Postnatal mortality in Brazilian territory: a literature review*

MORTALIDADE PÓS-NEONATAL NO TERRITÓRIO BRASILEIRO: UMA REVISÃO DA LITERATURA

MORTALIDAD POST-NEONATAL EN EL TERRITORIO BRASILEÑO: UNA REVISIÓN DE LA LITERATURA

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ABSTRACT

This is a systematic review regarding postnatal mortality, covering the period between 2004 and 2009. The objective was to identify how the causes of death and the relationship with socioeconomic conditions are stated in the literature. Twenty-seven articles were selected, 74.4% of which were published in public health journals, with 66.7% having an ecological study design. Nearly all articles addressed cause groups and their components (66.7%), followed by the remaining third, which addressed the identification of the determinant factors of the deaths. The Southeast region produced over 37% of the studies. In most Brazilians cities and states, there was a reduction of deaths by more than 50% by the end of the 1900s. Among the cause of death groups, the diarrhea-pneumonia group was predominant, followed by congenital abnormalities. The basic life conditions according to socioeconomic indicators – housing, basic sanitation, education, and accessibility to health – were determinants for the highest postnatal death rates due to reducible causes.

DESCRIPTORS

Infant mortality
Postneonatal mortality
Cause of death
Review

RESUMO

O presente trabalho trata-se de revisão sistemática, referente ao período de 2004 a 2009, sobre o tema mortalidade pós-neonatal. Teve o objetivo de identificar como se colocam na literatura, as causas da morte e a relação com as condições socioeconômicas. Foram selecionados 27 artigos, 74,4% publicados em periódicos da área da Saúde Pública e 66,7%, de desenho do tipo ecológico. Quase a totalidade versava sobre grupos de causas e seus componentes (66,7%), seguidos pelo terço restante, sobre a identificação dos fatores determinantes dos óbitos. A região Sudeste produziu mais de 37% dos estudos. Na maioria dos municípios e estados brasileiros, a redução superou 50% no final da década de 1990. Dentre os grupos de causas de óbitos, predominou o grupamento diarreia-pneumonia, seguido pelas malformações congênitas. As condições de vida segundo indicadores socioeconômicos – moradia, saneamento básico, educação e acesso à saúde – foram determinantes para os maiores índices de mortalidade pós-neonatal por causas passíveis de redutibilidade.

DESCRITORES

Mortalidade infantil
Mortalidade pós-neonatal
Causas de morte
Revisão

RESUMEN

Revisión sistemática referida al período entre 2004 y 2009 acerca del tema mortalidad post-neonatal. Objetivó identificar cómo se expresan en la literatura las causas de muerte y la relación con las condiciones socioeconómicas. Se seleccionaron 27 artículos, 74,4% publicados en revistas del área de Salud Pública y 66,7% de diseño de tipo ecológico. Casi la totalidad versaba sobre grupos de causas y sus componentes (66,7%), seguidos por el tercio restante, atendiendo identificación de factores determinantes de decesos. La región Sudeste produjo más del 37% de los estudios. En la mayoría de los municipios y estados brasileños, la reducción superó el 50% a fines de los '90. Entre los grupos de causas de muerte, predominó el agrupamiento diarrea-neumonía, seguido de malformaciones congénitas. Las condiciones de vida según indicadores socioeconómicos, residencia, sanidad básica, educación y acceso a la salud, fueron determinantes para mayores índices de mortalidad post-neonatal por causas pasibles de reductibilidad.

DESCRIPTORES

Mortalidad infantil
Mortalidad Postneonatal
Causas de muerte
Revisión

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INTRODUCTION

Over the years, the progress in reducing post-neonatal mortality has been more in evidence than reduction in neonatal mortality. This is due to the determining factors for the deaths. In relation to neonatal mortality, the determining factors are more associated with the pregnancy, the birth and to genetic factors, while post-neonatal mortality is related to factors which are determined by living conditions and family characteristics, such as socio-economic factors (particularly income), education, basic sanitation, treated water and access to the health services[1].

