



## Article

# Organ Donation through the Eyes of Jordanian Medical Students

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**Abstract: Background:** Organ donation is a critical component in the field of transplantation medicine, offering lifesaving opportunities for patients with end-stage organ failure. This study investigated the knowledge, attitude, and practice (KAP) survey regarding organ donation among medical students in Jordan. **Methods:** A cross-sectional survey was conducted among medical students across six Jordanian universities. Using a convenience sampling method, participants were invited via email, social media, and professional networks to complete a structured online questionnaire. The survey captured data on demographics, knowledge about organ donation processes, attitudes toward organ donation, and self-reported practices. Statistical analyses explored associations between students' KAP and their demographic characteristics. **Results:** A total of 539 medical students participated in the study. Findings revealed moderate knowledge and generally positive attitudes toward organ donation, with significant variability influenced by demographic factors. Students from various universities demonstrated different levels of knowledge and attitudes. Notably, religious and cultural beliefs significantly affected students' attitudes toward organ donation. **Conclusions:** The study highlighted a gap between the positive attitudes and the actual commitment to organ donation among the participants, revealing a need for targeted educational interventions to address misconceptions and enhance the willingness to donate organs. Promoting organ donation education within medical schools could foster a more supportive environment for organ donation, ultimately contributing to increased donor rates and improved transplantation outcomes in Jordan.

**Keywords:** medical students; organ transplant; knowledge; attitude



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## 1. Introduction

Organ donation and transplantation remain the best and most cost-effective clinical solutions for end-stage organ failure [1]. Jordan was among the first Arab countries to pass legislation governing organ donation and transplantation. The first living donor kidney transplant in the Middle East was carried out in Jordan in 1972 [2]. Subsequently, Jordan received early recognition and a well-known reputation in the medical field, serving patients from the Arab region in the 1990s [3]. Since then, donor rates in Jordan have been particularly low despite a relatively advanced healthcare system; only 202 organ donors were registered in 2021: 200 were living donors (living donor rate: 19.42 per million population (pmp)), and two were deceased donors (deceased donor rate: 0.19 pmp) with kidneys being the primary donated organ constituting 197 or 97.5% of the total donations [4]. Similar rates were observed within the region. However, the reasons for the shortage of deceased organ donors are multifactorial [5]. These may include knowledge gaps regarding brain death [6] and the registration process [7]. One previous study was conducted in Jordan and identified such gaps in knowledge [8].

A study in Jordan found that while there is substantial awareness and generally favorable views toward organ donation, there are prevailing concerns regarding the distrust of health services, emphasizing the need for targeted interventions to enhance trust and clarity in the organ donation process [9]. Another study underscores the knowledge and attitude

gaps toward organ donation among the urban Jordanian population, suggesting a potential for educational programs to reinforce understanding and willingness to donate [10].

Educational interventions have proven effective in boosting knowledge and positive attitudes toward organ donation, as demonstrated by a study among dental students, where a single educational session significantly increased knowledge and favorable attitudes toward organ donation [11]. This study aimed to explore the knowledge, attitude, and practice (KAP) survey regarding organ donation among medical students in Jordan.

## 2. Study Design and Participants

This cross-sectional study was conducted to assess KAP in relation to organ donation among medical students in Jordan. We used the STROBE cross-sectional checklist when writing our report.

### 2.1. Sampling and Recruitment

Participants were recruited using a convenience sampling method. Invitations to participate in the study were distributed via email, social media, and professional networks. The inclusion criteria specified that participants must be currently studying medicine in Jordan.

### 2.2. Data Collection Instrument

Data were collected using a structured, self-administered online questionnaire. The questionnaire is peer-validated and adopted from the literature. It is designed to capture demographic information, knowledge about organ donation processes, attitudes toward organ donation, and self-reported practices related to organ donation. The questionnaires included a mix of multiple-choice questions, Likert scale items, and yes/no questions. (Supplementary Materials).

### 2.3. Ethical Considerations

This study was conducted in accordance with the Helsinki Declaration. Participants were informed about the study's purpose, their voluntary participation, the confidentiality of their responses, and their right to withdraw at any time. Informed consent was obtained electronically before participation.

### 2.4. Statistical Analysis

Data were analyzed using SPSS version 26. The normality of the data distribution was assessed using the Shapiro–Wilk test. The Mann–Whitney U and Kruskal–Wallis tests were conducted to explore potential differences in the mean across variables. Significant values were adjusted for multiple comparisons using the Bonferroni correction after conducting post hoc analysis for pairwise comparisons. The Spearman's correlation coefficient was used to investigate the relationship between variables.

