

Profile of liver donors and recipients in Santa Catarina-Brazil between 2010 and 2011

Perfil dos doadores e receptores de fígado em Santa Catarina no período de 2010-2011

Laura Britz Soares, Anelise Thomé da Silva, Alexandre Ferreira Bello, Flávio Ricardo Liberali Magajewski

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ABSTRACT

OBJECTIVE: To analyze socio-demographic and clinical factors related to liver donation and reception process in Santa Catarina (SC). **METHODS:** Cross-sectional study of 389 medical records, held at the Center for Procurement, Notification and Distribution of Organs and Tissues of Santa Catarina between January 2010 and December 2011. The analysis was performed with the Statistical Package for Social Science software and Pearson's test. **RESULTS:** Of the donors, 46.5% were between 39-59 years ($p<0.001$). A higher proportion of recipients had a Body Mass Index (BMI) >30 , with 28% compared to 11,8% among donors ($p=0.001$). White people were the majority in both groups ($p=0.003$). Males were more prevalent in donors and recipients ($p=0.009$). The causes of death among donors were Traumatic Brain Injury, stroke and others. There was statistical significance among the cause of death, systemic arterial hypertension ($p<0.001$), and drugs ($p=0.035$). Liver failure among the recipients occurred due to secondary liver disease in 43.1%, infectious liver disease in 29.9%, toxic liver disease in 20.1%, post-transplant complications in 4%, and multiple diagnoses in 2.9%. Among the recipients with secondary liver disease, a higher proportion was in the younger age group as compared to other diagnoses ($p=0.011$). Secondary liver disease was more prevalent in women ($p=0.012$). **CONCLUSION:** High mortality of young people from external causes kept the profile of donors in Santa Catarina different from that in developed

countries, where donors are older and die predominantly from cardiocirculatory causes.

Keywords: Liver transplantation; Tissue donors; Health profile

RESUMO

OBJETIVO: Analisar fatores sociodemográficos e clínicos relacionados ao processo de doação e recepção de fígado. **MÉTODOS:** Estudo transversal com 389 prontuários, realizado na Gerência de Transplantes da Central de Notificação Captação e Distribuição de Órgãos e Tecidos do Estado de Santa Catarina entre janeiro de 2010 a dezembro de 2011. A análise foi realizada com o programa *Statistical Package for Social Science* e teste de Pearson. **RESULTADOS:** Dos doadores, 46,5% encontravam-se entre 39 e 59 anos ($p<0,001$). Maior proporção de receptores estava com índice massa corporal >30 , com 28% comparados a 11,8% entre os doadores ($p=0,001$). Brancos foram a maioria nos dois grupos ($p=0,003$). Sexo masculino foi mais prevalente em doadores e receptores ($p=0,009$). Os motivos de óbito entre os doadores foram traumatismo cranioencefálico, acidentes vasculares cerebrais e outros. Houve significância estatística entre causa de óbito, hipertensão arterial sistêmica ($p<0,001$) e entorpecentes ($p=0,035$). A falência hepática entre os receptores ocorreu por hepatopatia secundária em 43,1%, 29,9% por hepatopatia infecciosa, 20,1% por hepatopatia tóxica, 4% por intercorrências pós-transplante e 2,9% por múltiplos diagnósticos. Entre os receptores com hepatopatia secundária, uma maior proporção se situou na faixa etária mais jovem, quando comparada aos demais diagnósticos ($p=0,011$). O sexo feminino foi maioria nas hepatopatias secundárias ($p=0,012$). **CONCLUSÃO:** A alta mortalidade de jovens por causas externas manteve o perfil dos doadores de Santa Catarina diferente do observado nos países desenvolvidos, nos quais doadores são mais velhos e morrem predominantemente por causas cardiocirculatórias.

