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Original paper

A survey of medical students' opinions on the donation of cadavers for scientific and teaching purposes

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ABSTRACT

Introduction: This study aims to assess medical students' awareness and opinions regarding body donation for anatomy education and research, including concerns about donation and personal considerations for donating one's body.

Material and methods: The anonymous survey, comprising 20 questions, was completed by 528 medical students from across Poland (366 females and 162 males). Participation in the study was voluntary. The Shapiro–Wilk test was used to determine statistical distribution in the analyzed respondents. The chi-square test was used to compare demographic groups. Statistical significance was set at $p < 0.05$.

Results: 35.4% of respondents consider donating their bodies for scientific and educational purposes. More atheists wanted to donate the organs after death than Catholics ($p = 0.03$). The year of study and place of residence do not influence the willingness to donate the body for scientific purposes ($p = 0.55$ and $p = 0.23$), but females were more willing to donate the organs after death than males ($p = 0.002$). The willingness to donate body before medical studies affected the willingness to donate body during medical studies ($p < 0.001$). The lack of respect from students towards cadavers is the main concern regarding body donation (42.4%). 93.9% respondents think that it is not possible to teach the anatomy without the access to a human body.

Conclusions: Participation in dissection room classes increases students' willingness to donate their own bodies. The primary barrier remains the fear of disrespect toward the cadaver. Since learning about the donor's life story fosters respect, we recommend transitioning from anonymous approach to cadavers toward personalizing donor information and student participation in memorial ceremonies.

KEYWORDS

education, anatomy, cadaver, donation, body donation

INTRODUCTION

Human bodies have played a key role in teaching anatomy since the 3rd century B.C. For years, an indispensable part of learning this subject has been the autopsy. Andreas Vesalius from Brussels (1514–1564), considered the founder of modern anatomy, demonstrated numerous errors in Galen's works through his examination of human cadavers. He introduced cadaver dissection as the primary research method in human anatomy and corrected many misconceptions in this field [1].

Using the bodies of the deceased, it is possible to introduce students to clinical practice while providing knowledge of the human body's structure [2]. Since normal anatomy is a subject taught in

the first year of medical studies, students must demonstrate maturity and respect from the very beginning of their academic practice [3]. This is often related to their first contact with a human cadaver. Whether students starting their studies are mature enough may raise doubts among potential donors. In the era of very rapid development of technology and digitization in many areas, the use of human remains may seem to be an advanced undertaking, sometimes associated with a psychological burden for both the families of donors and students. The study of anatomy using human cadavers is becoming limited at many medical universities due to the insufficient number of cadavers compared to the growing number of students [4,5,6]. Moreover, the use of human cadavers for scientific purposes was difficult during the lockdown caused by the COVID-19 pandemic [5]. This pandemic has impacted medical education worldwide [7,8]. Medical universities could not accept bodies during the pandemic and also after the pandemic because there were suspicions that the body donor was a transmitter of COVID-19 [8]. The pandemic prompted reflection on the advantages and disadvantages of technology and innovation, leading to increased use of digital teaching resources [9,10]. This does not change the fact that may seem obvious to medical students – the human body is the best atlas of anatomy, and it is difficult to replace it with a plastic substitute in the learning process [3]. For this reason, in 2003, the Medical University of Silesia in Katowice was the first in Poland to establish the Conscious Corpse Donation Program, which continues to this day. The patron of this program is Father Professor Józef Bocheński – a world-famous logician, philosopher, theologian, and Sovietologist. After his death, in accordance with his last will, his remains were donated to the Institute of Anatomy at the University of Freiburg, where he had been a professor for many years.

The main aim of the study was to find out the awareness and opinions of medical students regarding the donation of cadavers for scientific and educational purposes and teaching anatomy. The specific goals included, among others: learning about concerns about donation, opinions on the effectiveness of various methods of learning anatomy, assessing the consideration of donating one's body for scientific and educational purposes, and possibly convincing friends or relatives to do so.

