Neonatal deaths from preventable causes in a central-eastern Brazilian capital from 2015 to 2018

Óbitos neonatais por causas evitáveis em uma capital no centro-oeste brasileiro de 2015 a 2018

Muertes neonatales por causas evitables en una capital del centro-oeste brasileño de 2015 a 2018

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Abstract

Objective: To analyze the evolution of neonatal deaths due to preventable causes in a capital city of the Brazilian center-west region from 2015 to 2018.

Methods: This descriptive and retrospective study analyzed preventable neonatal deaths occurring in Cuiabá (MT) using data from information systems. Deaths were classified according to the list of preventable causes of death after interventions carried out in the Unified Health System were then analyzed by descriptive statistics.

Results: A total of 331 neonatal deaths were identified; of these, 245 (74.0%) would be avoidable with adequate attention in the Unified Health System. The preventable neonatal deaths were due to inadequate care for women during pregnancy (132; 54.0%), inadequate care for fetuses and newborns (76; 31.0%), and inadequate care for women during childbirth (34; 13, 9%).

Conclusion: In the capital studied, preventable neonatal mortality remains high and requires investment to improve Health Care for this clientele.

Resumo

Objetivo: Analisar a evolução dos óbitos neonatais por causas evitáveis em uma capital do Centro-Oeste brasileiro de 2015 a 2018.

Métodos: Este estudo descritivo e retrospectivo analisou os óbitos neonatais evitáveis ocorridos em Cuiabá (MT) usando dados dos sistemas de informação. Os óbitos foram classificados conforme a lista de causas de morte evitável após intervenções realizadas no Sistema Único de Saúde sendo então analisados por estatística descritiva.

Resultados: Um total de 331 óbitos neonatais foi identificado; destes, 245 (74,0%) seriam evitáveis com uma adequada atenção no Sistema Único de Saúde. Das mortes neonatais evitáveis, 132 (54,0%) foram devidas a uma inadequada atenção às mulheres na gestação, 76 (31,0%) por inadequada atenção aos fetos e recém-nascidos, e 34 (13,9%) por inadequada atenção às mulheres no parto.

Conclusão: Na capital estudada, a mortalidade neonatal evitável permanece elevada e requer investimentos para melhorar a Atenção à Saúde a essa clientele.

Resumen

Objetivo: Analizar la evolución de las muertes neonatales por causas evitables en una capital del Centro-Oeste brasileño de 2015 a 2018.

Métodos: Este estudio descriptivo y retrospectivo analizó las muertes neonatales evitables que ocurrieron en Cuiabá (MT) utilizando datos de sistemas de información. Las muertes se clasificaron según la lista de causas de muerte evitables después de las intervenciones realizadas en el Sistema Único de Salud y luego se analizaron mediante estadísticas descriptivas.

Resultados: Se identificaron un total de 331 muertes neonatales; de ellos, 245 (74,0%) serían evitables con una atención adecuada en el Sistema Único de Salud. De las muertes neonatales evitables, 132 (54,0%) se debieron a una atención inadecuada a las mujeres durante el embarazo, 76 (31,0%) a una atención inadecuada a los fetos y recién nacidos y 34 (13,0%) a un 9%) a una atención inadecuada a las mujeres durante el parto.

Conclusión: En la capital estudiada, la mortalidad neonatal prevenible sigue siendo alta y requiere inversiones para mejorar la atención médica para esta clientele.

Introduction

The Sustainable Development Goals (SDGs) recommend an end to preventable newborn deaths in all countries to achieve a neonatal mortality rate equal to or lower than 12 deaths per thousand live births by 2030. In 2020, 17 deaths per thousand live births occurred as neonatal deaths. Of the deaths that occurred in children under 18 years, almost half occurred in the neonatal period (47.0%), making the first month of life the period most vulnerable to infant death. Therefore, doubling efforts is necessary for the global community to ensure that the most vulnerable children survive wherever they are.[1]

However, current trends in neonatal deaths continue to be a cause for alarm. It is predicted that more than 60 countries will not reach the neonatal mortality target without effective and immediate action, such as access to effective and high-quality care (including the continued expansion of life-saving interventions and primary health care). If all countries meet or exceed the SDG target, 8 million deaths of children under 5 years of age could be avoided in the period 2021-2030.[1]

