

# General Knowledge and Attitudes Toward Organ Donation in a Sample of Mexican Medical and Nursing Students

Conocimientos generales y actitudes hacia la donación de órganos en una muestra de estudiantes mexicanos de medicina y de enfermería

Conhecimentos gerais e atitudes para a doação de órgãos em uma amostra de estudantes mexicanos de medicina e de enfermagem

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## Abstract

**Introduction:** For many patients, organ transplantation is the only alternative available to them in order to achieve extended survival with a good quality of life. However, there is a significant shortage of organs available for transplantation and Mexico has one of the lowest organ donation rates. In many cases, physicians and nurses retain contact with potential donors' relatives who are key persons in facilitating the posthumous organ donation process. The objective of this study was to explore what knowledge and attitudes Mexican medical and nursing students have toward organ donation. **Materials and methods:** Three hundred eighty-four students completed two questionnaires, one about organ donation knowledge and the other about attitudes toward organ donation. **Results:** Participants, especially nursing students, showed an inadequate level of knowledge about organ donation. Many of them falsely believe that it is possible

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to recover from brain death. Most students also falsely believe that there is an age limitation for organ donation, and that prevailing religions in Mexico are opposed to organ donation. There was a negative correlation between knowledge of and unfavorable attitudes toward organ donation. *Conclusions:* It may be necessary to review current school curriculum to ensure that future health professionals are appropriately educated about organ donation and can promote donation to help reduce the shortage of organs.

*Keywords:* Attitude; knowledge; education; medical; education; nursing; organ transplantation.

## Resumen

*Introducción:* muchas personas tienen en el trasplante de órganos su única alternativa para lograr sobrevivir con una buena calidad de vida. Sin embargo, existe una gran escasez de órganos para trasplantes, y México posee una de las tasas más bajas de donación. El personal de medicina y de enfermería está en contacto con los familiares de los posibles donadores y son personas clave para facilitar el proceso de donación de órganos *post mortem*. El objetivo de este estudio fue explorar el conocimiento y las actitudes hacia la donación de órganos en estudiantes mexicanos de medicina y enfermería. *Materiales y métodos:* trescientos ochenta y cuatro estudiantes contestaron dos cuestionarios: uno sobre conocimientos y otro sobre actitudes hacia la donación de órganos. *Resultados:* los participantes mostraron un nivel de conocimiento inadecuado, especialmente los estudiantes de enfermería. Muchos de ellos creían que es posible recuperarse de la muerte cerebral. La mayoría de los estudiantes creen erróneamente que hay un límite de edad para donar y que las religiones que prevalecen en México se oponen a la donación de órganos. Hubo una correlación negativa entre conocimientos y actitudes desfavorables hacia la donación de órganos. *Conclusiones:* es necesario revisar los programas de estudio, a fin de asegurar que los futuros profesionales de la salud estén adecuadamente preparados para promover la donación y reducir la escasez de órganos.

*Palabras clave:* actitud; conocimiento; educación, medicina; educación, enfermería; trasplante de órganos.

## Resumo

*Introdução:* para muitos pacientes, o transplante de órgãos é a única alternativa para conseguir sobreviver com uma boa qualidade de vida. No entanto, existe uma grave escassez de órgãos para transplantes, e o México tem uma das taxas mais baixas de doação de órgãos. O pessoal de medicina e enfermagem têm contacto com os familiares dos possíveis doadores e são pessoas chave para facilitar o processo de doação de órgãos *post-mortem*. O objetivo deste estudo foi explorar o conhecimento e as atitudes para a doação de órgãos em estudantes mexicanos de medicina e enfermagem. *Materiais e métodos:* trezentos oitenta e quatro estudantes responderam Dois questionários, um sobre conhecimentos e outro sobre atitudes sobre a doação de órgãos. *Resultados:* os participantes mostraram um nível de conhecimento inadecuado, especialmente os estudantes de enfermagem. Muitos deles acreditavam que é possível se recuperar da morte cerebral. A maioria dos estudantes acreditavam erroneamente que há um limite de idade para doar, e que as religiões que prevalecem no México se opõem à doação de órgãos. Houve uma correlação negativa entre conhecimentos e atitudes desfavoráveis para a doação de órgãos. *Conclusões:* é necessário revisar os programas de estudo para garantir que os futuros profissionais da saúde estejam adequadamente preparados para promover a doação e reduzir a escassez de órgãos.

*Palavras-chave:* atitudes; conhecimento; educação, medicina; educação, enfermagem; doação de órgãos.

