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## **Study of social awareness regarding body donations for scientific and educational purposes**

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## ORIGINAL ARTICLE

### **Study of social awareness regarding body donations for scientific and educational purposes**

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## **ABSTRACT**

**Background:** The basis of teaching anatomy is the understanding of the body's structures using human cadavers. Body donation should be a fully conscious and voluntary act. There is a growing demand for human cadavers in medical universities. To meet these demands, it is necessary to understand the societal awareness regarding body donation.

**Materials and methods:** The study utilized a proprietary single-choice questionnaire while maintaining the anonymity of the respondents. The study included 1004 individuals, comprising 700 women and 304 men. The analysis employed the Mann-Whitney test, Pearson's chi-squared test with calculation of the Cramer's V coefficient.

**Results:** Among the respondents, 56.37% consider donating their bodies for scientific and educational purposes. Among the concerns associated with donation, fear of lack of proper respect for the remains by students (18.23%), family opposition (16.24%), and religious reasons (9.16%) were highlighted. Non-religious individuals are more inclined to donate their bodies for scientific and educational purposes than religious individuals ( $p < 0.001$ ). Residents of rural areas and small towns are less likely to consider donating their bodies for scientific and educational purposes than residents of large cities ( $p = 0.002$ ). As many as

85.76% of respondents believe that human remains are essential for effective anatomy education.

**Conclusions:** Increasing public awareness of cadaver donation may contribute to increasing the effectiveness of anatomy teaching at medical universities.

**Keywords:** donation, body donation, cadavers, anatomy

## INTRODUCTION

Anatomy (from Greek *anatemnein* — to cut open) is a science of the structure of the body. The first dissections of cadavers aimed at teaching anatomy to future physicians took place in Alexandria in the 3<sup>rd</sup> century BCE. [27]. The intensive development of this method of teaching anatomy in Europe occurred in the 18th and 19th centuries. In the 20<sup>th</sup> century, bodies of prisoners or homeless individuals were acquired for the purpose of teaching anatomy. The idea of conscious consent to donate one's body for the sake of science emerged in the 1970s [25].

The basis for teaching anatomy in medical schools is to understand the body's structures using human cadavers. Medical students encounter a dead human body for the first time in their first year of studies. This requires not only knowledge but also emotional maturity on the part of the student [6, 11, 14]. The educational value of donor bodies is invaluable and irreplaceable. Models, atlases, and other modern teaching aids can only supplement the learning of anatomy, not substitute it [11, 16, 29, 44]. Donation should be a fully conscious and voluntary act. It seems that it should not be associated with the motivation of third parties to gain potential financial benefits, although in some countries (such as the USA), such practices exist [16]. Shankaracharya stated that the body is meant for others, and death is not the end but the beginning (*org. Iddham sharirum paropakaram*) [44]. There is a need to increase awareness about societal attitudes towards body donation and to meet societal expectations. Various mass media outlets such as television, Internet, radio, as well as newspapers can be used for this purpose [42]. Donor bodies are increasingly being used for postgraduate medical education. Consequently, there is a continuous demand for obtaining cadavers by medical universities [30, 45]. Despite the increasing number of donations, it is insufficient to meet the dynamically growing demand [38]. Arguments in favor of the necessity of using human cadavers for anatomical education include: acquiring

practical skills, the superiority of learning efficiency in anatomy on cadavers, the opportunity to interact with the human body, which enables emotional development, and awareness of the multitude of anatomical variations [35]. The first conscious body donation program in Poland started in our institution — the Department and Division of Normal Anatomy of the Silesian Medical University in Katowice. This took place in 2003 and has been successful ever since. The patron of the program is Father Bocheński (a monk, professor, thinker, incorrigible optimist). It was Father Bocheński's wish that his body was donated for scientific purposes after his death, and it so happened. His body was given to the University of Freiburg, where he had been a professor for many years. It is worth quoting Father Bocheński's words regarding body donation: "A wise man — his body bequeaths to the anatomical institute and applies Spinoza's principle" — his wisdom is meditation on life, not death.

## **MATERIALS AND METHODS**

The study utilized a proprietary single-choice questionnaire constructed specifically for the needs of this research. The survey, consisting of 13 questions, included 1004 participants, comprising 700 females and 304 males. Participation in the study was voluntary. The characteristics of the participants (gender, place of residence, education, marital status, religion, socioeconomic status) are presented in Table 1.

