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Perinatal deaths preventable by intervention of the Unified Health System of Brazil

Óbitos perinatais evitáveis por intervenções do Sistema Único de Saúde do Brasil

Muertes perinatales evitables por intervención del Sistema de Salud Pública

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ABSTRACT

Objective: To describe the epidemiological characteristics of perinatal deaths by actions of the Public Health System.

Methods: Descriptive study of temporal analysis, population composed of perinatal deaths of mothers residing in Recife, 2010-2014. Used List of causes of preventable deaths to classify avoidance and, EpiInfo version 7 for analysis of variables.

Results: There were 1,756 perinatal deaths (1,019 fetal, 737 neonatal premature), reduction of early neonatal deaths (-15.8%), and fetal increase (12.1%). Main causes: fetus and newborn affected by maternal condition and asphyxia/hypoxia at birth.

Conclusions: Most deaths were avoidable, concentrating on the adequate grouping of attention given to the woman during pregnancy. Failures in the care given to the woman at birth explain the percentage of asphyxia/ hypoxia. Reduction of preventable perinatal mortality is associated with increased access and quality of care to ensure promotion, prevention, treatment, and specific and timely care.

Keywords: Perinatal mortality. Vital statistics. Obstetric nursing. Neonatal nursing. Public health.

RESUMO

Objetivo: Descrever características epidemiológicas dos óbitos perinatais por ações do Sistema Público de Saúde.

Métodos: Estudo descritivo de análise temporal, população composta por óbitos perinatais de mães residentes no Recife, 2010-2014. Utilizado Lista de causas de mortes evitáveis para classificar a evitabilidade e EpiInfo versão 7 para análise das variáveis.

Resultados: Ocorreram 1.756 óbitos perinatais (1.019 fetais e 737 neonatais precoce), observou-se redução dos óbitos neonatais precoces (-15,8%) e aumento dos fetais (12,1%). Apresentou como principais causas: feto e recém-nascido afetado por afecção materna e asfixia/hipóxia ao nascer.

Conclusões: A maior parte dos óbitos foi evitável, concentrando-se no grupamento de assistência adequada dispensada à mulher na gestação. Lacunas na assistência dispensada à mulher no parto, explicam o percentual de asfixia/hipóxia. Redução da mortalidade perinatal evitável associa-se à ampliação do acesso e qualidade da assistência para garantir promoção, prevenção, tratamento, cuidados específicos e oportunos.

Palavras-chave: Mortalidade perinatal. Estatísticas vitais. Enfermagem obstétrica. Enfermagem neonatal. Saúde pública.

RESUMEN

Objetivo: Describir las características epidemiológicas de las muertes perinatales por acciones del Sistema de Salud Pública.

Métodos: Estudio descriptivo del análisis temporal, población compuesta por muertes perinatales de madres residentes en Recife, 2010-2014. Lista de causas de muertes evitables para clasificar la evitación y, EpiInfo versión 7 para el análisis de variables.

Resultados: Hubo 1.756 muertes perinatales (1.019 fetales, 737 prematuros neonatos), reducción de muertes neonatales tempranas (-15,8%) y aumento fetal (12,1%). Principales causas: feto y recién-nacido afectados por afección materna y asfixia / hipoxia al nacer.

Conclusiones: La mayoría de las muertes fueron evitables, concentrándose en la agrupación adecuada de la atención prestada a la mujer durante el embarazo. Las fallas en el cuidado dado a la mujer al nacer explican el porcentaje de asfixia/hipoxia. La reducción de la mortalidad perinatal prevenible se asocia con un mayor acceso y calidad de atención para asegurar la promoción, prevención, tratamiento y atención específica y oportuna.

Palabras clave: Mortalidad perinatal. Estadísticas vitales. Enfermería obstétrica. Enfermería neonatal. Salud pública.

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INTRODUCTION

Perinatal mortality is an important indicator of maternal and child health because it reflects the socioeconomic conditions, reproductive health, and quality of care provided in the prenatal period, during labour, and to the newborn[1-2].

Child mortality has dropped significantly around the world. However, neonatal mortality, especially early neonatal mortality, has been dropping at a slower pace than postnatal mortality[2]. There is one foetal death for every neonatal death[3]. The causes of early neonatal and foetal deaths are closely linked and they are generally of obstetric origin[4].

