

# The Scenario of organ and Tissue Donation for Post-mortem Transplantation in the 16th Health Region/RS

Isadora Cristina da Silva<sup>1\*</sup> , Árien Eliza Oldoni<sup>1</sup> , Jean Carlos Zanardo<sup>1</sup> , Lázaro Pereira Jacobina<sup>1</sup> 

1. Universidade Regional Integrada do Alto Uruguai e das Missões  – Erechim (RS)-Brazil.

\*Corresponding author: [isadora\\_cristina\\_s@hotmail.com](mailto:isadora_cristina_s@hotmail.com)

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## ABSTRACT

**Introduction:** The donation and transplantation of organs and tissues is a topic of multiprofessional interest and an important theme regarding the promotion of public health policies regarding the application of this therapy. **Objectives:** The objective of this article is to present an analysis of the scenario of organ and tissue donation after death, for transplantation, in the 16th Health Region of Rio Grande do Sul between 2010 and 2020, focusing on evaluating family refusals to donate. **Methods:** A census survey was carried out of the data referring to the brain death protocols carried out in the period, tabulated in Microsoft Excel, analyzed through the construction of time series and related using the chi-square test. **Results:** The analysis in the region shows a higher proportion of negatives (57.8 %) concerning acceptances (42.2 %) for organ and tissue donation. However, when only the last years of the period are observed, another reality is seen: from 2017 to 2019, the donation statements corresponded to more than 75 % of the interviewed families. In 2020, however, in an atypical way, no brain death protocols were concluded; therefore, no family underwent the interview for donation. **Conclusion:** There has been a trend toward an increase in donation percentages over the years, both in the 16th Health Region of Rio Grande do Sul and the rest of the country. However, the number of transplants performed is still lower than the population's need.

**Descriptors:** Organ and tissue donation; Transplantation; Brain death.

## *Cenário de Doação de Órgãos e Tecidos para Transplante Pós-morte na 16ª Região de Saúde/RS*

## RESUMO

**Introdução:** A doação e o transplante de órgãos e tecidos é um tema de interesse multiprofissional e pauta importante quanto à promoção de políticas de saúde pública referentes à aplicação dessa terapêutica. **Objetivos:** Apresentar uma análise do cenário da doação de órgãos e tecidos para transplante pós-morte na 16ª Região de Saúde do estado do Rio Grande do Sul entre os anos de 2010 e 2020, com enfoque na avaliação das negativas familiares para a doação. **Métodos:** Foi realizado um levantamento censitário dos dados referentes aos protocolos de morte encefálica realizados no período, os quais foram tabulados no Microsoft Excel, analisados por meio da construção de séries temporais e relacionados utilizando o teste qui-quadrado. **Resultados:** A análise realizada na região evidencia uma maior proporção de negativas (57,8 %) em relação aos aceites (42,2 %) para doação de órgãos e tecidos. Porém, quando observados apenas os últimos anos do período, vê-se outra realidade: de 2017 a 2019 as afirmativas para a doação corresponderam a mais de 75 % das famílias entrevistadas. No ano de 2020, no entanto, de forma atípica, não foram concluídos protocolos de morte encefálica e, portanto, nenhuma família passou pela entrevista para doação. **Conclusão:** Há uma tendência de aumento nos percentuais de doação ao longo dos anos, tanto na 16ª Região de Saúde do estado do Rio Grande do Sul como no restante do país, porém, a quantidade de transplantes realizados ainda é inferior à necessidade da população.

**Descritores:** Doação de órgãos e tecidos; Transplante; Morte encefálica.

## INTRODUCTION

Organ transplantation, as a therapeutic modality, constitutes a safe and effective treatment due to the optimization of the operative act, the understanding of compatibility mechanisms, rejection control and the use of immunosuppressive drugs.<sup>1</sup> It is a globally accepted therapeutic resource that improves quality of life and saves hundreds of thousands of patients annually.<sup>1</sup> In view of this, the donation-transplant process, through postmortem organ donation, directly impacts the survival of patients on the transplant waiting list, being the only possible therapy for the vast majority of these patients. However, despite its importance, this subject is surrounded by taboos and uncertainties for a large part of the population, since, in Brazil, postmortem organ donation is authorized by the family.

