

## ORGAN DONATION AND TRANSPLANTATION IN NORTH MACEDONIA

**Andonovska Biljana<sup>1</sup>, Mojsova Mijovska Maja<sup>2</sup>, Trajkovska Vanja<sup>1</sup>, Andonovski Alan<sup>1</sup>,  
Muminovik Amela<sup>1</sup>, Kostadinova Kunovska Slavica<sup>3</sup>**

<sup>1</sup>University Clinic for Traumatology, Orthopedic Diseases, Anesthesia, Reanimation and Intensive Care and Emergency Center, Faculty of Medicine, Ss Cyril and Methodius University in Skopje, Republic of North Macedonia

<sup>2</sup> Faculty of Medical Sciences, Goce Delchev University in Shtip, Republic of North Macedonia

<sup>3</sup>Institute of Pathology, Faculty of Medicine, Ss Cyril and Methodius University in Skopje, Republic of North Macedonia  
e-mail: [andonovska.biljana1@gmail.com](mailto:andonovska.biljana1@gmail.com)

### Abstract

**Introduction:** In the era of transplantation development, the number of available organ donors is still insufficient. Several factors, including public education regarding organ donation, contribute to this shortage.

The **aim** of our study was to assess public opinion and level of information regarding transplantation and organ donation among citizens of the Republic of North Macedonia and to assess the development of transplantation from a deceased donor in recent years.

**Material and methods:** The study was conducted using a questionnaire and by reviewing official data on transplantations performed in the Republic of North Macedonia. The study included 90 randomly selected respondents (29 men and 61 women) with different level of education and ethnicity, and was realized in the period from January to February 2024.

**Results:** Most respondents (87.7%) responded that they were familiar with organ donation and transplantation and were informed about the development of transplantation in our country. From them, 74.4% fully supported organ transplantation and 70% supported cadaveric transplantation - mostly (64.4%) because of the desire to give life. Insufficient information about the entire transplantation process was the most common reason why families do not agree to donate organs. Cadaveric transplantation in our country has been increasing, with a peak in 2021/2022 (3.89 donations per million population), and it includes transplantations of kidney, heart, bone, ligament tissues, and liver.

**Conclusion:** Our study has shown that there is sufficient information and a positive attitude toward organ transplantation and organ donation in our country, as well as significant progress in transplantation from a deceased donor.

**Keywords:** organ donation, transplantation, attitudes, factors influencing organ donation

### Introduction

Transplantation or transfer of tissues or organs from one body (human or animal) to another body or from one part of the body to another part within the same person is the best and unique life-saving strategy for patients suffering from an end-stage organ failure. Nowadays, it comprises transplantation of the kidneys, liver, pancreas, heart, bones and bone marrow

tissues<sup>[1]</sup>. Owing to the progressive advancement in technology and medicine, today, transplantation is a more accessible method of treatment successfully applied in the health system worldwide. However, even today, one problem still remains, and that is the larger number of patients who are on transplant waiting lists than the number of individuals willing to donate their organs<sup>[2]</sup>.

Organ donation is an ethical and legal procedure of giving organs, tissues or cells with no compensation from a living or deceased person for the purpose of transplantation into the body of another person. In spite of the fact that the number of organ donors is gradually increasing each year, it has still not satisfied the demand for organs. Unfortunately, the insufficient percentage of organ donors over the past years is a trend that applies not only to less developed countries, but also to some developed ones as those in Western Europe. Thus, according to some studies<sup>[3]</sup>, even in Germany there was a reduced number of organ donors by 30% in the period from 2010 to 2018. This is due to several factors, among which the most important are: improvement in the therapeutic approach to ischemic and hemorrhagic stroke, decrease in the number of traffic accidents on one side, and, on the other side, an increase in the number of malignant diseases and incompatibility of organ donation, incomplete diagnosis and identification of patients with brain death in hospitals and their reporting to the national transplant coordination boards, low education level of the population regarding organ donation as well as the influence of the general opinion and accepting transplantation by the inhabitants of one country. For example, in Spain<sup>[4]</sup>, which is a country with the highest organ donation rates, in addition to efficient donor identification, successful coordination with the national transplant coordination boards and good communication with family members of a donor, of crucial importance is the strong public support of the transplantation system. With regard to our country, after the first successful kidney transplantation from a deceased donor in 1991, it has taken a higher position in the International Registry of Organ Donation than some other countries where transplantation from a deceased donor was started much earlier. Nevertheless, further support is necessary to strength public opinion in order to overcome cultural and religious barriers concerning organ donation, which unfortunately still exist among a large number of people in our country, as well as to strengthen the trust in the system that will guarantee that donated organs will be given to the right individual without misuse. All this has to be done in order to increase the number of organ donors, and consequently organ transplants because WITHOUT DONOR-THERE IS NO TRANSPLANTATION.