## Introduction

Organ transplantation can sometimes be the only alternative for many patients to survive and/or to improve their quality of life and, therefore, the number of people being added to transplant waiting lists around the world is only increasing over time (1). Although advances in organ donation and transplant processes have allowed for the increasing development of various types of organ transplantations, organ donors remain fewer in number than patients on transplant waiting lists (1).

Donated organs can come from either deceased or living donors and in both cases, the act of donation is a voluntary decision. The living donor is a living person from whom cells, tissues, or organs are removed for the purpose of transplantation. A deceased donor is a person who has been declared dead by established medical criteria, and whose cells, tissues and/or organs are recovered for transplantation (2). A living person can only donate one kidney or a fragment of select few organs to a single patient in need, while, on the other hand, it is possible to extract many more organs from a dead person to be transplanted to several patients who may need them. Therefore, the current study is focused on posthumous organ donation, that is, organs removed from a deceased donor using the medical criteria for declaring cardiopulmonary death or brain death. Brain death is defined as irreversible cessation of cerebral and brain stem function, characterized by the absence of electrical activity in the brain, blood flow to the brain, and brain function as determined by clinical assessment of responses (2). Although a brain dead person is technically considered to be dead, his or her cardiopulmonary functioning may be artificially maintained for some time to allow for the donation of more organs (3).

Donation rates for organ transplantation vary among different countries. The Global Observatory on Donation and Transplantation classifies countries from which official data is available according to their rates of deceased donors per million population (pmp) in five groups (4). Spain is the only country that is in the first group with a rate of 48.3 donors pmp. Mexico is in the last group with a rate of 4.1 donors, which is fewer than the average of Latin America (6.1 PMP) (4).

There are many commonly held beliefs that hinder people from becoming organ donors. Some of these beliefs have been reported throughout the world, although they may be more prevalent in some cultures than in others. For example, data shows that Hispanic Americans when compared with white Americans, are less willing to donate their organs due to various barriers that reflect fear, ignorance, and/or religious prejudices (5). This could be due to the fact that some Hispanics believe that organ donation takes place before death, which may pertain to a lack of understanding about the concept of brain death (6). Other barriers reported in Hispanic communities include the wish to be buried with the body intact and the belief that the Catholic Church disagrees with organ donation (5) when it encourages

organ donation as an act of love and charity (7). Another important barrier to consider is the distrust some individuals have with the transplant process (8).

These, and other barriers, contribute to the formation of negative attitudes toward organ donation. Attitudes are defined as the set of beliefs and cognitions, with an affective component in favor or against a social object, which predispose an individual to behave in a certain way toward that object (9). Several authors have stipulated that beliefs and attitudes toward organ donation can influence an individual's willingness to donate organs and even to accept transplants (5, 10). A negative attitude can predispose an individual into not donating their organs at death and/or to refuse the donation of a recently deceased relative's organs. In order to increase the rate of posthumous organ donation, several authors have agreed on the need to reduce negative attitudes and to educate the society about the donation-transplant process and about the concept of brain death (6, 11, 12). Because attitudes tend to fall on a continuum that range from favorable to unfavorable, we consider it important to study attitudes toward organ donation with a Likert scale, which unlike dichotomous questions, allows for the evaluation of a subject's degree of conformity to different statements (13).

Health professionals are an essential link between society and the health system. They play an important role in informing the society about concepts like brain death, organ donation, and the importance of donation (14-16). Therefore, it is important that they demonstrate positive attitudes for and have sufficient knowledge about organ transplantation to be able to encourage organ donation in the community, taking into account information provided by health professionals is usually considered a credible source (17, 18). Moreover, physicians are usually the first to recognize a patient as a potential donor and while nurses may have a closer relationship with patients, both have contact with potential donors' relatives who must authorize organ donation on behalf of the patient. Thus, doctors and nurses are key persons in facilitating the deceased organ donation process (19-22). Unfortunately, many of them are reluctant to discuss this important issue with patients and/or their relatives, due to lack of time, lack of knowledge, lack of experience, or due to negative attitudes and beliefs (20, 23-26).

