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Congenital Malformations in Neonates: Analysis of Morbidity and Associated Factors

ORIGINAL

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Abstract

Objective: To evaluate the neonatal morbidity due to congenital malformations in the city of Petrolina-PE, from 2008 to 2013.

Methods: A descriptive study with data from the Information System on Live Births (Sinasc). The analyzes were carried out through frequency distribution and measures of central tendency and dispersion. The associations were tested by the Pearson and Kruskal Wallis chi-square tests. Significance was set at 5% and 95% confidence.

Results: 436 cases of congenital malformations were recorded in the study period, with 2011 being the highest occurrence year. The mothers of the newborns were young (25.2 years old), single, upper level of education and household. In general multiparous, with single gestation, vaginal delivery and performed up to six prenatal visits. The newborns were males, at 39 weeks or more of gestation and with normal weight (> = 2500g). The malformations of the musculoskeletal system were the most frequent followed by the genitourinary system. Congenital malformations were especially associated with neonatal characteristics such as gender and weight. In all causes the mean

weight was greater than 2500g (p <0.05). The causes of malformation of greater occurrence in both sexes were osteomuscular (p <0.05). The aspects of the mother did not present significant differences in the present study (p> 0.05).

Conclusion: The present study evidenced relevant aspects in the occurrence of morbidities due to congenital malformations, directing to a greater attention the occurrence of these diseases especially in relation to the newborn.

Keywords
Malformations; Live Birth; Morbidity.

Introduction

The World Health Organization (WHO) defines congenital malformations as changes in the shape, structure and/or function of organs, cells or cellular components arising from factors that originate before birth and arise at any stage of fetal development [1].

Malformations may occur in isolation, when the newborn presents only one malformation, or conjugate, when numerous malformations involving several organs coexist. These diseases are chronic in nature and can affect many organs and systems, bringing consequences to the health of the individual, family and society. They may be detectable during pregnancy, in the neonatal period (zero to 27 days), or even at a considerable time after birth [2].

The main risk factors for congenital malformations are the socioeconomic conditions of the family; inadequate nutrition; environmental causes related to ionizing radiation, methyl mercury and lead; teratogenic medication; alcoholism; rubella, congenital syphilis and other maternal diseases such as (diabetes mellitus, hypertension and hypothyroidism); traumas; genetic disorders; lack of care or inadequate attention to women and the age of the mother, less than 20 years and over 35 years [3, 4].

Congenital malformations are among the five main causes of death in the neonatal period, the Americas being the second cause of death in newborns and children under five, the first being prematurity [5]. The reduction in neonatal mortality is related to improved sanitation, immunization campaigns, promotion of breastfeeding and increased coverage of prenatal care [2].

While child mortality in the world and in Brazil is decreasing, the proportion of deaths due to congenital anomalies has been rising steadily since 1999 [6]. Approximately 7.9 million children who were born worldwide between 1997 and 2004 have some serious congenital malformations, of which almost 3.2 million have lifelong disabilities and require clinical follow-up [7].

In 2005, the prevalence of malformations in the neonatal period in Brazil was approximately 2.1 per 1,000 live births, and ranged from 1.6 in the Southeast region to 2.3 in the Northeast region. Congenital malformations were among the main causes of neonatal morbidity and mortality in the period [8]. Most cases occur in low- or middle-income countries [2], and the rate of neonatal morbidity and mortality is higher than in high-income countries. In Brazil, starting in the 1990s, there was an increase in the proportion of deaths in the neonatal period in relation to the total number of infant deaths, especially post-neonatal deaths [8].

It is understood that the reduction of neonatal morbidity is a great challenge for the health servi-

ces, governments and society in general, especially in scenarios marked by the country's social inequality and difficulty in accessing health services.

The present study aimed to evaluate neonatal morbidity due to congenital malformations in the municipality of Petrolina-PE, from 2008 to 2013.

Methods

This is a descriptive study on morbidity due to congenital malformations among live births of mothers residing in Petrolina from January 2008 to December 2013.

The municipality is located in the extreme west of the State of Pernambuco, 730 km from the capital of Pernambuco - Recife - and is part of the largest urban cluster of the semi-arid. It has the second largest population and the highest Gross Domestic Product (GDP) in the interior of Pernambuco and, due to the dry climate and irrigation, became the second largest exporter of fruit and the second largest wine center in the country. In 2014 it had a population of 326,017 inhabitants in an area of 4,561,872 km² [9].

The live births that presented some type of congenital malformation were identified from the Information System on Live Births (Sinasc), fed by the declarations of live births (DLB). The data were collected through consultation of the records of the city of Petrolina-PE.