### **Aim of the study**

To estimate the attitude and the level of awareness regarding organ transplantation and organ donation of the population of North Macedonia and to determine the progress of transplantation from a deceased donor in North Macedonia over the past years compared to other countries globally.

### **Material and methods**

A combined method of research was used in this study. A survey was conducted to assess the public opinion regarding organ donation. It included a total of 90 respondents randomly selected and was realized in the period from January to February 2024.

In the survey that was distributed, respondents had to answer seven questions. To the first question, whether they had previously been familiar with the terms of "organ donation" and "transplantation," they had option to answer "yes," "no," or "partially." The same answers were offered to the question of whether the respondents were informed about the development of organ transplantation in our country in recent years. Regarding their attitude towards organ transplantation, they had to answer if they strongly support organ transplantation, partially support organ transplantation, do not support it, or have no defined attitude regarding organ

transplantation. The respondents also had the opportunity to express their attitude regarding cadaveric transplantation (from a deceased donor), where the same answers were offered: that they strongly support organ transplantation from a deceased donor, partially support organ transplantation, do not support it, or have no defined attitude regarding organ transplantation from a deceased donor. Humanity, willingness to give life to others, willingness to save lives, consolation that some organ of their loved ones will continue to live, knowing a person who is in need of organ transplant, knowing a person who has had a transplant and it saved his life were the most common possible reasons why individuals support organ donation. Lack of sufficient information concerning the overall process of transplantation, unfamiliarity with the meaning of the term “brain death”, religion and beliefs, distrust in the healthcare system and fear from the medical procedure itself, were cited as the most common possible reasons among which individuals could choose that deter people from the idea of organ donation. Respondents were also asked to express their opinion on the need for introducing a donor card in our country, where they could answer affirmatively or negatively.

For the purpose of determining the progress of transplantation from a deceased donor over the past years in North Macedonia compared to the situation in the world, official statistical data were obtained from the International Registry on performed transplantations worldwide as well as official data from the Transplantation Department at the Ministry of Health of N. Macedonia until June 2024. (Table 1).

## Results

The survey included 29 men and 61 women stratified in three age groups: up to the age of 18 years (4 respondents), 18-50 years (67 respondents), and over 50 years (19 respondents), having a different level of education and ethnicity.

Regarding the first question, the majority of respondents 79 (87.8%) answered that they were familiar with the terms organ donation and transplantation, 8 (8.9%) respondents said they were partially familiar with the term, and 3 that were not familiar. Regarding the second question, the majority of respondents 56 (62.2%) answered that they were familiar with the development of transplantation in our country, 25 (27.8%) respondents said that they were partially familiar and 9 (10%) that they were not familiar with it. Regarding the third question, 67 (74.4%) respondents answered that they strongly supported organ transplantation, 17 (18.9%) respondents answered they partially supported organ transplantation, and 6 (6.5%) that they were neither agreed nor disagreed. Regarding the fourth question, 63 (70%) respondents answered that they strongly supported cadaveric transplantation, 16 (17%) respondents said they partially supported cadaveric transplantation, and 11 (12.2%) had no defined attitude. Regarding the fifth question respondents answered that the main reasons for supporting organ donation are: their willingness to save someone's life 58 (64.5%), humanity 43 (47.8%), consolation that some organ of their loved ones will continue to live 32 (35.6%), knowing a person who has had a transplant and it has saved his life 17 (18.9%) and knowing a person who is in need of organ transplant 15 (16.7%). Regarding the sixth question respondents answered that lack of information about the overall process of transplantation 58 (64.4%), religion and beliefs 34 (37.8%), personal and family wishes and attitudes 30 (33.3%), unfamiliarity with the meaning of the term brain death 28 (31.1%), were the most common reasons why people refuse to donate organs. The distrust in the healthcare system and the degree of development of medicine 19 (21.1%), as well as the fear of danger and the risks of the medical procedure itself 20 (22.2%) of respondents, cite, as a reason for disagreement with organ donation, which should certainly be taken into account.