It is estimated that more than two million stillbirths occur around the world every year, in addition to the 2.9 million neonatal deaths[2,5]. Of the stillbirths, more than 40% are avoidable and intrapartum[6]. In this context, avoidable is the term used to describe all deaths preventable by adequate care and quality assistance in the prenatal period, during labour, and in the puerperium, especially in terms of early diagnosis and effective interventions[7].

In Brazil, child mortality and natimortality declined but the rates are still two times higher than the rates in developed countries and the inequality between the regions of the country persists[8]. In 2012, the rate of natimortality in Brazil was 10.0 for every 1000 births and in the north and northeast, the rates were higher (10.3 and 12.1 for every 1000 births, respectively)[8].

Perinatal deaths are potentially preventable events and reflect the quality of the care provided in the prenatal period and during childbirth[4]. The classification of causes of death according to the possibility of preventing these deaths is essential to assess the quality of healthcare services and, consequently, to plan actions that can reduce these deaths[7].

Thus, these deaths should be studied to gain insight into the relevance of neonatal deaths in infant mortality and the potential preventability of foetal deaths. The study on perinatal mortality and its preventability is critical to reduce infant mortality and pinpoint the factors that improve perinatal indicators. Therefore, the aim of this paper is to describe the epidemiological characteristics of perinatal deaths that could have been prevented by intervention of the Unified Health System ("SUS") in Brazil.

METHOD

This is a descriptive study based on sources of the Brazilian system of information on live births ("SINASC") and the system of information on mortality ("SIM"). The study population was all the perinatal deaths of mothers who resided in Recife, Pernambuco, Brazil, between 2010 and 2014. Foetal loss was considered as being a stillborn weighing more than or equal to 500 g and/or with ≥ 22 weeks of gestation and early neonatal death was considered the death of an infant from zero to six days of life and a birth weight greater than or equal to 500 g. We used the variables related to the mother's characteristics (age and education); delivery (type and location); the foetus and the newborn (gestational age, sex, and birth weight).

The perinatal deaths were classified as to whether they were preventable with the intervention of the SUS using a list that clarifies and elucidates different factors that cause death[7]. These factors are divided into the following groups: amenable (through immunisation, appropriate prenatal care, care during labour and care to the newborn infant; through appropriate diagnosis and treatment; through appropriate health promotion and care); ill-defined causes (symptoms, signs and abnormal clinical and laboratory findings unclassified elsewhere); and other not clearly preventable causes (other causes and deaths)[7].

The next step was calculating the indicators of foetal mortality (stillbirths divided by the total number of births multiplied by 10^3), early neonatal mortality (number of neonatal deaths within six days of life by the total number of live births multiplied by 10^3), and perinatal mortality (sum of stillbirths and neonatal deaths within six days of life by the total number of births multiplied by 10^3). The total number of births was considered the sum of stillbirths and neonatal deaths. The variables were analysed using descriptive statistics and Epi Info™ software version 7.

The project has approved by the municipal department of health of Recife and approved by the research ethics committee of Centro de Pesquisas Aggeu Magalhães – CPqAM/Fiocruz (CAEE #07336313.6.0000.5190), in accordance with Resolution 466/2012 of the National Health Council[9].

RESULTS

The total number of perinatal deaths in the studied period was 1,756 (1,019 foetal deaths and 737 early neonatal deaths), with a predominance of foetal deaths (58%). The perinatal mortality coefficient was 15.3 per thousand births, with risk of stillbirth (8.9 deaths per thousand births), superior to that found in the early neonatal period (6.5 deaths per thousand live births). A comparison of the coefficients between 2010 and 2014 revealed a reduction of early neonatal deaths (-15.8%) and an increase in foetal deaths (12.1%) (Table 1).

