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Impact of COVID-19 on brain death and organ donation; a single center study in Turkey

Impacto del COVID-19 sobre la muerte cerebral y la donación de órganos; estudio de un centro en Turquía

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ABSTRACT

Objectives: More than 50 million people in the world have been diagnosed with COVID-19 and more than 1 million 250 thousand patients have died. With the increasing number of COVID-19 patients admitted to hospitals, problems related to non- COVID-19 patient care have emerged. Organ transplant organizations have had to adapt to this difficult time. The current and long-term impact due to the COVID-19 pandemic is an important factor to be taken into account. An important question to ask is how this outbreak has changed the organ donation process and how long it will take to address a potentially growing waiting list. **Methods:** We analized the effects of the pandemic COVID-19 in 2020 inTurkey between March and May. We have counted the number of brain deaths and organ donations in these months. We retrospectively compared the same months in 2019, the months before and after the pandemic in 2020, and the years 2019-2020. **Results:** When examined in other months, it is seen that the effect of the pandemic on brain death and organ donation continues not only in the months when the pandemic is intense, but also in other months. The total number of brain deaths in 2019 was 37, and family donations were 22; In 2020, the number of brain deaths decreased to 13, and family donations decreased to 7. This corresponds to a decrease of 64.86% and 68.18%, respectively, compared to the previous year. **Conclusions:** Brain death, organ donation and organ transplantation have decreased significantly with the onset of the pandemic compared to the previous years and the pre-pandemic period. Studies from different countries and regions have also shown that this decrease becomes even more pronounced where the number of cases is high.

KEYWORDS: organ transplant; transplant surgery; infectious diseases; outbreak; COVID-19

RESUMEN

Objetivos: *Más de 50 millones de personas en el mundo han sido diagnosticadas con* COVID-19 y más de 1 millón 250 mil pacientes han fallecido. Con el creciente número de pacientes con COVID-19 ingresados en hospitales, han surgido problemas relacionados con la atención de pacientes que no son de COVID-19. Las organizaciones de trasplantes de órganos han tenido que adaptarse a este momento difícil. El impacto actual y a largo plazo de la pandemia de COVID-19 es un factor importante a tener en cuenta. Una pregunta importante que debemos hacernos es cómo este brote ha cambiado el proceso de donación de órganos y cuánto tiempo llevará abordar una lista de espera potencialmente creciente. **Material y métodos:** Analizamos los efectos de la pandemia COVID-19 en 2020 en Turquía entre marzo y mayo. Hemos contado el número de muertes cerebrales y donaciones de órganos en estos meses. Comparamos retrospectivamente los

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Limitation:
The fact that the study included single center data caused a small number of patients.

Conflicto de intereses:
Ninguno

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mismos meses de 2019, los meses antes y después de la pandemia en 2020 y los años 2019-2020. **Resultados:** Cuando se examina en otros meses, se observa que el efecto de la pandemia sobre la muerte cerebral y la donación de órganos continúa no solo en los meses en que la pandemia es intensa, sino también en otros meses. El número total de muertes cerebrales en 2019 fue de 37 y las donaciones familiares fueron 22. En 2020, el número de muertes cerebrales disminuyó a 13 y las donaciones familiares disminuyeron a 7. Esto corresponde a una disminución del 64,86% y 68,18%, respectivamente, en comparación con el año anterior. **Conclusiones:** La muerte cerebral, la donación de órganos y el trasplante de órganos han disminuido significativamente con el inicio de la pandemia en comparación con los años anteriores y el período prepandémico. Los estudios de diferentes países y regiones también han demostrado que esta disminución se vuelve aún más pronunciada donde el número de casos es alto.

PALABRAS CLAVE: trasplante de órganos; cirugía de trasplante; enfermedades infecciosas; brote; COVID-19

INTRODUCTION

The COVID-19 outbreak has an impact worldwide.[1] In December 2019, a series of cases of pneumonia with an unknown cause resembled viral pneumonia in Wuhan, Hubei, China.[2] In tests performed on patients' lower respiratory tract samples, a new coronavirus called novel coronavirus 2019 was shown.[3]

Outbreak; It was understood that it started from a zoonotic contamination event associated with a large seafood market where live wild animal trade was also carried out, and then person-to-person transmission was also observed. The clinical spectrum of COVID-19 is quite wide. It includes asymptomatic infection, mild upper respiratory tract disease, respiratory failure, and even severe viral pneumonia with death.[4-5]

It has also been identified that some chronic diseases such as cardiovascular diseases, chronic respiratory failure and diabetes are risk factors for the patients. The mortality rate is 1-2% in those who are in perfect health at the time of infection. In addition, it has been shown that the majority of infections are asymptomatic or mild, 13.8% of those infected develop critical pathological symptoms with symptoms such as severe infection, and 4.7% respiratory failure, septic shock or multiple organ failure.[6]