The diagnosis of congenital malformations was categorized from the International Classification of Diseases, 10th revision (ICD-10), chapter XVII (10): category 1: congenital malformations of the nervous system (Q00-Q07) and congenital malformations of the eye, ear, face and neck (Q10-Q18); Category 2: congenital malformations of the circulatory system (Q20-Q28) and congenital malformations of the respiratory system (Q30-Q34); Category 3: cleft lip and cleft palate (Q35-Q37) and other congenital malformations of the digestive tract (Q38-Q45); Category 4: congenital malformations of the genitals (Q50-Q56) and congenital malformations of the urinary tract (Q60-Q64); Category 5: congenital malformations and deformities of the musculoskeletal system (Q65-Q79); Category 6: other congenital malformations (Q80-Q89) and chromosomal abnormalities not elsewhere classified (Q90-Q99).

The following maternal variables were studied: marital status (married/single union, single), schooling (primary education: up to eight years, high school: nine to 11 years, higher education: 12 or more years); (yes or no), number of gestations (up to three pregnancies, four or more pregnancies), type of delivery (vaginal, cesarean), week Gestational age (less than 35 weeks, 35-38 weeks, 39 or more weeks), pregnancy (single, double, triple or more). And the following variables related to live births: gender (male, female), birth weight (mean value in grams).

The qualitative variables were analyzed by means of frequency distribution and the continuous ones, by means of the measures of central tendency and dispersion (average and standard deviation). The 95% confidence intervals were calculated for the means and for the proportions assuming the binomial distribution. In order to verify the association between the causes of the congenital malformations and the characteristics of the newborn and the mothers, the nonparametric tests of Chi-Square of Pearson and Kruskal Wallis were used, considering the non normality of the distribution of the quantitative variables by the test of Shapiro Wilk (P> 0.05). For all tests the significance level of 5% and 95% confidence were adopted.

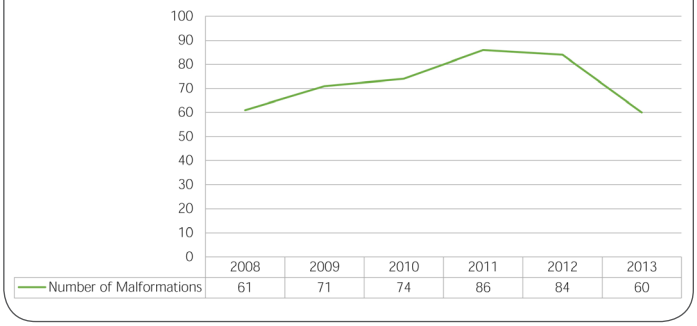
The data were treated by Stata 12.0 software. Tables and graphs were built in the Microsoft Office Excel 2013 program. The study was approved by the Ethics Committee in Research with Human Beings of the University of Pernambuco, on October 7, 2014, with opinion number 822.607, respecting ethical aspects And legal investigations involving human beings, based on the precepts established

in Resolution no. 466 of 12 December 2012 of the National Health Council [11].

Results

The number of live births with congenital malformations in Petrolina between 2008 and 2013 was 436 cases. The year of greatest prevalence was that of 2011 **(Figure 1)**.

Figure 1: Distribution of live births with congenital malformation second year of birth. Petrolina, Pernambuco, Brazil. 2008-2013.



The mothers of live births with congenital malformation had an average of 25.2 years (SD = 6.8, 95% CI - 24.6 - 25.9). The majority had a higher level (51.5%, CI95% 46.8 - 56.2), 51.3% (CI95% 46.5 - 56.0) and 42.9% (CI95% 38.0 - 47.8) housewives or rural workers (32.8%, CI95% 28.2 - 37.5). The majority had a live child (65.1%, 95% CI 60.6 - 69.6) and had a multiplicity of previous pregnancies with four or more pregnancies (93.1%/95% CI 90.7 - 95.5), with the highest occurrence of vaginal delivery (52.6%, 95% 47.9 - 57.4). Pregnancy was the single most (98.4/95% 97.2 - 99.6) and women had up to six prenatal consultations (82.3%; 95% CI 78.6 - 85.9) **(Table 1)**.

The mean weight of live births was 2,900.2g (SD = 777.2, IC95% 2827.1-2973.4). The majority of newborns (NB) were male (61.7%, 95% CI 57.1 - 66.3) and had a gestational age of 39 weeks or more (46.3%; 95% CI 39.8 - 52.8). Most of the malformations corresponded to those of the musculoskeletal system (40.1%, 95% CI 35.5 - 44.8), followed by malformations of the genitourinary system (20.6%, CI 95% 16.8-24.5) **(Table 2)**.

Table 1. Sociodemographic and obstetric characteristics of mothers of live births with congenital malformation. Petrolina, Pernambuco, Brazil. 2008-2013.