These last are considered to be reducible through effective public policies in health and social development, and also through preventive measures and health promotion. There are regional differences and inequalities between the mortality rates in the distinct social strata in Brazil. In 2000, the Infant Mortality Rate (IMR) among the poorest 20% was equivalent to more than double the rate among the richest 20%[1]. Over the last three decades, other studies have shown an association between socio-economic variables and Infant Mortality (IM)[2-4].

Socio-economic conditions such as family income, the parents´ level of schooling, the work done by the mother, and the social class are variables which *(...) although not causing illness directly, constitute distal determinants which affect living conditions*, as the *(...) insertion of class determines the child´s exposure to risk, as does her access to wealth, which in its turn establishes the levels of consumption, the availability of food, housing, sanitation, medical assistance, schooling etc*[5]. According to the 2008 UNICEF report, it is precisely the regional inequalities which keep Brazil´s infant mortality rate at a higher proportion than in the other countries of Latin America, it being the third-highest on the continent[1].

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In the developed countries, the Post-Neonatal Mortality Rate (PNNMR) is barely significant, but in Brazil, despite the decreases of the last few years, there are still high levels which are ethically unacceptable[2]. Such a fact is particularly important when one considers that the healthcare services' low effectiveness in infant health is one of the determining factors which are recognized as being avoidable[6].

Considering that in large part it is possible to reduce postnatal mortality, the study sought to investigate Brazilian scientific production concerning mortality in this segment with the aim of determining if, in those social groups with the lowest socio-economic conditions, it is death from avoidable causes that predominates.

METHOD

This is a descriptive bibliographic study and made use of a systematic review of research published with objectives, method and results clearly explained, on the issue of post-neonatal mortality between 2004 and 2009.

The inclusion criterion was that the articles had to be from scientific periodicals indexed on the Virtual Health Library (*Biblioteca Virtual de Saúde*, or BVS, in Portuguese) database. The identification of the bibliographical sources was extracted from the BVS Portal: (LILACS) Latin-American and Caribbean Literature in Health Sciences, MEDLINE (Medical Literature Analysis and Retrieval System Online), the Cochrane Library, (SciELO) Scientific Electronic Library Online; and in specialized databases: (BDENF) Nursing Database and (MEDCARIB) Caribbean Health Sciences Literature.

Descriptors were used by subject, title and words, starting from the terms of the DeCS[a]:Infant Mortality, Cause of Death, Post-neonatal Mortality, Late Infant Mortality, Health-Illness Process, Health Inequalities, Social Class, Social Indicators, Spatial Distribution of the Population and Epidemiological Factors. The articles were catalogued according to general description, raising the following identification data: period of publication, author(s), type of periodical, place of study, source of data, design of the research and results.

RESULTS

Scientific production in post-neonatal mortality

In total, the production selected on the issue of infant mortality – specifically, on its post-neonatal component, between 2004 and 2009, came to 27 articles. Of these, 71.4% had been published in Public Health periodicals[7-23] and 14.8% in Nursing periodicals[24-31].

Concerning publications specifically on post-neonatal mortality, only two works were found: one in the Revista Brasileira de Saúde Materno Infantil-Pe (Brazilian Journal of Mother and Child Health) and another in the Revista Paulista de Pediatria (São Paulo Journal of Pediatrics)[21,32]. The others dealt equally with both the neonatal component and the post-neonatal component.

Almost all sources researched were populational surveys (96.3%) using ecological studies (66.7%) and cohort studies (18.5%).

[a] Official list of approved descriptors in Brazil.

Of the 27 articles selected, two productions had a nationwide scope[23,33]. It may be observed that research is concentrated in the South-west region (37%)[9,10,12,15,17, 21,24-25,32,34]. Of these, 50% originated in the state of São Paulo[9,10,24, 32,34] with 30% from the city of São Paulo itself[9,10,24]. The other half was distributed between Rio de Janeiro[15,17,25] and Minas Gerais[12,21]. No studies were found on infant mortality or its components in the northern region.

In the majority of cases, the objective of the research was to elucidate infant mortality, along the lines of groups of causes and their components (66.7%) and to identify the determinant factors for the infant deaths (33.3%).

Post-neonatal mortality in Brazil and its regions

The reduction of infant mortality and its post-neonatal component was evident in all of the articles selected. In the majority of Brazilian towns and states, the reduction in post-neonatal mortality had exceeded 50% by the end of the 90s[7,11-12,14,19,21-22,25,33].