Statistical analysis was performed using the R Studio program with the R programming language. Descriptive analysis of the survey questions was presented in table form, and created using Microsoft Excel software. The Mann-Whitney test was used for comparing quantitative variables, while the Pearson's Chi-square test with calculation of the Cramer's V coefficient was used for comparing qualitative variables.

## **RESULTS**

The study included 1004 participants, consisting of 700 females (69.7%) and 304 males (30.3%). The average age for females was 36 years, and for males — 37.25 years. The majority of the respondents (68%) identified as religious. Over half of the participants (55.88%) reported having higher education. Medium education was reported by 38.05% of the respondents, vocational education by 3.29%, primary education by 2.19%, and junior

high school education by 0.6%. In terms of marital status, the respondents were either single (41.43%) or married (42.73%).

A significant majority of the participants (85.36%) had previously heard about the possibility of voluntarily donating their bodies for educational and scientific purposes after death. Among the respondents, 56.37% were considering donating their bodies for scientific and educational purposes. Additionally, 78.09% considered the option of organ donation for transplantation after death. Concerns regarding donation included fear of disrespect towards the cadavers by students (18.23%), family opposition (16.24%), and religious reasons (9.16%).

It is worth noting that 85.76% of the respondents believed that human cadavers are essential for effective teaching of anatomy. 67.53% believed that students of other medical disciplines besides medicine (e.g., nursing, midwifery, physiotherapy) should also learn anatomy using human cadavers.

The majority (61.25%) believed that the immediate family of the deceased should not receive financial compensation for body donation. Similarly, a significant majority of the respondents believed that after scientific and educational use, the remains of the donor should be returned to the family for funeral ceremonies (82.57%), rather than being subjected to a funeral ceremony organized by the university to which the donor's body was entrusted (17.43%).

It is noteworthy that 89.84% of the respondents believed that increased societal awareness about body donation would reduce concerns and increase the number of people willing to donate their bodies for scientific purposes. All questions and respondents' answers are presented in Table 2.

Furthermore, it is worth mentioning that non-religious individuals are more inclined to donate their bodies for scientific and educational purposes than religious individuals ( $p < 0.001$ , Table 3). Additionally, statistically significant differences were observed in the consideration of body donation between residents of rural areas and small towns compared to residents of large cities ( $p = 0.002$ , Table 4). However, no correlation was found between marital status (single vs. married) and the willingness to donate one's body for scientific and educational purposes ( $p = 0.112$ , Table 5). Similarly, there was no significant difference between genders in the willingness to donate bodies for science and education ( $p = 0.074$ , Table 6). Moreover, there was no statistically significant difference between individuals with

higher education and those without higher education in terms of willingness to donate their bodies for scientific and educational purposes ( $p = 0.723$ , Table 7). It is also noteworthy that respondents expecting financial compensation for donation were on average older than those who did not expect compensation ( $p = 0.015$ , Table 8).

## **DISCUSSION**

The human body is a gift of extraordinary value for effective anatomy learning. In the study by Bajor et al., the average age at the time of deciding to donate one's body for science was 62.55 years, with no statistical differences between genders [10].

A significant portion of the respondents (56.37%) consider donating their bodies for scientific and educational purposes, but it's worth noting that only 30.28% of the respondents have no concerns about donation. Similar results, but on a smaller sample size, were shown by Boulware et al., where 49% of individuals considered body donation [14]. In the study by Oktem H. et al., the willingness to donate bodies was declared by 25.5% [39].

There are many studies in the available scientific literature presenting the attitudes of students and/or anatomists towards body donation programs. However, there are few studies describing the general public's awareness on this topic. This is probably due to the easier conduct of studies on students than in the general population. However, it seems that research on the general population is crucial for understanding and subsequently increasing public awareness about donation, thereby increasing the number of bodies acquired for scientific purposes.

Abbasi Asl J. et al. conducted a study on a group of 331 students. Among those considering body donation programs, 60.7% expressed willingness to donate their bodies for educational and scientific purposes [1]. Galic BS et al., in their study among students, obtained a much lower result — 19.51%. It also indicated that these students would support body donation by a stranger (51.26%), but would not be as willing to support family members in this act (21.67%) [24]. Another study indicated the following values: donation of one's own body — 40.5%, support for body donation by a stranger — 83.8%, support for a family member in this regard — 43.2% [40]. Conversely, only 15% of anatomists would support a family member's body donation, while 2% would discourage such a decision [13].