Regarding the seventh question, 81 respondents answered that in our country a Donor card should be introduced, whereas 9 respondents gave a negative answer.

According to the International Registry on Organ Donation<sup>[5]</sup> for 2021/2022 the Republic of North Macedonia is listed in this registry with the number of 3.89 donors per one million people for the period 2021/2022. Regarding the countries in the region, according to the number of cadaveric transplantations from a deceased donors, North Macedonia is behind Croatia (29.5 donors), Slovenia and Greece but in front of Bulgaria, Romania and Turkey.

According to the official data obtained from the Transplantation Department at the Ministry of Health of North Macedonia, most of organ transplants in our country were made in the period between 1991 and 2024 (Table 1). From 1991 to 2013, a total of 260 kidney transplants from living donors were made, and since 2013 kidney transplants from deceased donors has started. In 2020, the first heart transplant from a deceased donor was made. In the following period of 3 years another 9 heart transplantations were done. From 2021 to 2023, 17 bone and ligament tissue transplantations from deceased donor were performed. In the period 2022/2023, three liver transplants were done.

**Table 1.** Number of performed transplantations in the Republic of North Macedonia in the period 1991-2023 (2024)

Year	Number of performed transplantation	
1991-2013	<i>Living organ donation:</i>	260 kidney transplantation
2013-2018	<i>Living organ donation:</i>	105 kidney transplantation
	<i>Cadaveric organ donation:</i>	8 kidney transplantation
2019	<i>Living organ donation:</i>	14 kidney transplantation
	<i>Cadaveric organ donation:</i>	6 kidney transplantation
2020	<i>Cadaveric organ donation:</i>	4 kidney transplantation <b>1 heart transplantation</b>
		16 kidney transplantation
2021	<i>Cadaveric organ donation:</i>	5 heart transplantation <b>8 bone and tissue transplantation</b>
		8 kidney transplantation 2 heart transplantation 3 bone and tissue transplantation <b>1 liver transplantation</b>
2022	<i>Cadaveric organ donation:</i>	6 kidney transplantation 2 heart transplantation 6 bone and tissue transplantation 2 liver transplantation
2023	<i>Cadaveric organ donation:</i>	

## Discussion

*NO DONOR-NO TRANSPLANTATION.* This paradigm is well known by almost every individual, but unfortunately facts and figures show that many years since the first organ and tissue transplantations have been made, there is still a huge disparity between the number of donated organs and the number of patients on organ transplant waiting list. The results presented by the Council of Europe showed that there were more than 1,000 transplantation centers in Europe, and in 2022 a total of 21,000 donors (living and deceased) were registered, and 39,000 transplantations were performed. In the same year, 48,000 new patients were registered on the transplant waiting lists, which means registration of 6 new patients every hour. It is a great tragedy of mankind that 7,000 patients die annually while waiting for organ transplants. Thus, by certain statistics, 3 people die each day in Germany, and in Poland 10% of patients on transplant waiting list annually die due to the lack of a sufficient number of donors<sup>[6]</sup>. The situation is similar in England, where 1,000 out of 6,500 patients, who were waiting on the organ transplant list in 2018, died within one year because they did not receive an organ<sup>[7]</sup>.

Unfortunately, recently the small percentage of organ donors is a trend that applies not only to underdeveloped countries, but also to some highly developed countries such as those in Western Europe.

The rate of deceased organ donation is not uniform across European countries and shows variations from 49.39 donors per million population in Spain as a country with the largest number of donors, to 30.9 in Slovenia, 29 in Croatia, 11.58 in Germany and 3.28 in Bulgaria. Also, organ donation and transplantation organizational structures in all countries are not uniform and standardized<sup>[8,9]</sup>.