Table 1 – Reduction in infant and post-neonatal mortality rates in towns and states by region according to the results of the articles selected, published between 2004 and 2009.

Towns and States by Region	Reduction in Mortality Rates	
	Infant	Post-neonatal
	%	%
Western Central Region		
Federal District, Brazil, 1990 to 2000[7]	54.8	59.1
South-West		
Metropolitan region of São Paulo/SP, 1980-2000[9]	18.0	12.5
Belo Horizonte/Minas Gerais, 1984-1998[12]	54.4	51.5
Belo Horizonte/Minas Gerais, 1996 a 2004[21]	50.0	50.0
Towns in the State of São Paulo, 1995-2000[26]	23.4	26.9
City of Rio de Janeiro, 1979-2004[28]	59.4	73.8
South		
State of Paraná, 1997/2000[14]	19.3	7.0
Pelotas/RGS, 1992 to 1993 and 2004[20]	46.7	56.2
North-East		
Feira de Santana, Bahia, 1979-2002[11]	50.0	87.2
Towns of the Brazilian North-east: 2000-2002[16]	10.6	3.9

In Brazil as a Whole

One of the nationwide research projects verifying the association between infant mortality and socio-economic conditions in medium-sized and large towns, between 1994 and 2004, identified that all of the socio-economic variables investigated presented statistically-significant correlations with rates of infant mortality. Among the causes of death, perinatal disorders totaled 60%[33].

The other investigation to determine the association between changers in health indicators (resources and coverage) and the variations in the infant mortality rates in the 27 states which make up Brazil, between 2000 and 2005, showed that there had been an improvement in women´s access to pre-natal care and to basic sanitation. It also found that in the years of the study, public investment in health had increased. Such results presented positive impacts and consequent reductions in the rates of infant mortality in the 27 states[23].

The Center-West Region

In the Federal District, the post-neonatal mortality rate reduced between 1990 and 2000 from 10.5% to 4.3%, respectively. Of the causes, infectious parasite-borne diseases showed a decrease of 84.2%, followed by respiratory diseases and malnutrition[7]. In another analysis from the same state, the Infant Mortality rate (IMR) of all the components underwent a reduction, although in the poorer regions these were still high when compared to those in regions with better economic conditions [19].

In the state of Mato Grosso do Sul, from 2000 to 2002, of the total of deaths, 83.8% were of children living in the urban area, 10.7% from indigenous villages, and 4.9% from the rural zone. The causes of post-neonatal mortality were infectious parasite-borne diseases (9.4%) and respiratory diseases (8.7%)[22].

South-West Region

The fall in IMR in the metropolitan region of São Paulo was of 69.4% passing from 55.2%, in 1980, to 16.9%, in 2000. In 1980, the groups with the worst socio-economic conditions had the highest rates of infant mortality but, in 2000, when more than 90% of households not only had basic sanitation, but the illiteracy rate had also dropped, they showed the biggest rate of decrease in post-neonatal mortality (from 64.5% to 5.8%), followed by late neonatal mortality (from 13.2% to 2.8%)[9].

Another study carried out in the state of São Paulo in 1999, which aimed to describe the pattern of infant mortality in the state of São Paulo according to multiple causes of death and to compare the data for basic and multiple causes of death, showed that post-neonatal mortality from infectious-contagious diseases was associated with respiratory illnesses. Malnutrition, low birth weight, premature birth, breathing or cardiovascular problems in the perinatal period were allied to these causes[10].

In the three-year-periods from 1995 to 1997 and from 1998 to 2000, the behavior of three health indicators (infant mortality; vaccination coverage/rate of abandonment of the DPT vaccine, and hospitalizations), in two areas of seven towns in the state of São Paulo with similar socioeconomic characteristics save for whether they had implanted or not the Family Health Program (FHP), showed that implanting the FHP was one of the factors which contributed to the fall in rates of infant mortality and discontinuation of the DPT vaccine when compared to those towns which had not joined the program[24].

