Epidemiological Profile of Maternal Mortality in the Southern Region of Brazil: A Cross-sectional Study

Perfil Epidemiológico de Mortalidade Materna na Região Sul do Brasil: Um Estudo Transversal

Perfil Epidemiológico de la Mortalidad Materna en la Región Sur de Brasil: Un Estudio Transversal

RESUMO

Objetivo: Descrever o perfil epidemiológico de mortalidade materna na região Sul do Brasil, entre os anos de 2019 a 2023. **Método:** Estudo transversal, descritivo e retrospectivo, com dados coletados através do Departamento de Informática do Sistema Único de Saúde. **Resultados:** O índice de mortes maternas foi predominante no Paraná, em todos os anos de análise. Quanto às causas, a maioria dos registros apontam para causas obstétricas indiretas no Paraná e em Santa Catarina; já no Rio Grande do Sul, prevalecem as causas obstétricas diretas. Considerando as variáveis sócio-demográficas, houve predominância de mulheres com idade entre 20 a 34 anos, solteiras, da raça branca e com escolaridade de oito anos ou mais. **Conclusão:** Estratégias para a promoção da saúde materna devem ser priorizadas para minimizar o risco de mortalidade materna, contribuindo para a redução de disparidades e proteção da saúde das mulheres na região Sul do Brasil.

DESCRITORES: Mortalidade materna; Saúde da mulher; Epidemiologia; Enfermagem materno-infantil.

ABSTRACT

Objective: To describe the epidemiological profile of maternal mortality in the Southern region of Brazil between 2019 and 2023. **Method:** Cross-sectional, descriptive, and retrospective study, with data collected through the Informatics Department of the Unified Health System. **Results:** The maternal mortality rate was predominant in Paraná in all years of analysis. Regarding the causes, most records point to indirect obstetric causes in Paraná and Santa Catarina; in Rio Grande do Sul, direct obstetric causes prevail. Considering socio-demographic variables, there was a predominance of women aged 20 to 34 years, single, white, and with eight or more years of schooling. **Conclusion:** Strategies for promoting maternal health should be prioritized to minimize the risk of maternal mortality, contributing to the reduction of disparities and protection of women's health in the Southern region of Brazil.

DESCRIPTORS: Maternal mortality; Women's health; Epidemiology; Maternal-child nursing.

RESUMEN

Objetivo: Describir el perfil epidemiológico de la mortalidad materna en la región sur de Brasil entre 2019 y 2023. **Método:** Estudio transversal, descriptivo y retrospectivo, con datos recopilados a través del Departamento de Informática del Sistema Único de Salud. **Resultados:** La tasa de mortalidad materna fue predominante en Paraná en todos los años de análisis. En cuanto a las causas, la mayoría de los registros apuntan a causas obstétricas indirectas en Paraná y Santa Catarina; en Rio Grande do Sul, prevalecen las causas obstétricas directas. Considerando las variables sociodemográficas, hubo un predominio de mujeres de 20 a 34 años, solteras, blancas y con ocho o más años de escolaridad. **Conclusión:** Se deben priorizar las estrategias de promoción de la salud materna para minimizar el riesgo de mortalidad materna, contribuyendo a la reducción de las disparidades y la protección de la salud de las mujeres en la región sur de Brasil.

DESCRIPTORES: Mortalidad materna; Salud de la mujer; Epidemiología; Enfermería maternoinfantil.

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Angélica Yukari Takemoto
Doctorate in Nursing. State University of the Midwest.
ORCID: https://orcid.org/0000-0002-0814-0193

Luana Aparecida Ribas Bueno
Bachelor's Degree in Nursing. Guairacá University Center
ORCID: https://orcid.org/0009-0001-5945-5339

Kelly Cristina Michalczyszyn
Master's Degree in Nursing. State University of the Midwest
ORCID: https://orcid.org/0000-0002-2010-7302

Mayra Rayane da Maia
Specialist in Urgent and Emergency Nursing. Midwestern State University.
ORCID: https://orcid.org/0000-0003-1000-0613

Talita Mendes dos Santos
Master's Degree in Nanoscience and Bioscience. State University of the Midwest.
ORCID: https://orcid.org/0000-0002-8217-1238

Carlos Eduardo dos Santos
Specialist in Urgent and Emergency Nursing. Guairacá University Center.
ORCID: https://orcid.org/0009-0005-3075-8714

Mariana Alves Rosa
Nursing Undergraduate Student. State University of the Midwest
ORCID: https://orcid.org/0009-0005-6084-2896

Gabriele Regiani de Assis
Undergraduate student in Nursing. State University of the Midwest.
ORCID: https://orcid.org/0009-0006-7068-1034

INTRODUCTION

Maternal mortality remains a public health challenge in many developing countries due to economic differences and unequal access to health services[1] . In southern Brazil, known for its socioeconomic diversity, we can observe an epidemiological scenario that reveals progress and persistent barriers with regard to maternal and child care.

