

# The profile of organ and tissue donors in southern Brazil

*O perfil dos doadores de órgãos e tecidos no sul do Brasil*

*El perfil de los donantes de órganos y tejidos en el sur de Brasil*

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**ABSTRACT: Objective:** To identify the profile of organ and tissue donors at a university hospital in southern Brazil. **Method:** This is a cross-sectional research with descriptive analysis. Data collection was carried out on 480 medical records of effective brain-dead organ donors at a University Hospital in Southern Brazil. **Results:** The most recurrent cause of death was Hemorrhagic Cerebrovascular Accident (HCVA), with 37.1% (n=176). Of these cases, 55.9% (n=268) were men, 71.4% (n=342) were White, and the most donated organ was the kidney, with 89.8% (n=430). The average time between the first brain death test and the beginning of organ removal was 26 hours. **Conclusions:** The profile of the effective organ donor is male, White, with an average age of 40 years, and overweight.

**Keywords:** Nursing. Tissue donors. Brain death.

**RESUMO: Objetivo:** Identificar o perfil dos doadores de órgãos e tecidos de um hospital universitário no Sul do Brasil. **Método:** Pesquisa transversal com análise descritiva. A coleta de dados foi realizada em 480 prontuários de doadores efetivos de órgãos em morte encefálica em um Hospital Universitário do Sul do Brasil. **Resultados:** A causa de morte mais recorrente foi Acidente Vascular Encefálico Hemorrágico (AVEh), com 37,1% (n=176). Desses casos, 55,9% (n=268) eram do sexo masculino, sendo 71,4% (n=342) da cor branca, e o órgão mais doado foi o rim, com 89,8% (n=430). A média de tempo entre o primeiro teste de morte encefálica e o início da remoção dos órgãos foi de 26 horas. **Conclusão:** O perfil do doador efetivo de órgãos é do sexo masculino, branco, com idade média de 40 anos e com sobrepeso.

**Palavras-chave:** Enfermagem. Doadores de tecidos. Morte encefálica.

**RESUMEN: Objetivo:** Identificar el perfil de los donantes de órganos y tejidos en un hospital universitario del Sur de Brasil. **Método:** Investigación transversal con análisis descriptivo. La recolección de datos se realizó en 480 prontuarios de donantes efectivos de órganos en muerte encefálica en un Hospital Universitario del Sur de Brasil. **Resultados:** La causa de muerte más recorrente fue Accidente Cerebrovascular Hemorrágico, con un 37,1% (n=176). El 55,9% (n=268) eran hombres, 71,4% (n=342) eran de raza blanca, y el órgano más donado fue el riñón, con un 89,8% (n=430). El tiempo promedio entre la primera prueba de Muerte Encefálica y el inicio de la extracción de los órganos fue de 26 horas. **Conclusión:** El perfil del donante efectivo de órganos es masculino, blanco, con edad promedio de 40 años y con sobrepeso.

**Palabras clave:** Enfermería. Donantes de tejidos. Muerte encefálica.

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## INTRODUCTION

The process of donating organs and tissues for transplantation is characterized as a set of actions and procedures that aim to convert a potential donor into an effective donor<sup>1</sup>. The practice of organ transplantation and donation in Brazil began in 1964, and is currently reflected in the largest public organ and tissue transplantation program in the world, ranking among the countries with the highest number of performed transplants<sup>2</sup>.

This process has considerable social impact due to the increase in the survival of recipients and the possibility of their return to personal activities and the job market. However, there are no organs available for everyone who needs them, resulting in a high mortality rate among transplant candidates<sup>1</sup>. Currently, less than 10% of the global need for transplants is met<sup>3</sup>.

There are two types of organ and tissue donors: those who have died due to Brain Death (BD) and those who are alive. *Inter vivos* donation only happens when it involves organs that are double or regenerative such as kidneys, liver, skin, and bone marrow. However, as recommended by the Brazilian legislation, it can only be carried out for the benefit of the spouse or blood relatives up to the fourth degree. In other cases, it may only occur with judicial authorization<sup>4</sup>.

For donation with deceased donors to be carried out, an effective set of actions and procedures is necessary, transforming the potential donor into an effective one<sup>4</sup>. The organs and tissues that can be donated by this type of donor are: lungs, liver, heart, pancreas, intestine, cornea, kidneys, heart valves, skin, bones, and tendons<sup>5</sup>.

According to Law No. 9.434, of February 4, 1997, the postmortem removal of organs or tissues for transplantation can only occur after the diagnosis of BD and upon family authorization, carried out through an interview. In turn, the Resolution No. 1.480 of the Federal Council of Medicine establishes that, in order to carry out the diagnosis, two clinical tests are necessary, verified and recorded by two doctors who are not part of the removal and transplantation teams. Moreover, additional tests should be requested<sup>6</sup>.