In the town of Embu in the state of São Paulo, the social strata with the worst living conditions, between 1995 and 1998, had the highest IMR, in relation to the intermediate strata; the social indicators and the health reality in many ways resemble the conditions found in the peripheries of the great urban centers, where infant mortality remains as yet one more manifestation of the contradictions between the social classes[34].

Besides the contradictions of the classes, other risk factors for post-neonatal mortality were identified in Santos, in the state of São Paulo: *birth weight under 2,500g*, *birth defect*, *necessity for hospitalization of the new-born after the mother´s discharge* and *sibling of more than two years of age*[32]. Further, the association between birth weight and infant mortality, in the town of Campos dos Goytacazes in the state of Rio de Janeiro, in 1999, was the most determinant factor, in both the neo-natal and post-neonatal periods, independent of variables related to the pregnancy and the care received[15].

In the city of Rio de Janeiro, the mortality rates per thousand live births decreased from 37.4%, in 1979, to 15.1%, in 2004, with the post-neonatal component being the principal component responsible for this decline. In 2004, the principal causes of neonatal deaths were perinatal conditions and congenital defects; among the post-neonatal deaths what stood out were infectious and parasite-borne diseases, poorly-defined causes, and respiratory diseases. Of the total of deaths, approximately 66.0% took place in public establishments[25]. On the other hand, another study carried out in the same city showed that the post-neonatal mortality rates, between 1999 and 2001, were six times higher in the city and state maternity units than in private maternity units not convened with the Unified Health System. In the post-neonatal period, 9.1% of deaths were caused by external causes, while infectious-contagious/parasite-borne diseases and respiratory illnesses contributed 25% each. There were three times fewer post-neonatal deaths from infectious-parasite-borne diseases in private hospitals than in public ones[17].

In the studies undertaken in Belo Horizonte and the metropolitan region, a reduction was ascertained in the post neonatal component from 34% to 16.5%, an average decline of 4.6%, between 1984 and 1998, respectively. Pneumonia and diarrhea predominated among the principal causes of death[12]. Another piece of research carried out in the same city, between 1996 and 2004, to determine the principal causes of post-neonatal infant deaths, showed that the diarrhea-pneumonia-malnutrition grouping was determinant for post-neonatal mortality[21].

Southern Region

In the 399 towns in the state of Paraná, between 1997 and 2001, it was also identified that the living conditions and infrastructure conditions were related to the infant mortality rate and its components – in particular to the post-neonatal component[14].

In the city of Maringá (Paraná), between 2000 and 2006, of the 595 infant deaths, 29.7% happened in the post-neonatal period. The three principal causes were: external (21.5%), congenital defects (19.2%) and the perinatal period disorders (15.8%)[26]. However, in Cianorte (Paraná), between 1999 and 2006, it was ascertained that 80.7% of the deaths occurred in the neonatal period, 68.3% due to perinatal causes, 61.4% with birth weight inferior to 2,500g. The mothers had low-qualification jobs (95.5%) and 6.8% had not made any pre-natal check-ups[35].

Continuing in the Southern region of Brazil, a reduction of 13% was observed in post-neonatal mortality between 2001 and 2002 in the city of Caxias do Sul, in the state of Rio Grande do Sul. On the other hand, deaths from congenital defects increased by 14% to 20.3%, while diseases of the respiratory system decreased by 10% to 2.7%[13]. Two other studies in the same state indicated a fall in the Infant Mortality Rate – the biggest of which was in the Post-Neonatal Mortality Rate (PNNMR), being over 70%, between the years 1982 and 2004. The principal causes of infant mortality were perinatal disorders and respiratory infections. There was a reduction of 16% in mortality among children with low birth weight born to poor families; however, this same coefficient increased more than 100% in families with high incomes, due to the increase in the number of premature births[20,36].

North-east Region

In the city of Feira de Santana, in the state of Bahía, post-neonatal mortality shrank from 63.3%, in 1979, to 8.1%, in 2002. Among the causes, diarrhea was predominant, while records of poorly-defined causes varied from 64.3% to 1.4%[11].