Descritores: Transplante de fígado; Doadores de tecidos; Perfil de saúde

INTRODUCTION

The development of transplantation and its application in the replacement of organs is one of the most successful advances in the history of medicine. In three decades, organ transplantation has evolved from a procedure with limited success

Medical School. Universidade do Sul de Santa Catarina, Palhoça, SC, Brasil.

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Corresponding address:

Laura Britz Soares

Avenida Pedra Branca, 25

Cidade Universitária Pedra Branca

Zip code: 88137-270 – Palhoça, SC, Brazil

Phone: (48) 9921-4901 – E-mail: laurabritz92@gmail.com

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to a very efficient procedure.⁽¹⁾ It consists of a surgical procedure to replace a problematic organ with another healthy organ from a donor.⁽²⁾

The first recorded case in the history of transplantation was in the Bible, in which Adam was the first living donor.⁽³⁾ Another ancient account is the story of two Chinese doctors who transplanted the leg of a dead soldier in another man.⁽⁴⁾ After the implementation of advances in hygiene and anesthesia, the first experimental transplants were feasible, especially of kidney, because it is a pair organ and has easy functional evaluation.⁽⁵⁾ The first transplants of non-regenerative organs occurred in the 50s, with the aid of the blood vessels suturing technique.⁽⁶⁾

In Brazil, with the first law of transplants in 1968, a procedural consensus was established, and in 1980 it was developed in the first organizations to notification and allocation of organs.^(7,8) In 1997, the National Transplant System (SNT), the Centers for Notification, Procurement and Distribution of Organs (CNCDO), and the donor and recipient lists for distribution of organs and tissues⁽⁹⁾ were established. The SNT is considered one of the largest public transplant systems in the world, and Brazil is the country with the second highest number of transplants.⁽¹⁰⁾

In the first half of 2013, 23,268 transplants were performed in Brazil.⁽¹¹⁾ Liver transplants increased 5.6% between 2012 and the first half of 2013; Heart Transplants increased 11%, lung transplants grew 1.4%, and pancreas transplants increased by 5.9%.⁽¹²⁾ The National Transplant Program (PTN) is known for the increase in the number of transplants and the public investment in transplant medical teams.⁽¹³⁾ The shortage of organs is due to factors such as cultural issues and late diagnosis of brain death (BD).⁽¹⁴⁾ The transplant donation list regulated by Ordinance 3.407/GM/MS, of August 5, 1998, is unique and uses technical, geographical and urgency criteria.⁽¹⁵⁻¹⁶⁾

The Brazilian population is mostly composed of women, and regarding ethnic groups, of Blacks and people of mixed descent,⁽¹²⁾ however, in Brazil, most donors presented were male, aged between 20-44 and of mixed descent.⁽¹⁷⁾ The prevalence of men in this study is explained by their more frequent involvement in traumatic accidents.^(18,19) The profile of donors surveyed by a public institution indicated a prevalence of single, white people, and those who had not completed primary education.⁽²⁰⁾

This study aims to describe and analyze the distribution of some variable, clinical, and epidemiological aspects of the donation and transplantation process, allowing the establishment of a profile of donors and recipients of liver transplants.

METHODS

This is a cross-sectional observational epidemiological study, developed in CNCDO of the state of Santa Catarina, which is considered the institution with the best performance in the procurement of organs among all states. Donors' medical records, and organ recipients notified at CNCDO/SC in 2010 and 2011 were evaluated.

The study was a census that included 389 medical records (174 recipients and 215 donors). Data were obtained from the records, copies of medical records, and other documents under

custody of the CNCDO/SC. The study included data from cadaveric donors' records and liver recipients over 18 years of age, of either genders. The study was approved by the Research and Ethics Committee of the State Health Department of Santa Catarina and access to the medical records of all sectors of CNCDO/SC was allowed, through the Declaration of Acknowledgment and Agreement of the Institutions Involved. The use of medical records was approved through an Authorization to Use Protected Health Information.