Table 1 - Births, deaths and foetal, early neonatal, and perinatal mortality coefficient (MC). Recife, Pernambuco, 2010 - 2014

Indicators	2010			2011			2012			2013			2014			Δ%
	n	%	MC	N	%	MC	n	%	MC	n	%	MC	n	%	MC	
Total births	21,787			22,253			22,642			23,186			23,520			
Foetal deaths	175	53.2	8.0	214	59.8	9.5	199	57.7	8.7	219	58.9	9.4	212	60.2	8.9	12.1
Early neonatal deaths	154	46.8	7.1	144	40.2	6.5	146	42.3	6.4	153	41.1	6.6	140	39.8	6.0	-15.8
Perinatal deaths	329	100	15.0	358	100	15.9	345	100	15.1	372	100	15.9	352	100	14.8	-1.0

Source: Sistema de Informações sobre Mortalidade, Secretaria de Saúde do Recife, Pernambuco, Brazil, 2016.
Note: Foetal and perinatal mortality coefficient per 1000 total births; early neonatal mortality coefficient per 1000 live births.

In relation to the characteristics of the deaths, more than 60% of mothers were in the 20 to 34 year age group and had more than 8 years of schooling (p<0.001). Almost all the deaths occurred in the hospital and vaginal delivery was the most common type of delivery (p<0.001). Of the perinatal deaths, 78.5% were premature and 140 (19.0%) of the babies born alive were full term. Of the total births, 37.9% had extremely low birth weight and 22.1% weighed 2,500 g or more (Table 2).

Table 2 – Characteristics of the mothers, delivery, and birth of perinatal deaths and their components. Recife, Pernambuco, 2010 - 2014

Variables	Foetal death (n= 1,019)		Early neonatal death (n = 737)		Perinatal death (n = 1,756)		p-value
	(n)	(%)	(n)	(%)	(n)	(%)	
Age group (years)	**955 (5)**		**732 (3)**				0.009 (1)
< 20	165	17.3	165	23	330	19.6	
20 to 34	624	65.3	466	63	1090	64.6	
≥ 35	166	17.4	101	14	267	15.8	
Schooling (years)	**873 [c]**		**731 (3)**				< 0.001 (1)
< 8	416	47.7	219	30	635	39.6	
8 or more	457	52.3	512	70	969	60.4	
Location	**1,011 (3)**		**737 (3)**				(2)
Hospital	991	98	730	99	1721	98.5	
Residence	9	0.9	3	0.4	12	0.7	
Other establishments	4	0.4	3	0.4	7	0.4	
Public roads	7	0.7	1	0.1	8	0.4	
Type of delivery	**985 (5)**		**731 (3)**				<0.001 (1)
Vaginal	701	71.2	456	62	1157	67.4	
Caesarean section	284	28.8	275	38	559	32.6	
Premature birth	**924 (5)**		**722 (4)**				0.082
Yes	711	77	582	81	1293	78.6	
No	213	23	140	19	353	21.4	

Sex	**979 (5)**		**772 (4)**				0.54
Girl	463	47.3	330	46	793	46.6	
Boy	516	52.7	392	54	908	53.4	

Source: Sistema de Informações sobre Mortalidade e Sistema de Informação sobre nascidos vivos. Secretaria de Saúde do Recife, Pernambuco, Brazil, 2016.
(1) Null hypothesis was rejected since the p-value is less than the established significance level, 0.05 (5%)
(2) Not established since this group does not meet the conditions for the χ^2 test, namely 20% of the frequency greater than 5.
(3) Unknown/Blank less than 1%.
(4) Unknown/Blank between 1% and 2%.
(5) Unknown/Blank more than 2%

Of the total perinatal deaths, 1426 (81.2%) were considered preventable. Of these deaths, 499 (49%) were foetal and 427 (57.9%) were early neonatal. The preventable mortality coefficient for the perinatal deaths was 12.5 per 1000 births. Of the perinatal deaths, 52.7% were classified as amenable by providing appropriate care to the women during pregnancy, with a coefficient of 8.1 per 1000 births (Table 3).