Although organ and tissue donation and transplantation rates vary between countries, the low level of organ donation is a universal problem<sup>2</sup> and, therefore, must be addressed according to the specificities of the population and health services in each region of the world. Thus, this article aims to analyze the scenario of family refusals to donate organs and tissues for postmortem transplantation in the 16th Health Region of the state of Rio Grande do Sul (RS) between the years 2010 and 2020 with the elaboration of an opinion regarding organ donation rates in that locality.

A study carried out by Pessoa, Schirmer and De Aguiar<sup>3</sup> related the unpreparedness of health professionals in the family approach to the refusal to donate. Therefore, with the observation of the percentages of refusals of the approached families for the donation of organs and tissues for transplantation in the region studied, there is the possibility of analyzing the effectiveness of the strategies used by the local health service in carrying out this contact. In view of this, if high rates of family refusals for donation are evidenced, it is possible to point out what are the flaws in the approach of the health service and, even, propose alternatives to correct them, leading to a satisfactory and full outcome to the organ and tissue receptors.

Regional epidemiological studies such as this one is important in enabling the targeting of strategic actions in view of the specificities of the population, since, according to the Associação Brasileira de Transplantes de Órgãos – ABTO<sup>4</sup>, there is a disparity in terms of organ donation between the different Brazilian regions and states. With that in mind, with regard to providing up-to-date data, this study proposes to stimulate the development of actions to guide the population on the subject, as well as interventions aimed at updating the health service with regard to transplantation of organs.

It should be noted that the region of interest is located in the South-Southeast zone, which, according to Soares et al.<sup>5</sup>, concentrates the largest number of transplants in the country, making it possible, for comparative purposes, to observe whether the percentages of donation local are consistent or discrepant with those verified in the macro-region. Still according to the author, despite the growing statistics of donation in the last decade, it is observed that the number of transplants performed is substantially lower than the need of the country's population.<sup>5</sup> In Brazil, for example, at the end of 2020, 43,642 patients were active on the waiting list for an organ transplant.<sup>6</sup>

Given the importance of developing actions aimed at donating organs and tissues for transplantation, the results obtained in this study make it possible to visualize the future of organ donation and transplantation in the region, bearing in mind a tendency towards an approach aimed at raising awareness among the families of potential donors regarding the donation process, given its importance.

## MATERIALS AND METHODS

A survey of data was carried out regarding the number of protocols initiated, as well as those concluded and authorized, or not, for the donation of organs and tissues for transplantation in the 16th Health Region of Rio Grande do Sul, in the period between 2010 and 2020. The Health Region in question is made up of the following municipalities: Aratiba, Áurea, Barão de Cotegipe, Barra do Rio Azul, Benjamin Constant do Sul, Campinas do Sul, Carlos Gomes, Centenário, Charrua, Cruzaltense, Entre Rios do Sul, Erebang, Erechim, Erval Grande, Estação, Faxinalzinho, Florianópolis, Gaurama, Getúlio Vargas, Ipiranga do Sul, Itatiba do Sul, Jacutinga, Marcelino Ramos, Mariano Moro, Nonoai, Paulo Bento, Ponte Preta, Quatro Irmãos, Rio dos Índios, São Valentim, Severiano de Almeida, Três Arroios and Viaducts<sup>7</sup>. The estimated population of this region, according to the last Census (2010) is 230,814 inhabitants<sup>8</sup>.

The collected data also involved the demographic characteristics related to the gender and age group of this population, in addition to data referring to the cause of death. This information was obtained through the Intra-Hospital Commissions for Donation of Organs and Tissues for Transplantation (CIHDOTT) of the institutions under investigation – tertiary hospitals in the referred region. Both consulted CIHDOTT are subordinated to Organ Procurement Organization (OPO) 4 - São Vicente de Paulo Hospital - Passo Fundo<sup>9</sup>. For comparative purposes, public domain data available in the Brazilian Transplant Registry (RBT), official vehicle of the Brazilian Association of Organ Transplantation (ABTO), for the same period were also collected. The protocol of the present study was approved by the Research Ethics Committee of URI Erechim, under the Presentation Certificate of Ethical Appreciation (CAAE) number 42852721.0.0000.5351, on May 29, 2021.

