REVISTA O MUNDO DA SAÚDE

Infant deaths due to preventable causes in the Far West Health Region of Santa Catarina

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Abstract

The discussion and scientific production on preventable infant deaths has attracted attention due to the intrinsic association with the quality of health services and social determinants. Its analysis, within the scope of SUS, supports the management and planning of health promotion and prevention interventions aimed at children. Thus, the present study aimed to analyze the occurrence of infant deaths from preventable causes in the Health Region of the Far West of Santa Catarina. Data collection was carried out between the months of July and December 2019, in secondary sources, in the death certificates, live birth certificates, and infant death investigation forms for the period from 01/01/2018 to 12/31/2018. The information obtained was analyzed using descriptive statistics. The instrument for the analysis of preventability was the Brazilian List of causes of preventable deaths by interventions of the Unified Health System. From a total of 3,046 births, verified in the analyzed period, there were 62 deaths, among which were 25 fetal deaths (40.32 %) and 37 infant deaths (59.67%). With an Infant Mortality Rate estimated at 12.14%, there was a predominance of fetal (40.32%) and early neonatal (29.03%) deaths. As for preventability, 40 (64%) deaths were classified as preventable, 14 (23%) were not preventable, and 8 (13%) had ill-defined causes. The causes that can be reduced by adequate care for women during pregnancy stood out as the main component in infant mortality. Our results demonstrate that there is a compromise in the quality of prenatal and neonatal care and demonstrate the importance of directing attention and investments to improve this care.

Keywords: Infant mortality. Primary prevention. Child health. Health Promotion. Public Health. Prenatal care.

INTRODUCTION

Infant mortality is considered an important indicator of the health situation of a country or region and its surveillance is one of the priorities of the World Health Organization (WHO) and the Brazilian Ministry of Health (MH)[1,2,3].

Conceptually, infant death is defined as that which occurs among children born alive from the moment of birth to an incomplete year of age, that is, 364 (three hundred and sixty-four) days; fetal death is the product of conception that occurred when the pregnancy lasted 22 weeks or more or a weight equal to or greater than 500 grams, or a length equal to or greater than 25 centimeters. For the purposes of death surveillance, the following classification was also considered: post-neonatal (28 days to 1

DOI: 10.15343/0104-7809.202044607618

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year of life or 364 days); neonatal (0 to 27 days of life); and fetal (stillborn). The neonatal component can also be divided into early (0 to 6 days) and late (7 to 27 days)[4].

Overall, substantial progress has been made in reducing child mortality, as the total number of infant deaths among children aged zero to five in 1990 was 12.6 million and in 2018 this figure dropped to 5.3 million. However, there are many disparities between regions and countries and progress in reducing neonatal mortality rates is slower, representing 2.5 million deaths in 2018 and characterizing the first month of life as the period with the highest risk of death[5].

In Brazil, in 2015, early neonatal mortality emerged as the main component in the occurrence of childhood deaths, corresponding to 41% of cases, followed by the ranges of 28-364 days, 7-27 days, and 1-4 years. The main causes of death were prematurity, congenital anomalies, asphyxia and trauma at birth, septicemia, and lower respiratory tract infections. Conditions that, in general, can be considered avoidable, highlighting the importance of factors related to pregnancy, at birth and postpartum[6,1].

The preventable or reducible causes of death are preventable events, wholly or partially, by effective actions by health services that are accessible in a specific place and time and should be reviewed in the light of the evolution of knowledge and technologies for care practices in health. Its knowledge allows, not only the understanding of the causes of death, but from the clinical point of view, it makes an appropriate approach possible, and in terms of management, it allows the construction of indicators sensitive to the quality of health care, triggering investigation mechanisms to explain the deaths and triggering actions to reduce it. Thus, the analysis of deaths according to preventable or reducible causes by adequate health care within the scope of SUS supports the management and planning of preventive and supporting interventions, as it provides essential elements for the improvement of production and health care[7].