Table 3 – Number, ratio and coefficients of foetal, early neonatal, and perinatal deaths (n, %, and MC) according to the Brazilian list of preventable deaths through intervention of the Unified Health System. Recife, Pernambuco, 2010 - 2014

Preventability	Foetal deaths			Early neonatal deaths			Perinatal deaths		
	(n)	(%)	(MC)	(n)	(%)	(MC)	(n)	(%)	(MC)
Preventable causes	843	82.7	7.4	583	79.1	5.1	1,426	81.2	12.5
Amenable by providing appropriate care to the women during pregnancy	499	49.0	4.4	427	57.9	3.8	926	52.7	8.1.
Amenable by providing appropriate care to the women during delivery	299	29.3	2.6	94	12.8	0.8	393	22.4	3.4
Amenable by providing appropriate care to the newborn child	45	4.4	0.4	57	7.7	0.5	102	5.8%	0.9
Amenable through appropriate diagnosis and treatment	-	-	-	2	0.3	-	2	0.1	0.0
Amenable through health promotion	-	-	-	3	0.4	-	2	0.1	0.0
Ill-defined causes	109	10.7	1.0	3	0.4	-	112	6.4	1.0
Other causes (not clearly preventable)	67	6.6	0.6	151	20.5	1.3	218	12.4	1.9
Total	**1,019**	**100.0**	8.9	**737**	**100.0**	6.5	**1,756**	**100.0**	15.3

Source: Sistema de Informações sobre Mortalidade. Secretaria de Saúde do Recife, Pernambuco, Brazil, 2016.

In this category of preventability, maternal disorders were predominant, totalling 28.6% of the foetal deaths and 32.4% of the early neonatal deaths, followed by foetus and newborn affected by maternal complications in pregnancy, totalling 28.6% of foetal deaths and 32.4% of early neonatal deaths. Congenital syphilis accounted for 118 of the perinatal deaths, representing 8.3%. Of these deaths, 101 were foetal (Table 4).

It was identified that 393 (22.4%) of preventable perinatal deaths occurred through inappropriate care during labour. Of these deaths, 299 (76.1%) were foetal. In this subgroup, intrauterine hypoxia and birth asphyxia were the main cause of perinatal deaths (204) and 168 (82.5%) of these deaths were foetal. The ill-defined causes accounted for 6.4% and other causes (not clearly preventable) totalled 12.4% (Table 4).

Table 4 - Perinatal deaths and their components according to root cause and criterion of preventability by intervention of the Unified Health System. Recife, Pernambuco, 2010 - 2014

Preventability	Foetal deaths		Early neonatal deaths		Perinatal deaths	
	(n)	(%)	(n)	(%)	(n)	(%)
1. Preventable causes	**843**	82.7	**583**	79.1	**1,426**	81.2
1.2.1. Amenable by providing appropriate care during pregnancy	**499**	49.0	**427**	57.9	**926**	52.7
Congenital syphilis	101	9.9	17	2.3	118	6.7
Foetus and newborn affected by complications of placenta membranes	41	4.0	24	3.3	65	3.7
Foetus and newborn affected by maternal conditions	291	28.6	239	32.4	530	30.2
Foetus and newborn affected by maternal complications during pregnancy	64	6.3	116	15.7	180	10.3
Retarded foetal growth and foetal malnutrition	1	0.1	2	0.3	3	0.2
Preterm pregnancy disorder and low birth weight	-	-	6	0.8	6	0.3
Respiratory distress syndrome of newborn	-	-	21	2.8	21	1.2
Pulmonary haemorrhage in the perinatal period	-	-	1	0.1	1	0.1
Necrotizing enterocolitis foetus and newborn	-	-	1	0.1	1	0.1
Other haemolytic disease of the newborn foetus due to isoimmunisation	1	0.1	-	-	1	0.1
Birth trauma	1	0.1	3	0.4	4	0.2
Intrauterine hypoxia and asphyxia at birth	168	16.5	36	4.9	204	11.6
Neonatal aspiration syndrome except regurgitated food or milk	-	-	4	0.5	4	0.2
1.2.2. Amenable by providing appropriate care during delivery	**299**	29.3	**94**	12.8	**393**	22.4
Newborn foetuses affected by placenta previa or placental abruption	65	6.4	32	4.3	97	5.5
Foetuses and newborns affected by umbilical cord disorders	46	4.5	6	0.8	52	3.0
Newborn foetuses affected by other complications at childbirth	19	1.9	13	1.8	32	1.8
Birth trauma	1	0.1	3	0.4	4	0.2
Intrauterine hypoxia and asphyxia at birth	168	16.5	36	4.9	204	11.6
Neonatal aspiration syndrome except regurgitated food or milk	-	-	4	0.5	4	0.2
1.2.3. Amenable by providing appropriate care to the newborn	**45**	4.4	**57**	7.7	**102**	5.8%
Cardiopulmonary and cardiovascular disorder specific to the neonatal period	-	-	26	3.5	26	1.5
Neonatal infections except CRS and congenital viral hepatitis	5	0.5	16	2.2	21	1.2
Neonatal haemorrhage except intracranial non-traumatic haemorrhage	-	-	1	0.1	1	0.1
Transitory endocrine metabolic disorder specific of foetus and newborn	18	1.8	4	0.5	22	1.3