The data collected with the CIHDOTT were tabulated in Microsoft Excel and the percentages of each category were calculated. Then, a descriptive analysis was carried out through the construction of time series, with the objective of knowing the evolution of the number of organ donation protocols carried out over the years. The association between categorical variables was investigated using the chi-square test, adopting  $p < 0.05$  as significant. All analyzes were performed using GraphPad Prism 9.2 software (URI license under serial GPS-2210048-EHT5-3C800).

## RESULTS

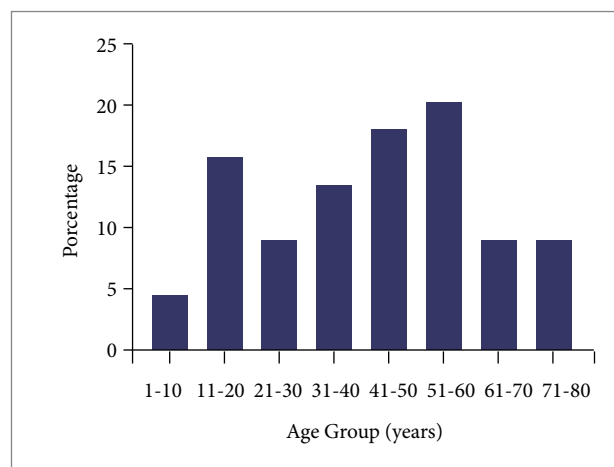
The status of organ and tissue donation for transplantation in the 16th Health Region was assessed following the analysis of data from 44 brain death (BD) protocols opened in two regional referral hospitals, spanning the period from 2010 to 2020. This represents the total number of organ donation processes initiated in the region during that period. The collected data is summarized in Table 1.

**Table 1.** Characteristics of potential organ and tissue donors for transplantation in the 16th Health Region of the state of Rio Grande do Sul, during the period 2010-2020.

	Number	%
<b>Sex</b>		
Female	19	43,18
Male	25	56,81
<b>Age</b>		
< 45 years old	26	59,09
> 45 years old	18	40,91
<b>Cause of Brain Death</b>		
Cranioencephalic Trauma	16	36,36
Stroke	19	43,18
Others	9	20,45
<b>Authorization for Organ Donation</b>		
Yes	19	43,18
No	25	56,82

Source: Elaborated by the authors.

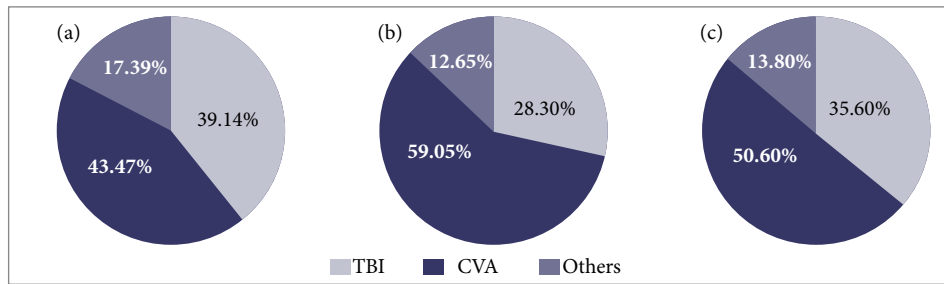
Regarding the age profile of potential organ donors, the average age was  $42.40 \pm 19.69$  years. The distribution by age group of these potential donors is illustrated in Fig. 1.



Source: Elaborated by the authors

**Figure 1.** Age distribution of potential organ and tissue donors for transplantation in the 16th Health Region of the state of Rio Grande do Sul, during the period 2010-2020.