The nursing professional's role in the donation process is regulated by the Federal Council of Nursing (*Conselho Federal de Enfermagem* – COFEN), through Resolution No. 292, of June 7, 2004. This resolution confers upon this professional some skills, such as planning, executing, coordinating, supervising, and evaluating the nursing procedures provided to donors, recipients, and family members. Therefore, the nurse

is present from pre-transplant care on an outpatient basis to intensive therapy and organ removal at the surgical center<sup>7</sup>.

The nurse's activities in the Multiple Organ Harvesting (MOH) team start when the Center for Notification, Procurement and Distribution of Organs and Tissues (CNPDOT) communicates to the transplant institution the existence of the potential donor. After communication, a series of activities begin, ranging from determining the start time for removal, the selection of materials, instruments and solutions necessary for the operation and perfusion of the transplanted organ, to managing the transplant surgery. In this context, the nurse's role improves the procurement and transplantation process<sup>8</sup>.

Public, private, or philanthropic hospitals with more than 80 beds must have an Intra-hospital Commission for Donation of Organs and Tissues for Transplantation (IHCDOTT). The IHCDOTT is responsible for organizing the hospital so that it is possible to detect potential donors of organs and tissues, as well as to facilitate the diagnosis of BD, in addition to working directly with the State Transplant Center to organize the process of donation and procurement of organs and tissues<sup>9</sup>.

In the global panorama of organ donation, Brazil ranks 24th, with an effective donor rate of 13.8 per million population (pmp), according to data from 2022<sup>10</sup>. In 2023, 58,908 candidates were waiting for a transplant in the country. That same year, the National Transplant Center (*Central Nacional de Transplantes* – CNT) received 10,422 notifications from potential donors, but only 2,982 became effective donors<sup>11</sup>. In the Southern region of Brazil, in 2022, 2,639 potential organ donors were notified, of which 997 became effective<sup>10</sup>.

## OBJECTIVE

To identify the profile of organ and tissue donors at a university hospital in southern Brazil.

## METHOD

This is a cross-sectional study with descriptive analysis, carried out at the IHCDOTT of a university hospital in southern Brazil. The institution in question has about 750 beds, serves 60 specialties, offers procedures ranging from the simplest to the most complex, and mostly serves patients from the Brazilian Unified Health System (SUS). In addition, the institution performs heart, lung, liver, and kidney transplants.

Data from medical records were collected from June 2021 to January 2022 by two researchers of the present study. The study population was composed of effective donors between 2010 and 2020, totaling 494 medical records. After analyzing and applying the inclusion criteria, 14 records were excluded due to incorrect completion of the donors' files, due to lack of complete data, resulting in a sample of 480 records. The sample contains records of effective organ donors, who were both internal and external to the hospital, which indicates that there was the participation of the MOH team, that is, people who had already worked in the team involved in MOH.

The established inclusion criteria of the sample were: diagnosis of BD based on the BD protocol (two positive clinical tests for BD and an imaging test compatible with BD); and donation of at least one organ in the last 10 years (2010–2020). The exclusion criteria were: medical records with incomplete information, which made data collection impossible.

The variables in this study, related to the donors, were: year of donation (2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020), donor age ( $\geq 18$ – $\leq 60$ ), sex (women and men), race/skin color (Black or White), cause of death (Ischemic Cerebrovascular Accident – ICVA, Hemorrhagic Cerebrovascular Accident – HCVA, Cranioencephalic Trauma – CET, subarachnoid hemorrhage and others), previous comorbidities (such as Arterial Hypertension – AH, Diabetes Mellitus – DM and others), personal history (smoking and/or alcohol consumption) and Body Mass Index (BMI).

The variables related to the time of BD diagnosis and organ removal were: time of the first BD test, time of the second BD test, start time of MOH, donated organs and tissues (kidney, liver, heart, lung, pancreas, cornea, and skin), transplanted or discarded organ, reason for discard (morphological change, poor organ perfusion, not having a compatible recipient, ischemia time, and injured organ from donor extraction).

The data were organized in a spreadsheet, in Excel, and analyzed in the Statistical Package for the Social Science (SPSS) program, version 23.0. Quantitative variables were described as mean and median, while categorical variables were described as relative frequencies and percentages.

This study was carried out in accordance with the ethical criteria provided for in Resolution No. 466, of December 12, 2012<sup>12</sup>, and was approved by the Institution's Ethics and Research Committee under No. 31641020.6.0000.5327. The researchers signed the data protection term, committing to maintain confidentiality regarding the identity of the participants, as well as to preserve the collected data.