Other haematological disorders of foetus and newborn	-	-	1	0.1	1	0.1
Digestive disorders of foetus and newborn except necrotizing enterocolitis	-	-	1	0.1	1	0.1
Disorders compromising the regular integument system of foetus and newborn	9	0.9	3	0.4	12	0.7
Other disorders of the perinatal period	13	1.3	5	0.7	18	1.0
1.3. Amenable through appropriate diagnosis and treatment	-	-	**2**	0.3	**1**	0.1
Down syndrome	-	-	2	0.3	2	0.1
1.4. Amenable through health promotion linked to healthcare actions	-	-	**3**	0.4	**3**	0.2
Other accidental respiratory risks	-	-	1	0.1	1	0.1
Aggression	-	-	1	0.1	1	0.1
Events (facts) with an undefined intention	-	-	1	0.1	1	0.1
2. Ill-defined causes	**109**	10.7	**3**	0.4	**112**	6.4
Disorders originating in the perinatal period, unspecified	92	9.0	3	0.4	95	5.4
Foetal death of unspecified cause	17	1.7	-	-	17	1.0
3. Other causes (not clearly preventable)	**67**	6.6	**151**	20.5	**218**	12.4
Total	**1019**	100.0	**737**	100.0	**1756**	100.0

Source: Sistema de Informações sobre Mortalidade. Secretaria de Saúde do Recife, Pernambuco, Brazil, 2016.

According to the analysis of preventable deaths by birth weight, 1,321 (77.9%) had a low perinatal birth weight (< 2.500g) whereas the neonatal component was 55% (725). Of these low birth weight infants, 642 (37.8%) weighed less than 1,000 g. Of the total perinatal deaths, 375 (22.1%) had appropriate weight at birth (≥ 2500 g) whereby the neonatal deaths totalled 242 (64.5%) (Table 5).

Table 5 – Foetal, neonatal, and perinatal deaths according to weight at birth of resident in Recife - Pernambuco, 2010 - 2014

	Foetal deaths (p-value < 0.001)		Neonatal deaths (p-value = 0.03)		Perinatal deaths (p-value < 0.001)	
Weight	**N**	**%**	**n**	**%**	**N**	**%**
<1000g	396	61.7	246	38.3	642	37.8
1000 to 1499g	91	35.0	169	65.0	260	15.4
1500 to 2499g	109	26.0	310	74.0	419	24.7
> 2500 g	133	35.5	242	64.5	375	22.1

Source: Sistema de Informações sobre Mortalidade, Secretaria de Saúde do Recife, Pernambuco, Brazil, 2016.

DISCUSSION

The observed perinatal coefficient behaved differently for the age components. The foetal mortality coefficient (FMC) increased slightly while the neonatal mortality coefficient (NMC) decreased between 2010 and 2014. The FMC in this study is lower than the coefficient for Brazil (10.0 per 1000 births) and the northeast region (12.1 per 1000 births), but higher than the coefficient of developed countries (2 to 7 per 1000 births)[8].

An ecological study conducted in Mexico found that 51% of foetal deaths occur during labour and 40% are late foetal deaths, which are those with viable extrauterine life conditions[6]. The occurrence of foetal deaths has also affected developed countries, which recorded around 1 stillborn for every 300 births[10]. In recent decades, efforts to reduce these deaths focused on neonatal diseases, while the prevention of stillbirths received less attention and investments because they were not specifically addressed in the Millennium Development Goals[11].