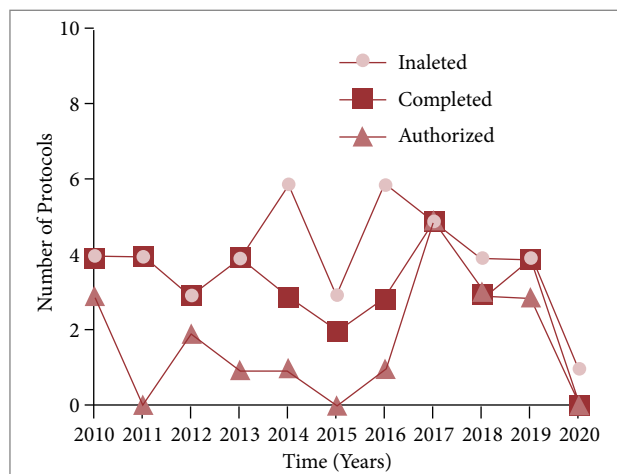
The cause of death among potential organ and tissue donors was also analyzed, revealing a predominance of Cerebrovascular Accidents (CVA), followed by Traumatic Brain Injuries (TBI), accounting for 43.47 % and 39.14 % of the deaths, respectively. In Fig. 2, you can observe the comparative percentages of the causes of death among potential organ and tissue donors in (2a) the 16th Health Region of RS, (2b) the state of Rio Grande do Sul, and (2c) Brazil as a whole.



CVA: cerebrovascular accidents. TBI: traumatic brain injuries. Source: Elaborated by the authors

**Figure 2.** Cause of death among potential organ and tissue donors for transplantation from 2010 to 2020, categorized into deaths due to Cerebrovascular Accidents (CVA), Traumatic Brain Injuries (TBI), and other causes.

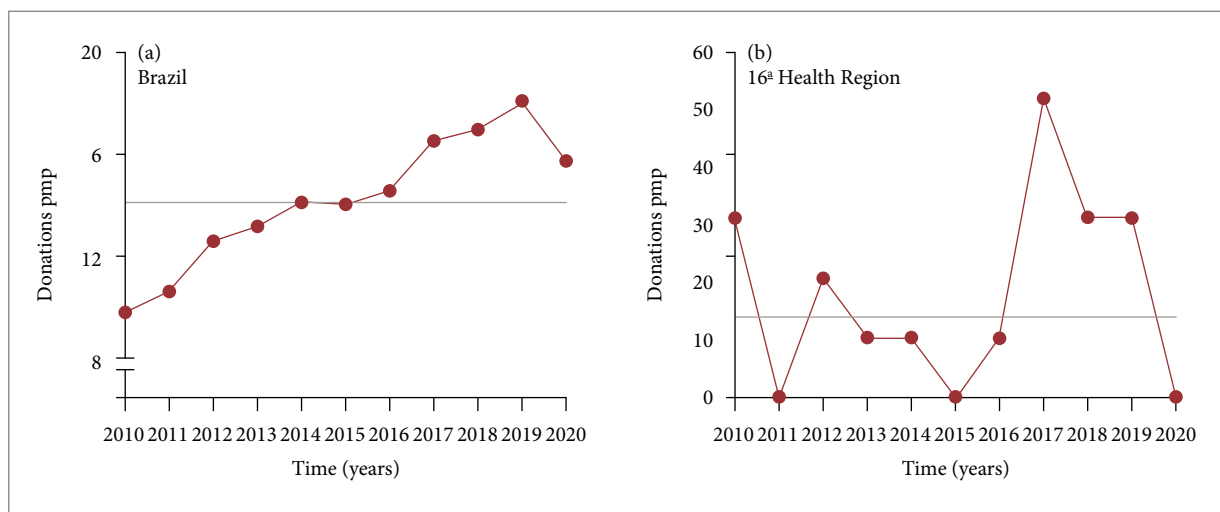
The acceptance status of families approached for organ and tissue donation for transplantation in the 16th Health Region of RS was examined. The results are summarized in Fig. 3, where you can observe the annual variation in the number of initiated and concluded BD protocols and, among those, the quantity of donations authorized by the families of potential donors.