Consulting the literature, if Germany is taken into consideration as a country with a very highly developed health system, it can still be underscored that there is no standardization across hospitals in terms of the procedures for discovering potential donors. The situation is even more complex since the evaluation of organ donation is exclusively organized and coordinated by the intensive care consultants, which is an additional burden for the already overloaded clinical personnel. Consequently, it has a negative impact on the process of identifying all potential organ donors. Also, the emotions of the healthcare professionals from the intensive care units have not to be neglected. They previously fought a battle for the life of the patient who is now being asked to be an organ donor. In the study by Exley *et al.*, a total of 1,650 physicians were surveyed and majority of them were reluctant to approach the grieving families. In a situation where their patient was diagnosed with brain death, only 17% communicated with the family, 19% ensured someone else did the job instead, and 17% did nothing<sup>[10]</sup>. In Germany, unfortunately, support is rarely requested from transplant coordinators, and the absence of such a professional consultant-transplant coordinator who has responsibility, experience, skills and training in the transplantation process again has a negative impact on identifying potential organ donors. All this leads to a decline in discovering potential organ donors and their insufficient reporting in the national transplant coordination boards<sup>[3]</sup>.

In Spain, there is a pyramidal system of organization on three levels, and at the top stands the National Transplantation Organization responsible for analyzing national activities with regard to organ donation and transplantation, building a general national strategy, collaborating with relevant affected parties and implementing relevant regulations and guidelines. It also coordinates transplant logistic procedures and provides 24-hour support to healthcare professionals. Moreover, Spain has 17 regional centers that support strategic reform processes and coordinate organ transport<sup>[11]</sup>. There are also “units for donor transplant coordination” in Spanish hospitals on local level. These units employ medical professionals trained and accredited for the purpose of training other members of the clinical staff about organ donation, to identify potential donors, to evaluate donors, to communicate with relatives and to coordinate the overall clinical donation process<sup>[12]</sup>.

This model has served as a framework for several other successful programs for organ donation and transplantation in other countries such as Great Britain, Portugal and Italy.

In our country, there is a National Board of Transplant Coordination at the Ministry of Health, and currently there are five hospital coordinators in the donor hospitals who are trained and certified with the task of finding potential donors, confirming brain death, communicating with families, organizing the organ donation process and maintaining the necessary documentation up to date.

The most reliable reason for this trend in reducing the number of organ donors is considered the poor diagnostics and identification of patients with brain death in hospitals as well as their reporting to the national transplant coordination boards, and all of this depend on medical, organizational and national political factors. However, the influence of the general opinion and acceptance of transplantation by the population within one country should not be neglected as a significant issue for successful development of organ donation and transplantation<sup>[13]</sup>.

According to Wakefield, younger and educated people with higher socioeconomic status, with knowledge about transplantation, and with altruistic beliefs are more likely to become organ donors than other people<sup>[14]</sup>. Also, among certain religious communities, such as Muslim ones, deceased organ donation is less common due to certain religious beliefs. This might explain to some extent the small number of donors from a deceased donor in certain countries such as Siria, Turkey or Saudi Arabia<sup>[15]</sup>. In general, people are afraid of things they do not know in detail. Families often do not know the last wishes of their relative regarding deceased organ donation. People avoid to talk about death and organ donation. Poor media campaigns lead to a rise in denial rates.

In Spain, which is the country with the largest number of organ donors, the public has strong trust in the transplantation system<sup>[10]</sup>. Conversely, the study by Fabian Becker showed that in Germany there is mistrust in the transplant system attributed to organ allocation scandal that happened in 2013 referring to a series of manipulations of data from the organ transplant waiting list in some centers for transplantation. In addition, organ donation is rarely discussed among members of a German family, and hence, they do not know whether a family brain-dead member previously was or was not willing to be an organ donor. The situation in Spain is opposite because family members often discuss about organ donation and they actually practice it. Of course, it has to be mentioned that the role of the country is of pivotal importance in these situations. It has to lead open campaigns for raising general public awareness in terms of organ donation and it has to prevent scandals such as those in Germany<sup>[11]</sup>.

