Chapter 135

Analysis of the annual variability of premature born lives and deaths regarding birth weight in ES

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ABSTRACT
Prematurity is one of the main factors of infant mortality. Thus, the objective of this study was to analyze the annual variability of live births and premature deaths concerning the birth weight range in the state of Espirito Santo, Brazil. The period studied was between the years 2000 to 2020 using a historical series of data from the Information System for Live Births - SINASC and the Mortality Information System - SIM. In the records analyzed, a total of 1,135,352 live births were obtained, of which 73,420 (6.47%) were premature, born between 22 and 36 weeks of gestational age, and weighing more than 1500 g. The highest proportion of premature newborns, referring to birth weight, occurred for weights from 1500 to 2500 g (Low Birth Weight). The highest proportions of premature deaths about birth weight were for the lowest weight ranges. The percentage of deaths related to gestational age was lower for the age group of 32-36 weeks.

Keywords: Weight at birth. Neonates. Mortality.

1 INTRODUCTION

Birth weight has been seen as a great marker of neonatal survival, as it is one of the main factors that influence the state of health of the newborn (ORGANIZACIÓN MUNDIAL DE LA SALUD, 2010). Since, the lower the birth weight, the greater the mortality risks (BARBAS et al., 2009).

Following the WHO recommendations on weight classification for newborns, “Insufficient Weight” is classified as a birth weighing between 2500 and 2999 g, and a birth weighing between 3000 and 3999 g is considered “Adequate Weight” as “Overweight”. newborns with 4000 g and more, classified as “Low Birth Weight” all births weighing less than 2,500 g (WORLD HEALTH ORGANIZATION, 1995; WORLD HEALTH ORGANIZATION, 2014; PUFFER et al., 1987)

Prematurity can be classified according to gestational age, in which babies born at 37 to 41 weeks and 6 days of gestational age are classified as full-term newborns, while babies born before completing 37 weeks of gestation are classified as preterm or premature (WORLD HEALTH ORGANIZATION, 2013).

Studies show that prematurity together with fetal growth restriction is a factor that leads to the birth of low-birth-weight neonates (VIANA et al., 2013; KHOUSHABI et al., 2010).

The lower the gestational age of the premature newborn, the greater the probability of death (RODRIGUES et al., 2011), since the formation of organs and tissues did not complete their development. Thus, there is a greater probability of a hospital stay for a prolonged period, which increases the baby's vulnerability to hospital infections, which can lead to the death of these children, mainly because the immune system is underdeveloped (AYACHE et al., 2003; EICKMANN et al., 2009).

Considering that low birth weight is a major public health problem, mainly because it is an important parameter for the survival of the newborn and is directly associated with the mortality of these neonates (LIMA et al., 2012; SEBAYANG et al. ., 2012), this study aimed to analyze the annual variability of live births and deaths of preterm infants concerning birth weight range in the state of Espirito Santo, Brazil.

2 METHODOLOGY

This study used a historical series of birth data for the period between 2000 and 2020 (20 years), obtained from the Live Birth Information System (SINASC) and Mortality Information System (SIM) for the state of Espírito Santo, Brazil.

According to the National Health Council of Brazil, for the use of these data, there was no need for evaluation by the Research Ethics Committee (CEP) or by the National Research Ethics Committee (CONEP), since they are publicly accessible data, following the guidelines of Resolutions 466/2012, 510/16 and 580/18.

The following variables were evaluated: the total number of live births, the total number of deaths, the number of births in each birth weight range, and several deaths in each birth weight range. Of the inclusion criteria, only gestational ages greater than 22 weeks and birth weight greater than 1500 g were analyzed. In this way, errors were reduced, because according to Chawanpaiboon (2019), in countries with low and middle income, many errors occur to classify these newborns.

The following classifications of gestational ages were considered: "extremely premature", being newborns with a gestational age of 22 to 27 weeks, "severe premature" those born with a gestational age of 28 to 32 weeks, and "moderate to late premature". those born at 32 to 36 weeks (WORLD HEALTH ORGANIZATION, 2012).

The initial analyses aimed to verify the proportion of preterm infants in each weight range, as well as the proportion of deaths in each weight range. The annual variability of deaths was determined through the analysis of annual deviations, calculated through the difference between the number of deaths in each year and the historical average of deaths.