Source: Elaborated by the authors

**Figure 3.** Comparative annual variation in the quantity of initiated, concluded, and authorized BD protocols in the 16th Health Region of RS during the period 2010-2020.

The national average of donations per million population (pmp) from 2010 to 2020 was 14.25. Based on this, Fig. 4 displays the annual variation in donations in Brazil (4a) and the 16th Health Region of RS (4b), with the national average as a reference, represented by a gray line.



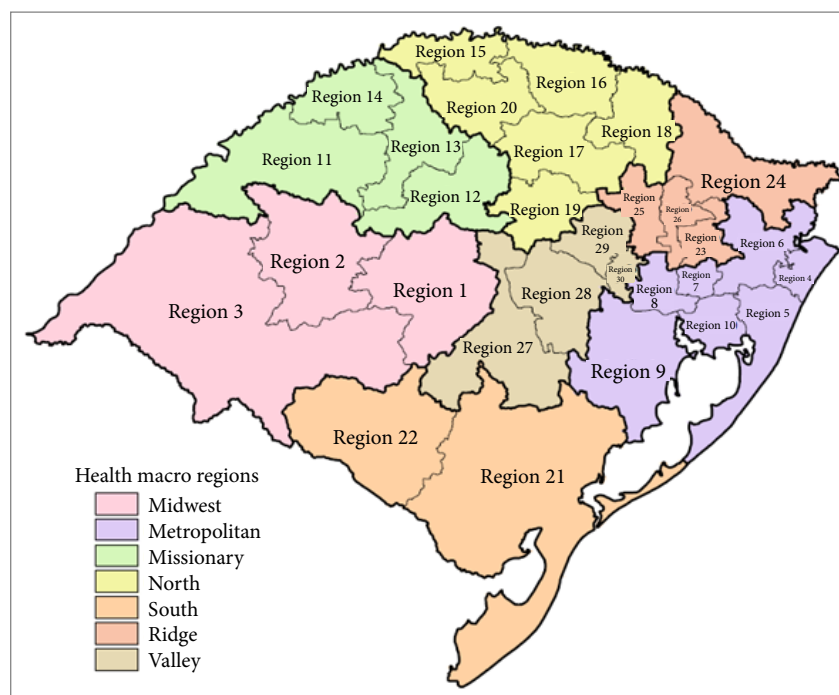
pmp: per million population. Source: Elaborated by the authors

**Figure 4.** Annual variation of organ and tissue donations for transplantation per million population (pmp) compared to the national average of donations pmp, represented by the gray line, from 2010 to 2020.

Another topic addressed in this study concerns the establishment of relationships between the characteristics of potential donors and family consent for organ and tissue donation for transplantation. About that, no association was found between gender and family authorization ( $p = 0.176$ ), nor between gender and the cause of death ( $p = 0.060$ ). Similarly, there was no association between the age of the potential donor or the cause of death and family authorization ( $p = 0.888$  and  $p = 0.174$ , respectively). However, when correlating the age groups of potential donors and the cause of death, it was possible to infer that younger individuals ( $< 45$  years) experienced more Traumatic Brain Injuries (TBI), while older individuals ( $> 45$  years) had a higher proportion of Cerebrovascular Accidents (CVA) ( $p = 0.003$ ).

## DISCUSSION

The organizational regulations of the Unified Health System (SUS) aim at the coordination of the Health Care Network, which implies defining geographical and population limits for the provision of health services. In this sense, in the state of Rio Grande do Sul (RS), seven Health Macroregions are delineated – defined by Resolution CIB/RS No. 192/2002 and reaffirmed in Resolution CIB/RS No. 188/2018<sup>10</sup> – which are subdivided into thirty Health Regions – established through Resolutions CIB/RS N° 555/2012, N° 26/2013, and N° 499/2014<sup>11</sup>. Among these, the 16th Health Region stands out, the focus of interest in this study, located in the Northern Macroregion, as shown in Fig. 5, whose territory corresponds to the area of operation of the 11th Regional Health Coordination<sup>7</sup>.