The willingness of medical students to donate their bodies in other studies was as follows: 6% (n = 100) [43], 4.1% (n = 707) [22], 22.2% (n = 72) [37], 63.5% (n = 490) [41], 16.67% (n = 90) [12], 44.75% [47]. Among anatomists, body donation was considered in various studies: 52.4% (n = 145) [6], 25.9% (n = 54) [13], 15.7% (n = 83) [45], 61.3% (n = 57) [41], 34.18% (n = 79) [6]. The willingness to donate one's body significantly increases with years of teaching experience [6].

Our study showed that residents of rural areas and small towns are less likely to consider donating their bodies for scientific and educational purposes than residents of large cities. This is consistent with the study by Bajor G. et al., which analyzed donation records. The majority of donors listed their place of residence as a city with fewer than 100,000 inhabitants (41.39%), followed by a city with more than 100,000 inhabitants (32.38%), and then a village (13.11%). The smallest percentage of donors reported living in small towns with fewer than 10,000 inhabitants (5.33%) and large cities with more than 500,000 inhabitants (7.79%). Additionally, in small towns, men were more likely than women to decide on donation [30].

The results of our study indicate that non-religious individuals are more willing to donate their bodies than those who identify as religious. At the same time, 9.16% of respondents cited religious reasons as a concern about donation. Similar results were obtained by Ciliberti et al. In their study conducted on a group of 472 students, they found that atheists and agnostics expressed six times greater approval for body donation than individuals identifying as Catholics [18]. This correlation was also demonstrated by Alexander et al. [3]. Jenkin et al. also showed that religious practitioners were almost half as likely (25.3%) as their non-practicing peers (48%) to cite religious reasons as a disincentive for body donation [33].

A study conducted among students at South African University by De Gama et al. found that in 28% of cases, religious beliefs accounted for reluctance to donate bodies. At the same time, 50% of respondents believed that their religion forbids such practices [21]. Kostorizos A. et al. showed that in the older age group, 20.7% of concerns about body donation were due to religious reasons. In the blood donor group, this percentage was 6.2% [36]. Anatomy teachers who identified as non-religious were more willing to donate their organs and bodies than religious individuals [6].

The study showed that individuals with higher education are not more willing to donate their bodies for scientific and educational purposes than those without higher education. Similarly, Oktem H. et al. found no correlation between the level of education and the willingness to become a body donor [39].

Among the concerns in our study, the fear of students not showing proper respect for cadavers during dissections predominated (18.23%). The belief that medical students would not respect the cadavers during dissections was noted at the level of 32.4% by Oktem et al. [39]. This indicates an aspect that requires increased awareness among individuals interested in body donation.

Ghosh et al. also emphasize the importance of expressing proper respect for body donors. Scientists highlight the immense significance of acknowledging and appreciating the contribution of body donors to anatomical research. Such practice should be promoted both by scientific journals and by scientists themselves [28].

It has been shown that exposure to the dissecting room and participation in cadaver dissections leads to reluctance to donate one's body for science and education. The reason for this reluctance was the negative perception of the dissecting room due to poor and disrespectful treatment of human cadavers [4]. Cahill KC et al. also showed that the willingness to donate one's body significantly decreased after participating in cadaver dissections (23% of respondents were against donation before starting dissections, and this percentage increased to 40% after dissections) [15]. Similar conclusions were drawn by Bahsi et al., who found that the percentage of students considering donating their bodies significantly decreased after the fifth class using cadavers [9]. Quiroga-Garza A et al. showed different results, as participation in cadaver dissections increased the willingness of participants, while the reluctance to such practices decreased by half [41].

Studying medicine often emphasizes medical knowledge while marginalizing humanistic aspects. However, some universities have addressed this issue by implementing special programs. Coulehan JL et al. devised a program to tackle this problem by having students write essays about their initial feelings after direct contact with human cadavers [19]. Similarly, Chu SY et al. developed an anatomy teaching program that involved interactions between students and donor families. Meetings were organized before and after the anatomy course, and students actively participated in a funeral ceremony, during which each student placed a letter beside the donor's coffin. Currently, this program has been fully or partially



adopted by all medical schools in Taiwan [17]. Halliday NL et al. describe the beneficial effect of a similar program where a communal meal for students and donor families was organized before starting the anatomy course [31]. Positive effects were observed in shaping students' attitudes through participation in the funeral ceremony [17, 20, 23]. Hasselblatt F et al. also draw attention to a change in the approach to anatomy teaching, showing that both students and donors support the “personalization” of bodies (78.1% of students and 92.5% of donors) by revealing part of the medical history. However, universities typically do not support this idea (78%) [32]. Bringing students closer to the donors and getting to know their families could have a positive impact on increasing their respect for bodies in the dissecting room. Anatomists should prepare students psychologically and emotionally before entering the dissection room, so they can actively participate in cadaver dissection, expanding their anatomical knowledge and future surgical skills [2].