MATERIAL AND METHODS

The study used an original single-choice survey questionnaire, specifically designed for this research. The survey items were developed based on a review of relevant literature and expert consensus among the authors to ensure content validity. Data collection was conducted between January 15 and January 21, 2024. The recruitment procedure involved an online distribution strategy, in which the survey link was deliberately shared in social media groups dedicated to medical students at individual medical universities across Poland. The target population consisted of medical students from all over Poland. The inclusion criteria were: being at least 18 years of age and actively enrolled in a medical degree program (years 1–6) at a Polish medical university.

Exclusion criteria included incomplete survey responses and students enrolled in non-medical healthcare faculties (e.g., dentistry, nursing). In accordance with these criteria, the final analysis included 528 medical students (366 women and 162 men). Participation in the study was voluntary and anonymous.

Statistical analysis

The statistical analysis was carried out using the Statistica® software, version 13.3 (StatSoft, Tulsa, OK, USA, 2013). For the presentation of qualitative variables, absolute values and percentages were employed. Due to the sample size, the Shapiro–Wilk test was used to assess the normality of the data distribution. The quantitative variables were described using ranges, means, and standard deviations (SD) in variables with normal distribution according to the Shapiro–Wilk test results, or medians with interquartile ranges (IQR) in cases of variables with nonparametric distribution. Chi-square test and/or Fisher’s exact test with a qualitative variable was used in the between-groups comparison. The Student’s *t*-test or Mann–Whitney *U* test was used in between-groups comparison with quantitative variables with parametric and non-parametric distribution of the variables, respectively. A *p*-value < 0.05 was considered statistically significant.

The authors hereby confirm that every effort was made to comply with all local and international ethical guidelines and laws concerning the use of human cadaveric donors in anatomical research.

Code of approval from the respective Bioethical Commission: BNW/NWN/0052/KB109/24.

RESULTS

The study group consisted of 528 respondents: 366 (69.3%) female and 162 (30.7%) male. The median age was 21 years (IQR: 2; range: 18–36). Most respondents were in their first year of medical school (*n*=185; 35%). The village was indicated as the most common place of residence (*n*=135; 25.6%). Most of the respondents identified as Catholics (*n*=302; 57.2%) (Table I).

Table I. Responders’ general characteristics

| Characteristic | n (%) |
|---------------------------|-------------|
| Sex | |
| Female | 366 (69.3%) |
| Male | 162 (30.7%) |
| Age (years) | |
| 18–20 | 254 (48.1%) |
| > 20 | 274 (51.9%) |
| Year of University | |

| | |
|---|-------------|
| 1 | 185 (35%) |
| 2 | 154 (29.2%) |
| 3 | 113 (21.4%) |
| 4 | 61 (11.6%) |
| 5 | 9 (1.7%) |
| 6 | 6 (1.1%) |

Place of residence

| | |
|--|-------------|
| Village | 135 (25.6%) |
| City up to 50 000 residents | 105 (19.9%) |
| City between 50 000 and 100 000 residents | 61 (11.6%) |
| City between 100 000 and 250 000 residents | 95 (18%) |
| City above 250 000 residents | 132 (25%) |

Faith

| | |
|----------|-------------|
| Catholic | 302 (57.2%) |
| Atheist | 226 (42.8%) |

Of the participants, 166 (31.4%) wanted to donate their whole body before starting university, while 187 (35.4%) wanted to donate it after starting university. In contrast, 481 (91.1%) wanted to donate their organs, while 47 (8.9%) did not want to donate organs. There was no statistically significant difference in willingness to donate a body after death in terms of age, sex, year of the university, and place of residence. However, more atheists wanted to donate the body after death than Catholics (106 (46.9%) vs. 81 (26.8%); $p < 0.001$) (Table II).