Until now, more than 50 million people in the world have been diagnosed with COVID-19 and more than 1 million 250 thousand patients have died. The COVID-19 diagnosis 1.5 million in Turkey, the number of death is 15 thousand.[7] COVID-19 first cases appeared in the March 11, 2020 in Turkey.[8]

With the increasing number of COVID-19 patients admitted to hospitals, problems related to non-COVID-19 patient care have emerged. Consequently, it has become especially complicated to maintain organ transplant care, because many factors related to donor and recipient management need to be calculated.[9-10] Organ transplant organizations have had to adapt to this difficult time. The current and long-term impact due to the COVID-19 pandemic is an important factor to be taken into account.[11-12]

Most of the current studies on transplantation and COVID-19 have approached recipient-related issues and drug-related challenges at a transplant center level, but little is known about its impact on organ supply organizations and donor service. An important question to ask is how this outbreak has changed the organ donation process and how long it will take to address a potentially growing waiting list.

Methods

All patients diagnosed with brain death were included in the study. The effects of the COVID-19 pandemic in 2020 in Turkey started in March and it was felt severely in May. We have counted the number of brain deaths and organ donations for these months. We retrospectively compared the same months in 2019, the months before and after the pandemic in 2020, and the years 2019-2020. Diagnosis of death was confirmed by strict adherence to standardized clinical, neurologic, and supplementary test in accordance with Turkish law and related guidelines. Since the study was about COVID-19, permission was also obtained from the ministry of health

Ethical statement

This study was a retrospective analysis of

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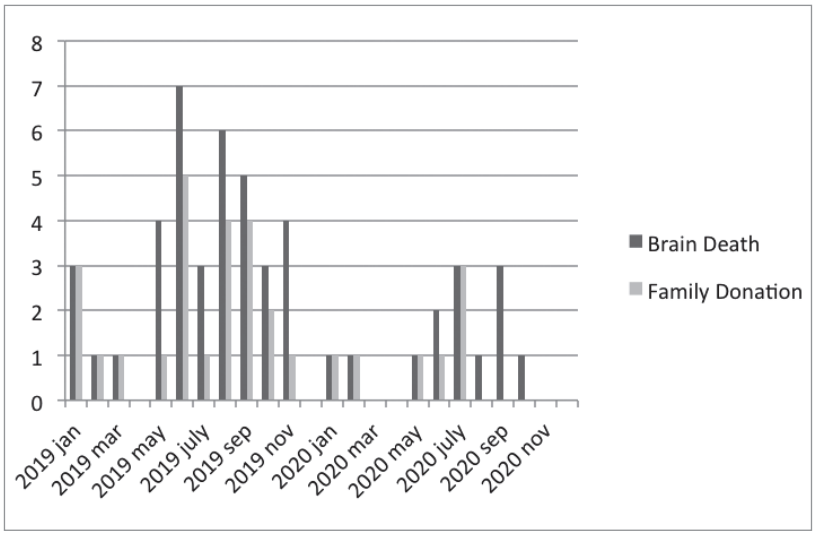
clinical data. There was no risk to patients during the study, and only nonidentifiable data were used for publication.

RESULTS

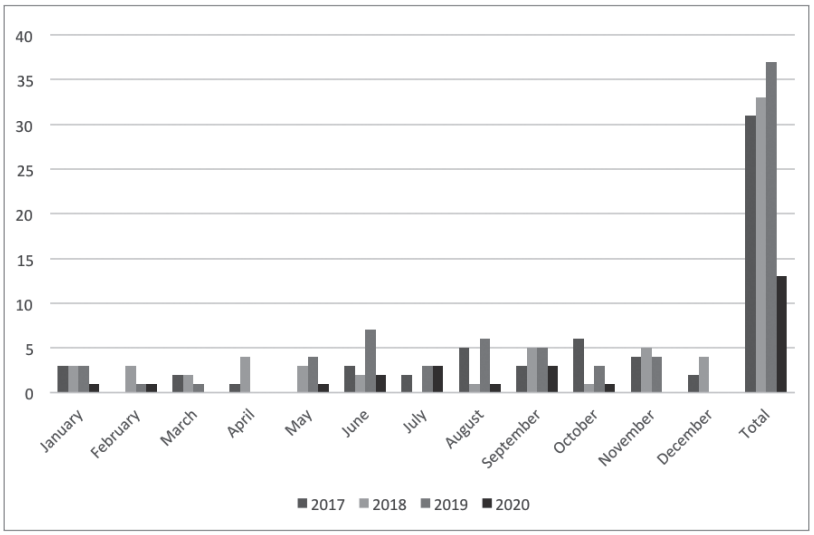
In this study, where we examine the effects of COVID-19 on brain death and organ donation, when we look at the number of brain deaths (B.D.) and family donations(F.D.) in March, April and May 2020, which are accepted as pandemic months in our country; respectively March (B.D:0, F.D:0), April (B.D:0, F:D:0) and May (B.D:1 - 0.81 PMP,F.D:1). In the same months of 2019, it was March (B.D:1- 0.81 PMP, F.D:1), April (B.D:0, F.D:0) and May (B.D:4-3.25 PMP, F.D:1), respectively. The distribution of the number of brain deaths and organ donations for the months of 2019-2020 is shown in **Figure 1**. When it is examined in other months, it is seen that the effect of the pandemic on brain death and organ donation continues not only in the months when the pandemic is intense, but also in other months.