In this study, the maternal age ranged from 20 and 34 years and schooling was more than eight years. This age group is addressed in a study conducted in developing and developed countries[12]. Perinatal deaths persist in women with average reproductive age, of low socioeconomic status, of specific ethnic groups, with little education, and living in poor areas[12]. The factors that contribute to perinatal mortality include poor obstetric history, short intervals between deliveries, multiple pregnancies, history of stillbirth, hypertension, diabetes, lack of prenatal care, and low socioeconomic level[3].

With respect to the biological characteristics of the newborns and foetuses, most were premature and had low birth weight. Studies have shown that the lower the gestational age, the greater the risk of death and age is considered one of the main predictors of perinatal mortality[3]. Premature birth is the dominant risk factor, as there are 32 times more chances of death in newborns with 25 weeks than newborns with 31 weeks[3].

Maternal disorders and complications, intrauterine hypoxia, birth asphyxia, and early labour were the major cause of perinatal deaths. The same causes are mentioned in other studies[1, 3]. Of the perinatal outcomes from maternal complications, haemorrhaging (mostly placental abruption) and hypertensive diseases (especially preeclampsia) are the most likely to contribute to the deaths, particularly in foetuses in the third quarter[13]. Reducing the risk of death by asphyxia at birth is associated with the quality of obstetric and neonatal care, indicating the need to increase efforts to improve obstetric and neonatal care in the first minute of life[14].

Of the conceptus, especially in the foetal component, more than 20% term births had a weight greater than or equal to 2,500 g. An estimated 33 to 46% of foetal deaths worldwide occur in the third trimester of pregnancy[6]. Late foetuses that eventually die during delivery suffer from intrauterine hypoxia and account for a third of foetal deaths in developing countries[6]. According to a study, essential obstetric care in emergency rooms can reduce foetal deaths during delivery by 40% in comparison with non-specialised care[15]. Comprehensive obstetric care may decrease late foetal deaths by up to 85% late with essential obstetric care, which includes the use of antibiotics, oxytocin, and parenteral anticonvulsant drugs, vaginal birth, manual removal of placenta, and removal of retained placenta[15]. Comprehensive obstetric support is standard obstetric care including Caesarean section and blood transfusion[15].

Death surveillance can identify theses factor during the investigation by discussing the case with a multidisciplinary team and recommending prevention measures. It also helps to improve the quality of information on the births and reduce deaths[1]. Possible obstacles to obtaining this information are the low quality or lack of evidence and difficulties accessing this evidence[16]. The low quality life records of some populations compromise the availability of information needed to determine health policies and priorities[2].

With regard to filling the variables, information on foetal deaths was more regularly unknown than the information of early neonatal deaths. A recent systematic review on foetal deaths in Brazil detected gaps in the declarations of death with regard to sociodemographic information, despite improvements in the completion of these records[17]. Imprecise information on the basic causes of death from the investigations conducted by the death surveillance teams was also identified[18].

FINAL CONSIDERATIONS

A slight decrease was detected in the perinatal mortality coefficient. The behaviour of the mortality coefficients differed and there was an increase of foetal deaths. Most of the deaths were preventable and were concentrated in the group of appropriate care for women during pregnancy. The analysis of the preventability of death identified that the possible faults related to the occurrence of deaths lie in the care offered to women during pregnancy and delivery, which explains the high percentage of asphyxia and hypoxia.

Since this research was based on the SIM records, the limitations of this study are the incomplete variables, problems classifying the neonatal deaths diagnosed as stillbirths, incorrect completion of the declarations of death, and incomplete records and information that can lead to the underestimation of the coefficients.

The role of professional obstetric nurses according to the obstetric care model offered by the Unified Health System is to assess and monitor pregnant women to ensure their right to healthcare during pregnancy, childbirth, and the puerperium and a successful and humanised experience. During this period, these women must be tracked and diagnosed to ensure the early identification of

preconception and gestational complications. In these cases, they must be referred to services specialising in high-risk prenatal care and delivery to reduce the possibility of complications, premature labour, intrauterine hypoxia, and birth asphyxia and subsequently reduce the coefficient of preventable perinatal death.

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