## RESULTS

Among the 494 medical records, 14 were excluded due to incorrect completion of the donors' files and lack of complete data. Therefore, we analyzed 480 medical records from internal and external donors from 2010 to 2020. The sample was composed of 55.9% (n=268) men and 44.1% (n=211) women. Of these, 84.4% (n=342) reported to be White and 15.6% (n=63), Black, according to the donor records completed during life.

Regarding the personal history of the donors, 23.2% (n=111) were smokers and 12.3% (n=59) were alcoholics. Regarding comorbidities, 22.5% (n=108) had systemic arterial hypertension, 5.8% (n=28) diabetes mellitus, and 14.4% (n=69) other comorbidities such as heart disease, obesity, and immunosuppression. The average BMI was 25.2 (n=346), with a maximum value of 43 and a minimum of 12.

As for age, an average of 40 years (n=476) and a standard deviation of 19 were obtained. However, we noticed that the sample is bimodal, with 22.3% (n=106) aged 18 to 29 years and 46.6% (n=222) aged 30 to 59 years.

The most prevalent cause of death also changes according to age group, with CET in individuals aged between 18 and 29 years, with a relative frequency of 64% (n=68), and HCVA in individuals aged between 30 and 59 years, 52.3% (n=116), as shown in Table 1.

Regarding donated organs, the following relative frequency was obtained: kidney 89.8% (n=430), liver 88.3% (n=423), heart 26.7% (n=128), lung 21.7% (n=194), pancreas 8.6% (n=41), corneas 32.8% (n=157), and skin 9.0% (n=43).

We also investigated the percentage of organ discard, which was 11% (n=53). The most frequent reasons that lead to discard are: morphological alteration, poor organ perfusion, not having a compatible recipient, ischemia time, and injured organ during donor extraction. The most recurrent reason for not using the transplant organ was morphological changes, accounting for 5.8% (n=28).

As for the time to complete the diagnosis of BD, we considered the interval between the first and second BD tests to analyze the total time, for carrying out all clinical tests and for the imaging test in a given period in hours. The average time to complete the diagnosis in the study was 8 hours and 34 minutes, showing a significant reduction in time as of 2017, the year in which the minimum time to complete the diagnosis was 2 hours and the maximum was 48 hours and 20 minutes. The relationship between time and year is presented in Table 2.

**Table 1.** Percentages of causes of Brain Death according to age groups in a university hospital – Porto Alegre (RS), Brazil, 2010–2020 (n=475).

Age	Cause of death				
	ICVA* % (n)	HCVA† % (n)	AH‡ % (n)	CET§ % (n)	Other % (n)
< 18	1.7 (1)	11.9 (7)	3.4 (2)	45.8 (27)	37.3 (22)
18 to 29	3.8 (4)	7.5 (8)	6.6 (7)	64.2 (68)	17.9 (19)
30 to 59	12.6 (28)	52.3 (116)	10.4 (23)	13.1 (29)	11.7 (26)
>= 60	21.6 (19)	51.1 (45)	12.5 (11)	4.5 (4)	10.2 (9)
Total	10.9 (52)	37.1 (176)	9.1 (43)	26.9 (128)	16.0 (76)

\*Ischemic Cerebrovascular Accident; †Hemorrhagic Cerebrovascular Accident; ‡Subarachnoid hemorrhage; §Cranioccephalic Trauma.  
Source: Research data (2010–2020).

**Table 2.** Time of completion of the Brain Death diagnosis according to the surveyed years – Porto Alegre (RS), Brazil, 2010–2020 (n=446).

Year	Time in hours		Quartiles (%)		
	Minimum	Maximum	25	50	75
2010	06:00	67:30	6:15:00	06:50	8:37:30
2011	06:00	26:15	6:10:00	07:17	9:45:00
2012	06:00	25:55	6:15:00	07:00	11:22:30
2013	05:55	18:15	6:05:00	06:52	8:28:45
2014	06:00	117:05	6:27:30	07:30	10:35:00
2015	06:00	31:30	6:02:30	06:55	7:27:30
2016	06:15	30:00	6:10:00	07:00	10:05:00
2017	02:00	48:20	6:21:15	07:23	11:12:45
2018	01:00	46:43	1:45:00	02:35	6:43:00
2019	01:00	92:15	1:37:45	02:27	4:33:45
2020	01:07	24:07	1:41:30	02:38	9:17:15

Source: Research data (2010–2020).

When analyzing the data, we noticed that the distance between the minimum and maximum hours during the years 2010 and 2020 is extreme. The median represents the interquartile range when describing the 50% half of values, when ordered from lowest to highest, which can also be obtained by the difference between the first quartile (25%) and the third quartile (75%).

