







Impact of the Covid-19 Pandemic on Organ Donation and Transplants at Hospital de Base and in the State of São Paulo, Brazil

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Conflict of interest
Nothing to declare.

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Abstract: The Covid-19 pandemic had severe impacts on various sectors of society, especially in the area of medicine. In this area, one segment of activity that was greatly impacted was transplantation, which at first had to be halted in numerous centers, for various reasons. The objective of this article was to analyze, in a comparative way between the years 2019 and 2020, the impact of the Covid-19 pandemic in the numbers of transplantations in a district hospital (DH), a national reference in transplantations, and in the state of São Paulo, as well as in the number of donations from these locations. The method used in this work was the comparative analysis using data obtained from the Brazilian Transplant Registry, the Brazilian Association of Organ Transplantation and the State Transplant System. The following organs were analyzed in the DH and in the state of São Paulo: heart, liver, lung and kidney. Pancreas was analyzed only in the state. Through the analyses, it was observed that in the DH there was a decrease in the numbers of transplantations for all organs analyzed, and in the state of São Paulo, in the numbers of lung and kidney transplantations, maintaining the number of pancreas transplantations and increasing the numbers of heart and liver transplantations. Regarding donors, there was a decrease in the number of potential donors, but an increase in the number of actual donors, due to a decrease in the family refusal rate.

Keywords: Tissue Donors; Transplantation; Pandemics; Covid-19; Organ Transplantation.

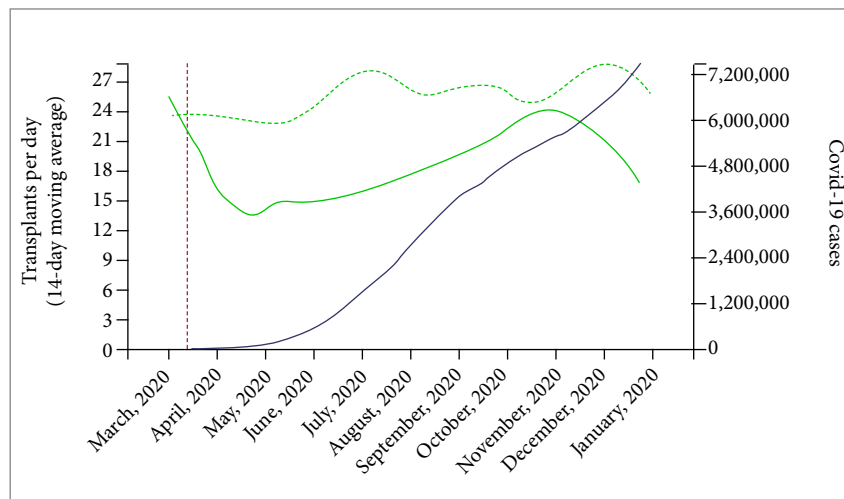
INTRODUCTION

In December 2019, the first reports of the spread of a new coronavirus causing a new disease began to emerge. Called Covid-19, this disease, caused by Sars-CoV-2, presents as most common symptoms: fever, dry cough, fatigue and, in more severe cases, dyspnea, chest pain and loss of appetite, and may evolve with respiratory failure, severe acute respiratory syndrome, septic shock, thromboembolism and/or multiple organ failure.¹ On March 11, 2020, the World Health Organization decreed a pandemic of the new coronavirus.²

Among the many impacts caused by this pandemic, a very important one was what happened in the Brazilian transplantation program, because of the suspension of many of these services. The analysis of the Brazilian Transplant Registry shows an increase in the number of donors and solid organ transplantations in the period from 2013 to 2019. In 2020, drops of 24.5% in kidney transplantation, 9% in liver transplantation, 16.7% in heart transplantation, 38.7% in lung transplantation, and 12.5% in pancreas transplantation were observed in Brazil when compared to 2019. As for the rate of effective donors, there was a generalized drop in Brazil with variations related to the regions, the periods, and the severity of the pandemic.

Nationally, the effective donor rate had a reduction of 12.7%, and the least affected region was the Midwest (4.5% drop) and the most affected was the North (43%).³

Although there was a decrease in the numbers of Brazilian transplantations in 2020 due to the pandemic, this drop was not constant or proportional to the increase in cases of Covid-19, as shown in Fig. 1,⁴ which makes the comparison with the year 2019. The graph demonstrates a sharp drop in transplantations at the start of the pandemic, followed by a progressive increase in transplantations until October 2020 (at which point the 2019 and 2020 figures most closely matched). In October, the numbers dropped again.



Source: Aubert et al.⁴

Note: Dotted green line represents transplantations in 2019, solid green line those in 2020, and the blue line equals the backlog of Covid-19 cases.

Figure 1. Solid organ transplantation activity and Covid-19 cases in Brazil over time.

Given this chaotic context and the direct impact of the pandemic on organ donation and transplantation in Brazil, this study aims to critically analyze organ donation and transplantation in the state of São Paulo and in the District Hospital (DH) of São José do Rio Preto (SP).

