



# Fall in organ donations and transplants in Ceará in the COVID-19 pandemic: a descriptive study, April - June 2020


doi: 10.1590/S1679-49742021000100016

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## Abstract

**Objective:** To describe organ donations and transplants in Ceará state, Brazil, following the declaration of the COVID-19 pandemic. **Methods:** This was a descriptive study using data from the Brazilian Organ Transplantation Association. The number of donors and transplants from April to June 2020 was compared to the same period in 2019 and to the first quarter of 2020. **Results:** In the first half of 2020, the state registered 72 effective donors, just 17 (23.6%) of whom related to the second quarter. Of the 352 transplants in the first half of 2020, 37 (10.7%) were performed in the second quarter. Compared with the period from April to June 2019, there was a reduction of 67.9% and 89.3% in the number of donors and transplants, respectively, in the same period of 2020. **Conclusion:** The number of donors and transplants in Ceará showed an important fall in the three months following the declaration of the COVID-19 pandemic, especially for kidney, heart and cornea transplants.

**Keywords:** Transplantation; Tissue and Organ Procurement; Tissue Donors; Pandemics; Coronavirus Infections.

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## Introduction

At the end of 2019 the world looked on as a new disease caused by Coronavirus 2 (SARS-CoV-2) emerged. The disease was given the name COVID-19 and its signs and symptoms include fever, breathing difficulty and pulmonary infiltrates, and its outcomes can include accentuated inflammatory response, cardiopulmonary and multisystem organ failure.<sup>1-4</sup>

*The spread of COVID-19 has significantly restricted transplantation programs worldwide.*

On March 11<sup>th</sup> 2020, the World Health Organization (WHO) declared the disease to be a pandemic.<sup>5</sup> Brazil's first COVID-19 case was confirmed in February and its first COVID-19 death in March.<sup>6</sup> In Ceará state, as at June 29<sup>th</sup>, there were 108,136 cases, 6,153 deaths and the lethality rate was 5.7%.<sup>7</sup>

The spread of COVID-19 has significantly restricted transplantation programs worldwide.<sup>8</sup> In Brazil, in the second quarter of 2020, there was a decrease in liver (6.9%), kidney (18.4%), heart (27.1%), lung (27.1%), pancreas (29.1%) and especially cornea (44.3%) transplants due to most transplantation services being suspended.<sup>9</sup>

Considering the impacts in this area, the objective of this article was to describe organ donations and transplants in Ceará state following the declaration of the COVID-19 pandemic.

## Methods

This is a descriptive study based on the number of potential deceased donors, effective donors and transplants performed in the state of Ceará between April and June 2020. The data were retrieved in September 2020 from the Brazilian Transplant Registry,<sup>9-12</sup> following access provided by the Brazilian Organ Transplant Association (ABTO), which updates these indicators cumulatively on a quarterly basis.

In 2020, Ceará has an estimated population of 9,187,103 inhabitants and a Human Development Index of 0.682.<sup>13</sup> In 2019, the state recorded 1,454 transplants, involving kidney, liver, pancreas, heart, liver and cornea transplants. At that time, almost three months prior to

the pandemic, Ceará had the largest number of liver and cornea transplants among the other Northeast Brazilian states.<sup>14</sup>

The variables taken into consideration in this analysis were the absolute frequencies of potential deceased donors and effective donors, and the number of liver, kidney, heart and cornea transplants performed. Pancreas, pancreas-kidney and lung transplants were excluded because they had not been performed in 2020, even before the pandemic was declared.

The data were organized using the Excel computer program to obtain a descriptive analysis of the frequencies. Given the declaration of the pandemic in mid March and ABTO's forecast that its impacts would be felt with effect from the second quarter,<sup>11</sup> the results for the period April to June 2020 were compared with those for the first quarter of the year, considering the absolute and relative frequency of each variable. In this way it was possible to follow the temporal evolution of donations and transplants immediately before and following the declaration of the pandemic. In order to arrive at the data for the period April to June, the figures for the first quarter were subtracted from the cumulative total as at the end of the second quarter (January to June).