In this context, the study aimed to analyze the occurrence of infant deaths from preventable causes in the Health Region of the Far West of Santa Catarina, in 2018.

METHODOLOGY

This was an exploratory and descriptive study of a quantitative nature. The study sample consisted of 62 (sixty-two) Child and Fetal Death Certificates (DC) that occurred in the Health Region of the Far West of Santa Catarina for the period from 01/01/2018 to 12/31/2018, in addition to child death investigation forms, and Live Birth Certificates (LBC).

The Far West Health Region (FWHR), the area covered by the study, had an estimated population of 231,848 inhabitants in 2018 and is composed of 30 municipalities. In general, the cities are all small, with an essentially agricultural economy and concentrated food production activities, the average salary is 2 minimum wages, the HDI (Human Development Index) was considered high for most municipalities, where the largest index was in São Miguel do Oeste (0.801) and the lowest in Saltinho (0.654). The municipality with the largest population is São Miguel do Oeste with 40,090 inhabitants and the smallest is Flor do Sertão, with 1,586 inhabitants8.

Table 1 comprises the search variables in the analysis of the LBC, DC and Investigation Forms, according to the Ministry of Health's Investigation Form for Infant and Fetal Death:

Table 1 – Search variables in the analysis of documents for investigating infant and fetal deaths that occurred in the Far West Health Region in 2018.

Concerning infant and fetal deaths	Concerning the characteristics of mothers
Sex	Age and education;
Race	Previous pregnancies
Type of pregnancy	Abortions
Type of delivery	Current pregnancy considered high risk
Gestational age	Gestational age at the first consultation
Child weight	Number of prenatal consultations
Apgar score	Presence of pathologies during pregnancy

Source: Adapted from Brazil, 2011

The Infant Mortality Rate (IMR) was calculated using the direct calculation method and comprises the number of deaths of children under one year of age, per thousand live births, in a given geographical space and time:

$$\frac{\text{Number of deaths of residents under one year of age}}{\text{Number of live births of resident mothers}} \times 1000$$

IMR estimates the risk of death from a live birth within the first year of life, it also represents, in general, the conditions of socioeconomic development and environmental infrastructure, as well as the access and quality of the resources available for maternal and child health care. It is classified as high (50 or more), medium (20-49), and low (less than 20)9.

The fetal, early neonatal, late neonatal, and post-neonatal mortality rate was calculated using the same method, considering the number of deaths according to the age classification (stillborn, from 0 to 6 days, from 7 to 27 days, and from 28 to 28 365 days, respectively).

The data obtained in the study were tabulated in Excel spreadsheets, exported to the SPSS Statistical Program version 20.0 and analyzed using descriptive statistics with a distribution of relative and absolute frequencies.

Determining the preventability of death was based on the List of Causes of Avoidable Deaths by interventions of the Unified Health System and is comprised into three classification groups: preventable causes, ill-defined causes of death, and other causes of death (not clearly defined)[10].

To obtain the information contained in the Death Certificates, Live Birth Certificates, and investigation forms, a request was made to the database of the State's Ministry of Health at the Epidemiological Surveillance Directory of Santa Catarina. The study was also submitted to the Ethics and Research Committee of the Western University de Santa Catarina - UNOESC, and approved under the opinion no. 3.054.363, dated December 4, 2018.

RESULTS

FWHR presented, in 2018, 3,046 births and a total number of 62 deaths, of these, 37 infant deaths (59.67%) and 25 fetal deaths (40.32%). There were 4 cases of twins, in a percentage of 3.50% of the total deaths. The Infant Mortality Rate was calculated at 12.14 deaths of children under one year old for every 1,000 children born alive in the region, in the year 2018. By distributing the proportion of deaths that occurred according to age group, the following was calculated: Fetal Death Rate 8.20/1,000LB, Early Neonatal Mortality Rate of 5.90/1,000LB; Late Neonatal Mortality Rate of 3.28/1,000LB; and of Post-neonatal of 2.95/1,000LB. Table 2 shows the death characteristics, according to variables found in the DC and LBC.

