



Pediatric Organ and Tissue Donation—A 10-Year Retrospective Study in Portugal

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ABSTRACT

Organ and tissue donation can transform lives. One donor can ensure the survival of up to 8 people through their organs and improve the quality of life for dozens more through tissue donation. Portugal has an excellent transplantation rate, but deaths still occur while waiting for an organ. The study aimed to analyze pediatric organ and tissue donors nationally and evaluate brain deaths in a pediatric intensive care unit (PICU) over the past 10 years to identify any potential lost donors. We conducted a retrospective descriptive study of pediatric organ and tissue donors and diagnosed brain deaths from January 2011 to December 2021. Demographic and clinical data were analyzed, including those provided by the National Transplant Coordination. Over the past 10 years in Portugal, 121 pediatric donors (11.7 per million population) were collected, and 569 organs and tissues were collected. During the same period in the PICU, there were 125 deaths, including 20 brain deaths. Of this group, 4 were organ and tissue donors. In the non-donor group ($n = 16$), a potential lost donor case stands out. Pediatric specialists need to be more familiar with the donation process, which would enable the identification and optimization of all potential donors, thus minimizing the number of potentially lost organs.

THE organ donation and transplantation field has undergone significant advancements due to enhancements in organ preservation methods, surgical techniques, and immuno-therapies. As a result, transplantation has emerged as the best and most cost-effective clinical solution for end-stage organ failure worldwide [1,2]. One donor can ensure the survival of up to 8 people through their organs and improve the quality of life for dozens more through tissue donation.

With increasing demand, greater indications for transplantation, and a growing number of patients on waiting lists, the shortage of donor organs represents the most challenging global problem facing transplantation. Although the number of transplants during the last 3 decades increased 2-fold, the number of patients on waiting lists increased 6-fold, and the demand for donor organs far exceeds the supply [3].

In 2021, Portugal recorded 302 donors, encompassing pediatric and adult populations, with a rate of 29.1 per million. Despite this, the number of patients registered on the waiting list was notably higher, with 828 individuals waiting for organ transplants, which represents a 3-fold increase in comparison to the number of donors. Regrettably, 59 patients died during this period while waiting for organ

transplants [4]. There is a dearth of information available regarding the pediatric population.

Various factors, including health care systems, organizational structures, and ethical, cultural, and societal aspects, influence the number of available organ donors. Nonetheless, the primary determinant of pediatric organ donation is the incidence of patients who die in situations of brain death. Therefore, it is of utmost importance to recognize all cases of brain death as potential donors.

Thus, this study aimed to conduct a national-level analysis of pediatric organ and tissue donors and assess brain death cases in a pediatric intensive care unit (PICU) over the past 10 years to identify any potential lost donors.

MATERIAL AND METHODS

A retrospective descriptive study of pediatric organ and tissue donors and diagnosed brain deaths was conducted from January 2011 to

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December 2021. Demographic and clinical data were analyzed, including those provided by the National Transplant Coordination.

RESULTS

Over the past 10 years in Portugal, there were 121 pediatric donors (11.7 per million population), with a median age of 10 years (minimum 10 days, maximum 17 years), and 56% were male. The most frequent cause of death was traumatic brain injury, accounting for 46.7% of cases, including road accidents ($n = 33$), falls ($n = 5$), and gunshot wounds/assault ($n = 3$), followed by cerebral anoxia in 24.2% of cases ($n = 29$) and stroke ($n = 16$). Multi-organ collecting was performed in 87.6% of cases ($n = 106$). A total of 569 organs and tissues were collected, with the most frequently collected organs including the kidney ($n = 212$), liver ($n = 98$), heart ($n = 41$), lung ($n = 40$), pancreas ($n = 30$), and cardiac valves ($n = 14$). Conversely, only 1 bone, 2 vessels, and 3 digestive tract donations were reported.

Regarding annual variation, the highest number of donors ($n = 19$) and collected organs ($n = 66$) was observed in 2011, whereas the lowest number of donors ($n = 2$) and collected organs ($n = 10$) was observed in 2018. The remaining annual distribution varied between 7 and 15 donors per year.

During the same period in the PICU of a tertiary hospital, there were 125 deaths, including 20 brain deaths. Of this last group, 4 were organ and tissue donors, and 75% were female, aged between 4 and 15 years old. The cause of death in all cases was cerebral anoxia, and a total of 18 organs and tissues were collected.

In the non-donor group ($n = 16$), 14 did not meet donation criteria due to multiorgan failure ($n = 11$), lack of diagnosis ($n = 2$), and infectious risk ($n = 1$). In 1 case, conclusive data were not found. One potential lost donor was identified: a healthy 5-year-old female with hypoxic-ischemic encephalopathy post-cardiopulmonary arrest due to *Haemophilus Influenza type b* epiglottitis, which worsened with no neurologic response. Brain death clinical tests were not conducted due to refractory hypernatremia, and care was withdrawn. Additionally, no further diagnostic exams were conducted for brain death, potentially resulting in the loss of the kidneys, liver, and heart.

DISCUSSION

Portugal has an excellent transplant rate and is recognized as one of the nations with the highest rates of donors per

million population worldwide [4]. However, deaths still occur while waiting for an organ. During the last 10 years, the number of organ donations remained stable while the waiting list grew. It remains crucial to make sure all potential donors are identified. Only one case of potential donor loss was identified in the PICU under analysis. Although clinical brain death tests could not be performed due to persistent hypernatremia, complementary diagnostic tests could have been carried out.

Responding to children on the waiting list for transplantation is difficult. It is especially challenging due to the unique characteristics of this population and the scarcity of pediatric donors. The demand for donor organs far exceeds the supply. Therefore, the reduction of potential organ donor loss by non-identification and expansion of the transplant donor pool are important challenges that must be faced to reduce the organ-supply imbalance. For this reason, pediatric specialists need to be more familiar with the donation process, enabling the identification and optimization of all potential donors and thus minimizing the number of potentially lost organs. Professional training is the way to improve these results. Health care professionals can give meaning to unexpected death, which cannot be avoided, and enable gains in life expectancy for other children.

DATA AVAILABILITY

Data will be made available on request.

DECLARATION OF COMPETING INTEREST

All the authors declare no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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