Table II. The impact of demographic variables on the willingness to donate a body after death

| Demographic variable | Do you want to donate the body after death? | | <i>p</i> -value |
|--|---|-------------|-----------------|
| | Yes, n (%) | No, n (%) | |
| Age (years) | | | 0.7 |
| 18–20 | 92 (36.2%) | 162 (63.8%) | |
| > 20 | 95 (34.7%) | 179 (65.3%) | |
| Sex | | | 0.13 |
| Female | 122 (33.3%) | 244 (66.7%) | |
| Male | 65 (40.1%) | 97 (59.9%) | |
| Year of University | | | 0.55 |
| 1 | 75 (40.5%) | 110 (59.5%) | |
| 2 | 47 (30.5%) | 107 (69.5%) | |
| 3 | 20 (32.4%) | 73 (64.6%) | |
| 4 | 20 (32.8%) | 41 (67.2%) | |
| 5 | 3 (33.3%) | 6 (66.7%) | |
| 6 | 2 (33.3%) | 4 (66.7%) | |
| Place of residence | | | 0.23 |
| Village | 54 (40%) | 81 (60%) | |
| City up to 50 000 residents | 37 (35.2%) | 68 (64.8%) | |
| City between 50 000 and 100 000 residents | 14 (23%) | 47 (77%) | |
| City between 100 000 and 250 000 residents | 36 (37.9%) | 59 (62.1%) | |
| City above 250 000 residents | 46 (34.8%) | 86 (65.2%) | |
| Faith | | | < 0.001 |
| Catholic | 81 (26.8%) | 221 (73.2%) | |
| Atheist | 106 (46.9%) | 120 (53.1%) | |

Females were more willing to donate the organs after death than males (343(93.7%) vs 138(85.2%); $p=0.002$). More atheists wanted to donate the organs after death than Catholics (213 (94.3%) vs 268 (88.7%); $p=0.03$). There were no statistically significant differences in willingness to donate organs after death by age, year of university, or place of residence (Table III).

Table III. The impact of demographic variables on the willingness to donate the organs after death

| Demographic variable | Do you want to donate the organs after death? | | <i>p</i> -value |
|--|---|------------|-----------------|
| | Yes, n (%) | No, n (%) | |
| Age (years) | | | 0.1 |
| 18–20 | 226 (89%) | 28 (11%) | |
| > 20 | 255 (93.1%) | 19 (6.9%) | |
| Sex | | | 0.002 |
| Female | 343 (93.7%) | 23 (6.3%) | |
| Male | 138 (85.2%) | 24 (14.8%) | |
| Year of University | | | 0.1 |
| 1 | 161 (87%) | 24 (13%) | |
| 2 | 147 (95.5%) | 7 (4.5%) | |
| 3 | 102 (90.3%) | 11 (9.7%) | |
| 4 | 56 (91.8%) | 5 (8.2%) | |
| 5 | 9 (100%) | 0 (0%) | |
| 6 | 6 (100%) | 0 (0%) | |
| Place of residence | | | 0.5 |
| Village | 124 (91.9%) | 11 (8.1%) | |
| City up to 50 000 residents | 97 (92.4%) | 8 (7.6%) | |
| City between 50 000 and 100 000 residents | 54 (88.5%) | 7 (11.5%) | |
| City between 100 000 and 250 000 residents | 83 (87.4%) | 12 (12.6%) | |
| City above 250 000 residents | 123 (93.2%) | 9 (6.8%) | |
| Faith | | | 0.03 |
| Catholic | 268 (88.7%) | 34 (11.3%) | |
| Atheist | 213 (94.2%) | 13 (5.8%) | |

The willingness to donate a body before medical studies affected the willingness to donate a body during medical studies ($p<0.001$) (Table IV).

Table IV. The impact of willingness to donate a body before medical studies on the current willingness to donate a body

| Characteristic | Current YES, n (%) | Current NO, n (%) |
|------------------|--------------------|-------------------|
| Prior YES | 109 (58.3%) | 57 (16.7%) |
| Prior NO | 78 (41.7%) | 284 (83.3%) |

Most respondents ($n=224$; 42.4%) indicated that the fear of students disrespecting the body was their greatest concern regarding body donation. The responders' concerns are presented in Figure 1.

