ABSTRACT

Objective: to correlate the indicators of infant mortality in the city of João Pessoa (JP) with the Brazilians (BR) and the State of Paraíba (PB) in the period 2007-2011. Method: quantitative and descriptive study of Infant Mortality Rates (IMR), neonatal mortality (NMR) and mortality rate post-neonatal (PNMR) JP, PB and BR in the period 2007-2011, obtained in the Collection of the Health Pact collected between February to June 2012. Statistical analysis was performed to describe and compare those rates. Results: Brazil, Paraiba and Joao Pessoa showed reduction in IMR and TMN. As for PNMR, Paraiba and Joao Pessoa, had increased. Conclusions: the goals outlined in the Pact for Life were not fully achieved, so there is need of effective strategies/interventions to achieve significant reductions in infant mortality rate and its components in the municipality, state and federal. Descriptors: Infant Mortality; Neonatal Mortality, Post-Neonatal Mortality; Health Indicators.

RESUMEN


RESUMO

INTRODUCTION

Infant mortality can be conceptualized as the number of deaths of infants under one year of age per thousand live births, the population living in a given geographical area in a given year. This indicator estimates the risk of death of the newborns during their first year of life.¹ Also reflects the situation of the population with regard to their education, socioeconomic development, sanitation, income generation and distribution, health, as well as the effectiveness of public policies in force in this area, access and quality of resources available for health care maternal and child.¹² This fee is split into early neonatal mortality (first six days of life) when the death is usually influenced by the conditions of pregnancy and childbirth; late neonatal mortality, due to effects of childbirth and infections occurred between the 7th and 27th days of life, and the post-neonatal mortality, strongly influenced by environmental conditions in which the child develops, including the deaths that take place from the 28th day to the 1st year of life.³

The decrease in mortality rates is one of the main goals of policies for children, in all countries, especially in children under one year, which occurs in greater numbers compared with other age groups of childhood.³ Worldwide, mortality in children under 5 years reached 6.9 million children in 2011, about 19.000 children die per day,⁴ and an absolute majority of these deaths occur in developing countries.⁵ However, early deaths are considered preventable if the guarantee timely access to qualified health services.⁶

In Brazil, there is a trend of reduction in child mortality in all regions, but decreased 37.4% between 1996 and 2005.³ However, studies show that rates are still high, especially in the Northeast, even with significant decline (40.7%).¹³ From 1997 to 2005 infant mortality fell from 31.9 to 21.2 deaths per 1.000 live births in every country.⁸

Although they observed reductions in specific age groups, mortality rates in Brazil remain a major concern of public health.⁶ Moreover, the country has large regional disparities, especially in relation to the Northeast, which had in 2005 infant mortality rate 2, 3 times higher than in the South Region.¹²

How to achieve goals of reducing Infant Mortality Rates were established by the Ministry of Health the following purposes: reduction of neonatal mortality, deaths from diarrheal diseases and pneumonia, supporting the preparation of proposals for action for the qualification of attention to prevalent diseases and creation of vigilance committees of death.⁹

It is noteworthy that, despite the importance of indicators of Infant Mortality Rates in Brazil, underreporting of deaths is still a problem to be faced, especially in the North and Northeast. This compromises the actual determination of the problem and the identification of appropriate health actions to reduce these rates.⁶

Reducing infant mortality is one of the objectives of the Millennium Development Goals,⁸ being an indicator impacting on the health situation of the population and consists of a given priority through the Pact for Life (Ordinance Nº 399/2006 regarding the Pact health). This document consists of the search of public management in health outcomes by establishing a set of commitments health priority, agreed upon in three ways, to be implemented by federal agencies.⁹

Among the eleven priorities established by the Pact for Life, this study focuses on the Priority III which deals with the reduction of infant and child mortality, with the following indicators: Infant Mortality Rates, Mortality Neonatal and Post-Neonatal Mortality.

In the State of Paraíba, the number of deaths of infants under one year, informed, representing 73.4% of the estimated cases in 2008. This value suggests that the state may have an index of underreporting of deaths.¹⁰ Between 1997 and 2008, in the State, the mortality rate of children under 1 year, corrected for areas of low rates of registration, decreased from 53.4 to 21.2 per thousand live births, which represents a decrease of 60.3% over 1997.¹¹

The mortality rate of children under one year to the city of João Pessoa, estimated from the 2010 Census data, is 8.6 per 1.000 children under one year. Children under 1 year of age, in 2010, 13,1% had no birth certificate notarized. This percentage drops to 6.8% among children up to 10 years. And in 2011, 90,2% of children under 1 year old were with their vaccination days.¹⁰

Through this perspective, it was justified the relevance of this study due to social factors and health that have infant mortality as a health indicator.