	Mean	Std. Dev.	CI95%*	
Mother's age	25.2	6.8	24.6	25.9
	n	%	CI95%**	
Education				
Elementary	55	12.8	9.6	15.9
Highschool	154	35.7	31.2	40.3
Higher education	222	51.5	46.8	56.2
Marital status				
Married/Stable union	212	48.7	44.0	53.5
Single	223	51.3	46.5	56.0
Mother's occupation				
Student	28	7.1	4.5	9.6
Rural worker	130	32.8	28.2	37.5
Housewife	170	42.9	38.0	47.8
Others	68	17.2	13.4	20.9
Has a living child				
No	152	34.9	30.4	39.4
Yes	284	65.1	60.6	69.6
Has a dead child				
No	336	77.1	73.1	81.0
Yes	100	22.9	19.0	26.9
Number of previous gestations				
Up to 3	30	6.9	4.5	9.3
4 or more	405	93.1	90.7	95.5
Type of delivery				
Cesarean	206	47.4	42.6	52.1
Vaginal	229	52.6	47.9	57.4
Type of pregnancy				
Unique	426	98.4	97.2	99.6
Double	6	1.4	0.3	2.5
Triple or more	1	0.2	-0.2	0.7
Number of pre-natal consultations				
7 or more	77	17.7	14.1	21.4
Up to 6	357	82.3	78.6	85.9

*: Confidence Interval of 95% for the average.
**: Confidence Interval of 95% for proportion assuming the binomial distribution.

Table 2. Characteristics of live births with congenital malformations according to birth and cause information. Petrolina, Pernambuco, Brazil. 2008-2013.

	Mean	Std. Dev.	CI95%*	
NB weight	2900.2	777.2	2827.1	2973.4
	n	%	CI95%**	
Gestational age				
Less than 35 weeks	30	13.0	8.6	17.4
Of 35 to 38 weeks	94	40.7	34.3	47.1
39 weeks of more	107	46.3	39.8	52.8
Sex of the NB				
Female	166	38.3	33.7	42.9
Male	267	61.7	57.1	66.3
Congenital malformation				
Sist. Nervous/Eye/Ear	59	13.5	10.3	16.8
Circulatory and Respiratory Sist.	20	4.6	2.6	6.6
Digestive and Labial Sist.	40	9.2	6.5	11.9
Genitourinary Sist.	90	20.6	16.8	24.5
Osteomuscular Sist.	175	40.1	35.5	44.8
Chromosomes and other	52	11.9	8.9	15.0
Autonomy	61.47	61.47	61.47	61.47

*: Confidence Interval of 95% for the average.
**: Confidence Interval of 95% for proportion assuming the binomial distribution.

Analyzing the factors associated with the causes of congenital malformations in NB in the period studied, it was observed that only the characteristics of the newborn presented statistical significance ($p < 0.050$) as weight and gender of the newborn. The mean birth weight of newborns with malformations in all analyzed causes was above 2500g ($p = 0.010$). In both sexes, the musculoskeletal system was the one with the highest prevalence. In boys, the second major cause of congenital malformation was that of the genitourinary system ($p = 0.000$).

Maternal characteristics assessed in this study, such as maternal age, multiparity, and number of prenatal consultations, did not present statistically significant differences between the causes of morbidity due to congenital anomalies ($p > 0.05$) **(Table 3)**.

Discussion

The present study showed that congenital malformations affected 436 newborns (NB), with 2011 as the highest occurrence of cases. The mothers of newborn infants were young, single and with high schooling presented, mostly higher level.

Low schooling and adverse socioeconomic conditions may be related to nutritional deficiencies

Table 3. Distribution of the occurrence of congenital malformations according to cause and associations between the maternal characteristics and those of the newborn. Petrolina, Pernambuco, Brazil. 2008-2013.

Congenital mal formation	Mother's age	NB Weight	Previous gestations				Number of pre-natal consultations				Sex of the newborn			
			Up to 3		4 or more		7 or more		Up to 6		Female		Male	
	Median	Median	n	%	n	%	n	%	n	%	n	%	n	%
Sist. Nervous/Eye/Ear	25.3	2769.3	2	6.7	57	14.1	12	15.6	47	13.2	24	14.5	35	13.1
Circulatory and Respiratory Sist.	26.3	2746.5	1	3.3	19	4.7	1	1.3	19	5.3	8	4.8	12	4.5
Digestive and Labial Sist.	25.8	2936.6	5	16.7	35	8.6	5	6.5	34	9.5	15	9.0	24	9.0
Genitourinary Sist.	24.1	2971.2	5	16.7	85	21.0	21	27.3	69	19.3	11	6.6	79	29.6
Osteomuscular Sist.	25.0	3014.9	11	36.7	163	40.3	33	42.9	141	39.5	80	48.2	93	34.8
Chromosomes and other	27.0	2571.1	6	20.0	46	11.4	5	6.5	47	13.2	28	16.9	24	9.0
p-value	0.380*	0.010*	0.382**				0.179**				0.000**			

*: Kruskal Wallis test. **: Pearson's Chi-square test.

related to congenital malformations [12]. On the other hand, greater maternal schooling favors the search for information about the risk factors that can affect the child during the gestational period and stimulates the demand for actions of health professionals in the promotion and prevention of injuries [13]. Thus, higher education of the mother, as evidenced in the present study may favor a reduction of risks.