Even with a relatively well-established public health infrastructure in southern Brazil, there is still an association between deaths and preventable factors when it comes to maternal health, such as lack of adequate monitoring during pregnancy and incorrect management of obstetric complications[(2)].

The maternal mortality rate is commonly used as a key indicator of the quality of the health system, as it directly reflects the effectiveness of the services provided to pregnant women at all stages of the pregnancy and postpartum cycle[(3)]. According to the World Health Organization (WHO), maternal mortality is defined as the death of a woman during pregnancy or up to 42 days after the end of pregnancy, regardless of the duration or location of the pregnancy, due to any cause related to or aggravated by pregnancy or its management, but not from accidental or incidental causes.

They can be classified as direct obstetric deaths (resulting from obstetric complications during pregnancy, childbirth, or the postpartum period, resulting from negligence or inadequate treatment) and indirect deaths (triggered by diseases/conditions pre-existing to pregnancy or that developed during this period, aggravated by the physiological effects of the moment)[4] .

The importance of monitoring these indicators in the southern region of Brazil becomes even more evident when considering the distribution of health resources and the variation in the quality of prenatal care, factors that directly influence obstetric outcomes.

Recent studies indicate that gestational hypertension, hemorrhages, and infections remain among the leading causes of maternal death[(5,6)]. Most of these deaths could be prevented with adequate and timely care, highlighting the need for greater training of health teams and better access to technologies and possibilities that can prevent or manage these complications.

Reducing mortality rates in Brazil is a significant challenge for public health, as it affects different regions of the country unevenly, especially areas with high social vulnerability. Maternal mortality can be characterized as a violation of human rights, since in most cases it is a preventable death[(7)].

In this context, nursing has proven to be of fundamental importance, especially in preventive actions and close monitoring of pregnant women at risk, ensuring early and efficient intervention in cases of complications[(8)].

Recent literature highlights the importance of continuing education for nursing professionals and expanding their scope of practice to improve obstetric outcomes. It is known that the implementation of evidence-based protocols in nursing practice contributes significantly to the reduction of serious complica-

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tions, such as postpartum hemorrhage and puerperal infections. In addition, strengthening primary care with a qualified and well-structured nursing team has been identified as one of the main strategies for reducing maternal mortality, especially in regions that are more deprived or distant from large urban centers[(, 9,10)].

The COVID-19 pandemic has brought new challenges to maternal health. With the overload of health systems and the temporary suspension of care services for pregnant women, there has been a worrying increase in maternal deaths related to complications that could have been prevented[(((6))] . Amid this scenario, nursing has taken on an even more central role, not only in clinical support, but also in welcoming and guiding pregnant women, ensuring that, even in times of crisis, there is continuous monitoring.

It is important to emphasize the need for an integrated and multidisciplinary approach, in which nursing plays a strategic role in monitoring and promoting maternal health. The active participation of these professionals on the front line of care allows for the early identification of risk factors and the implementation of effective preventive measures, which are crucial for reducing maternal mortality[(10)] .

Strengthening public health policies that prioritize the continuous development and enhancement of the role of nursing, combined with improvements in healthcare infrastructure, are essential actions to address the persistent challenges in this field.

Therefore, this study aims to describe the epidemiological profile of maternal mortality in southern Brazil between 2019 and 2023. By identifying the epidemiological characteristics and causes of death, we hope to contribute to the development of more effective health policies that reduce maternal mortality rates and promote access to healthcare.

METHOD

This is a cross-sectional, descriptive, and retrospective study based on secondary data collected from the official website of the Department of Informatics of the Unified Health System (DATASUS), using the Mortality Information System (SIM) and the Live Birth Information System (SINASC).