Source: Brazil, 2021

**Figure 5.** Distribution of Health Macroregions and Health Regions in the state of Rio Grande do Sul (RS).

In the mentioned region, it was observed that, for the period between 2010 and 2020, 44 protocols of brain death (BD) were opened, when combining the protocols initiated in the two regional referral hospitals. About this group of potential organ donors, there is a wide distribution across age groups, ranging from 5 to 75 years old, with an average age of 42.40 years. This variability in the age profile of patients allows for a more accurate analysis of the donation landscape, although the total number of protocols opened in the 16th Health Region is insufficient to draw a precise conclusion. Furthermore, in terms of gender, 56.81 % (25/44) were males, and 43.18 % (19/44) were females, a distribution that resembles what was observed in the country during this period: 59.37 % were males and 40.63 % were females.<sup>4, 6, 12, 13, 14, 15, 16, 17, 18, 19, 20</sup>

When analyzing the causes of death among these potential organ donors, a predominance of stroke (Cerebrovascular Accident, CVA) was observed, followed by Traumatic Brain Injury (TBI). Other causes of death due to brain death in the period include infectious encephalitis, post-cardiorespiratory arrest anoxia, and brain tumors. As shown in Figure 2, this is a trend that is not limited to the 16th Health Region but becomes even more evident when observing statewide and nationwide data for the period. During this time, deaths due to TBI and CVA account for 87.35 % and 86.20 %, respectively.<sup>4, 6, 12, 13, 14, 15, 16, 17, 18, 19, 20</sup> Regarding the

acceptance of the families approached for organ and tissue donation for transplantation, it was observed that in the 16th Health Region of Rio Grande do Sul (RS), until the year 2016, the number of family authorizations for donation was significantly lower than the number of protocols concluded in the region's hospitals. In fact, it reached zero in the years 2011 and 2015, which reflects the substantial percentage of family refusals for donation during that period (56.82 %). Starting from 2017, the percentage of authorizations increased, representing 100 % of the concluded protocols in that year and the subsequent year. In 2019, there were 75 % authorizations.

Among the possible causes for this increase, a significant factor is the change in the approach of healthcare teams during this period. According to their accounts, there was a shift towards offering professional development courses aimed at improving family interviews. These courses were designed to enhance the team's empathetic, respectful, and supportive communication with families, consequently leading to more effective donation outcomes. In the year 2016, which marked the transition in donation rates, the Central Agencies for Organ Notification, Procurement, and Distribution (CNCODORS) provided training courses for professionals across the state of Rio Grande do Sul (RS). Some of these courses included the Organ Donation and Transplantation Course for Intensive Care Physicians, the Intra-Hospital Transplant Coordinator Training Course, the Communication in Critical Situations Course, and the Donation and Transplantation Course for CIHDOTT Professionals.<sup>21</sup>

The year 2020, in particular, was atypical due to the onset of the COVID-19 epidemic in Brazil. The first case of the disease in the country was confirmed on February 26th in São Paulo (SP).<sup>22</sup> The disease was swiftly declared a pandemic by the World Health Organization<sup>23</sup>, leading to a rapid adaptation of healthcare services to address the local needs of COVID-19, often at the expense of other healthcare areas, including organ and tissue donation and transplantation. In the 16th Health Region, for instance, in the year 2020, only one brain death protocol was initiated, and none were concluded. Consequently, no families underwent the donation interview, as shown in Figure 3. The data found in this analysis align with a trend observed globally due to the pandemic. Transplant centers in various countries, such as "Australia, Italy, Spain, Portugal, Finland, France and England, nearly halted their activities, while the United States and Germany reduced their activities by almost 50 %"<sup>24,3</sup>

In Brazil, the decline in donation and transplantation rates for organs and tissues from deceased donors wasn't as significant as feared following the announcement of the pandemic.<sup>6</sup> According to the Brazilian Association of Organ Transplantation (ABTO)<sup>6</sup>, the effective donor rate, which was 18.1 per million population (pmp) in 2019 and was projected to surpass 20 pmp in 2020, decreased by 12.7 %, returning to the level achieved in July 2017, at 15.8 pmp. Furthermore, according to ABTO<sup>6</sup>, it was observed that the rates varied among regions and over time, correlating with the regional severity of the pandemic: the Northern (N) and Northeastern (NE) regions exhibited the most significant declines in donation rates, with decreases of 43 % and 28.3 % respectively; the Southern (S) region experienced an intermediate decrease (13%); the Central-West (CO) and Southeastern (SE) regions, on the other hand, had the smallest decline rates, at 4.5 % and 5.6 %, respectively.