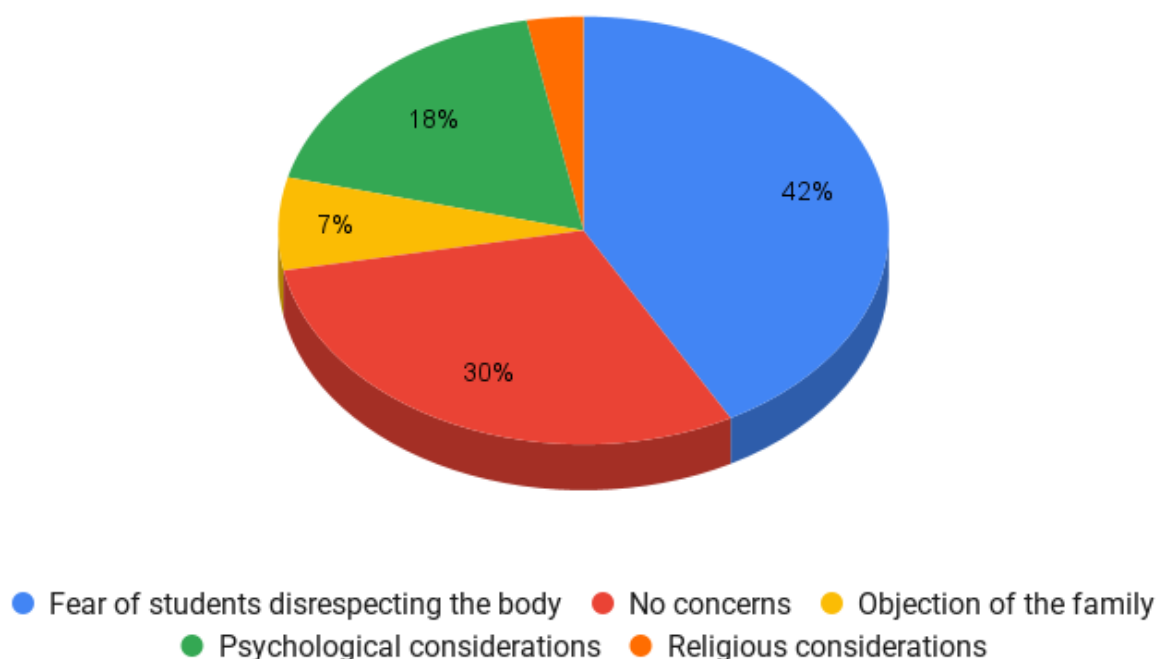


Fig. 1. Responders' concerns in donating their body

Only 1 (0.2%) participant did not use donated bodies during anatomical classes. Most responders ($n=496$; 94%) think that it is not possible to teach anatomy without access to a human body. Students' perception of anatomical classes is presented in Table V.

Table V. Students' perception of anatomy classes with donated bodies

| Question | Yes, n (%) | No, n (%) |
|--|-------------|-------------|
| During anatomy classes, did you use donated bodies? | 527 (99.8%) | 1 (0.2%) |
| Do you think it is possible to teach anatomy effectively and efficiently in a medical school without access to a human body? | 32 (6.1%) | 496 (93.9%) |
| Do you think that alternative teaching methods can replace the use of human bodies in anatomy teaching? | 58 (11.0%) | 470 (89.0%) |
| Do you think that the amount of preparations during anatomy classes was sufficient? | 198 (37.5%) | 330 (62.5%) |

| | | |
|---|-------------|-------------|
| Do you think the condition of the specimens in the anatomy class was good enough to be able to study them effectively? | 127 (24.1%) | 401 (75.9%) |
| Do you think that non-medical students (e.g. nursing, midwifery, physiotherapy) should also learn anatomy using human cadavers? | 453 (85.8%) | 75 (14.2%) |

Most responders ($n=418$; 79.2%) think that receiving more information about donors would increase students' respect for donor bodies. More than half of the participants ($n=303$, 57.4%) have encountered an act of disrespect for donors' bodies during an anatomy class. Participants' awareness of body donations is presented in Table VI.