Multiple linear regression was employed to identify potential predictors associated with higher KAP scores. For the knowledge model, there was a weak positive relationship between the predictors and the knowledge score, with an R-value of 0.252, indicating that approximately 6.3% of the variability in the knowledge scores can be explained by the predictors in the model. The adjusted R square was 0.031, suggesting that the model's explanatory power is limited.

Regarding the attitude model, there was a weak positive relationship between the predictors and the attitude score, with an R-value of 0.336, indicating that approximately 11.3% of the variability in the attitude scores can be explained by the predictors in the model. The adjusted R square was 0.083, suggesting that the model's explanatory power is limited.

For the practice model, there was a weak positive relationship between the predictors and the practice score, with an R-value of 0.324, indicating that approximately 10.5% of the variability in the practice scores can be explained by the predictors in the model. The

adjusted R square was 0.074, suggesting that the model's explanatory power is limited. A *p*-value of less than 0.05 was considered statistically significant.

### 3. Results

#### 3.1. Demographic Characteristics

Five hundred and thirty-nine respondents completed the questionnaire. Their mean age was  $21.52 \pm 1.96$ . Female respondents numbered 308 (57.1%), and a majority were single (95.2%). A total of 253 respondents were from the University of Jordan (46.9%), and 161 were fifth-year medical students (29.9%). Furthermore, 495 respondents were Muslims (91.8%). Table 1 shows the frequency of the demographic characteristics.

**Table 1.** Demographic characteristics (*n* = 539).

Variables	Frequency (%)
Age (mean $\pm$ SD)	21.52 $\pm$ 1.96
Gender	
Male	231 (42.9)
Female	308 (57.1)
University	
University of Jordan	253 (46.9)
Jordan University of Science & Technology	91 (16.9)
Mut'ah University	49 (9.1)
Yarmouk University	45 (8.3)
Hashemite University	59 (10.9)
Al-Balqa Applied University	42 (7.9)
Year of study	
First basic years	166 (30.8)
Fourth clinical years	373 (69.2)
Religion	
Muslim	495 (91.8)
Christian	37 (6.9)
Others	7 (1.3)

SD: standard deviation.

#### 3.2. Knowledge, Attitude, and Practice Scales

The mean score for the knowledge scale was  $8.85 \pm 1.57$  ( $\pm$ SD), with a range of 9 (3–12), while for attitude it was  $7.70 \pm 2.27$  ( $\pm$ SD), with a range of 10 (1–11), and for practice it was  $0.40 \pm 0.84$  ( $\pm$ SD), with a range of 3 (0–3). Furthermore, there was a significant weak positive association between knowledge and attitude ( $r_s = 0.236$ ,  $p < 0.001$ ).

Mann–Whitney U and Kruskal–Wallis tests were employed to investigate potential differences between the scales and the demographic characteristics. Respondents who were single had significantly higher knowledge scores ( $p$ -value = 0.009). Furthermore, respondents were female ( $p$ -value = 0.009), single ( $p$ -value = 0.004), and Christian ( $p$ -value = 0.029).

The Kruskal–Wallis test revealed significant differences in attitude scores between universities ( $p$ -value = 0.045) and years of study ( $p$ -value = 0.034). However, post hoc analysis found no significant differences between the groups ( $p$ -value  $>$  0.05). Regarding the practice score, the Kruskal–Wallis test revealed significant differences between universities ( $p$ -value = 0.003). Post hoc comparisons using the Bonferroni correction revealed that students at the University of Jordan had significantly lower scores compared to students at Mut'ah University (adjusted  $p$ -value = 0.030), and students at Jordan University of Science & Technology had significantly lower scores compared to Mut'ah University (adjusted  $p$ -value = 0.017). Table 2 shows the comparisons between the knowledge, attitude, and practice scales and the demographic characteristics.