OBJECTIVES

To analyze, in a comparative manner, the relation between the number of donors and transplantations performed in the DH and in the state of São Paulo in the period from January to December 2019 and 2020 in order to identify the effects of the Covid-19 pandemic on this sector as a whole and on the transplantations of each organ specifically.

METHODS AND MATERIALS

An observational analytical cross-sectional study based on the number of transplantations registered in DH and in the state of São Paulo in the years 2019 and 2020 and on the number of donors from the Organ Procurement Organization (OPO) of São José do Rio Preto and the state of São Paulo in the same period. The data were obtained from the 2019 and 2020 Brazilian Transplant Registry (BTR), made available by the Brazilian Association of Organ Transplantation (BAOT),^{3,5} and the State Transplant System.⁶

The variables considered for donors were the frequencies per million population (pmp) of deceased potential and effective donors, as well as the family refusal rate. In the São José do Rio Preto's OPO, the values of notifications and of effective donors were analyzed by adding the data from the 142 municipalities that make up the area of operation of the analyzed OPO, whose estimated population is 2,315,658 inhabitants.^{6,7}

In the state, the variable taken into account for transplantations was the number pmp of liver, kidney, heart, lung and pancreas transplantations.⁵ In DH, the variable taken into account for transplantations was the number pmp of liver, kidney, heart and lung transplantations only, since the DH does not perform pancreas transplantations anymore. The estimate of pmp values of transplantations in DH was calculated based on the estimated population of the OPO in São José do Rio Preto.^{6,7}

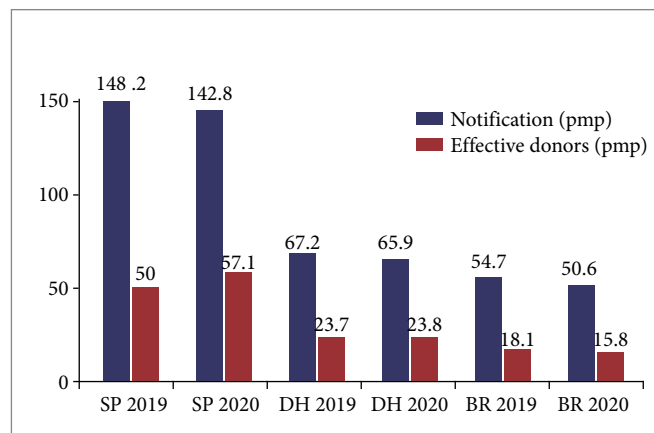
The data were organized in the software Google Sheets for descriptive analysis. This analysis involved the comparison of the frequencies obtained in 2019 with those obtained in 2020—for each type of data. Based on the results obtained, a comparison of the conclusive data from the state of São Paulo was performed with those from the DH, with the exception of pancreas transplantation.

The submission to the Research Ethics Committee was waived by Resolution No. 510/2016, since this is a survey that uses publicly accessible data, with aggregated information and no possibility of individual identification.

RESULTS

As for donors in the state of São Paulo, in the period from 2019 to 2020, there was a drop of 1.93% in the number of potential deceased pmp donors. Despite this decrease in notifications, there was a 0.42% increase in the number of pmp effective donors, which is explained by the 13.88% drop in the family refusal rate.

In the DH, from 2019 to 2020, there was a 3.64% decrease in the number of pmp potential deceased donors. On the other hand, there was an increase of 14.2% in the number of pmp effective donors, related to the decrease in the family refusal rate in the DH, of 40.5% (Fig. 2).

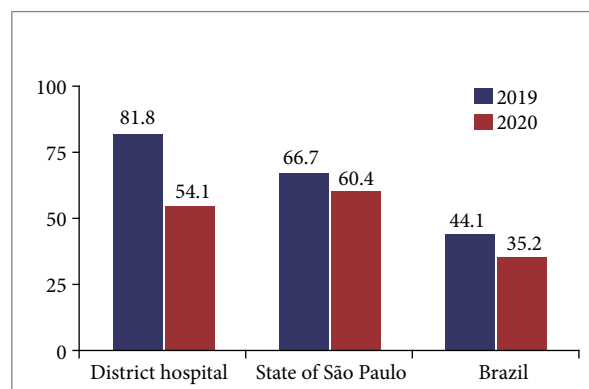


Source: Adapted from Brazilian Association of Organ Transplantation^{3,5} and São Paulo State Government.⁶
Note: SP: São Paulo; DH: Hospital de Base de São José do Rio Preto; BR: Brazil; pmp: per million population.

Figure 2. Variation of donation data in the District Hospital of São José do Rio Preto (SP), in the state of São Paulo and in Brazil between 2019 and 2020.

As for organ transplantations in the state, in these 2 years, there was, in pmp, an increase of 7.69% and 4.57% in heart and liver transplantations, respectively, maintenance in pancreas transplantations, and a decrease of 25% and 15.19% in lung and kidney transplantations, respectively.

As for organ transplantations performed in the DH in these 2 years, there was a decrease of 20%, 19.35%, 25%, and 42.98% in heart, liver, lung, and kidney transplantations, respectively (Fig. 3).



Source: Adapted from Brazilian Association of Organ Transplantation^{3,5} and São Paulo State Government.⁶
Note pmp: per million population.