Considering that today's students will become tomorrow's healthcare professionals, it is important for them to study both the knowledge and attitudes surrounding organ transplantation. In a study conducted in the United Kingdom belonging to the second group of classification made by The Global Observatory on Donation and Transplantation, almost half of medical students demonstrated having a basic understanding about the concepts, but lacked detailed knowledge (27). On the other hand, more recent studies conducted in countries with lower rates of deceased donors show that students, in general, have several gaps in knowledge surrounding organ donation. In India, about half of the medical and nursing student population did not know the correct definition of brain death (24, 28). The authors of these studies concluded that this could be due to prevailing myths and misconceptions concerning brain death and/or due to lack of content about the subject in the school

curriculum. In Saudi Arabia, medical students were also confused regarding other concepts germane to the topic, and less than half of the students were willing to donate their organs to a patient other than their relative (22). In Turkey, most medical students felt responsible for increasing organ donation rates in their society, but only 14% of them thought that they had an adequate understanding about the issue. Although about half of the students had positive attitudes toward organ donation, there were many participants who did not want to donate organs because they did not want to disturb the integrity of the body; they thought donation was unacceptable in terms of religion and/or they did not want to think about organ donation as it reminded them of death (29). In another study also conducted in Turkey, nursing students showed humanitarian and charitable feelings toward organ donation, but they were also afraid of bodily mutilation and medical neglect (30). In Germany, a developed country classified in the third group (out of five total groups) according to the rates of deceased donors, medical students showed an adequate level of medical knowledge, but some of them reported fear of still being alive and experiencing pain during the organ extirpation procedure (31).

Currently, only one study has been conducted with Mexican medical students, who were surveyed between 2013 and 2015 (32). It was found that 26% of them were not willing to donate their organs, mainly due to fear that their organs would be removed before death. Sixty eight percent claimed to understand the concept of brain death - although the definition that was considered correct did not meet the criteria established by recognized authorities such as the World Health Organization. Of the participants 37% considered their knowledge of organ donation to be “normal” and 33% thought their knowledge was scarce. In order to expand the knowledge base surrounding this subject in Mexico, the objective of this descriptive study was to explore: a) the general level of knowledge there is surrounding organ donation in nursing and medical students; b) the students’ attitudes toward organ donation; and (c) their experiences of training in this area.

## Materials and methods

### Participants

A sample of undergraduate Mexican nursing and medical students were recruited in five universities in the cities of Xalapa, Cuernavaca, and Mexico City. They were in the second year or above of their career. Three hundred and eighty-four students were surveyed; 205 were from a medical background and 179 were from a nursing background and their ages ranged from 19 to 28 years old (mean 21.34). Table 1 shows their sociodemographic characteristics. The sample size was calculated to obtain a confidence level of 95% with a margin of error of 5%.

**Table 1.** Sociodemographic characteristics

	Medical students		Nursing students	
	n	%	n	%
<i>Gender</i>				
Female	106	51.7	132	73.7
Male	99	48.3	47	26.3
<i>Religion</i>				
Roman Catholic	149	72.7	135	75.4
Other Christian denomination	16	7.8	24	13.4
Other	2	1.0	0	0
None	38	18.5	20	11.2
<i>University</i>				
Public	126	61.5	57	31.8
Private	79	38.5	122	68.2
<i>Degree of career advancement<sup>§</sup></i>				
Beginners	81	39.5	75	41.9
Advanced	124	60.5	104	58.1

<sup>§</sup>Medical students: beginners 2<sup>nd</sup>-3<sup>rd</sup> year and advanced 4<sup>th</sup>-5<sup>th</sup> year.

Nursing students: beginners 2<sup>nd</sup> year and advanced 3<sup>rd</sup> year.

## Measures

Participants were asked to fill out sociodemographic questions and to state if they were willing to donate their organs after death. Those who expressed willingness were asked if they had signed a donor card or if they had specified such to be the case on their driver’s license. Then, independent of their answers, all students responded to two instruments:

1) A questionnaire used to measure knowledge about organ donation, which was specifically created for this study. First, students were asked from which donors (alive, brain dead, or without a heart beat) could the most organs be extracted from for transplant. Then, they were given a list of eight organs or tissues and were asked to check those that could be transplanted. Finally, students answered “true” or “false” to ten affirmations about organ donation.

Items were developed from a review of literature on this issue by two of the authors, along with two experts in organ donation (a physician who in addition to practicing transplants, is a researcher and teacher on the subject; and a health professional who is in charge of coordinating organ donation in a national health institute). Six judges (three physicians and three nurses) were asked to evaluate each item based on both their relevance and wording. As a result, some changes were made and, afterwards, another 12 judges were asked to rate each item as “essential,” “useful but not essential,” or “not necessary.” Next, the validity of each item was assessed

using the Lawshe's formula to obtain the content validity ratio (33), and items with low content validity ratio were discarded. The instrument was then piloted with ten medical students and ten nursing students, who were asked to answer all questions and to comment on any items that they considered difficult to understand and final changes were made accordingly.