In this context, the following questions were constructed on the situation of child mortality in the city of João Pessoa-Paraíba: What are the indicators of infant mortality? What repercussions on the situation of child mortality? That no quantitative relationship...
between mortality rates in Brazil, in the State of Paraíba and the city of João Pessoa in the period 2007-2011? To answer them, we tried to correlate the indicators of infant mortality in the city of João Pessoa/Paraíba, Brazil and the state of Paraíba. This study has a significant in that it may provide grants that enable situational awareness of child mortality and achieving the goals of the Pact for Life.

**METHOD**

Study of quantitative and descriptive approach which involved collecting and presenting data sets rates of infant mortality, neonatal and post-neonatal mortality, comparing them between the city of João Pessoa, Paraíba State and Brazil. The background was built in the period 2007-2011, this period being selected due to the availability of the results of the indicators agreed in the Pact for Health.

We used the following formulas to the calculation method of the mortality rate in the selected period:  

$$ \text{Infant Mortality} = \frac{n^* \text{ deaths <1 year}}{n^* \text{ being born alive}} \times 1000 $$

$$ \text{Neonatal Mortality} = \frac{n^* \text{ deaths from 0 to 6 days}}{n^* \text{ born alive}} \times 1000 $$

$$ \text{Infant mortality post neonatal} = \frac{n^* \text{ of deaths from 28 to 364 days}}{n^* \text{ born alive}} \times 1000 $$

![Figure 1. Indicators and formulas applied to calculate the coefficient of mortality * Children living. ** Live births to resident mothers](image)

The age groups were described as presenting the database DATASUL, divided into three groups: a) children under one year of age, b) neonates 0-6 days old, c) children 28-364 days of age.

Data were collected through a survey of records in the Collection of the Health Pact, between the months of February to June 2012, available in the public domain through the web tab of the Department of the SUS - DATASUL.

To produce a print faster and more accurately the phenomenon investigated, the presentation of the data was performed by means of table that summarizes all the observations of the study. It should be noted that data from some tables were calculated by the researchers, having as primary source data coming from DATASUL.

Data were analyzed using descriptive statistics, calculating the relative frequency (%) and absolute (n) of the variables; held relative comparison of the rates of infant mortality and its components presented by the city of João Pessoa, State of Paraíba and Brazil in the period 2007-2011. There was identified the increase or decrease of these factors, individually, per year, inter-relating and comparing the decrease/increase between the federated entities. The data were discussed according to the literature concerning the matter.

**RESULTS**

To obtain mortality rates, we use the direct and indirect method. Paraíba State and the city of João Pessoa, the method is indirect, based on the estimated demographic techniques for special, from the infant mortality rate estimated by the Department of Population and Social Indicators (COPIS) / Research Board (DPE) of the Brazilian Institute of Geography and Statistics (IBGE), and the proportion of deaths in children under 28 days reported by Information System (SIM) - percentage in relation to all deaths of children under 1 year, excluding the old ignored. Data from this method have been adopted by the United Federation of presenting coverage of the Information System on Live Births (SINASC) less than 90% or so that do not reach the value of 80% of a composite index, especially created which combines the coverage infant death with regularity SIM.  

In 2007, the coverage of SINASC coverage of more than 90% of total births in the country, with its filling considered appropriate. From this perspective, the time frame of the study, from 2007 to 2011 in the city of João Pessoa, there were 773 infant deaths spread among children under one year of age, newborns 0-6 days old and children 28-364 days old. The incidence of infant deaths ranged from 166 in the year 2007 to 144 deaths in 2011, verifying the period studied a reduction in infant mortality from 13.26% in the city of João Pessoa - Paraíba (Table 1).
As the goals set by the Pact for Life, the reduction of IMR to be 2,4% and 3% for NMR and PNMR per year. Performing the comparison between the Infant Mortality Rate (IMR) observed in the years 2007-2011, it can be seen that in this period there was a 2.2% reduction in this rate in Brazil, 3.96% in the State of Paraíba and 2.5% in the city of João Pessoa.

The Neonatal Mortality Rate (NMR) showed a decrease, being recorded in Brazil in 2007 an NMR and 10,66% in 2011, 9,34%, representing a reduction of 3.789 deaths of newborns in the five years studied. In Paraíba, reducing this rate was even higher with decreasing trend over the years when in 2007 had rate of 13,14% was recorded in 2011 and 10,06%. The city of João Pessoa decreased in TMN, however, in 2009 (10,92% - 125 deaths) there was a considerable increase compared to 2008 (8,93% - 105 deaths); already in 2011 presented a rate of 7,47%, with 87 deaths.