**Table 2.** Comparison between knowledge, attitude, and practice total scores and demographic characteristics.

Variables	Knowledge		Attitude		Practice	
	Mean ± SD	p-Value	Mean ± SD	p-Value	Mean ± SD	p-Value
Gender		0.165 <sup>A</sup>		0.009 <sup>A</sup>		0.688 <sup>A</sup>
Male	8.78 ± 1.48		7.35 ± 2.45		0.44 ± 0.90	
Female	8.90 ± 1.63		7.95 ± 2.10		0.36 ± 0.78	
University		0.091 <sup>B</sup>		0.045 <sup>B</sup>		0.003 <sup>B</sup>
University of Jordan	8.97 ± 1.60		7.88 ± 2.16		0.30 ± 0.71	
Jordan University of Science & Technology	8.95 ± 1.35		8.08 ± 2.00		0.27 ± 0.76	
Mut'ah University	8.65 ± 1.68		7.39 ± 2.32		0.80 ± 1.17	
Yarmouk University	8.24 ± 1.75		7.18 ± 2.45		0.56 ± 0.99	
Hashemite University	8.92 ± 1.44		6.98 ± 2.52		0.58 ± 0.97	
Al-Balqa Applied University	8.69 ± 1.59		7.67 ± 2.61		0.33 ± 0.65	
Year of study		0.058 <sup>B</sup>		0.034 <sup>B</sup>		0.619 <sup>B</sup>
1st	8.47 ± 1.64		7.49 ± 2.34		0.33 ± 0.64	
2nd	8.71 ± 1.42		7.57 ± 2.28		0.54 ± 0.99	
3rd	8.45 ± 1.61		7.13 ± 2.49		0.47 ± 0.95	
4th	9.01 ± 1.64		7.20 ± 2.52		0.49 ± 0.96	
5th	9.07 ± 1.58		8.06 ± 2.00		0.29 ± 0.68	
6th	8.81 ± 1.49		8.01 ± 2.19		0.37 ± 0.82	
Religion		0.082 <sup>A</sup>		0.029 <sup>A</sup>		0.183 <sup>A</sup>
Muslim	8.82 ± 1.56		7.62 ± 2.29		0.39 ± 0.84	
Christian	9.30 ± 1.61		8.46 ± 2.02		0.51 ± 0.87	

SD: standard deviation. <sup>A</sup>: Mann–Whitney U test, <sup>B</sup>: Kruskal–Wallis test.

Regarding the predictors of having scores, being female and being Muslim were significantly negative predictors of having higher attitude scores ( $\beta = -0.667$ ,  $p = 0.001$ , 95% CI:  $-1.063$ – $-0.271$ ), ( $\beta = -0.917$ ,  $p = 0.010$ , 95% CI:  $-1.611$ – $-0.233$ ), and ( $\beta = -0.426$ ,  $p = 0.042$ , 95% CI:  $-0.836$ – $-0.016$ ), respectively. Finally, increasing age and being single were significant negative predictors of having a higher attitude ( $\beta = -0.056$ ,  $p = 0.025$ , 95% CI:  $-0.105$ – $-0.007$  and ( $\beta = -1.046$ ,  $p < 0.001$ , 95% CI:  $-1.503$ – $-0.588$ ), respectively. Table 3 demonstrates the predictors of having higher knowledge, attitude, and practice scores.

**Table 3.** Predictors of higher knowledge, attitude, and practice scores.

	Knowledge			Attitude			Practice		
	Beta ( $\beta$ )	95% CI	<i>p</i> -Value	Beta ( $\beta$ )	95% CI	<i>p</i> -Value	Beta ( $\beta$ )	95% CI	<i>p</i> -Value
Age	-0.014	-0.115–0.088	0.790	0.029	-0.117–0.175	0.695	-0.056	-0.105–-0.007	0.025
Gender									
Male	A								
Female	-0.143	-0.418–0.132	0.307	-0.667	-1.063–-0.271	0.001	0.115	-0.018–0.247	0.089
University									
University of Jordan	0.256	-0.286–0.799	0.354	0.329	-0.452–1.110	0.408	-0.155	-0.416–0.106	0.244
Jordan University of Science & Technology	0.300	-0.275–0.876	0.305	0.750	-0.078–1.578	0.076	-0.140	-0.416–0.137	0.322
Mut'ah University	0.056	-0.628–0.747	0.865	0.106	-0.884–1.096	0.834	0.038	-0.293–0.370	0.819
Yarmouk University	-0.397	-1.109–0.315	0.274	-0.409	-1.434–0.616	0.434	-0.025	-0.368–0.318	0.886
Hashemite University	0.110	-0.540–0.760	0.740	-0.320	-1.256–0.616	0.502	0.101	-0.212–0.414	0.526
Al-Balqa Applied University	A								
Year of study									
1st	A								
2nd	0.097	-0.561–0.755	0.772	0.010	-0.938–0.957	0.984	-0.025	-0.342–0.291	0.875
3rd	-0.506	-1.088–0.077	0.089	-0.805	-1.644–0.033	0.060	-0.048	-0.328–0.233	0.739
4th	0.222	-0.269–0.713	0.375	-0.546	-1.253–0.161	0.130	0.041	-0.195–0.278	0.732
5th	0.146	-0.275–0.567	0.496	-0.079	-0.686–0.527	0.797	0.009	-0.193–0.212	0.928
6th	-0.491	-1.213–0.232	0.183	-0.328	-1.368–0.712	0.536	-0.104	-0.452–0.244	0.557
Religion									
Muslim	-0.338	-0.820–0.144	0.169	-0.917	-1.611–-0.233	0.010	-0.140	-0.372–0.092	0.236
Christian	A								

A = The reference category.