Data collection was carried out in July 2024, considering the time interval from 2019 to 2023. It should be noted that, for this study, only the variable corresponding to maternal death was used, excluding data on late maternal deaths (characterized when death occurs more than 42 days and less than one year after the end of pregnancy). In addition, the underlying causes of death were identified according to the International Classification of Diseases (ICD-10).

The data were compiled and processed using *Statistical Package for the Social Sciences* (SPSS) software, version 20.0. The variables analyzed included the cause of maternal death, classification of the obstetric cause, place of occurrence, age, marital status, race/color, and education level. For these data, univariate descriptive statistics were calculated based on the identification of absolute and relative frequencies of the information.

In addition, the maternal mortality ratio (MMR) was calculated for statistical analysis. The formula used to calculate the MMR was as follows:

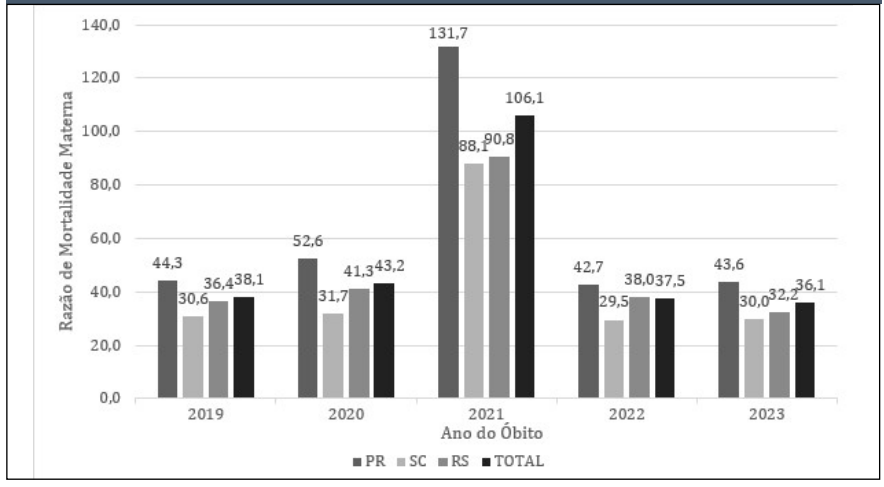
$$RMM = \frac{\text{nº.de óbitos de mulheres por causas ligadas à gravidez,parto e puerpério (SIM)}}{\text{número total de nascidos vivos (SINASC)}} \times 100.000$$

Ethical aspects were governed by the principles of Resolution 466/2012 of the National Health Council (CNS). As this was a study using secondary data and without identification of individuals, it did not require review by a Research Ethics Committee (REB).

RESULTS

Between 2019 and 2023, 958 maternal deaths were recorded in the southern region of Brazil, with 453 deaths recorded in Paraná, 204 in Santa Catarina, and 301 in Rio Grande do Sul. Overall, the MMR in the southern region for the study period was 52.0 deaths per 100,000 live births. The MMR is shown in Figure 1 for the period from 2019 to 2023

Figure 1 – Maternal Mortality Ratio in the Southern Region of Brazil, 2019-2023.



Among the causes of maternal death, the majority are related to ICD-10 Chapter XV – Pregnancy, Childbirth, and the Puerperium (99.6%). Among these causes, conditions such as gestational hypertension, eclampsia, postpartum hemorrhage, and urinary tract infection are the most recurrent. It is worth noting that in 2021, due to the COVID-19 pandemic, there was an increase in maternal deaths as a result of this condition.

As for the obstetric causes of maternal deaths, indirect obstetric maternal death predominates (48.5%). However, in the state of Rio Grande do Sul, most deaths are classified as direct obstetric causes (49.9%). Regarding the place of occurrence, most deaths occurred in hospitals (92.6%) (Table 1).