In the period 2000-2018, 591,097 neonatal deaths were registered in Brazil; 76.0% of these deaths occurred after interventions carried out by the Unified Health System (SUS) and were classified as preventable. In the period 2000-2018, the neonatal mortality rate from all causes reduced from 13.6 to 8.5 per thousand live births. On the other hand, the preventable neonatal mortality rate reduced from 11.0 to 6.7 per thousand live births in the same period. The average rate of preventable deaths was 8.4 in this period.[2]

In the period 2000-2013, although mortality rates from preventable causes in children under 5 years of age showed a decline of 5.1% per year in Brazil, (when compared to non-preventable causes: 2.5% per year) year), preventable deaths through adequate care during pregnancy had a higher death rate. A survey on mortality trends in children under 5 years of age, living in different regions of Brazil, used the Brazilian list of causes of preventable deaths and showed that the central-west region showed the smallest decline (3.5%) in infant mortality due to preventable deaths per year.[3] This decline pointed out that investing more in regions where the reduction in deaths has

been lower and acting on the main preventable causes is necessary.

In the period 2007-2016, the State of Mato Grosso (MT) presented 65.1% of preventable infant deaths. We highlight the rate of preventable deaths in the early neonatal period. It was responsible for 76.3% of these preventable deaths, and 51.1% of them could have been avoided with adequate care for women (during pregnancy and childbirth) and newborns.[4] There, the preventable neonatal mortality rate declined from 11.7 to 6.3 in the period 2000-2018. The measures related to care for women during pregnancy were the main causes. This result was similar to that found in other Brazilian regions.[2] Improving the quality of care from the prenatal period is the challenge so that avoidable deaths can be prevented with qualified actions.

Research carried out in different regions of Brazil shows that neonatal and perinatal deaths could be reduced by adequate care for women (during pregnancy and childbirth) and newborns.[5,6] These data reinforce that social inequality is also present in the distribution of preventable deaths in the country,[7] highlighting that assistance to women (during pregnancy and childbirth) and newborns requires intersectoral, multidisciplinary, and health policy actions to reduce these deaths.

Considering the high rates of neonatal mortality from preventable causes in MT, successive regional assessments are necessary to highlight changes in the profiles of these deaths, organize and plan health actions, and propose health policies aimed at this clientele.[4] The objective of the present study was to analyze the evolution of neonatal deaths from preventable causes in a city in the Brazilian center-west in the period 2015-2018 to answer the following question: What were the main causes of preventable neonatal deaths in Cuiabá (MT) in the period 2015-2018?

Methods

This descriptive and retrospective study analyzed secondary data on neonatal mortality from January 2015 to December 2018 in the city of Cuiabá. We emphasize that this period was chosen to compose the research sample as Brazil reached goal 4 to reduce the mortality of children under 5 years of age before 2015 (date es-

tablished by the United Nations Organization, UNO) and due to the mortality data available until 2018 in Information Systems.

The population was composed of children under 28 days of age, who died in the period 2015-2018 due to underlying causes (International Statistical Classification of Diseases and Health-Related Problems, 10th Revision, ICD-10). The data were obtained from the Municipal Health Department (Live Birth Information System, Sinasc, and Mortality Information System, SIM) of Cuiabá in 2019 because they were not yet available in a public repository at the time of collection. The systems were linked using the manual linkage technique (Excel 2016 software) and the following variables: birth certificate number, mother's name, and sex and date of birth of the child. The basic cause of death was obtained from SIM, which uses CID-10 as a reference. The Brazilian list of preventable causes of death through interventions in SUS for the population with less than 5 years old was used to classify deaths.[8]

The list of causes of preventable deaths in children younger than 5 years old uses six subgroups reducible by appropriate actions: immunoprevention (subgroup 1); care for women during pregnancy (subgroup 2) and childbirth (subgroup 3); care for fetuses and newborns (subgroup 4); diagnosis and treatment (subgroup 5); health promotion linked to Health Care (subgroup 6) according to the type of health intervention based on the technology available by SUS.[8]

The maternal and newborn sociodemographic variables were analyzed. The maternal sociodemographic variables were as follows: age (with age groups of ≤15, 16-35, and ≥36 years); race and/or skin color (white, black, or brown); education (no education, Elementary Education I and II, Secondary Education, and incomplete and complete Higher Education); and marital status (single, married, stable union, or divorced). The gestational variables were as follows: number of prenatal consultations (≤ five or ≥ six consultations); type of birth (vaginal and cesarean); and gestational age (<37; 37-41; or >41 weeks; preterm, term, and post-term, respectively). The variables referring to newborns were as follows: sex (male or female); race and/or skin color (white, black, or brown); birth weight (<1.0, <1.5, <2.5, 2.5-3.9, and >3.9 kg; and extremely low weight, very low weight, low weight, adequate weight, and macrosomy, respectively); peri-

od of birth and death (deaths and births occurring in the intervals 07:00-18:59 h and 19:00-6:59 h the following day were considered daytime and nocturnal periods, respectively) and presence or absence of congenital malformation. The evolution of preventable deaths occurring in the period 2015-2018 was analyzed using the Brazilian list of preventable causes of death. Descriptive analysis was performed with absolute and relative frequency distribution using the Microsoft Excel 2016 program.