#### 4. Discussion

Our study revealed significant insights into the knowledge, attitudes, and practices regarding organ donation among Jordanian healthcare professionals and students, echoing trends observed in various global contexts. While there was a foundational understanding of organ donation, knowledge gaps persisted.

Firstly, the results highlight a significant disparity in knowledge and attitudes among medical students from different universities in Jordan. Mut'ah University students exhibited more positive attitudes and practices towards organ donation than students from other universities. This discrepancy suggests a need for targeted interventions and educational programs to address specific knowledge gaps within each medical school. In 2011, a survey was conducted among university students in Northern Jordan at the Jordan University of Science and Technology, aiming to study attitudes toward organ donation. It was found that a staggering two-thirds and one-third of students were not willing to donate an organ during their lives and after death, respectively. The reasons behind their attitudes were attributed to a strong religious belief against donation and the fear of health deterioration during their lifetime after donating an organ [12].

Similar trends were observed in the region; research involving Omani university students and an adult population in urban Puducherry, South India, also depicted low knowledge levels and attitudes towards organ donation, highlighting the role of educational initiatives in enhancing understanding and positive attitudes [13,14]. Additionally, community-based studies contrasting rural and urban populations indicate that demographic factors can significantly influence perceptions and willingness regarding organ donation [15].

The notable hesitancy among medical students to commit to organ donation suggests that early educational interventions could be pivotal in shaping future healthcare professionals' perspectives and actions regarding organ donation [16]. As students progress through medical school, their understanding of ethical dilemmas on organ donation typically expands, with those in clinical years exhibiting greater comprehension compared to their counterparts in basic years [17], but that was not observed in our study. By addressing these variations, educational initiatives can be optimized to effectively engage and empower medical students across all stages of their academic progression, ultimately fostering a culture of organ donation awareness and advocacy within the medical community.

The overall positive attitude toward organ donation aligns with broader trends observed in healthcare professionals worldwide [18–21]. However, the disconnect between these attitudes and the low rates of actual commitment to organ donation, especially evident among medical students, points to potential barriers, possibly rooted in personal and cultural beliefs [22]. This discrepancy underscores the importance of addressing misconceptions and fears through targeted educational programs, which have been shown to positively influence attitudes and intentions regarding organ donation [23].

The influence of religion on attitudes towards organ donation is evident, with Christian participants demonstrating more positive attitudes compared to their Muslim counterparts. This underscores the importance of considering religious beliefs and cultural perspectives in organ donation education and awareness campaigns [24]. Efforts to promote organ donation should be sensitive to religious values while providing accurate information to dissipate misconceptions and encourage informed decision-making.

Both Christianity and Islam emphasize compassion and the sanctity of life, though their views on organ donation differ [25]. In Christianity, organ donation is often regarded as an expression of love and service, aligning with the principles of saving lives and aiding the vulnerable. While not explicitly addressed in religious texts, Christian ethics generally support organ donation as a means to extend and enhance life [26]. In Islam, the permissibility of organ donation is debated, with scholars considering factors such as preserving the integrity of the human body after death [27]. Some argue that organ donation can be acceptable if it serves the greater good and respects principles of dignity and respect for the deceased [28]. Despite theological nuances, both religions share common values of

compassion and altruism, which can encourage believers to consider organ donation as a selfless act benefiting society [29].

Tailored interventions should address religious and cultural considerations, target specific demographic groups, and utilize innovative approaches to enhance knowledge and positive attitudes toward organ donation.

Some limitations to the study might include the reliance on self-reported data, which can introduce a social desirability bias, in which respondents may have provided answers that they believe are more socially acceptable than their true feelings or practices. Furthermore, the study was conducted among healthcare professionals and students primarily in Jordan, which might limit the generalizability of the findings to other regions or countries with different cultural, social, and healthcare contexts.

In conclusion, this study provides valuable insights into the knowledge, attitude, and practice of medical students in Jordan towards organ donation. Collaborative efforts between medical schools, healthcare institutions, religious leaders, and community organizations are essential to overcome barriers and increase organ donation rates in Jordan. Future research should focus on longitudinal studies to assess the impact of educational interventions on organ donation attitudes and practices, offering a more dynamic understanding of how these evolve.

**Supplementary Materials:** The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/transplantology5030020/s1>, Knowledge, Attitude, and Practice Towards Organ Donation Questionnaire.

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