Table 1 – Maternal deaths, according to type of obstetric cause and place of occurrence in the Southern Region of Brazil, 2019-2023a

Obstetric cause	PR		SC		RS		Total	
	n	%	n	%	n	%	n	%
Direct obstetric maternal mortality	204	45,0	97	47,5	150	49,9	451	47,1
Indirect obstetric maternal mortality	221	48,8	100	49,0	144	47,8	465	48,5
Unspecified obstetric maternal death	28	6,2	7	3,5	7	2,3	42	4,4
Location of Occurrence	n	%	n	%	n	%	n	%
Hospital	421	92,9	185	90,7	281	93,4	887	92,6
Residence	13	2,9	12	5,9	10	3,3	35	3,7
Other healthcare facility	12	2,6	2	1,0	7	2,3	21	2,2
Public road	2	0,5	1	0,5	---	---	3	0,3
Others	5	1,1	4	1,9	3	1,0	12	1,2

Regarding maternal deaths, considering socio-demographic variables, Table 2 shows that there was a predominance of women aged 20 to 34 years (60.6%), single (45.3%), white

Table 2 – Maternal deaths according to socio-demographic variables in the Southern Region of Brazil, 2019-2023

Age group	PR		SC		RS		Total	
	n	%	n	%	n	%	n	%
10 to 19 years	36	7,9	7	3,4	17	5,6	60	6,3
20 to 34 years old	277	61,2	126	61,8	178	59,2	581	60,6
35 years or older	140	30,9	71	34,8	106	35,2	317	33,1
Marital status	n	%	n	%	n	%	n	%
Single	197	43,5	78	38,2	159	52,8	434	45,3
Married	169	37,3	74	36,3	68	22,6	311	32,5
Legally separated	14	3,1	6	2,9	7	2,3	27	2,8
Widow	4	0,9	1	0,5	---	---	5	0,5
Others	60	13,2	33	16,2	27	9,0	120	12,5
Ignored	9	2,0	12	5,9	40	13,3	61	6,4
Race/Color								
White	294	64,9	145	71,1	227	75,4	666	69,5
Black	31	6,8	26	12,7	33	11,0	90	9,4
Yellow	1	0,2	---	---	2	0,7	3	0,3
Brown	118	26,0	28	13,7	34	11,2	180	18,8
Indigenous	8	1,9	2	1,0	2	0,7	12	1,3
Ignored	1	0,2	3	1,5	3	1,0	7	0,7

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Education								
0 to 3 years	21	4,6	9	4,4	12	4,0	42	4,3
4 to 7 years	72	15,9	31	15,2	50	16,6	153	16,0
8 years or more	332	73,3	157	77,0	162	53,8	651	68,0
Ignored	28	6,2	7	3,4	77	25,6	112	11,7

DISCUSSION

Maternal mortality in southern Brazil presents specific characteristics and challenges that reflect both demographic aspects and the particularities of local health systems. Although the southern region has better health indicators compared to other regions of the country, maternal mortality remains a significant concern[(11)].

It is noted that the state of Paraná has a relatively higher MMR compared to other states in the region. This discrepancy can be understood from a detailed analysis of the socioeconomic, structural, and epidemiological variables that impact maternal health.

Paraná, like other Brazilian states, suffered from the COVID-19 index, which considerably increased the indirect obstetric causes of maternal mortality. During the pandemic, maternal mortality increased due to complications associated with the virus and the overload of hospitals, interfering with the ability to care for pregnant women[(12)].

This situation had direct repercussions on maternal health and contributed to an increase in mortality rates among women who were pregnant or had recently given birth, especially those with pre-existing comorbidities, as they were more susceptible to developing serious complications in case of infection.

However, other factors also help to explain the differences between the states in southern Brazil. Compared to Santa Catarina and Rio Grande do Sul, Paraná has a larger population and a more extensive territory, which contributes to regional disparities in access to healthcare. State health management also influences maternal mortality, since public policies focused on maternal health, especially in regions with lower socioeconomic development, are essential to reduce mortality[(9)].

In Brazil, the Ministry of Health considers a rate of 30 maternal deaths per 100,000 live births to be an acceptable target for maternal mortality. This goal is aligned with the Sustainable Development Goals (SDGs), which aim to significantly reduce preventable maternal deaths globally by 2030. The target reflects an effort to combat the main causes of maternal deaths, such as hypertension, infections, and hemorrhages, and to improve access to and the quality of obstetric health services in the country

An assessment of MMR rates shows that 2021 had the highest rate in all states. This is believed to be due to the COVID-19 pandemic, which had an impact on the health system, influencing maternal mortality rates. The increase in deaths of pregnant women and women who recently gave birth due to indirect obstetric causes, due to SARS-CoV-2 infection, pointed to weaknesses in health services[(14)]. Indirect causes of maternal mortality are those that occur due to pre-existing conditions or conditions aggravated by pregnancy, which, in addition to the context of COVID-19, include conditions such as hypertension, diabetes, heart disease, and respiratory diseases[(15)].