The research was developed following the ethical principles defined by the Brazilian Health Council (CNS; Resolution 466/2012) and was approved by the Research Ethics Committee (Opinion 3.512.521; CAAE 18437219.6.0000.8097).

Results

Characterization of newborns and their mothers

More than half (170; 51.4%) of newborns who died in the neonatal period were born by cesarean section, preterm (265; 80.1%), male (191; 58.0%), had brown skin (24; 73.4%), Apgar score less than seven in the first minute (218; 65.9%), and congenital malformation at birth (40; 12.1%). Concerning the maternal sociodemographic profile, the majority (268; 81.0%) of neonatal deaths occurred among mothers aged 16-35 years, of brown race and/or skin color (233; 70.4%), single (159; 45.3%), and with medium education (159; 48.0%).

Characterization of preventable neonatal deaths

In Cuiabá, the number of live births was 40,745 in the period 2015-2018. In this period, 481 (1.2%) deaths occurred in children under one year of age. Of these, 331 (0.8 %) were eligible for this study as they corresponded to deaths occurring in the neonatal period (0-27 days of life; 69.0% of total deaths in children up to one year of age). Of these neonatal deaths, 224 (67.7%) were early neonatal deaths; 106 (47.3%) of them died in the first 24 hours of life and 107 (32.3%) were late neonatal deaths (7-28 days of life). During this period, 331 neonatal deaths occurred; 245 of them (almost

75%) could have been avoided if children had access to quality care in the SUS. We highlight 132 (53.9%) deaths with the highest proportion among the subgroups studied, which resulted from avoided deaths by adequate care for women during pregnancy. Table 1 shows the distribution of deaths that occurred in the neonatal period by groups. These groups are following the Brazilian list of causes of deaths preventable by interventions in SUS for the population of children under five years of age.[8] All subgroups showed a decline, except for deaths that were avoidable through adequate health care.

Among the most frequent categories of causes of preventable deaths through adequate care for women during pregnancy, we highlight maternal conditions that affect fetuses or newborns (ICD-10 P00 and P04). Table 2 shows 45 (18.4%) cases followed by newborn respiratory distress syndrome (26; 10.6%), disorders related to short-term pregnancy and low birth weight (23; 9.4%), and maternal complications of pregnancy (21; 8.6%). In the category of avoidable deaths through adequate care for fetuses and newborns, we also highlight specific infections (43; 17.5%), specific respiratory and cardiovascular disorders (13; 5.3%), and other disorders originating in the perinatal period (12; 4.9%). The absence of quality birth care resulted in 34 (13.8%) deaths that could have been prevented, including intrauterine hypoxia and birth asphyxia (18; 7.3%), placenta previa and placental abruption (8; 3.3 %), and neonatal aspiration (3; 1.2%).

Table 1. Distribution of neonatal deaths according to the preventability classification

Causes of preventable deaths through	Anos				
	2015	2016	2017	2018	Total
Adequate care for women during pregnancy	44(56.4)	27(45.0)	37 (63.8)	24(49.0)	132(53.9)
Adequate care for fetuses and newborns	22(28.2)	25(41.6)	16 (27.6)	13(26.5)	76(31.0)
Adequate care during childbirth	12(15.4)	7(11.6)	5 (8.6)	10(20.4)	34(13.9)
Adequate health care	0(0)	0(0)	0(0)	2(4.1)	2(0.8)
Adequate diagnosis and treatment	0(0)	1(1.6)	0(0)	0(0)	1(0.4)
Total	78(100)	60(100)	58 (100)	49(100)	245(100)

Results are expressed as n(%); Basic causes according to the preventability criterion proposed by Malta et al.[8]