The disparities among the five Brazilian regions extend beyond the impact of the COVID-19 pandemic on organ and tissue donation and transplantation rates. These regional disparities in the rates of donation and transplantation had already been a reality before the pandemic<sup>6</sup>. According to Marinho, Cardoso and Almeida<sup>25</sup>, the Central-West (CO), Southern (S), and Southeastern (SE) regions have the highest rates of meeting transplantation needs, in contrast to the Northern (N) and Northeastern (NE) regions. Recognizing this variability and in order to standardize the results inferred by this study, the national average of donations per million population (pmp) was chosen as a reference for the epidemiological analysis of the regional donation landscape. For the period from 2010 to 2020, the national average of donations was 14.25 pmp.<sup>4, 6, 12, 13, 14, 15, 16, 17, 18, 19, 20</sup>

Through the analysis of Figure 4a, which displays the profile of organ and tissue donations for transplantation in Brazil, it's possible to observe that the national donation rates have shown a linear growth trend over the years, except for the year 2020 as mentioned earlier. However, this trend isn't mirrored in Figure 4b, which represents the profile in the 16th Health Region of Rio Grande do Sul (RS). In this figure, instead of linearity, there's a heterogeneous annual variation in the number of donations per million population (pmp) around the national average. Furthermore, in Figure 4b, it can be observed that the 16th Health Region was above the national average for organ donations only in the years 2010, 2012, 2017, 2018, and 2019.

Indeed, the significance of interventions aimed at encouraging family participation in organ and tissue donation for transplantation cannot be overlooked. For instance, in the case of the 16th Health Region of Rio Grande do Sul (RS), the region only achieved organ donation rates per million population (pmp) higher than the national average for three consecutive years after the implementation of a restructured approach by the CIHDOTT (Intra-Hospital Donation and Transplantation Committees) in addressing families regarding the potential for organ and tissue donation for transplantation.

A study conducted by De Moraes and Massarollo<sup>26</sup> outlined various reasons that lead family members to decline organ and tissue donation for transplantation. Some of these reasons include the desperate situation experienced during hospitalization, lack of trust related to organ donation, misunderstanding or non-acceptance of brain death diagnosis, grief and exhaustion due to the loss of a loved one, religious beliefs, unpreparedness of the healthcare professional conducting the interview, and conflicts

among family members regarding the decision. As a result, it is evident that an approach focused on involving grieving families, educating them about the donation-transplantation process, is essential for maintaining donation rates.

Among the possible associations between the characteristics of potential organ and tissue donors from the 16th Health Region of Rio Grande do Sul (RS), it was possible to infer that Traumatic Brain Injuries (TBI) led to a higher proportion of deaths among young individuals (< 45 years), while Strokes (CVA) affected older individuals more frequently (> 45 years). This finding aligns with the national trend where traumatic events often lead to the deaths of young individuals between 20 and 49 years old<sup>27</sup>. Moreover, concerning the epidemiological profile of strokes in Brazil, in agreement with the analysis conducted in this study, an increase in stroke incidence is observed with advancing age, along with other cardiovascular risk factors.

The conclusions drawn from the obtained results have limited scope due to the study's regional nature. However, the data can be used for comparative purposes with other similar studies. Additionally, the low number of protocols opened each year in the region (1 every 2-3 months) hampers a robust analysis and conclusion. Furthermore, in the year 2012, data regarding the gender, age, and cause of death of three potential organ and tissue donors were not recorded, and these instances were excluded from the statistical tests assessing these characteristics.