Table 1. Incidence of infant mortality and death rates, according to the Health Pact in Brazil, Paraíba and João Pessoa between 2007-2011.

<table>
<thead>
<tr>
<th>Year</th>
<th>Local</th>
<th>Infant Mortality</th>
<th>Neonatal Mortality</th>
<th>Post Neonatal Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>2007</td>
<td>BR</td>
<td>45.370</td>
<td>15.69</td>
<td>30.821</td>
</tr>
<tr>
<td></td>
<td>PB</td>
<td>1.087</td>
<td>18.28</td>
<td>781</td>
</tr>
<tr>
<td></td>
<td>JP</td>
<td>166</td>
<td>14.93</td>
<td>130</td>
</tr>
<tr>
<td>2008</td>
<td>BR</td>
<td>44.100</td>
<td>15.03</td>
<td>30.179</td>
</tr>
<tr>
<td></td>
<td>PB</td>
<td>1.026</td>
<td>16.56</td>
<td>698</td>
</tr>
<tr>
<td></td>
<td>JP</td>
<td>156</td>
<td>13.27</td>
<td>105</td>
</tr>
<tr>
<td>2009</td>
<td>BR</td>
<td>42.661</td>
<td>14.18</td>
<td>29.231</td>
</tr>
<tr>
<td></td>
<td>PB</td>
<td>909</td>
<td>15.16</td>
<td>645</td>
</tr>
<tr>
<td></td>
<td>JP</td>
<td>165</td>
<td>14.41</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>PB</td>
<td>848</td>
<td>14.44</td>
<td>611</td>
</tr>
<tr>
<td></td>
<td>JP</td>
<td>142</td>
<td>12.34</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>PB</td>
<td>840</td>
<td>14.32</td>
<td>590</td>
</tr>
<tr>
<td></td>
<td>JP</td>
<td>144</td>
<td>12.37</td>
<td>87</td>
</tr>
</tbody>
</table>

Source: Datasus/MS. Notebooks Pact for Health 2010/2011

As befits TMN in Paraiba State notes that, the reduction of IMT was closer than agreed in the years 2007-2009. There was a reduction in the rate 1,72% between 2007 and 2008 and 1,40% between 2008 and 2009, while in the three years between 2009 to 2011 obtained a reduction less representative.

The analysis of the time series discussed in the study of the dynamics - percentage increase / decrease - of mortality and its components are presented in Table 2.

Table 2. Comparative increase/decrease the mortality rate and its components in the years 2007 to 2011, in Brazil, Paraíba and the city of João Pessoa.

<table>
<thead>
<tr>
<th>Year - Period</th>
<th>Local</th>
<th>Infant Mortality</th>
<th>Neonatal Mortality</th>
<th>Post Neonatal Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>2007 - 2008</td>
<td>BR</td>
<td>-0.63</td>
<td>-0.38</td>
<td>-0.27</td>
</tr>
<tr>
<td></td>
<td>PB</td>
<td>-1.72</td>
<td>-1.88</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>JP</td>
<td>-1.66</td>
<td>-2.76</td>
<td>-1.10</td>
</tr>
<tr>
<td>2008 - 2009</td>
<td>BR</td>
<td>-1.17</td>
<td>-0.14</td>
<td>-0.10</td>
</tr>
<tr>
<td></td>
<td>PB</td>
<td>-1.40</td>
<td>-0.51</td>
<td>-0.89</td>
</tr>
<tr>
<td></td>
<td>JP</td>
<td>1.14</td>
<td>1.99</td>
<td>-0.85</td>
</tr>
<tr>
<td>2009 - 2010</td>
<td>BR</td>
<td>-0.94</td>
<td>-0.51</td>
<td>-0.41</td>
</tr>
<tr>
<td></td>
<td>PB</td>
<td>-0.72</td>
<td>-0.34</td>
<td>-0.36</td>
</tr>
<tr>
<td></td>
<td>JP</td>
<td>-2.07</td>
<td>-2.05</td>
<td>-0.01</td>
</tr>
<tr>
<td>2010 - 2011</td>
<td>BR</td>
<td>-0.37</td>
<td>-0.29</td>
<td>-0.08</td>
</tr>
<tr>
<td></td>
<td>PB</td>
<td>-0.12</td>
<td>-0.35</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>JP</td>
<td>-0.03</td>
<td>-1.40</td>
<td>1.42</td>
</tr>
</tbody>
</table>

Source: Data calculated by the researchers, primary source DATASUL/MS

Regarding the state of Paraiba, the reduction of IMT was closer than agreed in the years 2007-2009. There was a reduction in the rate 1,72% between 2007 and 2008 and 1,40% between 2008 and 2009, while in the three years between 2009 to 2011 obtained a reduction less representative.