Table 2. Profile of preventable causes of neonatal deaths

Causes of preventable deaths through adequate care	Basic cause of death (ICD-10)	
For women during pregnancy	Maternal conditions that affect fetuses or newborns (P00, P04)	45(18.4)
	Respiratory distress syndrome of newborns (P22.0)	26(10.6)
	Disorders related to short gestation and low birth weight not classified elsewhere (P07, P07.1, P07.2)	23(9.4)
	Maternal complications of pregnancy affecting newborns (P01.0, P01.1)	21(8.6)
	Fetuses and newborns affected by complications in the placenta and membranes (P02.2, P02.3, P02.7, P02.8, P02.9)	10(4.1)
	Congenital syphilis (A50)	3(1.2)
	Pulmonary hemorrhage originating in the perinatal period (P26)	3(1.2)
	Necrotizing enterocolitis of fetus and newborn (P77)	1(0.4)
For fetuses and newborns	Specific infections of the perinatal period (P35 to P39.9, except P35.0 and P35.3)	43(17.5)
	Respiratory and cardiovascular disorders specific to the perinatal period (P22.1, P22.8, P22.9, P23, P25, P27, P28)	13(5.3)
	Other disorders originating in the perinatal period (P90 to P96.8)	12(4.9)
	Conditions that compromise the integument and thermal regulation of newborns (P80 to P83)	3(1.2)
	Transient and specific endocrine and metabolic disorders of fetuses and newborns (P70 to P74)	3(1.2)
	Hematological disorders of newborns (P60, P61)	2(0.8)
In childbirth	Intrauterine hypoxia and birth asphyxia (P21.0, P21.9)	18(7.3)
	Placenta previa and placental abruption (P02.0 to P02.1)	8(3.3)
	Neonatal aspiration (P24, except P24.3)	3(1.2)
	Fetus and newborn affected by umbilical cord disorders (P02.4 to P02.6)	2(0.8)
	Other complications of labor or birth that affect newborns (P03.1, P03.8)	2(0.8)
	Birth trauma (P10 to P15)	1(0.4)
In health promotion	Other accidental breathing hazards (W75 to W84)	2(0.8)
In diagnosis and treatment	Down Syndrome (Q90)	1(0.4)
Total		245

Results are expressed as n(%). ICD-10: International Statistical Classification of Diseases and Related Health Problems, 10th Revision.

Discussion

Although reductions have occurred in recent years, neonatal mortality remains high, with emphasis on deaths occurring in the early neonatal period (first 24 hours of life). Thus, constant tracking and monitoring are necessary for health services, particularly in public SUS policies that were created to reduce neonatal deaths, especially deaths considered preventable.

The study showed that the majority (74.0%) of neonatal deaths that occurred in Cuiabá in the period analyzed could have been avoided with qualified attention to the services that SUS provided to this clientele. Preventable deaths through adequate care for women during pregnancy were the main category of preventability of neonatal deaths that occurred, suggesting the need for improvement and/or better assistance in the prenatal period. The group of causes that can be reduced by adequate care for fetuses and newborns and adequate care during childbirth occupied the second and third categories, respectively. Both causes point to better qualifications in the assistance services provided during delivery and birth. In this research, preventable neonatal deaths decreased by 62.8% during the study period. A 46.9% reduction in neonatal deaths from preventable causes was also observed in Minas Gerais (central region; 1999-2011)[9] and other Brazilian regions.[2]

Regarding the preventability of neonatal deaths, a study also developed with data on deaths occurring in Cuiabá (2010) showed that 81.1% of deaths occurring there were avoidable.[10] A 7.1% reduction was observed in comparison to data from the present study, showing a reduction in neonatal deaths that could be avoided with qualified care, pointing out the paths that must be taken in search of continuous improvements.

Despite the reduction in preventable neonatal deaths, the high percentage of these deaths is still a reality in Cuiabá and several Brazilian states. An analysis of neonatal deaths occurring in the State of Piauí (2006-2011) showed that 72.4% of them were preventable.[6] Another investigation carried out in the same State (2010-2015) showed a percentage of 77.1% in these deaths.[11] A similar value was observed in an investigation carried out in the State of Pernambuco, with 77.4% of preventable neonatal deaths.[12] In contrast, neonatal mortality rates from preventable causes were low in developed countries such as Japan (22.5%)[13] or even Germany (60.4%).[14]

A study analyzed neonatal deaths that occurred in seven Brazilian states and the Federal District in the period 2010-2015 and observed that 66.3% of the 96,170 deaths that occurred on the first day of life were due to preventable causes. Of these deaths, 40.8% could be avoided by adequate care for women during pregnancy,[15] similar to the results found in Cuiabá (53.9%).