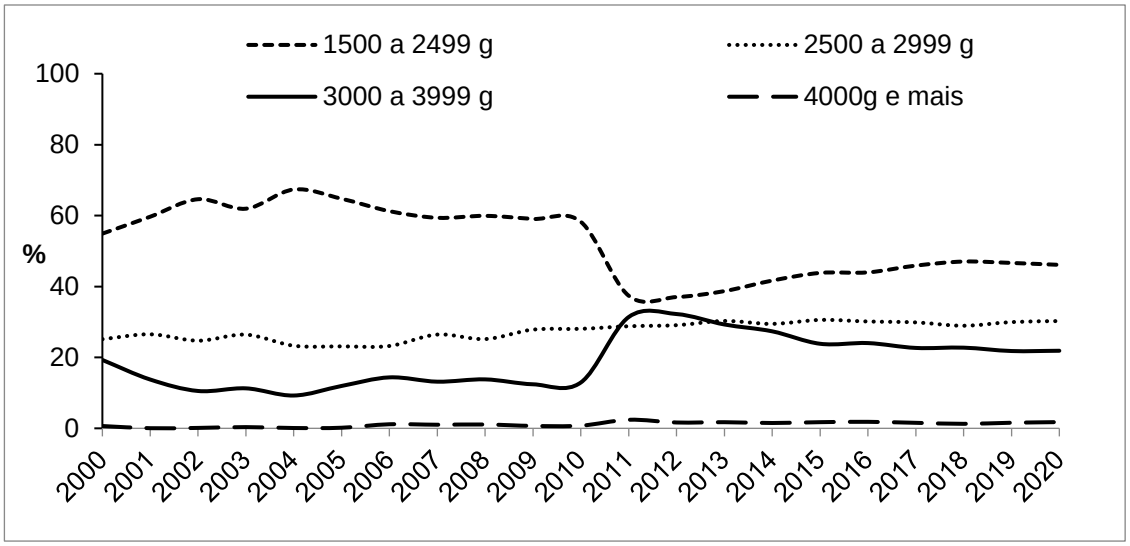
Then, the absolute and relative frequencies of preterm infants at each gestational age and deaths at each gestational age were calculated, as well as the percentage of deaths for each gestational age range. The entire statistical procedure was performed using Microsoft Office Excel 2010 software.

3 RESULTS AND DISCUSSION

Entre os anos de 2000 a 2020, foram registrados 1.135.352 nascimentos no estado do Espírito Santo (SINASC, 2022). Desse total, 73.420 (6,47 %) eram prematuros, destes 36.306 (49,45 %) nasceram com Baixo Peso ao Nascer (1500 a 2500 g), 20.685 (28,17 %) com o Peso Insuficiente (2500 a 2999 g), nasceram 15.485 (21,09 %) com o Peso Adequado (3000 e 3999 g) e 945 (1,29 %) os nascimentos com Excesso de Peso (4000 g e mais). O monitoramento de possíveis fatores que levam um nascimento de um bebê prematuro e por consequência ter um baixo peso ao nascer, tem sido bastante estudado nos últimos anos, pois estão ligados diretamente com determinantes de riscos de mortalidade neonatal (GONZAGA et al., 2016).

Nota-se na Figura 1 a proporção referente a cada faixa de peso dos prematuros nascidos vivos neste período estudado. Houve uma variação de 37,03 % a 67,36 % para a faixa de peso de 1500 a 2499 g, com variação de 23,22 % a 30,58 % as faixas de peso de 2500 a 2999 g, variaram de 9,25 % a 32,23 % as faixas de peso 3000 a 3999 g e 0,04 % a 1,84 % os pesos de 4000 g e mais. Em duas faixas de peso houve grande variação, e em outras duas a variação foram muito menores.

Figure 1 – Proportion of premature infants born alive in each weight range from 2000 to 2020 in the state of Espírito Santo, Brazil.



Source: The author.

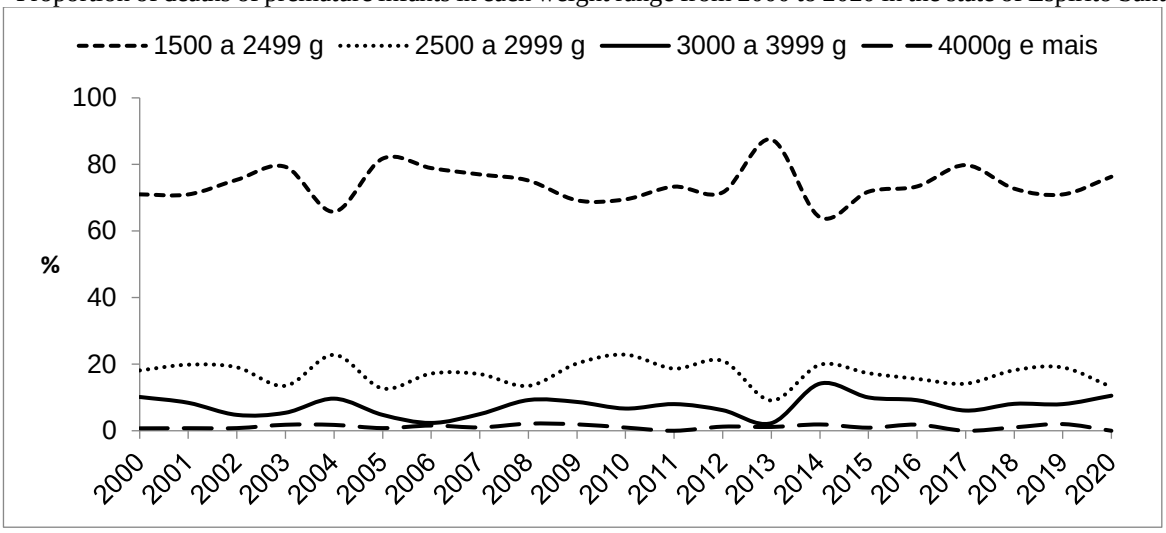
The most predominant weight range in this studied period was from 1500 to 2499 g, which corresponds to Low Birth Weight. According to De Almeida et al., (2018), evaluating the characteristics of newborns for a certain region is important, mainly for health promotion and prevention, since Low Birth Weight is one of the main factors of neonatal deaths (CAÇOLA et al., 2010).