Most of the women in this study were housewives or agricultural workers in general. The municipalities of Petrolina-PE and Juazeiro-BA, located in the Valley of the São Francisco, Northeast of Brazil, have about 120 thousand irrigated hectares, being one of the main areas of horticultural exploitation irrigated in the country. In 2009, this region had more than 51% of its economically active population employed in agriculture, being a large proportion of women of childbearing age. A study carried out in this region showed an association between parents' exposure to pesticides in the periconceptional period and births with congenital malformations [14].

Regarding maternal age, some studies show that the majority of mothers who present pregnancies in which their children have some type of malformation are young, corroborating the findings of this study. Thus, gestation in youngsters and adolescents requires more care and attention due to the fact that they may develop some complications both in pregnancy and puerperium, thus corroborating a study done in a municipality in the South of the country, which speaks about the significance of maternal age with congenital malformation [15].

Regarding the marital status of the mothers, it was possible to observe that in this study the majority of the mothers were single, unlike the studies carried out in a municipality in the south of Brazil, showing that the majority of mothers are living with their married or In a stable connection [15].

Regarding the type of delivery, several studies show that practically two out of three live births with malformation were born from cesarean section [16-18]. This fact may be related to the diagnosis and its referral to cesarean section, such as medical conduct [18]. In this study, a higher occurrence of vaginal delivery was observed.

A study conducted in Vale do Paraíba Paulista, in 2002 and 2003, showed that there was an increase in the frequency of congenital anomalies as there was a reduction in the number of prenatal consultations [18]. In the present study, more than half of the mothers performed a low number of prenatal consultations, six or fewer visits, showing agreement with the presented study. However, there is no clear association between prenatal consultations and the presence of congenital defects [17, 18].

Regarding the type of pregnancy, it is verified that the majority of the mothers had single pregnancies, corroborating the study of Melo carried out in the south of Brazil. As well as gestational age, seen in the same study, in which it shows that the majority had preterm infants, different from the results seen in this study, in which the majority of mothers present pregnancies with a gestational age of on average 39 weeks [18].

Most of the malformations corresponded to those of the musculoskeletal system, consistent with a study carried out in the State of Maranhão, where abnormalities of the musculoskeletal system presented the most frequent (48%), accompanied by malformations of the nervous system [16, 23, 19].

In the present study, it was observed that the majority of live births with malformation were male, which corroborates with research carried out in Fortaleza-CE in 2012; and Foz do Iguaçu-PR, between 1996 and 2006, in which 53% and 56.7%, respectively, of live births with malformation were male [20, 21].

The variables related to the NBs that presented the most significance were gender and birth weight. With regard to gender, it was possible to see in this study that there was predominance in the male gender, corroborating with studies done

in Ribeirão Preto and Vale do Paraíba Paulista [6, 7, 14]. In relation to the birth weight, it was seen that in this study, the newborns had a weight greater than 2,500 kg, unlike other studies, which show that most newborns are born underweight, and that this is one of the major concerns in the precocious and late neonatal period, as it is one of the factors that can result in mortality [17].

Conclusions

It was found that the majority of LB had adequate weight, with an average of 2,500 g, which is a factor that facilitates the adaptation to extrauterine life. Thus, since the majority of LBs were full-term, the fact that they were born with a weight suitable for gestational age, reveals, despite the presence of malformation and/or chromosomal abnormalities, normal weight gain and length, not being an aggravating factor to the fetus from the general point of view.

Among the characteristics that presented a statistically significant association with the congenital anomalies, the characteristics of the RN as gender and weight are outstanding. Neonates with adequate birth weight were the main findings in all causes of morbidity. Regarding the malformations related to gender, both boys and girls, malformations of the musculoskeletal system prevailed. However, the second major cause in boys was that of the genitourinary system and in girls, chromosomal or other anomalies. Aspects related to the mother were not relevant in explaining the occurrence of the event in the present study.

Among the limitations of the study, we highlight the exclusive use of secondary data, which due to restrictions in coverage may have underestimated the results found. The quality of the information may still have been compromised by the presence of incomplete fields or inaccurate records.

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