Table VI. Awareness of body donations

| Question | Yes, n (%) | No, n (%) |
|---|-------------|-------------|
| Do you think that receiving more information about donors would increase respect from students for donor bodies? | 418 (79.2%) | 110 (20.8%) |
| Do you think that getting to know and talking to representatives of donor families (e.g., over a shared meal) before the start of the anatomy course would increase students' respect for donor bodies? | 347 (65.7%) | 181 (34.3%) |
| Would you be willing to encourage others to donate their bodies for scientific and educational purposes? | 249 (47.2%) | 279 (52.8%) |
| Would you be willing to encourage members of your family to donate their body for scientific and educational purposes? | 145 (27.5%) | 383 (72.5%) |
| Have you ever encountered an act of disrespect for donor bodies during an anatomy class? | 303 (57.4%) | 225 (42.6%) |
| Do you think that public awareness of donating bodies for scientific and educational purposes is sufficient? | 20 (3.8%) | 508 (96.2%) |
| Do you think that the family of the deceased should receive monetary compensation if the body is donated for scientific teaching? | 252 (47.7%) | 276 (52.3%) |

DISCUSSION

The human body is an incredible gift for medical students, lecturers, and future patients. The average age of deciding on donating a body for scientific purposes is 62.55 years ± 12.35 , with no statistical differences between the two genders (female 62.53 ± 13.96 years vs. male 62.56 ± 11.48 years, $p = 0.493$) [11]. Overall, 35.4% of our respondents consider donating their bodies for science and education purposes.

Regarding learning methods, 89% of the surveyed students argued that technological alternatives, like 3D atlases or software, cannot substitute for real cadavers. This perspective closely aligns with findings from Asante et al. [12], who reported that 77.6% of students felt they would be at a distinct disadvantage without traditional dissection. At the same time, our data highlights a clear problem in daily educational practice. In our study, a large number of respondents reported that both the quantity (62.5%) and the physical condition (75.9%) of available specimens were inadequate. Interestingly, a survey of anatomists' opinions showed a different picture: only 24.6% reported that their teaching unit lacked cadavers, and 62.8% reported having enough [13]. Such a gap between what students expect and what institutions provide points to a pressing need to improve body donation programs. This is especially important given that surgeons continue to warn against abandoning cadaver-based learning [14,15]. Students find human cadavers the most useful study aid in learning anatomy. In a study conducted by Azer and Eizenberg [15] in a group of first-year medical students, human corpses were indicated as the most helpful in learning (44%), followed by textbooks (23%) – however, among second-year students, textbooks were claimed as the most useful, with no difference in the opinion of 1st and 2nd year students on the usefulness of digital educational resources.

Our study shows that men are more willing to donate their bodies to science than women. Similar results were presented by Saha et al. [16]. On the other hand, Singh et al. [17] revealed that women are more likely to donate. When our respondents were asked about their willingness to donate, 31.4% (n = 166) reported having considered donation before starting their studies; this figure increased to 35.4% (n = 187) after they began their medical education, representing a 12.7% relative increase. These results fall within the wide range reported in the global literature (4.1%-63.5%) and represent a moderate level of willingness compared to international cohorts [2,16,17,18,19,20,21,22,23]. The most interesting finding, however, relates to the students' exposure to the anatomy lab. It seems that direct contact with cadavers helps remove initial fears, allowing students to recognize the value of the donor. Still, the scientific literature is divided here: some studies report similar increases [23], while others observed a drop in willingness after dissection classes [24,25,26]. What this likely means is that the specific environment of the dissection room – its ethical standards and the condition of the bodies – strongly dictates whether a student will want to donate their own body in the future. Furthermore, the inconsistency in gender across studies suggests that we are examining cultural rather than biological influences. Among the surveyed students who do not consider donating their body to science, the most common reason is the fear of a lack of proper respect for the body by students. A similar result was obtained by Ebeye et al. [18], whose work also proved that the most common reason for reluctance to donate was lack of respect for the corpse (30%). Other factors in their study included fear of the effect of donation (23%), religious beliefs (10%), and traditional beliefs (6%). Reluctance to donate one's body may

also result from a negative perception of the dissection room [26]. If students project their own worries about bodily integrity onto the donors and notice any lack of professionalism in the lab, they will naturally refuse to donate. In turn, in the study by Likus and Janiszewska [27], the main reasons for the lack of willingness were the psychological barrier and the family's apprehension. Because of this, medical universities need to rethink how they manage body donation.