There was a predominance of female children (50%). The vast majority of children (75.8%) were white, the type of pregnancy was single birth in 93.5% of cases, and the predominant type of delivery was vaginal (54.8%). As for gestational age, there was a higher percentage of full-term children with gestational ages between 37 to 41 weeks (30.6%); as for the weight the greater proportion was between 1500 to 2500g (30.6%) and, above 2500g (29%). The Apgar score was less than 4 (59.67%) for most children.

Table 3 shows data related to the mothers' characteristics.

Most mothers of children under one year of age who died, according to the records in the data collection documents, were aged between 21 and 35 years old and the predominant level of education was high school (43.38%). As for prenatal care, 61.30% of these women started in the first trimester of pregnancy. Regarding the obstetric history, most of them already had a child (74.10%) and, 66.10% of these women had no previous abortion. In the records of the investigation forms, it was observed that 14.50% of mothers had their pregnancies classified as high-risk.

Figure 1 indicates the number of prenatal consultations carried out by the mothers of children and fetuses who died in FWHR, in 2018. It was observed that 12.90% of mothers had eight consultations, 11.29% had four consultations, and 8.06% had five prenatal consultations. The lowest number of consultations was three, for 4.83% of mothers. However, in 35.48% of the cases, there was no information on the number of consultations in the analyzed documents.

Regarding the presence of pathologies during pregnancy, even though most of the investigation records of infant death do not contain information about the mother's diseases (54.84%), the presence of urinary infections (16.13%) and arterial hypertension (9.67%) were the two most prevalent conditions, according to the percentages shown in figure 2.

As for the preventability of deaths based on the Brazilian List of Causes of Preventable Deaths by SUS Interventions, 40 (64%) were classified as preventable, 14 (23%) were not preventable, and 8 (13%) had an ill-defined cause. Among the preventable causes, the causes that can be reduced by adequate care for women during pregnancy were the main component in infant mortality, followed by the causes that could be reduced by adequate care for the fetus and newborn. The main causes of preventable infant deaths stood out: fetuses and newborns affected by maternal hypertensive disorders, newborn respiratory distress syndrome, extreme immaturity, and non-specific bacterial septicemia of the newborn, as shown in Table 4.

Table 2 – Variables related to Infant and Fetal Deaths according to sex, race, type of pregnancy, type of delivery, gestational age, weight, and Apgar score at birth, which occurred in the Far West Health Region in 2018.

Variable	Nº	%
Sex		
Male	29	46.80
Female	31	50.00
Ignored	2	3.20
Race		
White	47	75.80
Brown	1	1.60
Not informed	14	22.60
Type of pregnancy		
Single	58	93.50
Twin	4	3.50
Type of birth		
Cesarian	27	43.50
Vaginal	34	54.80
Not informed	1	1.60
Gestacional Age (weeks)		
From 22 to 27	17	27.40
From 27 to 31	11	17.70
From 32 to36	15	24.20
From 37 to 41	19	30.60
Total	62	100.00
Birth weight		
Below 500g	4	6.50
From 500 to 999g	12	19.40
From 1000 to 1449g	9	14.50
From 1500 to 2500	19	30.60
Above 2500g	18	29.00
Apgar Score (1st and 5th min.)		
>4	37	59.67
9 – 10	8	12.90
8 – 9	3	4.84

Table 3 – Variables related to the mothers' characteristics according to the mother's age, education, number of previous pregnancies, abortions, current pregnancy considered high risk, and gestational age at the first prenatal consultation, of the infant and fetal deaths that occurred in the Far West Health Region in 2018.