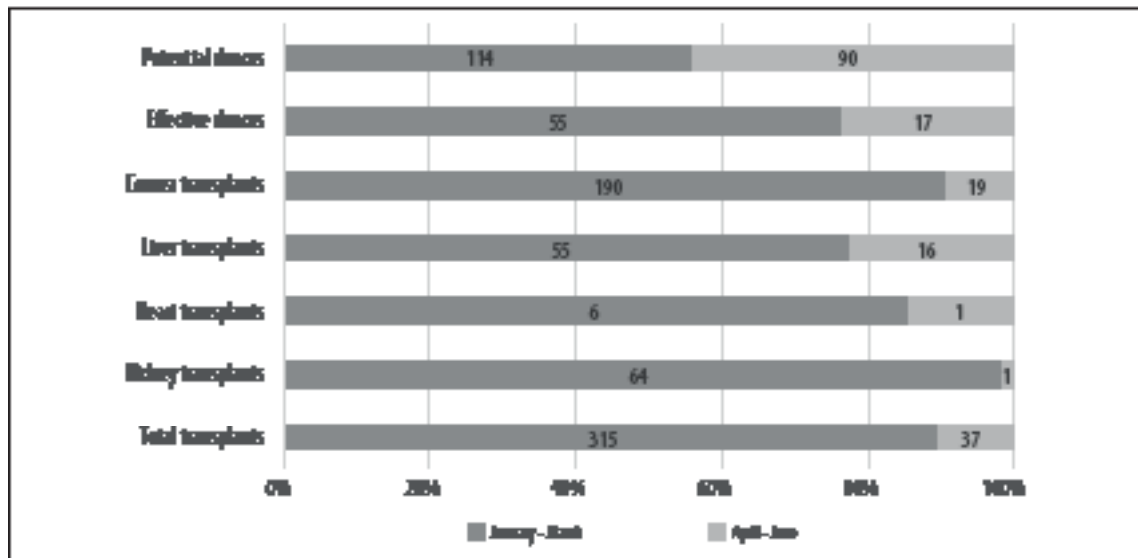
The absolute frequencies of potential deceased donors, effective donors and transplants performed in the second quarter of 2020 were also compared with the corresponding frequencies for the same period in 2019, and the percentage change for each variable were calculated.

As this study used public information, in which cases are not identified, it did not need to be submitted for appraisal by a Research Ethics Committee.

## Results

In the first semester quarter of 2020, Ceará had 72 effective donors, 55 of whom were notified in the first quarter (76.4%) and 17 in the second quarter (23.6%). With regard to transplants, of the 352 procedures in the first semester, 37 (10.5%) were carried out between April and June, indicating a fall in donations and transplants immediately after the pandemic was declared. Figure 1 shows the number of potential deceased donors, effective donors and transplants performed.

When analyzing each kind of transplant individually, it can be seen that the kidney and heart transplant



a) Total number of kidney, heart, liver and cornea transplants.

**Figure 1 – Distribution of notifications of potential deceased donors, effective donors and transplants performed quarterly, Ceará, January - June 2020**

programs were practically interrupted, with just one transplant of these two organs in the second quarter of 2020. Of the 71 liver transplants in the first semester, 16 (22.5%) were performed between April and June. Cornea transplants also fell considerably, with 190 (91%) procedures in the first quarter and 19 (9%) in the second quarter (Figure 1).

Table 1 shows the number of potential deceased donors, effective donors and transplants performed between April and June 2020. In comparison with the same period in 2019, there was a 38.8% reduction in the number of potential donors and a 67.9% reduction in the number of effective donors. In all, 37 transplants were recorded, this being 89.3% less than in the same period in 2019, when 348 procedures were performed. Kidney, heart and cornea transplants decreased most.

**Discussion**

The results point to a considerable reduction in the number of potential deceased donors and effective donors immediately after the COVID-19 pandemic was declared. All types of transplantation included in this study were affected, especially the kidney, heart and cornea transplantation programs.

When the first COVID-19 cases were confirmed in Ceará in March, the state government introduced social

isolation measures,<sup>15</sup> with the aim of reducing infection and ensuring availability of hospital beds for people with severe COVID-19 symptoms. In the first fortnight, road traffic accidents fell by 61%.<sup>16</sup> However, in April and May there was an increase of almost 500% in occupation of hospital beds reserved for treatment of COVID-19. ICU beds at several hospitals became 100% occupied.<sup>17</sup>

The reduction in notifications of potential donors may be related to the drop in road traffic accidents and the consequent impact on brain death cases. In addition, potential donors being infected with SARS-CoV-2 contributed to an even greater reduction in effective donors. Organ donation is absolutely contraindicated in the case of potential donors with active COVID-19, positive SARS-CoV-2 RT-PCR results for severe acute respiratory syndrome, with undefined etiology or undefined laboratory test results.<sup>2,18</sup>

Ceará was the first state to implement testing of potential donors. Between March and June 2020, 23% of potential donors notified in the state tested positive for SARS-CoV-2,<sup>19</sup> which may have contributed to raising the rate of medical contraindication in relation to organ donation. In 2019, this rate was 17% in Ceará, while it jumped to 28% in the first semester of 2020.<sup>9,14</sup>