In our study, we were able to ascertain that people in our country are generally informed about transplantation and organ donation. Also, most of them have a positive attitude, supporting cadaveric transplantation as a method of treatment and chance to extend and save lives. However, certain dilemmas still exist. On one hand, humanity, willingness to save someone's life, hope and consolation that a part of a loved one will continue to live are the greatest support and motive among people, and on the other hand, fear, risk, distrust, but above all lack of information are issues people refuse to accept the idea of organ donation. Therefore, the influence of family members is of particular importance in increasing the organ donation rate.

According to some research, there are several factors that have a significant influence on the decisions of family members to donate the organs of their loved brain-dead relatives, including:

- Willingness of family members to help other people;
- Respecting the wish of the donor to donate his organs;
- Good communication of medical staff with family members, where empathy and respect are shown along with giving detailed information regarding all aspects of brain death and the need of organ donation;
- Ethnicity, religious beliefs, sex, socioeconomic status of family members, and legal regulations;
- Knowledge about the organ and tissue donation process<sup>[16]</sup>.

In our country, after many years of performing kidney transplantation from a living donor, rules, regulations, transplantation protocols from deceased brain-dead donors have been prepared. Medical and legal regulations define brain death as an irreversible loss of the functions of the cerebrum, cerebellum and brainstem, which is confirmed by performing two consecutive clinical examinations by two independent medical experts in the relevant field (of medicine), as well as one paraclinical or instrumental examination (selective cerebral angiography and MSCT angiography; transcranial Doppler sonography; radionuclide scintigraphy, somatosensory evoked potentials; electroencephalography)<sup>[17]</sup>.

In the Republic of North Macedonia, in line with the Law on Taking and Transplantation of Parts of a Human Body for Medical Treatment, parts of a deceased body can be taken for the

purpose of transplantation if the deceased person, while still alive, provided a written consent certified by a notary that he/she did not object to that matter. As an exception of this paragraph, parts of a deceased body intended for transplantation may not be taken if the two living parents, that is, caregivers, spouse, adoptive parents or a majority of adult relatives give a written statement no later than six hours after brain death that they do not agree parts of the deceased body to be taken for transplantation<sup>[17]</sup>. Most European countries use an opt-out (presumed consent) legal framework and donor rates are higher than in countries with donor cards. In recent years, several countries such as Greece, Ireland, Norway, Switzerland and the United Kingdom have changed their regulation from opting in to opting out. The rationale behind this shift is that opt-out system could increase organ procurement rates as the default assumption is that the individual is willing to donate. This eliminates the need for people to actively register as organ donors, which can be a major barrier for some people. Spain currently has the highest organ donation rate in the world and uses opt-out consent.

Based on the obtained data, it can be concluded that cadaveric transplantation in our country is increasing. A peak was reached in 2021/2022 with 3.89 donations per million population. Until today, transplantations of kidney, heart, bone and ligament tissues and liver have been made (Table 1). Kidney transplantation from a deceased donor was first performed in 2013, but the program has been improved and in 2020 the first heart transplantation was performed; in 2021 the first bone and bone marrow transplantations were realized; and in 2022 the first liver transplantation. By this, our country entered the group of more developed countries where this type of surgical interventions is being performed. All of this is primarily due to medical advances, engagement and commitment of the healthcare professionals, as well as willingness and awareness of people to donate organs because everything starts and ends with people – they are the principal driving force in the development and rise of the transplantation process. In the overall development, the support from the country in shaping the public opinion is certainly indispensable in order to overcome cultural and religious barriers with regard to organ donations. It is also very important to strengthen the trust in the system that would ensure that donated organs are given to the right person without any abuses and scandals<sup>[17,18]</sup>.

## Conclusion

Our study conducted by completing a survey questionnaire and analyzing the official data on realized transplantations in the Republic of North Macedonia has shown that there is sufficient amount of information and positive attitude toward organ donation and transplantation in our country, as well as significant development in transplantation from a deceased donor. Of course, much is still to be done to educate people about the transplantation process and to raise the general awareness, peoples' willingness, perseverance and desire to help, save and extend someone's life.

The motto “To donate an organ – to give a life” is the highest act of humanity that should unite all people in our country and globally.