Almost 80% of our respondents believed that knowing more about the donor would build respect for the donor. Therefore, we highly recommend shifting away from the traditional, anonymous approach. Implementing a "silent mentor" program in which students learn information about the body donor and stay in contact with their family would increase respect for bodies used in teaching [28].

Another action that significantly influenced the development of an ethical approach was a ceremony commemorating the dead. A study conducted in Porto Alegre showed that participation in celebrations dedicated to donors' memory contributes to dedication to the field of study, significantly affects the development of empathy, and will likely improve doctor-patient communication in the future [29]. El-Haddad et al. [30] also showed that the majority of students (76.3%) supported introducing ceremonies commemorating deceased donors. Even though many European institutions hesitate to personalize cadavers [31], the evidence is clear. When students learn about a donor's life and participate in commemoration ceremonies, their empathy and ethical awareness improve significantly.

Decisions about body donation are deeply rooted in cultural backgrounds. Our study shows that non-believers are more willing to donate their bodies to science than people who declare themselves believers, which aligns with several other papers [32,33,34,35,36,37]. Poland remains a country with a strong Catholic background where traditional burial is the cultural standard. At the same time, only 3% of our respondents indicated religious reasons as their main fear. This implies the barrier is not strictly about church dogma, but rather a general cultural discomfort with dissection. This cultural and emotional burden also explains how students promote the idea of donation.

Among the surveyed students, 47.2% were willing to encourage others (strangers) to donate their bodies. At the same time, only 27.5% were willing to encourage their relatives. Similar results were obtained by Srdić Galić et al. [19] (51.26% and 26.67%, respectively), and Perry and Ettarh [21]. Furthermore, a study by Bolt et al. [38] revealed that even among anatomists, support for a family member's decision to donate was low (15%). This dichotomy clearly highlights the gap between acknowledging the objective scientific value of cadavers and the emotional trauma of visualizing a loved one on the dissection table. The financial aspect of donation also evokes mixed feelings.

While analyzing the results of our survey, we learned that 47.7% of respondents believe the family of the deceased donor should receive financial compensation. However, most students believe that the act of donation is a voluntary act and should not involve payment. A different position was taken by Iranian medical students, who mentioned not only financial compensation but also media promotion among the factors encouraging donation. Crucially, both our respondents and the Iranian cohort agree that the primary factor capable of genuinely increasing donation rates is elevating the level of respect shown to cadavers [22].

Finally, respondents expressed a much greater willingness to donate their organs for transplantation (91.1%) than to donate their bodies for scientific purposes (35.4%). A study in Mexico showed that the number of students willing to donate organs changed only slightly (from 87% to 81%) after an anatomy course, maintaining a high acceptance rate compared to body donation [23]. A positive correlation was found between the willingness to donate organs and exposure to the autopsy room [26]. Society views organ donation as a heroic, immediate intervention that saves lives. Body donation, on the other hand, is often seen through the lens of prolonged dissection. To change this narrative, university campaigns should start framing whole-body donation not just as “providing material,” but as a crucial, life-saving act that trains the next generation of doctors.

CONCLUSIONS

Our findings highlight a frustrating contrast: students firmly believe that human cadavers are essential for effective teaching of anatomy, yet they consistently struggle to find well-preserved bodies in the lab. Interestingly, simply being in the dissection room changes their perspective. Once they begin their practical training, their initial fears tend to fade, and they become much more open to donating their own bodies. When students still hesitate, religion is rarely the main reason. Most of the time, they worry that their body will not be treated with enough respect by others in the lab. If we want to change this mindset and bridge the huge gap between organ and body donation, universities need to move past the tradition of anonymous dissection. Introducing “silent mentor” programs and holding memorial ceremonies are practical ways to build the empathy and ethical awareness needed to encourage more donations.

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