As befits TMN in Paraiba State notes that, the analysis of Table 2, in the years between 2007 and 2008 there was a
significant reduction of 1.88%, but in other years the best rate of decrease was achieved 0.69%. The PNMR, in turn, shows oscillation, when we biennia between 2008 and 2010 showed a slight decrease (0.89%, 0.36%), and in other periods there was an increase.

The TMI in João Pessoa showed an increase only in 2008-2009 (1.14%), and decreased from 2007 to 2008 representing 1.66% and 2.07% between 2009-2010. However, between 2010-2011 reduction of 0.03% was slight. Regarding the Neonatal Mortality Rate in the city, there was an increase of 1.99% from 2008 to 2009 and decreased in the other years, especially for the period 2007-2008 with a decrease of 2.76%. Regarding the PNMR, only in the period 2007-2008 there was a decrease (1.11%), while in the 2010-2011 biennium increased by 1.42%. It was possible to highlight that among the components of the Infant Mortality Rate, which showed greater reduction was the neonatal component.

**DISCUSSION**

The factors that influence the TMI are numerous. To obtain the reduction of child mortality requires a set of measures, among which we can point: increased maternal education; coverage of primary care activities, improvement of hospital care in the process of childbirth, and postpartum care preterm infants and term. Search\'ensures that, to reduce Infant Mortality Rates, aiming to improve the health situation of the population, are necessary social inclusion policies, such as access to sanitation, education, family planning programs and increased income. Studies\(^\text{15-16}\) indicate that the guarantee to one pregnant prenatal care quality, with adequate number of consultations, medical assistance during childbirth, newborn care and postpartum women, can have a reduction in neonatal mortality.

From the data obtained in the study, it is clear that between the years 2007 to 2011, sometimes there was a reduction in IMR and its components. In the city of João Pessoa, this reduction may be related to greater coverage of primary and follow-up during the pre-natal as well as the commitment of mothers to exclusive breastfeeding.\(^\text{17}\)

Accordingly, the realization of some health actions is associated with the implementation of the Family Health Strategy, which began in the second half of the 1990s and has been consolidating every year. Primary care in the city of João Pessoa, provides increasingly Family Health Teams (FHT), while in 2007 there were 175 FHS passing for 180 teams in 2010, although representing the same level of population coverage.\(^\text{17}\)

Brazil has strategic programs aimed at contributing to the achievement of the goals of reducing IMR and its components, such as: Brazil Breastfeeding Network, Baby Friendly Hospital Initiative, Kangaroo Method, Human Milk Banks; surveillance of maternal and infant deaths,\(^\text{16}\) and deployment of Stork Network, started in 2011. According to the city of João Pessoa, there was slight growth in prenatal care, 92.2% in 2007 to 93.1% in 2009, and that exclusive breastfeeding was 68.5% in 2007 became the 70.2% in 2009.\(^\text{17}\)

Although there has been decrease in IMR and its components in the years evaluated, it was realized that it was not consistent with the established goals agreed. This is explained by numerous factors that need to be correlated in improved attention to maternal and child health. In this perspective, one can also cite the routine childhood vaccination aimed at vaccine prevention of diseases, a strategy that culminates in reducing IMR and subsidizes improves the quality of life of children and society. However, it is observed that in João Pessoa-PB was no reduction in coverage of 86.90% in 2007 to 79.29% in 2010.\(^\text{17}\)

In addition, there is the need for supply of sanitation for the population, because in 2010 the city of João Pessoa had only 68.69% of permanent private households with adequate sanitation,\(^\text{18}\) which reflects a deficit in access hygiene, health and quality of life.