2267 deaths were recorded throughout the period studied (SINASC, 2022), of which 1678 (74.02%) had Low Birth Weight (1500 to 2500 g), 392 (17.29%) were born with insufficient weight (2500 to 2999 g), 170 (7.5 %) were born in the Adequate Weight range (3000 to 3999 g) and 27 (1.19 %) were born with Excess Weight (4000 g and more). Studies show that the probability of death risk for low birth weight is

44 times greater than for those born with adequate weight, the lower the birth weight, the greater the risk of life for newborns (MARAN et al., 2008).

It is observed in Figure 2 that in the deaths of premature infants in this period, there was variation from 64.15% to 87.5% for the weight range from 1500 to 2499 g, from 9.09% to 22.86% for the weight ranges from 2500 to 2999 g, ranging from 2.27% to 14.15% for weight ranges from 3000 to 3999 g and ranged from 0 to 2.13% for weights of 4000 g and more. According to Puffer et al (1987), above the weight range of 3000 to 3999 g there is greater safety for newborns since the formation of their organs and tissues is more complete.

Figure 2 – Proportion of deaths of premature infants in each weight range from 2000 to 2020 in the state of Espírito Santo, Brazil.



Source: The author.

Next, it is worth highlighting the weight range from 1500 to 2499 g, referring to Low Birth Weight, which had the highest proportion of registered preterm deaths. On the other hand, the weight ranges from 3000 to 3999 g, and 4000 g and more represented the lowest proportions of deaths among the weight ranges of preterm infants (Figure 2). Research shows that the prevalence of Low Birth Weight is higher in premature newborns and they are considered the riskiest weight ranges for the neonate (LIMA et al., 2012; BARBAS et al., 2009).

Regarding the gestational period of preterm births, Table 1 shows that the highest relative frequency was for the gestational age of 32-36 weeks, with a total number of deliveries of 69,569 (94.74%). There were a total of 2267 deaths of which 38 (1.67%) were at the gestational age of 22-27 weeks, 335 deaths (14.78%) were at the gestational age of 28-31 weeks, and 1894 deaths (83.55%) at the age of 32-36 weeks. According to the result of Lima et al., (2012), the gestational age groups being less than or equal to 31 weeks, present a greater probability of neonatal deaths.

Table 1. Absolute frequency (Fa) and relative frequency (Fr) of premature births and deaths at three gestational ages and Percentage of deaths at each gestational age of premature births, from 2000 to 2020 in the state of Espirito Santo, Brazil.

Gestation time	Premature births		Infant deaths		Percentage of deaths (%)
	Fa	Fr(%)	Fa	Fr(%)	
22 - 27 weeks	436	0,59	38	1,67	8,72
28 - 31 weeks	3415	4,65	335	14,78	9,81
32 - 36 weeks	69569	94,74	1894	83,55	2,72
Total	73420	100		100	-

Source: The author.

Relating the relative frequency of deaths with gestational times, it was found that the gestational age of 32-36 weeks had the highest relative frequency of deaths, with 83.55% and the lowest relative frequency was 22-27 weeks with 1.67 % (Table 1). However, the gestational ages of 32-36 weeks had the lowest percentage of deaths regarding the total number of premature births in this weight range, with 2.72%. Taking into account that prematurity is directly related to neonatal mortality, similar studies confirm that babies born at less than 37 weeks are more likely to be at risk of mortality (GAIVA et al., 2014).

4 CONCLUSION

Among the years analyzed, the highest weight proportions of premature births occurred in the weight range from 1500 to 2499g (Low Birth Weight). The highest proportions of weight deaths of preterm infants occurred for Low Birth Weight (1500 to 2499 g), the lowest for Adequate Weight (3000 and 3999 g), and Excess Weight (4000g and more). The highest frequencies of deaths occurred at the lowest gestational ages and in the lowest weight ranges. The percentage of deaths related to gestational age was lower for the age group of 32-36 weeks.

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