL code had not been registered, besides the sub-information of other DD fields, making the linkage process adopted, difficult.

Table 2 shows the logistic regression results and OR values. The birth weight was less than 2,500 g, in relation to weight greater than or equal to 2,500 g, and males, in relation to females presented significant differences. Odds ratios showed that children weighing less than 2,500g had a higher risk of death (OR = 1.71), as male children had a six times greater chance of dying in the perinatal period (OR = 6, 24).

Table 2. Logistic regression of the occurrence of early neonatal deaths according to proximal, intermediate and distal determinants. Petrolina (PE), Brazil, 2008 to 2012.

Variables	OR adjusted	IC 95%	Value of p
Weight at birth			
<2500g	1.71	3.6 - 8.2	0.027
≥ 2500g	1.00		
Duration of gestation			
<37 weeks	1.28	5.6 - 29.3	0.558
≥ 37 weeks	1.00		
Gender			
Male	6.24	4.2 - 9.4	0.023
Female	1.00		
Mother's age			
<35 years	1.28	6.9 - 24.2	0.431
≥ 35 years	1.00		
Type of pregnancy			
Double or more	1.74	3.7 - 8.2	0.481
Unique	1.00		
Type of birth			
Vaginal	1.11	7.3 - 17.1	0.613
Cesarean	1.00		
Mother's education			
<4 years	1.31	7.0 -24.8	0.406
≥ 4 years	1.00		

Source: Own elaboration, based on data from SIM and SINASC.

The correlation between the mother's education and the weight of the children who died did not present statistical significance (Spearman = -0.0770, p-value = 0.1051).

DISCUSSION

Perinatal death is considered an important health indicator that supports the assessment of the quality of care offered to women and children, as well as the degree of socioeconomic development of the population.⁶

The situation of perinatal mortality in Brazil is still not known homogeneously throughout the country due to the high underreporting of fetal deaths and the poor quality of information on the duration of gestation in the Declaration of Death.⁷

The evolution of the perinatal mortality rate, between 2008 and 2012, did not show a significant reduction, showing variations during the study period. This finding differs from a study carried out in the city of Salvador, where PMR presented a decreasing character, from 33.1 in 2000, to 19.2 / 1000 live births, in 2009.⁸

Children with low birth weight and those born with less than 37 weeks of gestation presented high proportions of mortality, similar to other published studies.^{1,9} When adjusted to the other variables of the regression model, children weighing less than 2,500 G had an increased chance of death.

Low birth weight and duration of gestation should not be studied as factors of isolates, but as mediators, which are influenced by several correlated determinants, among them, maternal behavior regarding health care, precarious social conditions Access to health services during pregnancy and the quality of these services offered.¹⁰⁻²

Regarding the sex of the child, there was a greater chance of death for males than for females, a result similar to the study,¹³ who found an increased risk of death for males. The reason for lower female mortality could be explained by early pulmonary maturation and, consequently, lower respiratory complications, one of the main causes of death in this period.

Regarding the maternal characteristics, a higher proportion of perinatal deaths was observed when the mother was younger than

35 years, presenting a similar result with studies that found predominance of mothers with the same age group,^{1,14} but, with no association with perinatal death. On the other hand, another study¹⁰ showed that maternal age equal to or greater than 35 years was associated with perinatal mortality, and did not find significant results for mothers below this age group.

Most of the perinatal deaths came from a single pregnancy, converging with other findings^{1,14-7}, which showed that the highest proportions of deaths were due to single gestation. However, other studies¹⁸⁻⁹ have pointed to multiple gestation as a risk factor for premature delivery and low birth weight.

Regarding the assistance aspects, the public establishments had the highest percentage of perinatal deaths. The probability of early neonatal death in the hospital was 65% higher in public hospitals than in the private network. According to these authors, in the UHS network there is a greater participation of hospitals of high complexity and a high volume of deliveries/year, therefore a smaller number of infant deaths should be expected.²⁰

Failure to provide care in maternity hospitals may come from the predominant model of obstetrical care in the country, a hospital-centered model and with excessive interventions that may cause iatrogenic damage. In addition, the precarious physical infrastructure, human resources, materials and equipment required, the lack of reception and humanization of care and management contribute to adverse perinatal outcomes.⁷

The prevalence, of vaginal delivery births, was predominant in perinatal mortality, a result similar to other studies^{14,21}, since this is the natural and preferential route for births in general. The study showed that the increase in the rate of vaginal birth occurred through the political incentive of the Brazilian Unique Health System to reduce the number of operative deliveries, in order to minimize health costs and optimize the recovery of mothers, noting that Brazil has one the world's highest cesarean rates and, therefore, it is necessary to implement new policies that can reverse this situation.²²

In this study, the level of maternal schooling was not associated with perinatal death, unlike the results of published studies^{10,14,16}, which observed that newborns of mothers with less years of schooling had a higher chance of death when compared to newborns of mothers with more years of education.

Low instruction causes disinformation, which is a condition of lesser interest in health care or greater difficulty in accessing health services.¹⁰ It is believed that the high level of education improves child survival through knowledge of effective ways to prevent, recognize and treat childhood diseases.²³

There was no correlation between the mother's schooling and the weight of the child who died, unlike another study,²⁴ who observed that mothers with lower schooling had an increased chance of having underweight children than those with longer schooling time. In one study,²⁵ the correlation between maternal schooling and obstetric indicators, was investigated, which identified that poorer socioeconomic status of mothers may interfere with fetal weight gain and attendance at prenatal care.

The use of information systems, to analyze perinatal mortality, was useful for the survey of the database, however, a large incompleteness of the variables studied was found in these banks, making it difficult to know the real situation of perinatal mortality in the municipality, but not invalidating the results.

CONCLUSION

The best monitoring of the occurrence of perinatal deaths depends on the analysis of the quality of the completion of the Declaration of Death and the Declaration of Live Birth, as well as updating the health professionals regarding the correct completion of these documents.

The majority of perinatal deaths is considered preventable and could be prevented by improving prenatal, delivery and newborn care, not only in their clinical aspect, but also in the integration of this assistance into a hierarchical and regionalized health network, ensuring the timely access of pregnant women and newborn to quality services.

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