In our study, 85.76% of respondents stated that human cadavers are essential for effective anatomy learning by medical students. Moreover, this is corroborated by studies conducted among students. Galic BS et al. obtained a very similar result in their study among students: 87.38% [24]. Similarly, Asante EA et al. showed that 77.6% of medical students agree that they would feel disadvantaged if they could not participate in cadaver dissections during anatomy learning [7]. Other studies also demonstrate the significant value of working with cadavers [8, 12, 46]. Medical students clearly indicate the necessity of human cadavers in teaching anatomy. At the same time, they emphasize that cadaver dissections should be supplemented with other educational tools [34].

Surgeons point out that working with cadavers and participating in cadaver dissections are the best sources of learning anatomy [46]. Among students, opinions regarding the effectiveness of learning anatomy vary widely. Sometimes, students do not prioritize cadaver dissections over other methods of learning anatomy, but at the same time, they highlight many positive aspects of working with cadavers [7]. These opinions, however, are divided. A study by Azer SA et al. showed differences in how students in the first and second year value working with cadavers. First-year students preferred learning during cadaver dissections (dissections 44%, textbooks 23%), while second-year students most often regarded textbooks as the most valuable source of knowledge (textbooks 38%, dissections 18%) [8]. Sometimes, modern 3D models are the most preferred by students [48]. Therefore, it seems that the most effective way of learning anatomy is to use multiple different methods, with particular value placed on cadaver dissections. It is worth emphasizing that in our study,

67.53% of respondents believe that students in other medical fields besides medicine (e.g., nursing, obstetrics, physiotherapy) should also learn anatomy using human cadavers. This confirms that acquiring a sufficiently large number of bodies for teaching purposes is extremely important.

In our study, 88.75% of respondents believe that donating cadavers should not be associated with financial compensation for the donor's family. However, opinions on this matter are highly divided. In a study by Abbasi Asl J et al. conducted among Iranian students, 59.5% believed that such compensation would be justified, while 40.5% disagreed [1]. In the study by Oktem H. et al., 26.6% were in favor of financial compensation, 37.2% were against it, and 36.2% did not express their opinion on this issue. Moreover, 53% of respondents expressed concern about an increase in crime rates if financial compensation were introduced for the donor's family [39].

Posthumous organ donation for transplantation was considered by 78.09% of respondents in our study, which is more than those considering body donation for educational purposes (43.63%). This trend is also observed in other studies [12, 39, 41]. Gerbi et al. showed that among healthcare workers, 39.5% of individuals declare willingness to donate their organs for transplantation after death [26].

## **CONCLUSIONS**

The statement that the human body is the best anatomical atlas remains relevant. Increasing public awareness of cadaver donation may contribute to increasing the effectiveness of anatomy teaching in medical universities.

### **Article information and declarations**

#### **Author contributions**

Radosław Karaś: conception, design, execution, interpretation of the data being published.

Tomasz Lepich: design, execution, interpretation of the data being published.

Krzysztof Starszak: design, execution, interpretation of the data being published.

Grzegorz Bajor: conception, scientific supervision.

**Conflict of interest:** None declared.

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**Table 1.** Characteristics of the respondents (gender, place of residence, education, marital status, faith, socioeconomic situation)

Sex	Woman	700	69.72%
	Man	304	30.28%
Place of residence	Village	223	22.21%
	Town with fewer than 50,000 inhabitants	180	17.93%
	City with 50,000–250,000 inhabitants	214	21.31%
	City with over 250,000 inhabitants	387	38.55%
Education	Primary education	22	2.19%
	Middle school	6	0.60%
	Secondary education	382	38.05%
	Vocational education	33	3.29%
	Higher education	561	55.88
Marital status	Married	429	42.73%
	Single	416	41.43%
	Other	121	12.05%
	Widow/widower	38	3.78%
Are you a believer?	No	317	31.57%