In the state of Ceará, between 2000 and 2002, two other studies showed that the possible determinants for neonatal mortality were made up of socio-economic factors and factors relating to access to, and quality of, healthcare. Despite the improvement of sanitation conditions in the nineties, infectious and parasite-borne diseases still occupied the second position, with 31% of hospitalizations in children under one year old. Also

present were the variables of low birth weight, length of pregnancy, Apgar score below seven in the first and fifth minutes and a number of pre-natal check-ups equal to or greater than six[16,18].

In Campina Grande, Paraíba, from 2006 to 2007, the relationship between vaccination coverage and mortality of children under one year of age decreased, such that the calculation of the average of the IMR reached a rate of below 20[27]. This fact was also found in the city of Olinda in the state of Pernambuco, in the years 1990/1997, 1995/1996 and 1997/2002, in addition to the reduction of infant mortality through avoidable causes (12.7 deaths/year), even without there being any reduction in the city´s absolute poverty or increase in the coverage of public health systems or sewerage drainage[37].

In a comparative study, between two cohorts of births in Ribeirão Preto in the state of São Paulo in 1994, and São Luiz in the state of Ceará from 1997 to 1998, identified that the IMR in São Luis was 26.6/1000LB and the post-neonatal mortality rate (PNNMR) was 8.2/LB. The risk factor for infant mortality in both cities was a maternal age of below 18. Besides this, the inadequacy of pre-natal check-ups in São Luiz was also considered a risk factor, although living in a household with five or more inhabitants was found to be a protective factor. The risk factor in Ribeirão Preto was the mothers´ habit of smoking[8].

DISCUSSION

Publication of the principal studies has been concentrated in the periodicals in the field of Public Health originating predominantly from the South-Western and Southern regions of Brazil. In the three-year period 2007 to 2009, there was an increase in publication on infant mortality in Nursing magazines. It is worth noting that the investments in research have been concentrated in the regions which possess both centers of study, and health indicators which indicate an improvement in health quality, while the North and North-eastern regions have both poor health indicators and under-reporting of information.

In terms of the under-reporting or adequacy of the information provided by the System for Information on Mortality (SIM) and the System for Information on Live Births (SINASC, in Portuguese), the cities which perform satisfactorily are to be found in the South-West, South and Center-West of Brazil, while the under-performers predominate in the North and North-Eastern regions of Brazil, with variation of 5% in the North-East and 63% in the South[38].

The quality and use of information systems may be observed in the increase in studies that use ministerial data. This increase is due to the technological evolution of computer science, with its consequent improvement in the quality of data, permitting the execution of linkage, which widens the detailing of the analysis of mortality´s causal factors, despite the disparity of information between the different regions of Brazil[39,40].

It´s important to note that populational health surveys were developed in industrialized countries in the 1960´s as instruments for formulating and evaluating public policies, as well as making it possible to collect data for constructing indicators associated with health and not just illness, such as risk factors and the social determinants of the health-illness process, while being fast to apply with a reasonable cost-benefit ratio[41]. In this study, many used populational surveys to identify the relationship between living conditions, infant mortality and health inequalities[12,14,18,24,34].

Infant mortality in Brazil, particularly its post-neonatal component, despite the evident reduction since the 90´s, is still mainly related to causes that are possible to reduce, principally in those social groups which have the worst living conditions and access to health care services. On considering the studies in which this component was reduced by 50% in the South, South-Western and Center-West regions, one may observe that in the North-East the fall has been small when compared to the national average. On the other hand, at the end of the 90´s, the Family Health Program was implanted across Brazil, and some of the articles selected in this study show the significant reduction in infant mortality in the cities with the greatest coverage by the program, in particular, in the North-East region[24,27,37].

It was the post-neonatal component that most contributed to the fall in Brazil´s infant mortality rate. Between 1996 and 2000, the reduction was of 20.5% and, between 2000 and 2004, of 15.9%. In relation to this rate´s reduction in the different regions of Brazil, in the North-East it remains high, falling from 41.4% in 2000 to 33.9% in 2004, principally in the state of Alagoas, with 47.1% in 2004. In the South-West and Southern regions, in 2004 it represented 15% and 14.9%, respectively[42].