## References

1. Oli AN, Babajide Rowaiye A, Adejumo SA, Anazodo FI, Ahmad R, Sinha S, *et al.* Classic and Current Opinions in Human Organ and Tissue Transplantation. Cureus. 2022 Nov 1; 14(11): e30982. doi: 10.7759/cureus.30982.
2. Dominguez JM, Procaccio F, Galiardo JV, *et al.* Diagnosis of death by neurological criteria (Brain Death). Transplant coordination manual, TPM-DTI Foundation.2014.p 155-80.

3. Schulte K, Borzikowsky C, Rahmel A, Kolibay F, Polze N, *et al.* Decline in organ donation in Germany—a nationwide secondary analysis of all inpatient cases. *Dtsch Arztebl Int* 2018; 115: 463–468. doi: 10.3238/ärztebl.2018.0463
4. Becker F, Roberts KJ, Nadal M, Zink M, Stiegler P, Pemberger S, *et al.* Optimizing Organ Donation: Expert Opinion from Austria, Germany, Spain and the U.K. *Ann Transplant* 2020; e921727-1–e921727-16. doi: 10.12659/AOT.921727.
5. <https://www.irodat.org>
6. Kosieradzki M, Jakubowska-Winecka A, Felksiak M, Kawalec I, Zawilinska E, Danielewicz R, *et al.* Attitude of healthcare professionals: a major limiting factor in organ donation from brain-dead donors. *J Transplant* 2014; 2014: 2969126. doi: 10.1155/2014/296912.
7. Hulme W, Allen J, Manara AR, Murphy PG, Gardiner D, Poppitt E. Factors influencing the family consent rate for organ donation in the UK. *Associations of anaesthetists* 2016; 71(9):1053-63. doi: 10.1111/anae.13535.
8. <https://www.statista.com>
9. Domínguez-Gil B, Matesanz Matesanz R, editor. International figures on donation and transplantation. Council of Europe Newsletter Transplant. 2017. p. 22. <http://www.transplant-observatory.org/download/newsletter-2017>
10. Exley MH, Serbin MF, R M Goldstein RM. Approaching families for organ donation: physicians are willing. *Tex Med*. 1992 Sep;88(9):58-61
11. Pengel LHM, Mazarello-Paes V, Paredes-Zapata D, Oniscu GC, Gouveia Gaglianone C, Zhu L, et all. The experiences of clinical staff approaching families for organ donation consent: A systematic review and thematic synthesis of qualitative studies. *Transplantation Reviews*. Volume 39, Issue 3, July 2025, 100935
12. Matesanz R, Dominguez-Gil B. The Spanish Model of Organ Donation and Transplantation. *Organ Transplantation in Times of Donor Shortage*. 2015. p. 302-312 doi:10.1007/978-3-319-16441-0\_26
13. Sinner B, Schweiger S. The role of the the transplant coordinator. *Anaesthetist*. 2021 Nov;70(11):911-921. doi: 10.1007/s00101-021-01023-5. Epub 2021 Sep 3. PMID: 34477902
14. Wakefield C.E, Watts K.J, Homewood J, Meiser B, Siminoff L.A. Attitudes toward organ donation and donor behavior: a review of the international literature. *Prog Transplant*. 2010 Dec; 20(4):380-91.1
15. Singh R, Agarwal T.M, Al-Thani H, Al Maslamani Y, El-Menyar A. Validation of a Survey Questionnaire on Organ Donation: An Arabic World Scenario. *J Transplant*. 2018; 2018: 9309486
16. C. Miller, R. Breakwell. What factors influence a family's decision to agree to organ donation? A critical literature review. *London J Prim Care (Abingdon)*. 2018 Apr 23;10(4):103–107. doi: 10.1080/17571472.2018.1459226
17. <https://zdravstvo.gov.mk/wp-content/uploads/2018/01/> Law on the removal and transplantation of parts of the human body for the purpose of treatment.
18. V. Carola, C. Morale, C. Vincenzo, V. Cecchi, L. Errico, G. Nicolais. Organ donation: psychosocial factors of the decision-making process. *Front Psychol*. 2023 May 26;14:1111328. doi: 10.3389/fpsyg.2023.1111328