	Yes	687	68.43%
How do you assess your socio-economic situation?	Very good	179	17.83%
	Rather good	475	47.31%
	On average	323	32.17%
	Rather bad	22	2.19%
	Very bad	5	0.50%

**Table 2.** Results of answers to questions posed in the questionnaire

Question		n	%
Have you heard before about the possibility of voluntarily donating your body after death for the purpose of education and research?	No	147	14.64
	Yes	857	85.36
Are you considering the possibility of donating your body for scientific purposes after death?	No	566	56.37
	Yes	438	43.63
What concerns related to body donation do you have?	Other	93	9.26
	Fear of students not properly respecting corpses	183	18.23
	I have no worries	304	30.28
	Family opposition	163	16.24
	Psychological considerations	169	16.83
	Religious reasons	92	9.16
Do you believe that human cadavers are essential for effective anatomy education for medical students?	No	143	14.24
	Yes	861	85.76
Do you think that students of other medical fields besides medicine (e.g., nursing, midwifery, physiotherapy) should also learn anatomy using human cadavers?	No	326	32.47
	Yes	678	67.53
Do you think that the immediate family of the deceased should receive financial compensation for body donation?	No	615	61.25
	Yes	389	38.75

Do you know how long bodies are used for educational and scientific purposes?	No	890	88.65
	Yes	114	11.35
Who, in your opinion, should bear the total costs of the burial of the donor?	The university receiving the donor's body	480	47.81
	The appropriate social insurance institution for the deceased donor	524	52.19
Should the ashes of the donor be...	The funeral ceremony should be conducted by the institution to which the donor's body was entrusted.	175	17.43
	Be handed over to the family for conducting the funeral ceremony	829	82.57
Do you think that public knowledge about body donation is adequate?	No	891	88.75
	Yes	113	11.25
Do you think that greater public awareness about body donation would reduce concerns and, at the same time, increase the number of people willing to donate their bodies for scientific purposes?	No	102	10.16
	Yes	902	89.84
Do you think that knowledge about organ donation for transplantation purposes in society is greater than knowledge about body donation for scientific purposes?	No	151	15.04
	Yes	853	84.96
Are you considering the possibility of donating your organs for transplantation purposes after death?	No	220	21.91
	Yes	784	78.09

**Table 3.** The relationship between the readiness to donate one's body for science after death and one's faith

		Do you consider the possibility of donating your body to science after death?				p	V cramera
Are you a believer?		Yes		No			
	No	126	22.30%	191	43.60%	< 0.001	0.2277
	Yes	440	77.70%	247	56.40%		
Totally	566	100.00%	438	100.00%			

**Table 4.** The relationship between willingness to donate one's body to science after death and place of residence

		Do you consider the possibility of donating your body to science after death?				p	V cramera
Place of residence: residents of small agglomerations = 0		Yes		No			
	0	251	44.30%	152	34.70%	0.002	0.09756
	1	315	55.70%	286	65.30%		
Totally	566	100.00%	438	100.00%			

**Table 5.** The relationship between willingness to donate one's body to science after death and marital status

		Do you consider the possibility of donating your body to science after death?				p	V cramera
Marital status: single (single/widow) = 0		Yes		No			
	0	243	42.90%	211	48.20%	0.112	0.05222
	1	323	57.10%	227	51.80%		
Totally	566	100.00%	438	100.00%			

**Table 6.** The relationship between willingness to donate one's body to science after death and gender

		Do you consider the possibility of donating your body to science after death?					
		Yes		No		p	V cramer
Sex	Woman	408	72.10%	292	66.70%	0,074	0.05848
	Man	158	27.90%	146	33.30%		
Totality		566	100.00%	438	100.00%		

**Table 7.** The relationship between willingness to donate one's body to science after death and education

		Do you consider the possibility of donating your body to science after death?					
		Yes		No		p	V cramer
Education: higher = 1	0	253	44.70%	190	43.40%	0,723	0.01319
	1	313	55.30%	248	56.60%		
Totality		566	100.00%	438	100.00%		

**Table 8.** The relationship between expectations regarding compensation for body donation and age

		Do you believe that the closest family of the deceased should receive financial compensation for body donation?				
		Yes		No		
		median	Q1/Q3	median	Q1/Q3	p
Age (median [IQR])	(median [IQR])	37	24.00/ 49.00	29	22.00/ 42.50	0.015