It must be observed that when IMR is high, the post-neonatal component is predominant, and when it is low, its principal component is neonatal mortality, with early neonatal mortality predominating. In general, high rates of infant mortality reflect low levels of health and socio-economic development and, if reduced, can mask the bad living conditions of specific social classes. This coefficient also offers tools for analyzing geographical and temporal variations in infant mortality, identifying tendencies and situations of inequality that may require the undertaking of specific studies. This indicator is used to contribute to the evaluation of the population´s health levels and socio-economic development and to support processes of planning, managing and evaluating health policies and actions which focus on pre-natal health care and birth, as well as the protection of infant health[43].

Among the principal avoidable causes of infant deaths, diarrhea and then pneumonias predominate, followed by congenital defects, which are considered to be avoidable with difficulty. The fourth cause refers to undefined or poorly-defined causes[44]. The illnesses which are most common as causes of hospitalization for respiratory illness were the pneumonias, which led the statistics for both morbidity and mortality in Brazil and the world. The risk factors most commonly associated with sickness were: age below six months, weight below 2,500 grams, early weaning, malnutrition, deficiency of micronutrients (vitamin A, iron and zinc) and the presence of a previous episode of pneumonia[29,45].

In relation to the diarrheal illnesses, although they can be prevented and treated, they are still the second biggest cause of death of children in under-developed countries. In Brazil, the decline in recent decades is clear. This fact is associated with the improvement in the condition of the country´s infrastructure (sewerage system and drinking water)[45-46].

The living and health conditions are determined according to the social stratification which configures a determined context or territory and which determine the unequal distribution of factors which produce health, such as material, biological, psycho-social and behavioral factors. The economic inequalities, expressed by position occupied in the social strata, determine inequality of access, which increases the inequalities. To combat them, it will be necessary to develop inter-sectorial policies, involving the economic, income, housing and education sectors, among others, and to ensure the participation and empowerment of those populations, such that they may participate in the transformation to a just society[30,47].

In addition to the social inequalities associated with a greater risk of post-neonatal death through diarrheal or respiratory diseases, low weight was also identified as an element which potentializes death from this component[15-16,20,32]. Such a finding may suggest that, with the technological advent of Neonatal Intensive Care Units, the length of survival in the first month of life has increased - with death following consequently in the period which follows it (28 to 364 days of complete life) [31].

This technology may also be related to the increase in survival of children with congenital defects, the third biggest cause of death in the post-neonatal period in the articles analyzed, considered by some to be a non-avoidable cause of infant death. In some studies, this has gone from 4.0% to approximately 25.0% in the last fifteen years[12-13,17,19,26,32,34] and, in another, it was the leading cause of death[12]. All populations are exposed to the risk of developing congenital defects. However, its frequency and type vary with race, ethnicity and socio-economic conditions[48].

Another cause of post-neonatal mortality, which attracted the attention of the articles analyzed, was ´external causes´. Its occurrence varied from 5.4% to 21.5%[13,17,25-26]. Worldwide, accidents are among the five principal causes of death, occupying either second or third position in almost all countries. In Brazil, between 10% and 30% of hospital beds are occupied by those who have had accidents and it is estimated that for every ten children, one needs attention from the health system. It is also estimated that for each individual who dies, 15 are left with permanent sequelae[49].

Besides the causes mentioned above, another relevant fact met in the articles selected was the significant percentage of post-neonatal deaths in which the basic cause of death was either not made clear or left at "other poorly-defined causes"[17,21,25]. Such causes may be cleared up through improving the investigation of cases of death by Committees for Investigation of Infant and Fetal Deaths, by means of reliable health service records both from primary healthcare and from hospitals, and through correct notification of the information in the respective databanks[50].

CONCLUSION

All of the studies were of quantitative analysis, using primary and secondary data. The majority of causes of death in the post-neonatal period were considered avoidable. On the other hand, no study was found which stated explicitly the social determinants that could have affected the health-illness process and consequently have favored death in this infant component. However, it is worth emphasizing that even though the studies have demonstrated associations between a higher mortality rate and living conditions, in different years or decades, the impact of the reduction has not been clearly elucidated in terms of the efficacy of the social and health interventions put in place until now. On the other hand, the data makes it clear that for there to be reduction in deaths from causes recognized as avoidable, health care practices must be supported by health monitoring.

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