These factors, combined with the body's immunosuppression during pregnancy, increased the risk of maternal death, as the virus proved aggressive for patients with such conditions. The overload of health services and the difficulty in maintaining adequate prenatal care further increased these risks[(6)].

Analysis of the location of deaths reveals that most deaths were recorded in a hospital setting. This can be explained by inadequate prenatal care, leading to a higher risk of adverse pregnancy outcomes. It is known that the causes of most maternal deaths could be prevented through quality prenatal care, identifying possible complications during pregnancy and intervening to address them[(16)].

With regard to maternal deaths during the COVID-19 pandemic, the overload of intensive care units (ICUs) and the organization of hospital flows to care for critical COVID-19 patients negatively influenced access to care for pregnant women, especially those classified as high risk. This reveals the importance of care protocols that address the needs of pregnant women, training professionals, and improving infrastructure in the field of obstetrics[(17)].

Another significant characteristic is the age group of women most affected in all states, predominantly between 20 and 34 years old, an age associated with the peak of reproductive life and, normally, satisfactory health conditions. Similar data were found in other Brazilian studies, justified by the fact that this is considered reproductive age and has the highest prevalence of pregnancies.

The number of deaths prevalent in this age group during the COVID-19 pandemic suggests that the epidemiological profile was aggravated by factors such as stress, social isolation, and difficulty in accessing regular

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medical care. Fragmentation in care may have led to late diagnoses and interventions, increasing the risk of serious complications.

An analysis of the marital status and educational level of maternal deaths indicates a predominance of single women and women with more than eight years of schooling, respectively.

> “Marital status needs to be further analyzed, as some marriages break down during pregnancy.”

It is believed that unmarried, widowed, or separated women are vulnerable groups. This is justified by the absence of affective, emotional, social, and financial support and encouragement for self-care by the baby's father[(18)].

In addition, although education is generally associated with better living conditions and health, women with low levels of education may show a lack of interest in seeking access to health services[(19)]. It can be inferred that the risk of maternal death is associated with low educational attainment, considering socioeconomic influences and the difficulty of accessing quality health services[(20)].

With regard to maternal deaths among white women, this information differs from that presented in the literature, which indicates that black and brown women are at greater risk of death[(21)] . This observation reinforces the need for public health policies that ensure equitable and inclusive care for all pregnant women and guarantee the necessary resources for the protection of maternal health, regardless of class, race, or origin.

It is important to emphasize that healthcare networks must be prepared to respond quickly to the needs of pregnant women, offering access to intensive care when necessary and maintaining accessible and safe prenatal care, ensuring that all pregnant women have access to dignified and efficient care. In this way, it is possible to mitigate the effects of possible gestational complications and ensure better outcomes for maternal health.

Given the above, social inequalities still exist in Paraná, allowing, based on maternal mortality rates, to predict a scenario regarding women's living conditions, difficulties in accessing health services and care, as well as limited information on preventive and health promotion actions.

A limitation of the study is the use of secondary data from DATASUS, since it is not possible to predict possible errors in the information fed into the databases, in addition to problems related to underreporting and the presentation of ignored or unreported variables.

CONCLUSION

The COVID-19 pandemic had a significant impact on maternal mortality in southern Brazil between 2019 and 2023, especially in Paraná, as evidenced by the epidemiological profile characterized predominantly by indirect obstetric causes. The data show that most maternal deaths occurred in a hospital setting, suggesting that, although pregnant women may have sought medical assistance, access to highly complex specialized care was possibly hampered by the overload of health services during the pandemic.

Regarding the epidemiological profile, most maternal deaths occurred in the 20-34 age group, among single women, white women, and women with 8 or more years of schooling. Despite high levels of education, the relationship between socioeconomic conditions and maternal mortality is evident, as factors such as income and social support directly influence access to and quality of care received by pregnant women. Women in more vulnerable socioeconomic situations often face significant barriers to regular prenatal care, emergency care, and access to specialized care.

The findings of this study point to the urgent need for public policies that ensure continuity and access to prenatal and emergency care, in addition to reinforcing the importance of a prepared and decentralized hospital network to serve pregnant women in all locations.

Strategies for promoting maternal health, training professionals, and expanding social support should be prioritized to minimize the risk of maternal mortality in future scenarios, contributing to the reduction of disparities and protection of women's health in southern Brazil.

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