Figure 3. Variation in the number of transplantations performed at the Hospital de Base of São José do Rio Preto (SP), in the state of São Paulo and in Brazil between 2019 and 2020.

DISCUSSION

Analyzing the data from the last 7 years from the BTR^{3,5} and from the State Transplant System,⁶ it is clear that there was an increasing trend in the number of transplantations in the state of São Paulo and in DH until the pandemic, which reinforces the negative impact of the pandemic on the transplant program in general. The impact on the decrease of transplantations can be related to changes in the activities at transplant centers, such as decrease or suspension of activities, and the drop in notifications of potential donors. This scenario occurred because of the increase in contraindications for transplantation, the reduction of beds in intensive care and emergency units for patients with potential brain death (due to overcrowding with patients with Covid-19), the family fear of taking their sick loved ones to the hospital (due to the risk of infection), generating deaths at home, and the decrease in head trauma due to traffic accidents or firearms.⁸

As for the most affected transplantations, kidney transplantation was the most compromised in the DH, following a national trend, and this is due to the fact that it was practically paralyzed at the beginning of the pandemic. This drastic reduction occurred mainly because of the possibility of alternative treatments, such as peritoneal dialysis and hemodialysis, highlighting the higher lethality by Covid-19 in transplantation than in dialysis treatment⁹ and because the DH has become a reference hospital for treatment of Covid-19.

Regarding the state of São Paulo, kidney transplantation was less affected when compared to its impact in other states.^{3,5} This may be explained by the existence of the kidney hospital, specialized in kidney transplantation, which may have been able to absorb the organs not used elsewhere in the state capital, enabling the maintenance of a high number of procedures in the state.¹⁰

Besides kidney transplantation, the state of São Paulo stood out in heart and liver transplantation, which increased, and in pancreas transplantation, which was maintained. These results can be explained by a probable redirection of procedures from the interior of the state, especially to the city of São Paulo, because the capital city has greater infrastructure and capacity to maintain the procedures, besides being a national reference in the sector. Moreover, heart and liver transplantations are nonelective procedures.

Regarding lung transplantation, it was observed that this was the most impaired organ, since Covid-19 is a disease that affects mainly the lower respiratory system, making many potential donors unviable; however, it is important to highlight that when the state of São Paulo is compared to others, the percentages of lung transplantation drop were similar.

Regarding the donors, the DH and state of São Paulo had similar performances, but they contradicted the national trend of donors throughout the analyzed period. As previously mentioned, the notifications fell in many transplant centers; however, the number of effective donors from the hospital and the state increased as the family refusal rate fell, indicating a direct relationship between the two factors. The causes of the family refusal rate reduction, however, are difficult to be determined, as they depend on subjective factors associated with experience, knowledge, and empathy of each family interviewed. Nonetheless, by analyzing the protocols followed by the DH in the process of welcoming and interviewing the donor family, it is believed that such phenomenon is related to the following facts: the effort of the OPO team in making possible the contact and the farewell of the families with their loved ones during hospitalization; and the care to organize, in a safe way, face-to-face interviews.

It is important to emphasize that, although the Covid-19 pandemic was decreed in March 2020, data referring to the entire year 2020 were used, because the annual BAOT database gave access to a large amount of information regarding transplantations and donations performed in Brazil and in each state individually. Even so, the conclusions were not prejudiced, since, besides the prepandemic period of 2020 being short, the percentage results show the damage caused by the new virus in the sector.

Although, to justify all the specific causes for each result obtained in this study is not possible, because, besides being an extremely complex sector with many variables, from organ procurement to the postoperative of each procedure, there were still specificities of each place analyzed. Therefore, it is necessary to point out that, up to the moment of the literature review of this study, there is a lack of studies and data to confirm the causes of such results, limiting the discussion to hypothetical analyses.

CONCLUSION

In 2020, during the Covid-19 pandemic, there was a general trend of drop in the notifications of potential donors, but an increase in the number of effective donors, explained by the drop in the family refusal rate. Regarding organ transplantations in the DH, there was a drop in the overall figures, while in the state of São Paulo there was a drop in the pmp numbers of lung and kidney transplantations, despite the increase in the pmp numbers of heart and liver transplantations, and maintenance of the pmp numbers of pancreas transplantations. Thus, it was observed that in the pandemic period there was an increase in the number of donors, despite a relative drop in the number of transplantations.

AUTHORS' CONTRIBUTIONS

Substantive scientific and intellectual contributions to the study: Adriano VV, Westin LG, Castro YA, Oliveira JFP; **Conception and design:** Adriano VV, Westin LG, Castro YA, Oliveira JFP; **Data collection, analysis and interpretation:** Adriano VV, Westin LG, Castro YA, Oliveira JFP; **Article writing:** Adriano VV, Westin LG, Castro YA, Oliveira JFP; **Critical revision:** Adriano VV, Westin LG, Castro YA, Oliveira JFP; **Final approval:** Adriano VV, Westin LG, Castro YA, Oliveira JFP.

AVAILABILITY OF RESEARCH DATA

All data were generated or analyzed in the present study.

FINANCING

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