The statistical associations were calculated with Pearson's chi-square test or Fisher exact test, with a pre-specified level of significance of 5% ($p < 0.05$). The Statistical Package for Social Sciences (SPSS) version 18.0 was used to analyze data. All institutional permits needed to access the data from medical records of donors and recipients of organs and tissues of interest for this research were requested for submission of the project to the relevant ethics committees.

RESULTS

In 2011, CNCDO/SC registered 389 medical records of liver donors and recipients. Of the total, 215 matched the record of patients with brain death (BD) who have donated organs, including the liver, and 174 cases were liver transplant recipients. Table 1 shows that a higher proportion of donors is at a younger age (< 40 years) as compared to recipients ($p < 0.001$). Regarding the Body Mass Index (BMI), a greater proportion of recipients had $BMI > 30$, with 28% compared to 11.8% among donors. Most patients were white, with 88.6% of donors, and 76.9% of recipients ($p = 0.003$). In both groups males prevailed ($p = 0.009$).

Table 2 shows the causes of death among donors were head injury (43.6%), hemorrhagic stroke (37%), ischemic stroke (15.4%) and others (3.7%). There was statistical significance among cause of death, High Blood Pressure (HBP) and use of narcotics. Among organ donors who had died due to ischemic stroke, 41.8% suffered from hypertension and this prevalence was of 33.3% among donors whose cause of death was ischemic stroke ($p < 0.001$). In deaths from other causes, 50% were using drugs. This prevalence was of 34.4% among donors with ischemic stroke and 31.8% among those who died from head injury ($p = 0.035$).

Table 3 shows that 43.1% of recipients had been diagnosed with secondary liver disease, 29.9% with infectious liver disease, 20.1% with toxic liver disease, 4% post-transplant, and 2.9% with multiple diagnoses complications. There was statistical significance among diagnosis of liver failure, age and gender. Among the recipients diagnosed with secondary liver disease, a higher proportion was in the youngest age group (< 40 years) ($p = 0.011$). Female patients were significant majority in secondary liver diseases, with 62.2% ($p = 0.012$).

DISCUSSION

The highest prevalence of recipients was among the age group between 39 and 60 years (87.9%), and of donors was

Table 1. Socio-demographic variables and studied correlations between liver transplant donors and recipients. Santa Catarina, from 2010 to 2011

Groups variables	Recipients n (%)	Donors n (%)	p-value
Age			
18-39	21 (12.1)	84 (39.1)	<0.001
39-59	97 (55.7)	100 (46.5)	
≥60	56 (32.2)	31 (14.4)	
BMI			
<18,5	2 (1.1)	2 (0.9)	0.001
18.5-24.9	53 (30.5)	99 (46.3)	
25-29.9	70 (40.2)	89 (41.6)	
30-34.9	35 (20.1)	18 (8.4)	
35-39.9	6 (3.4)	4 (1.9)	
≥40	8 (4.6)	2 (0.9)	
Race			
White	110 (76.9)	140 (88.6)	0.003
Brown	30 (21)	11 (7)	
Black	3 (2.1)	6 (3.8)	
Yellow	-	1 (0.6)	
Sex			
Male	129 (74.1)	132 (61.7)	0.009
Female	45 (25.9)	82 (38.3)	

Source: Medical records CNCDO-SC, 2015 organized by the author. BMI: body mass index.

between 18 and 59 years (85.6%). Freire et al., in Pernambuco, observed a predominant age group between 21-30 years⁽²¹⁾ among donors. In Spain, the donor liver tissue with less than 50 years prevailed over the older age groups.⁽²²⁾ The predominance of young donors suggests that the liver donation and liver transplant system in Santa Catarina is a sustained process for intergenerational solidarity.