Finally, in relation to the time between the first BD test and the start time of organ removal, an average of 29 hours was obtained. The minimum time was 6 hours in 2019 and the maximum was 129 hours in 2020.

## DISCUSSION

The sample profile included men and women of all ages, with several factors and comorbidities as causes of death, including ICVA, HCVA, CET, AH, DM, and high BMI.

We evidenced that the sociodemographic profile of the donor in this study is predominantly male (55.9% of the sample), corroborating current studies in Brazil<sup>13</sup>. Internationally, a study from the United States of America (USA) represented the profile of organ donors from traumatic causes, and the authors found that they are also predominantly composed of men under the age of 40 years<sup>14</sup>. Although these are data from another country, they are in line with the findings of our study. Donors who were between 18 and 29 years old had a percentage of 64.2% as a traumatic cause of death; conversely, when analyzing the sample in general, the cause of death with the highest incidence was HCVA.

HCVA is the prevalent cause of BD in the state and country, and the highest incidence results are less than 2 hours after the BD diagnosis is completed, as pointed out in this study<sup>15</sup>. However, it should be noted that this is not a Brazilian particularity. Authors of a study carried out in Portugal showed that 59.5% of effective organ donors had CVA as the cause

of BD. Of these, 51% were over 60 years of age and all suffered from AH<sup>16</sup>.

In 2017, the Federal Council of Medicine published Resolution No. 2.173, of November 23, 2017<sup>17</sup>, which changes some criteria of the BD protocol. Among these changes, it is worth highlighting the reduction in the time between the first and second clinical test to 1 hour in people over two years of age, which was previously 6 hours. This change is in line with the findings of this study, considering that, as of 2017, the minimum time to complete the diagnosis of BD reduced from 6 to less than 2 hours, which remained the average time to complete the diagnosis in the following years. Another change was the mandatory application of the BD protocol to all patients in non-perceptive coma and persistent apnea. Coincidentally, it was the year with the highest number of donors in the present study (n=83).

Despite the increase in the number of donors following changes in the protocol, the transplant waiting list is far from being filled. In December 2022, 1,333 candidates were waiting for a kidney transplant in the state of Rio Grande do Sul (RS). The total number of kidney donations in the state that same year was 414, that is, only 31.05% of the state need<sup>18</sup>. At a national level, kidney transplant candidates were estimated at 29,690 in 2022, and the absolute number of transplants in the year was 5,306, 733 from living donors and 4,573 from deceased donors<sup>10</sup>. It is worth noting that the main aspect of the raised question is the organ with the highest percentage of donations, which in the present study is represented by 89.8% of kidney donors. In this sense, state and national data are in lined in our findings.

Meanwhile, the percentage of family denial in the state of Rio Grande do Sul in 2019 was 41%<sup>18</sup>. The main reason for refusing donation was the fact that the potential donor was not a living donor, highlighting the importance of reporting the desire to be a donor while alive<sup>13</sup>.

Finally, as limitations of the study, it should be noted that data from only one IHCDOTT were analyzed, making it impossible to generalize the results. Furthermore, the incorrect completion of donor forms and data incompleteness also limited the understanding of some cases.

## CONCLUSION

Based on the data analyzed in the present study, we could identify the profile of organ and tissue donors at a university hospital in southern Brazil.

The profile of the effective organ and tissue donor is male, White, with an average age of 40 years, and overweight. The main causes of death were HCVA and CET, the first being the most prevalent and the second associated with younger donors.

The time between carrying out the first and second clinical tests for the diagnosis of BD was, on average, 8 hours and 34 minutes, showing a significant reduction since 2017. Regarding the time between the first BD test and the start time of organ removal, there is an average of 29 hours.

This study enabled greater knowledge of the profile of organ donors in southern Brazil, which could support the development of strategies and public policies to identify new cases of BD. In this sense, we observed a change in the time taken to complete the diagnosis of BD with a significant reduction, as recommended by law.

Therefore, we conclude that greater knowledge of the topic, both for healthcare professionals and the population, through the dissemination of this study, will contribute to an increase in the number of donations and, consequently, will be reflected in the reduction of transplant waiting lists.

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None.

## CONFLICT OF INTERESTS

The authors declare no conflicts of interest.

## AUTHORS' CONTRIBUTIONS

MFR: Formal analysis, Investigation, Methodology, Writing – original draft. LR: Writing – review & editing. GPM: Investigation. LRMB: Project administration, Conceptualization, Writing – original draft. NMF: Project administration, Research, Writing – original draft. PRAC: Writing – original draft. CHG: Project administration, Conceptualization, Data curation, Writing – original draft, Writing – review & editing.



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