Variable	N°	%
Mother's age		
Less than 15 years	2	3.20
From 15 to 20 years	7	11.30
From 21 to 25 years	16	25.80
From 26 to 30 years	14	22.60
From 31 to 35 years	17	27.40
Over 35 years	6	9.70
Mother's education		
Incomplete elementary school	4	6.50
Complete primary education	8	12.90
High school	30	48.40
Third degree	17	27.40
No information	2	3.20
No schooling	1	1.60
Previous Pregnancy		
None	16	25.80
One	33	53.20
Two	9	14.50
Three	3	4.80
Four	1	1.60
Abortions		
None	41	66.10
One	20	32.30
Two	1	1.60
Current pregnancy considered high risk		
Yes	9	14.50
No	51	82.30
No information	2	3.20
Gestational age at the first consultation		
First Trimester	38	61.30
Second Trimester	5	8.10
No information	19	30.60

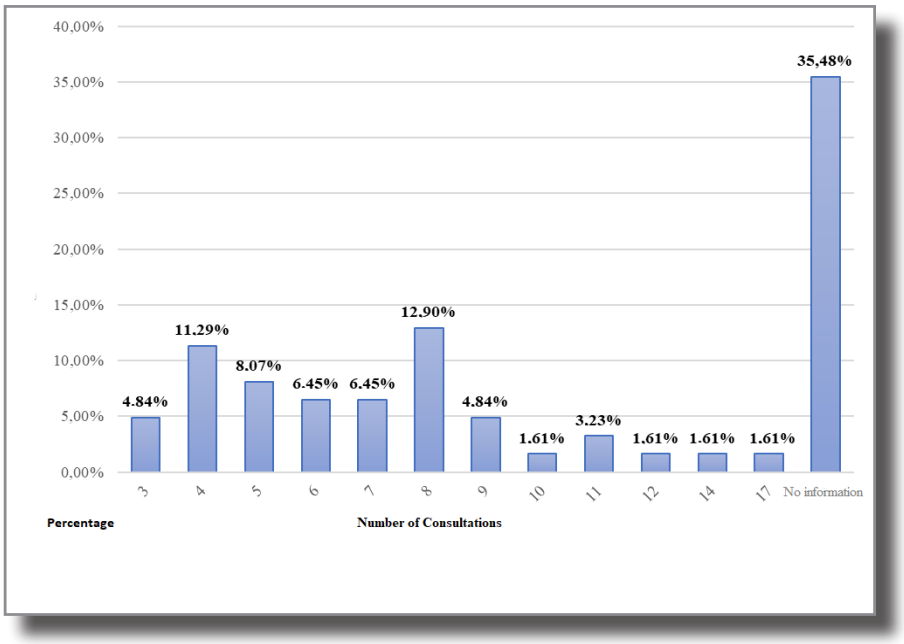

Figure 1 – The number of prenatal consultations carried out in relation to the characteristics of mothers of infant and fetal deaths that occurred in the Far West Health Region in 2018.

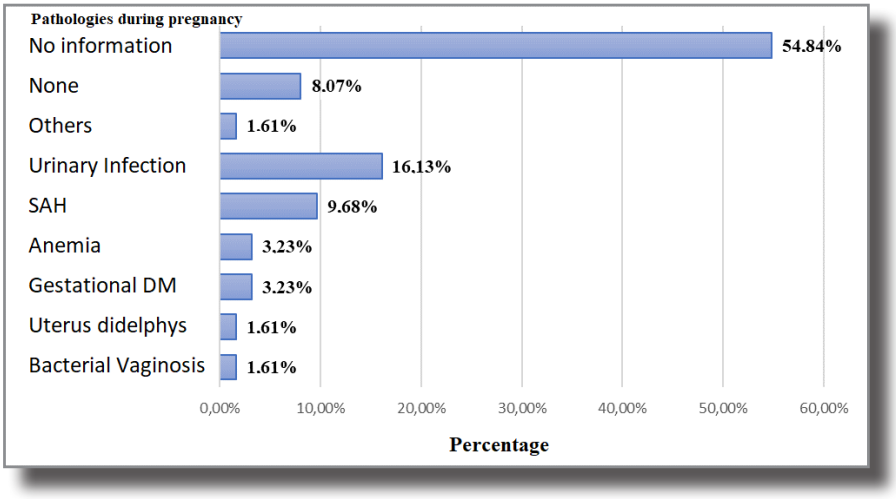

Figure 2 – The pathologies during pregnancy in relation to the characteristics of mothers of infant and fetal deaths that occurred in the Far West Health Region in 2018.