Figure 1. Distribution by months for the years 2019-2020



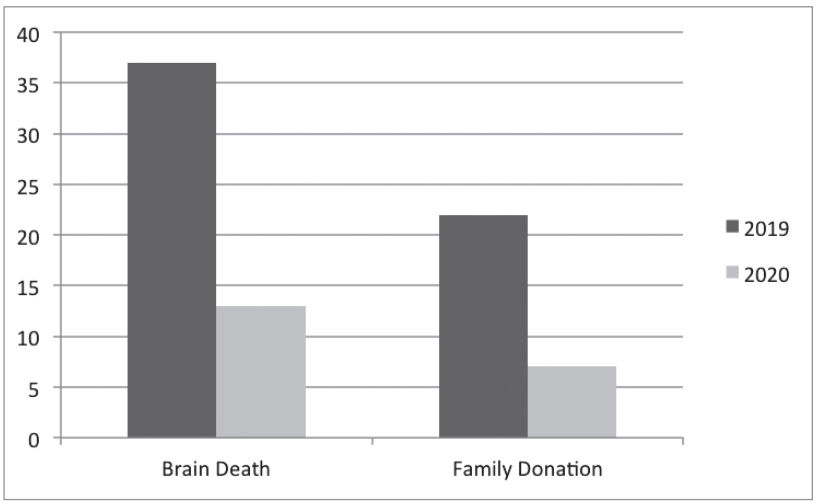
When we examine the years of 2017 and 2020, the annual total number of brain deaths is as follows: 2017 (n=31, 25.2 PMP), 2018 (n=33, 26.8 PMP), 2019 (n=37, 30.1 PMP), 2020 (n=13, 10.5 PMP) **(Figure 2)**.

Figure 2. Distribution of brain death by months for the years 2017-2020



When we compare it with the average of the last 3 years, there was a decrease of 61.6%. The total number of brain deaths in 2019 was 37, and family donations were 22; In 2020, the number of brain deaths decreased to 13, and family donations decreased to 7 **(Figure 3)**. This corresponds to a decrease of 64.86% and 68.18%, respectively, compared to the previous year.

Figure 3. Brain Death And Family Donation Numbers For The Years 2019-2020



DISCUSSION

End-stage organ failure is estimated to affect more than six million people worldwide. According to the data of the World Health Organization, more than 1.500.000 people worldwide live with organ transplants. In the USA, approximately 40.000 patients receive organ transplants each year, but 120.000 patients remain on the waiting list for transplantation, and 7600 people die while waiting for transplantation annually. In Europe and many other countries, patients are affected by similar organ shortages and high mortality rates while they are on the waiting list for transplantation.[13-14] In our country, there are more than 25.000 patients awaiting organ transplantation.

The COVID-19 outbreak had a huge impact on the healthcare services of many countries and resulted in emergency health care reform. Intensive care facilities faced extreme pressure due to increased adoptions of new measures for COVID-19 infections, while most clinical programs, including organ donation and transplantation, were interrupted, and many transplant programs were either suspended or had to significantly reduce their activities. The COVID-19 outbreak had the effect of severely reducing organ donation and transplant activity in all countries.[15-16]

Elective surgeries were discontinued, and a "surgery only if necessary" philosophy was adopted by most units for cases where timely interventions could significantly alter the results.[17]

Organ transplantation is a highly specialized field that offers the only treatment option for terminal organ failure. Considering the increasing number of cases and the currently lack of an approved, licensed treatment for COVID-19, important policy changes had to be made in organ transplantation in a short time.