In the present study, a 7.4% reduction in preventable deaths through adequate care for women during pregnancy was also observed. However, these deaths are still responsible for a significant number of deaths when added to the final amount. Such deaths could have been avoided with quality care in the prenatal period. This situation also occurred in other Brazilian cities,[2,3,16-19] reinforcing the importance of prenatal care to avoid unfavorable outcomes for both mothers and newborns.

This trend towards preventability of neonatal deaths with a greater rate in causes related to adequate care for women during pregnancy, followed by adequate care for fetuses and newborns and women during childbirth (as found in this study) is similar to that observed in investigations carried out in other Brazilian states.[2,3]

In the subgroup of deaths that can be reduced through better care for women during pregnancy, we identified that the main causes of neonatal deaths were related to maternal conditions that affect fetuses or newborns (45; 18.4%) and respiratory distress syndrome of newborns (26; 10.6%). This is similar to what was observed in the study carried out in the city of Rio de Janeiro (RJ), where respiratory distress syndrome in newborns was the second cause of death.[18]

In Brazil, the care provided to pregnant women has shown weaknesses, probably because it only covers their biological aspects, without including maternal and fetal needs in all their dimensions. Economic, family, education, and housing difficulties (in addition to biological needs) can result in higher-risk pregnancies and, thus, neonatal mortality. In this sense, restructuring existing policies is necessary. More comprehensive actions, co-responsibility of managers, and training of professionals must be proposed to improve these social and health indicators of women and their families, thus making it possible to positively impact preventable deaths.[2]

Regarding the causes of preventable deaths through adequate care for fetuses and newborns, typical infections in the perinatal period (43; 17.5%) were highlighted, followed by respiratory and cardiovascular disorders typical of the perinatal period (13; 5.3%). Such data can be compared to those presented in studies previously carried out in Cuiabá and Rio de Janeiro, where the highest percentage of deaths resulted from typical respiratory and cardiovascular disorders (35.0%) and typical infections in the perinatal period (21.6%), [9] and perinatal infection with unspecified bacterial septicemia of newborns,[18] respectively. In countries with the highest infant mortality rates, half of the neonatal deaths were caused by infections; in countries with lower rates, prematurity, and congenital malformations were the main causes of death.[13,20]

In Cuiabá (2015-2018), the percentage of deaths preventable by adequate care for women during childbirth (34; 13.8%) was also similar to that observed in seven Brazilian states and the Federal District (2010-2015)[15] and the city of Rio de Janeiro (2000-2018),[18] as well as the two main underlying causes (asphyxia and intrauterine hypoxia).[3,18] They were also observed in the present study and research developed in Japan.[13]

In our reality, the causes that can be avoided through adequate care for women in childbirth point to weaknesses in obstetric management during labor. As recommended in the policies, technical and scientific knowledge of health managers and professionals is fundamental for integral, humanized, and resolute management and care from prenatal care, through birth, to the first month of life, so that there is an impact on improving indicators.[2]

The data presented here indicate that the preventable causes of neonatal mortality are similar even in different health periods and contexts. Thus, the tracking and diagnosis of failures that have been occurring in health services (particularly in prenatal care) are necessary as higher proportions of these basic causes of death were observed in many places, as well as in the present study.

The limitations inherent to information systems (such as a large number of missing and/or ignored data, as observed in sociodemographic variables) made it difficult for a more in-depth analysis of inequalities and can therefore be considered as limitations of this investigation. Furthermore, the interference of periodic data updates in information systems on the results was minimized because data directly produced by the department recipient of this information was analyzed. However, data from Sinasc and SIM made it possible to trace the profile and evolution of preventable neonatal deaths in Cuiabá, offering subsidies to work on reducing these deaths.

Conclusion

Improving prenatal care is necessary to provide qualified, effective, and comprehensive care. The grouping of the most common preventable causes can support decisions about the best interventions. Using the classification of preventable deaths as an indicator will be useful for monitoring regional trends, identifying persistent gaps, and supporting decisions appropriate to each reality. Proposing strategies for effective coping with neonatal deaths is urgent to improve the quality of care offered by health services to women and newborns. Actions for improving access to prenatal care, labor, and birth must cover the social and living conditions of this population. These actions will make it possible to reduce preventable causes of neonatal death, and improve pregnancy care, thus contributing to reducing neonatal mortality.

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Collaborations

Modes PSSA, Gaíva MAM, Santos CAS, and Raia VA declare to have contributed to the design of the study, collection, analysis, and interpretation of data, writing of the manuscript, relevant critical review of the intellectual content, and approval of the final version to be published.

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