Table 4 – Distribution of the basic cause of infant and fetal deaths, according to the Classification of Preventability, Far West Health Region of Santa Catarina, 2018.

Preventability Classification	Causas Básicas do Óbito - CID 10	Frequency
1.2.1. Reducible by adequate care for women during pregnancy	P059 - Fetal growth delay, unspecified	2
	P000 - Fetus and newborn affected by maternal hypertensive disorders	4
	P009 - Fetus and newborn affected by non-specific maternal condition	1
	P220 - Newborn's respiratory distress syndrome	3
	P070 - Very low birth weight newborn	3
	P002 - Fetus and newborn affected by mother's infectious and parasitic diseases	1
	P072 - Extreme immaturity	3
	P011 - Fetus and newborn affected by premature rupture of membranes	1
	P202 - HIV disease resulting in pneumocystis carinii pneumonia	1
	P001 - Fetus and newborn affected by maternal kidney and urinary tract diseases	1
1.2.2. Reducible by adequate care for women during childbirth	P021 - Fetus and newborn affected by other forms of placental detachment and hemorrhage	2
	P038 - Fetus and newborn affected by other specific complications of labor and delivery	1
	P209 - Non-specific intrauterine hypoxia	2
	P200 - Intrauterine hypoxia diagnosed before labor begins	1
	P022 - Fetus and newborn affected by other nonspecific morphological and functional abnormalities of the placenta	1
	P012 - Fetus and newborn affected by oligodrama	1
1.2.3. Reducible by adequate care for the fetus and newborn	P282 - Cyanotic seizures of newborn	1
	P916 - Hypoxic - ischemic encephalopathy of newborn	1
	P398 - Other specific infections perinatal period	1
	P251 - Pneumothorax originating in the perinatal period	1
	P369 - Unspecified bacterial septicemia of newborn	3
	P77 - Necrotizing enterocolitis of newborn	1
	P239 - Congenital pneumonia, unspecified	1
1.3 Reducible by appropriate diagnostic and treatment actions	Q909 - Down syndrome, unspecified	1
1.4 Reducible by appropriate health promotion actions, linked to appropriate health care actions.	W780 - Inhalation of gastric-resident contents	1
	E43 - Protein-caloric malnutrition, unspecified	1
2 Ill-defined causes of death	P95 and R96	8

DISCUSSION

The analysis of the results of the study showed that, in the Far West Health Region of the state of Santa Catarina, in 2018, fetal and neonatal deaths had a greater representation in infant mortality, with a significant participation of preventable causes that were due to inadequate care for women during pregnancy and inadequate care for the fetus and newborn.

Our findings are similar to that found in other studies. In Recife (PE) between 2000 and 2009, of the total of 3,743 registered infant deaths, 2,861 (76.4%) were classified as preventable and the deaths that could be reduced by adequate care for women during pregnancy stood out. In Cuiabá, Mato Grosso, in 2010, in a study conducted with data from SIM and SINASC on neonatal deaths, of the total of 81 deaths, 81.1% were preventable, of which 47.3% were due to inadequate care for the newborn, 21.6% were inadequate care for women during pregnancy, and 12.2% were inadequate care during childbirth[12].

In Porto Alegre (RS), between the years 2000 and 2003, of the 1,139 deaths studied, 873 (76.6%) were classified as preventable and 266 (23.4%) as unavoidable, with the neonatal period presenting 56.9% of the total deaths[13].

In the United States, between 2014 and 2016 the perinatal mortality rate was essentially unchanged (6.00 perinatal deaths per 1,000), showing the difficulty in decreasing this indicator also in developed countries, although they have better levels[14].