While the absence of data regarding the reasons for non-donation of organs in the region is a limiting factor in this analysis, as this factor appears crucial for achieving success in the donation-transplantation process, it is possible to link non-donation to the limited spread of information about the concepts of brain death and organ and tissue donation for transplantation.

According to Bjelland and Jones<sup>28</sup>, the low health literacy of the approached families, coupled with the lack of communication skills within the healthcare team, can lead to misunderstandings about brain death and, consequently, to refusals of organ donation. Therefore, if the results obtained in studies like this one are utilized to improve public policies, programs, and campaigns aimed at training healthcare professionals and educating the public, the likelihood of achieving the desired outcome – organ donation – is significantly increased.

## CONCLUSION

The donation of organs and tissues for postmortem transplantation is presented as an object of multifaceted discussion, because, when on the agenda, it provides analysis from different social perspectives: scientific, judicial and cultural. First, the transplant is presented as a form of treatment, recognized by medical science as effective therapy for organic diseases. However, specific legal norms guide the implementation of this therapeutic resource, and it is essential to carry it out in accordance with the legislation in force in the country. In Brazil, the legal requirement of family authorization for donation, in turn, provides the analysis of the third social point of view, that of the moral, ethical and religious convictions of the population, in addition to their level of knowledge on the subject.

The result of the articulation of the different facets of the donation-transplantation process consists of the effective donation of organs and tissues, which can be evaluated by observing the rates of organ procurement carried out in a given place and period. Thus, the results obtained from this study allow a valuable epidemiological diagnosis regarding the effectiveness of the strategies used by the local health service and regarding the community's understanding of the subject.

As observed throughout the article, there is a trend towards an increase in donation percentages over the years, both in the region and in the rest of the country, however, the number of transplants performed is still lower than the population's need. The analysis of the data found in the 16th Health Region of RS regarding the donation of organs and tissues for transplantation is in line with the national level, which allows us to infer that family affirmations regarding donation have been increasing in recent years, since which correspond to more than 75% of the responses obtained from the year 2017 onwards. On the other hand, as mentioned above, the global assessment of the donation percentages, in the period from 2010 to 2020, shows a higher proportion of negatives in relation to those accepted for donation of organs and tissues (57.8% and 42.2%, respectively).

It is concluded, therefore, that the percentages of organ and tissue donation in the 16th Health Region of RS are below ideal, whether due to diagnostic, logistical and technical difficulties or due to family refusals to donate. Therefore, the action of local CIHDOIT more emphatically in encouraging the donation of organs and tissues for transplants is an important tool to reach levels of donation consistent with local transplant needs.

In fact, it is only possible to increase the number of organ transplants, and consequently, to supply the transplant needs of the population, with the increase in the number of donations. For this reason, some barriers to organ donation must be eliminated, such as the health professional's unpreparedness in contacting the probable donor's family and the community's lack of information about the donation of organs and tissues for transplantation.

Thus, it is expected that the results presented in this study will be used to guide the development of strategic actions to encourage the donation of organs and tissues, aimed at improving communication between the parties, the availability of quality care at the end of life for the patient and his family, as well as directing support to support the grieving process to the family for the death of the loved one.

Finally, as stated above, future studies of a similar nature are encouraged, aiming to improve the diagnosis of the factors involved in determining the rates of donation-transplantation in the country. In addition, this analysis allowed the observation of a fact that was not foreseen - the impact of the COVID-19 pandemic on organ donation rates. Therefore, this is a topic worthy of future research on the subject.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## AUTHORS' CONTRIBUTION

**Substantive scientific and intellectual contributions to the study:** Silva IC, Oldoni AE, Zanardo JC, Jacobina LP; **Conception and design:** Silva IC, Oldoni AE; **Data analysis and interpretation:** Silva IC, Oldoni AE; **Article writing:** Silva IC, Oldoni AE; **Critical revision:** Silva IC, Oldoni AE, Zanardo JC, Jacobina LP; **Final approval:** Silva IC, Oldoni AE, Zanardo JC, Jacobina LP.

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