The high number of trauma brain injury (TBI), mostly arising from car accidents, is often associated with younger age groups and alcohol abuse. It is noteworthy that the organ maintenance conditions and its feasibility must match the pre-defined parameters. However, the gradual prevalence of chronic degenerative diseases indicates that this process tends to be reduced and even reversed.⁽²³⁾

In the group of donors, 46.3% were eutrophic and 41.6% were classified as overweight (BMI of 25-29.9). In the city of Campinas (2014), with the evaluation of donors about their background and lifestyle habits, overweight stood out as the main personal record.⁽²⁴⁾ The higher prevalence of overweight may be related to the fact that most of the world's population has this problem; among donors, the main causes of death are related to chronic degenerative diseases, the risk factors of which are physical inactivity, overweight and associated comorbidities.

In this study the white ethnic group had a prevalence of 83.05% of the total, similar to most results from the South and Southeast⁽²⁴⁻²⁷⁾ regions. The white race predominated over the others in this study, probably reflecting the demographic profile of the region where the study was conducted.⁽²⁸⁾

Males were more frequent (67.26%), consistent with most findings in the literature.^(21,24,26,27,29-31) Few studies show a higher

Table 2. Frequency and distribution of death reasons in liver donors. Santa Catarina, from 2010 to 2011

Death causesvariables	Ischemic stroke n (%)	Hemorrhagic stroke n (%)	Traumatic brain injury n (%)	Others n (%)	p-value
Diabetes mellitus					
Yes	2 (6.3)	7 (9.1)	1 (1.1)	-	0.228
No	30 (93.8)	70 (90.9)	91 (98.9)	8 (100)	
Hypertension					
Yes	11 (33.3)	33 (41.8)	4 (4.3)	1 (12.5)	<0.001
No	22 (66.7)	46 (58.2)	88 (95.7)	7 (87.5)	
Drugs					
Yes	11 (34.4)	13(17.3)	29 (31.8)	4 (50)	0.035
No	21 (65.6)	62(82.7)	60 (65.2)	4 (50)	
Kind of drugs					
Alcohol	8 (80)	13 (100)	18 (62.1)	2 (50)	0.091
Crack/cocaine	-	-	1 (3.4)	1 (25)	
Cannabis	1 (10)	-	3 (10.3)	1(25)	
Multiple	1 (10)	-	7 (24.1)	-	

Source Medical records CNCDO-SC, 2015 organized by the author.

Table 3. Frequency and distribution of liver failure diagnoses among liver transplant recipients. Santa Catarina, from 2010 to 2011

Failure diagnose variables	Complications following transplantation n (%)*	Infectious liver disease n (%)*	Toxic liver disease n (%)*	Secondary hepatic disease n (%)*	Multiple n (%)*	p-value
Age						
18-39	-	2 (9.5)	2 (9.5)	17 (81)	-	
39-59	5 (5.2)	33 (34.0)	25 (25.8)	32 (33)	2 (2.1)	
≥ 60	2 (3.6)	17 (30.4)	8 (14.3)	26(46.4)	3 (5.4)	0.011
BMI						
<18.5	-	-	1 (50)	1 (50)	-	
18.5-24.9	2 (3.8)	14 (26.4)	11 (20.8)	25 (47.2)	1 (1.9)	
25-29.9	4 (5.7)	24 (34.3)	13 (18.6)	27 (38.6)	2 (2.9)	
30-34.9	-	11 (31.4)	6 (17.1)	16 (45.7)	2 (5.7)	
35-39.9	1 (16.7)	1(16.7)	3 (50)	1 (16.7)	-	0.813
≥40	-	2 (25)	1 (12.5)	5 (62.5)	-	
Race						
White	3 (2.7)	33 (30)	20 (18.2)	51 (46.4)	3 (2.7)	
Brown	2 (6.7)	10 (33.3)	4 (13.3)	12 (40)	2 (6.7)	0.656
Black	-	2 (66.7)	1 (33.3)	-	-	
Yellow	-	-	-	-	-	
Sex						
Male	6 (4.7)	39 (30.2)	32(24.8)	47(36.4)	5 (3.9)	
Female	1 (2.2)	13 (28.9)	3 (6.7)	28 (62.2)	-	0.012

Source: Medical records CNCDO-SC, 2015 organized by the author.