According to Lansky *et al.*[6] there is concern about perinatal causes of mortality, but they were restricted to the survival of live births. However, little attention has been given to deaths that occur before birth, despite fetal mortality being influenced by the same circumstances and the same etiology as early neonatal mortality. The losses have so far been neglected because, in a general and misguided way, they are seen as deaths that cannot be prevented, contrary to what has been shown by several studies.

Perinatal mortality is considered a sensitive indicator of the quality of obstetric and neonatal care due to the close relationship it has with the care provided to pregnant women and newborns[14]. In addition, it is influenced by the population's demographic and socioeconomic context, which was be demonstrated in an epidemiological study carried out in Paraná municipalities, from 2006 to 2015, in which the Perinatal Mortality Rate demonstrated a spatial correlation with the high rate of illiteracy in children under 15 years old, fertility rate between 15 and 17 years, and the Gini Index[15].

It should be noted that there is also a challenge regarding the quality of information on infant death, in addition to its incorporation into the routine of public health services, since the proper recording can provide a better understanding of the occurrence of these deaths and, consequently, better control and prevention of events considered preventable[6].

It is important to highlight that much information sought for in the study was not found or was not sufficient to compose the data analysis, such as the number of prenatal consultations and pregnancy pathologies. There was also a shortage of hospital data, data on vaccination, tests performed, marital status, and medications used by the mother. This fact draws attention to the importance of correctly and completely filling out the different fields of the Death Certificate, Live Birth Certificate, and investigation forms for infant and fetal death. This favors communication between members of the health team, facilitating the coordinated

planning and continuity of care, in addition to being a fundamental tool for the management, research, and coordination of care practices in maternal and child health.

It is important to highlight that, according to the classification proposed by the Ministry of Health, the region's IMR is considered low (less than 20). However, in 2011 the state had a better index with an estimated IMR of 10.8, and the southern region of the Brazil was 11.3. This highlights the importance of analyzing this parameter in the regions of the state and the need to improve these indicators[16].

Moreover, among the age classifications, a higher percentage of early fetal and neonatal deaths stands out, demonstrating the high participation of perinatal causes in the mortality profile in the year of the study. Most mothers (61.3%) entered prenatal care in the first gestational trimester, demonstrating that these women had access to health services to start prenatal care.

Attention should also be given to the fact that, even with a higher percentage of vaginal delivery, the proportion of cesarean sections (43.4%) was high in the cases analyzed, although operative delivery in high-risk pregnancies is considered important for the reduction of maternal and child mortality[17]. The high frequency of cesarean sections is also a challenge for care practice in health services. According to the World Health Organization (WHO), the rate of cesarean sections should not exceed 15%, and in Brazil, its high prevalence is strongly related to socioeconomic and cultural factors[18].

The percentage of pregnancies classified as high-risk was 14.5%. According to Leal *et al.* [19], determining gestational risk is extremely important in prenatal care and draws attention to the persistence of invisibility of high-risk women, indicating possible failure in care for pregnant women due to the absence of detection and treatment of problems during pregnancy.

The Apgar score shows that most children had an index lower than 4 in the 1st and 5th minutes, reflecting a poor condition at birth.

The risk of neonatal death is, respectively, 44 and 50 times higher among low birthweight (<2,500g) and premature newborns (gestational age <37 weeks), just as it is 54 and 125 times higher when Apgar score is less than 7 in the 1st and 5th minute, respectively[20].

In a study carried out by Bittencourt and Gaiva on interventions in the delivery room, most neonates (72.7%) were born with asphyxia (Apgar <7 in the 1st minute). And among those who died in the first week of life, 78.57% had an Apgar score less than 7 in the 1st minute and 80.6% less than 7 in the 5th minute. In relation to childbirth, there is still unpreparedness for the immediate care of the complications at childbirth/birth, such as resuscitation, maternal and neonatal stabilization, and the high number of deaths from intrapartum asphyxia, especially of children with adequate weight at birth and in low-risk pregnancies, demonstrate the potential for preventability of these deaths[21].

Regarding the number of prenatal consultations, the Ministry of Health's Program for the Humanization of Prenatal and Birth (PHPB) foresees the first prenatal consultation until the fourth month of pregnancy, at least 06 (six) prenatal care visits throughout pregnancy[22].