Study indicates that the factors for reduction of deaths in post-neonatal period are related to environmental sanitation improvement, whereas the decrease in neonatal mortality rate is linked to factors related to pregnancy and childbirth, which assigns this component a slower reduction in of the PNMR.\(^\text{7}\)

Although there was a decrease in IMR, this indicator is still high, not befitting acceptable to a developing country, and the neonatal component most responsible for this high rate. Stresses the relevance of the actions of health services to achieve recommended levels of TMI.\(^\text{19}\)

There is a rising contribution of neonatal infant mortality in Brazil from the 1990s, with perinatal causes represented about 60% of infant deaths. Predominate as factors related to death, low birth weight, prematurity, birth asphyxia and neonatal infections, conditions generally resulting from controllable situations through effective actions in the
neonatal mortality is not significantly reduced, being observed that these deaths were concentrated in areas of high social vulnerability, with high rates of violence and influence of drug trafficking, which can be one of the causes for the change in the downward trend in the post-neonatal mortality that was occurring in the years 2009 and 2010.\textsuperscript{23}

The data relating to PNMR presented in this study demonstrate that the reduction of 3\% per year is not reality in Paraíba and João Pessoa. Was recorded in Paraíba increase in this rate between 2007 and 2008 (0,18\%) and in the years 2010 and 2011 (0,22\%). In the city of João Pessoa’s situation PNMR defies agreed, registering an increase of 1.1\% between 2007 and 2008, and 1,42\% between 2010 and 2011.

The highest incidence of causes of mortality in the post-neonatal period persists in preventable causes and important, such as pneumonia, diarrhea and malnutrition.\textsuperscript{14,24} An important contributor to the reduction of mortality rates is the supplementation of iron and vitamin A. A meta-analysis encompassing eight clinical trials concluded that vitamin A supplementation reduced mortality by about 23\% in children aged six months to five years of age.\textsuperscript{25} In addition, monitoring of the Bolsa Família (Family Grant), in respect the mother and child are factors that interfere positively to the reduction of mortality rates, as well as the investigation of deaths and contract/training of human resources to work in health interventions needed. Thus, it requires effort and mobilization of managers and health teams to identify the infant death as part of routine health services, the classification of information and implementation of the evaluation of health services to improve care and accountability and commitment of health services on the population of its catchment area.\textsuperscript{6}

It is also necessary to have records updated and reliable information on the subsystems and training of professionals who handle from the death certificates (DO) and live births (DNV), the medical record, the hospital admission (IAI) and other systems reporting of injuries and instruments important as the Card Pregnancy and Child Health Handbook,\textsuperscript{14} because the statistics show is deficient in presenting the real dimension of the problem of population, from the sub-indicators registered and unreliable information systems.\textsuperscript{19}

Given the complexity of the processes that underlie infant mortality, it is essential that there be continuing your monitor in order to allow the information to be analyzed in order
to reflect the real state of health at the local level, to adopt strategies to promote health appropriate. Furthermore, the study of how living conditions and infrastructure are associated with TMI is important to support decision-making of public policies aimed at broader, ultimately reducing the magnitude and inequalities in health.26

**FINAL REMARKS**

The present study showed that, despite the reduction of Infant Mortality Rate, Mortality Rate Neonatal and Post-neonatal mortality in the period 2007-2011, the data presented in Brazil, Paraiba and the city of João Pessoa, did not achieve the goals outlined in Pact for Life, corresponding to 2,4% in IMR and 3% in TMN and PNMR, the year, nor the reduction of 5% by the proposed reduction of inequalities in the country regions of the Amazon and Northeast Brazil. In Brazil, the reduction of IMT and their components present in every year slight decrease.

The city of João Pessoa operates planning, implementing and evaluating the strategies proposed by the Federal Government, from the consolidated data in Health Information Systems, with a view to reduce the IMR and improve child health. The municipality presented among the same indicators analyzed, a greater reduction in IMR from the state of Paraiba and also Brazil. However, it is clear that there is need for greater investment in relation to the operating structure of health services that meet and accompany the mother during pregnancy to the effective monitoring of growth and development in the first two years of the child’s life; access suitable both for local assistance, as the diagnostic and therapeutic procedures.

It is necessary to invest in human resources, training and improvement in working conditions for health professionals and also for professionals who feed the Health Information Systems, so that they can analyze reliable indicators of the health status of population of the Brazilian states and municipalities.

One cannot fail to mention that the improvement of socioeconomic and environmental conditions such as hygiene, sanitation, education and work are factors that are associated with health conditions of the population, and intrinsically the survival of children, especially when referring component to the Post-Neonatal infant mortality. Great is the challenge to achieve the targets for reduction of IMR, ranging from the conformation of regionalized and sufficient in care during pregnancy, childbirth and newborn to improve working conditions and qualifications at all levels of complexity health system aimed at comprehensiveness of care.

It is important that such studies be conducted, especially in the Northeast, with a view to reassessing the situation of child mortality. Furthermore, the dissemination of strategies some states/counties on the extent of reduction target proposed by the Covenant Life can support decision-making to choose strategies that lead to positive results.

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Infant mortality: correlation between federative...