In a study examining the organ donation and transplant activities in the UK in the same period, it was found that the number of donors decreased by 66% and the number of donor transplants by 68% compared to 2019. They said that during the pandemic, trauma and other emergency room admissions decreased by more than 50% in the UK. Despite this decrease in organ donation, families continued to support the donation with an approval rate of 74%, despite restrictions on going to the hospital.[18]

The overall reduction in death donor transplants since the COVID-19 outbreak was 90.6% in France and 51.1% in the USA, respectively. In both France and the USA, this decrease was mostly due to kidney transplantation, but a significant impact was also seen in heart, lung and liver transplants, all of which provided significant improvement in survival probability.[15] Again, in a Netherlands-based study, it was stated that in the first month

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of the epidemic (15 March 2020 - 15 April 2020), donation volumes decreased significantly compared to the previous months.[19]

Dominguez-Gil et al. stated that in Spain, an average of 7.2 donor / day and 16.1 transplant / day activities were maintained until the national alarm status announced on 13 March 2020, after which the corresponding values decreased to 1.1 and 2, respectively.[20] In another study, they observed that organ donation decreased by more than 50% in Brazil.[21] Similarly, in two different studies conducted in Italy, it was stated that there was a decrease of more than 25% in the number of organ donations and donors in the early stages of the epidemic, and this decrease was more in places where the number of cases was more intense.[22-23]

When the above studies were examined, it was found that more than 50% decrease in organ donation and organ transplantation due to COVID-19 in many countries. Similarly, when we examine our hospital data, there was a 64.86% decrease in brain death and 68.18% decrease in family donations between 2019 and 2020.

By showing the geographical relationship between regions with COVID-19 clusters and reduction in organ supply, a significant reduction in transplantation rates was observed even in regions with low COVID-19 cases, and COVID-19 infection had an impact across the country and worldwide beyond its local impact.[15]

The COVID-19 pandemic has brought some difficulties for brain death and organ donation. In many countries, at least 2 negative SARS-nCOV2 PCR samples were required from a potential organ donor due to medical and legal concerns. After the brain death was confirmed, the CT thoracic and infectious diseases specialist were asked to evaluate donor suitability in terms of COVID-19. A similar procedure is applied in our country. However, this additional process further delayed brain death certification and organ procurement. Therefore, in order to protect the organ donation opportunity of the potential organ donor patient, verifying the patient's COVID-19 status as soon as possible will speed up the process. At this point, the delays experienced after the diagnosis of brain death cause problems in terms of donor care and the stability of the patient's vital signs, and may lead to the death of the patient without an organ donation.[24-26]

Many specialist nurses and doctors involved in organ donation were assigned to various roles related to intensive care units and the pandemic. As a result, in this process, when early diagnosis became more important, problems were experienced.[27]

Another problem is that the strict visitor policy in all hospitals does not allow family members to visit freely. This creates an emotional barrier for family members to accept death, and it becomes more difficult to discuss organ donation with the family.

When all these studies are examined, brain death, organ donation and organ transplantation from living and dead have decreased significantly all over the world. Similar to the rest of the world, the number of brain death and organ donation has decreased in our hospital. Considering the number of patients awaiting organ transplantation all over the world and in our country, the necessity to continue organ transplant procedures stands out. This decrease in organ transplants causes the number of patients waiting to increase and it is obvious that the pandemic effect will spread over a longer period of time.

Even during the periods when there were confirmed cases, a serious part of the intensive care beds were still kept ready for non-covid patients due to the anxiety of increasing the number of cases. In addition, although the number of cases has decreased, possible brain death patients may have been overlooked due to the focus of healthcare professionals on COVID-19 cases. Nevertheless, the assignment of personnel who specialize in brain death and organ donation to other tasks and the general fatigue of healthcare workers may also be the reasons for the decrease in brain death and organ donation during the decline in confirmed cases.

Our hospital is one of the most important hospitals in the southern marmara region, which produces the most brain death and organ donation in our country. For this reason, although this study we conducted is a limited study including single center data, there is no doubt that there are similar results across the country. In addition, there is not yet a large-scale study on this issue across the country, and this study becomes a pioneering study by drawing attention to the need for a larger study.

CONCLUSION

With the onset of the COVID-19 pandemic, many changes have been made in health policies and the functioning of daily life. Current health

policies and measures taken in daily life have affected donor volume and organ productivity. Brain death, organ donation and organ transplantation have decreased significantly with the onset of the pandemic compared to the previous years and the pre-pandemic period. Studies from different countries and regions have also shown that this decrease becomes even more pronounced where the number of cases is high.

The reasons for this have not been fully determined. Increased work from home, decrease in trauma patients, procedural changes in organ donation, people who are afraid of being infected with COVID-19 in a health institution become more reluctant to seek medical help, serious part of intensive care beds are reserved for COVID-19 patients and emergency doctors and intensive donor awareness among care professionals may have been reduced due to the pressure placed on them by the COVID-19 outbreak.

Every effort should be made to protect every donation opportunity. It should not be judged early on whether a patient is a good enough candidate for donation. The physician should be aware of this cognitive bias when managing a patient whose brain death is approaching.

It is always easier to take the easy route, especially in a pandemic crisis, when complexity increases, resources are limited, and emotions are heightened. However, the demand for life-saving organs continues, and we shouldn't let the COVID-19 outbreak deter us.

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