Adequate gestational follow-up allows the prevention and timely management of complications and pathologies such as the presence of urinary tract infections and arterial hypertension. The presence of pathologies during pregnancy can be an important risk factor for infant death[23].

Urinary tract infections are quite frequent in pregnancy due to changes arising from pregnancy, and due to the restriction of the use of antimicrobials and the susceptibility

of the fetus, they are associated with perinatal complications[24,25]. Such infections can be treated if there is good adherence to prenatal care and the availability and quality of care is adequate. Health education for its prevention, identification, and early management is essential to reduce maternal and child morbidity and mortality[26].

There was also a high incidence for arterial hypertension, whether pre-existing or that which develops during pregnancy, and was associated with several factors including age (the greater the age group the higher the risk), family history, diabetes, smoking, alcoholism, and obesity. Complications mainly include miscarriage, premature birth, fetal growth restriction, placental detachment, fetal distress, and disorders of vital organs after birth. There is still a high risk to the mother's life when the disease progresses to pre-eclampsia, eclampsia, or hemolysis syndrome, elevated liver enzymes and low platelet count. In this regard, early diagnosis and classification of pregnancy risk are essential. The pregnant woman needs to be accompanied by an interdisciplinary team, whose objective is to reduce the risks of an unfavorable result for the mother and/or baby/fetus[27,28].

In newborn respiratory distress syndrome, which affects premature children due to deficiency in surfactant production, exogenous surfactant therapy appears to improve oxygenation and lung function in many babies, with no apparent negative side effects, resulting in longer survival of newborns[29]. The use of antenatal corticosteroids is also a protective factor against neonatal mortality. Whenever there is an imminent risk of giving birth prematurely, corticosteroid therapy is recommended, as there is evidence that its use decreases the frequency and severity of respiratory distress syndrome, intracranial hemorrhaging, and necrotizing enteritis. It should be recommended between 26 and 34 weeks of gestation[30].

Bacterial septicemia is also a major cause of morbidity and mortality in the neonatal period, and its incidence was high, especially in premature and low birth weight infants. It is directly related to gestational and/or peripartum factors, such as infections of the mother's genitourinary tract, labor during pregnancy at less than 35 weeks, and ruptured placenta for more than 18 hours. In this sense, both prenatal care in the Basic Health Unit and hospital, has a fundamental role in prevention and early intervention in the face of these infections[25].

In all aspects, prenatal and neonatal care plays an extremely important role in preventing perinatal morbidity and mortality. In this scenario, it is necessary to invest in preventable death prevention actions, focusing on prenatal care, with special attention to high-risk pregnancies[23].

Fetal and infant death is the result of an extensive chain of determining factors, however it is indisputable that most preventable infant deaths are related to the quality of care during the prenatal period, labor, and birth, which makes it imperative to change the model of biomedical and technocratic health care for an evidence-based model, in order to produce comprehensive health actions based on the needs of women and children for safe and humanized labor and birth, as well as to construct and support perinatal networks[18].

CONCLUSION

According to the classification proposed by the Ministry of Health of Brazil, infant mortality can be considered low in the Far West Health Region of Santa Catarina in the years analyzed; however, it is necessary to consider the profile of preventable deaths to direct essential public health policies toward the prenatal and early neonatal period.

Preventable infant deaths are still an important challenge for health services in the region, and the effective performance of committees and the assessment of cases by health teams, managers, and the community can be the first step towards proposing preventive and control measures.

It is also imperative, in health care, the need to expand political, institutional, and technical conditions for changes in work processes, with a view to preparing management and maternal and childcare services for comprehensive, humanized, and equitable care. In this scenario, the interdisciplinarity of the team is essential since it allows the exercise of essential skills to all those involved in care, in a collective commitment to improving the quality of healthcare and carrying out preventive actions aimed at reducing preventable infant deaths.

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Received in may 2020.
Accepted in november 2020.