*Calculation done in relation to all of the recipients; BMI: body mass index.

prevalence of female donors and recipients.⁽³²⁾ The predominance of male donors is possibly related to the fact that the male population dies at younger ages, and are more vulnerable to risk factors, morbidities and mortality from external causes and cardiovascular disease due to riskier lifestyle when compared to women. According to MS, the male population has reduced longevity compared to females.⁽³³⁾

The main causes of death among donors were traumatic brain injury (43.6%), hemorrhagic stroke (37%) and ischemic stroke (15.4%). According to Matesanz, Spain presented a growth rate of stroke as a cause of death, which corroborates the results found by Noronha et al., and Rodrigues et al.^(24,32,34) In contrast, Freire et al. found a higher prevalence of traumatic brain injury in their study.^(21,29,30,35) Data from studies in different periods may suggest a change in the organ donor profile. A possible explanation in the Brazilian context would be the reduction of motor vehicle accidents associated with the “Dry Law”. Twelve months after the approval of the law, deaths decreased by 6.2%.

Among the 46 organ donors with hemorrhagic stroke as cause of death, 41.8% had associated high blood pressure (BP), and this prevalence was of 33.3% in donors diagnosed with ischemic stroke. Mortality from cardiovascular disease (CVD) tends to increase linearly, continuously and independently with elevation of BP from 115/75 mmHg. A hypothesis that may explain the findings is that in the first 48 hours after ischemic stroke, acute hypertensive response occurs in about 80% of patients.⁽³⁶⁾

Among the donors with death due to other reason, 50% were using drugs, while the prevalence was 34.4% among donors with ischemic stroke and 31.8% in those with TBI. It is known that the use of certain substances predisposes vascular diseases and alters the level of consciousness/sensorium being closely linked to TBI. According to Sloan, among individuals aged 20 to 30 years the rate of strokes related to drug use reaches 90%.⁽³⁷⁾

Regarding the distribution of the most prevalent diseases in the recipients, it was observed that 43.1% of the recipients had a diagnosis of secondary liver disease, 29.9% of infectious liver disease, 20.1% of toxic hepatopathy, 4% of post-transplant complications, and 2,9% of multiple diagnoses. Ferreira found a higher prevalence, among patients in the preoperative period, of liver transplant due to hepatitis C virus followed by alcoholic hepatitis.⁽²⁷⁾ Strauss et al., in an etiological analysis of 200 cases of liver cirrhosis, found that alcoholism was the main etiological agent, representing 71% of cases, and viral hepatitis followed with 15%.⁽³⁸⁾

A relevant aspect in this survey is the presence of the category “multiple diagnoses”, which includes combined diagnoses in other studies. They were analyzed separately and may interfere with higher prevalence of infectious and toxic diseases. There was a higher prevalence of younger age groups in secondary liver diseases, and a majority of males in all liver diseases, with the exception of secondary liver diseases. A higher proportion

of men with liver disease was also reported by others.^(26,39) The fact that secondary liver diseases encompass diagnoses such as autoimmune hepatitis favors the findings, as they have a higher incidence of female and younger patients.^(40,41)

The comparison of the groups of liver donors and recipients clarifies a number of aspects that are still little studied in the country. Some of them relate to contexts of vulnerability and social inequality that expose part of the population to risk factors that increase both the chances of death due to encephalitis, feeding the organ donation system, and of liver failure, extending the demand for organ transplants in the system.

CONCLUSION

Studies in the field of organ and tissue transplants appear to be increasingly necessary, as there is a shortage of investigation on the subject. Considering the high cost of the organ donation, distribution and transplantation system, it is important to develop public policies that reduce the identified causes, and extend the company's awareness so it can mostly choose behaviors and lifestyles that incorporate strategies for reduction of risks associated with early mortality from trauma, and fatal consequences of preventable or controllable chronic degenerative diseases.

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