Ceará does not have hospitals that exclusively perform transplants, so that these procedures are carried out at large general hospitals which are also

**Table 1 – Fall in the number of notifications of potential deceased donors, effective donors and transplants, Ceará, April - June 2019, April - June 2020**

Variables	April - June 2019	April - June 2020	Percentage change (%)
Potential donors	147	90	38.8
Effective donors	53	17	67.9
Total transplants <sup>a</sup>	348	37	89.3
Kidney transplants	61	1	98.3
Heart transplants	6	1	83.3
Liver transplants	52	16	69.2
Cornea transplants	229	19	91.7

a) Total number of kidney, heart, liver and cornea transplants.

now caring for COVID-19 cases. As such, it is not possible to ensure areas totally free from risk of exposure to the virus for transplant patients. The transplantation centers have therefore reserved transplantation procedures for severe and urgent situations and have adopted more conservative measures in relation to using borderline donors.

In accordance with Ministry of Health guidelines, active tracing of circulatory death donors for cornea donation has been suspended, although donation of ocular tissues from brain death donors has been maintained.<sup>2</sup> Liver transplants have continued, since for many diseases this is the only and immediate therapy. Ceará does not perform living-donor liver transplants.

With regard to kidney transplantation, substitute therapies such as dialysis have been considered. Living-donor kidney transplants have been suspended, in accordance with Ministry of Health recommendations to assess suspension of elective living-donor transplants during the period of SARS-CoV-2 community transmission.<sup>2</sup> In the first semester of 2019, Ceará performed eight living-donor kidney transplants, while only one was performed in the same period in 2020.<sup>9,12</sup>

Studies indicate that there is still uncertainty about the risk of transmission of this disease, the immune response of recipients and exposure of healthy living donors.<sup>3,20-22</sup> A systematic review indicated that the clinical presentation of COVID-19 in kidney transplant recipients can be different in the general population in view of a higher rate of the more severe form of the disease. Based on 24 studies and reports of 129 people who had had kidney transplants and became infected with SARS-CoV-2, the systematic review

showed that, on average, 20% of infected recipients needed to be admitted to an ICU and 34.1% had acute kidney injury; the COVID-19 mortality rate was 18.8%, whereas among the general population it was 3.4%.<sup>22</sup> With regard to liver transplantation, a prospective multi-center study conducted with COVID-19-infected recipients identified 12% lethality. This increased to 17% when taking only hospitalized recipients into consideration.<sup>23</sup>

In Spain there was a drastic reduction in the number of donors and transplants even in the first month of the pandemic.<sup>4</sup> In Ceará, April and May were the most critical months and no kidney or heart transplants were performed then.<sup>24</sup> In that period, kidneys continued to be removed from deceased donors with undetectable COVID-19 RT-PCR test results and with no clinical signs of the disease. Those kidneys were sent to the National Organ Transplantation Bank.

Multiple factors affect the reduction in donors and transplants, and it is related to social distancing, hospital capacity, reallocation of hospital beds and mechanical ventilators, reduced availability of health workers and uncertainty about results, which has led the transplantation centers to indicate the procedure only in severe situations.<sup>3,25-27</sup>

This study analyzed a single scenario and only the single three-month period following the declaration of the pandemic. No comparisons were made with other Brazilian states. As no lung, pancreas or pancreas-kidney transplants were performed in Ceará in 2020, even before the pandemic was declared, this study only examined liver, kidney, heart and cornea transplants. Further studies are needed to monitor the impact on donations and transplants in the long term and in other scenarios.

We conclude that the numbers of donors and transplants in Ceará fell considerably in the three months following the declaration of the COVID-19 pandemic. This reduction may restrict patients being included on waiting lists and, consequently, increase the waiting time of recipients already on waiting lists, in addition to favoring complications. We therefore hope that the results of this study will inform the implementation of strategies that contribute to the safe return of transplantations in the state of Ceará.

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## Authors' contributions

Araújo AYCC and Almeida ERB took part in the concept of the study and data acquisition. Araújo AYCC, Pinto AGA, Almeida ERB, Sandes-Freitas TV and Lima LKS contributed to data analysis and interpretation, drafting and critically reviewing the manuscript. All the authors have approved the final version of the article and declare themselves to be responsible for its accuracy and integrity.

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Received on 13/09/2020

Approved on 05/11/2020

Associate editor: Bárbara Reis-Santos -  [orcid.org/0000-0001-6952-0352](https://orcid.org/0000-0001-6952-0352)