2) The Attitudes toward Posthumous Organ Donation Questionnaire (APOD), which was developed in Mexico (34). It is a 5-point scale that ranges from 1 (*strongly disagree*) to 5 (*strongly agree*), with 16 items comprising of three subscales: a) "Favorable attitudes," which evaluate the importance of organ donation (*It's satisfying that the organs can help others, even if they're strangers*); b) "Unfavorable attitudes" that suggest rejection of organ donation (*I'm afraid that after I die, my organs will be donated*), and c) "Mistrust" that reflects lack of confidence mainly in the ethical management of the organ donation-transplant process (*I distrust institutions where organ transplants are performed*). Cronbach's alpha in our study was .86.

Afterwards, participants were asked if they had received any training on organ donation (course, seminar, workshop); and if so, they were asked to specify what the training was and how long it lasted. Students were also asked if they would know who to consult if they were asked about the topic and did not possess enough information themselves to answer the question. Finally, they were asked if they would like to add any additional comments.

## Procedure

The study was approved by the institutional review board of Universidad Veracruzana. Informed consent was obtained from all students. Participants were recruited in different places at their universities or at their hospitals in the case of those who were taking courses at hospitals. A researcher asked them if they wanted to participate in a study about organ donation. Upon agreement, some students preferred to answer a printed survey (68%), while others preferred the survey posted on SurveyMonkey.com (32%). The surveys were carried out between January and February 2018.

Participants were told that their information would remain anonymous. It took 10–15 minutes to complete each survey.

## Data analyses

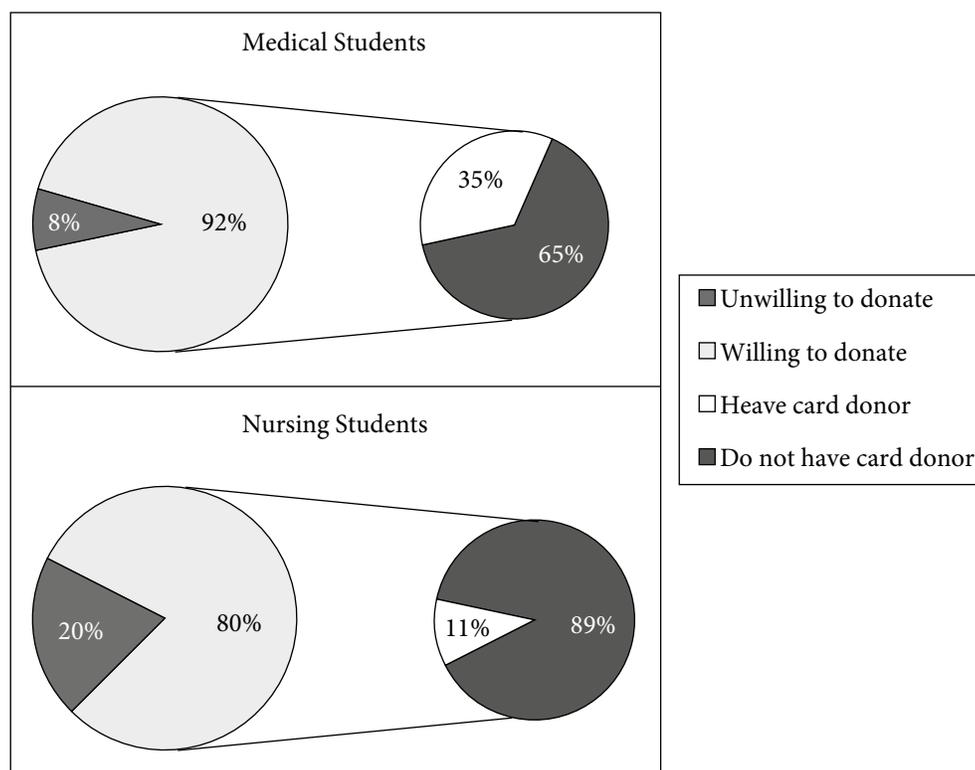
Due to the descriptive nature of this study, the number of students who answered correctly or incorrectly each item of the questionnaire of knowledge about organ donation was analyzed using the chi-squared goodness-of-fit test. Next, a global score of knowledge was calculated for each participant, adding up 1 point for each correct answer. Thus, each participant could obtain a score from 0 to 11. To determine if the data had a normal distribution, the Kolmogorov-Smirnov test was used. However, since it did not have a normal distribution, Mann-Whitney U tests were conducted to compare the results of both the global knowledge score and the

three factors of attitudes toward organ donation between subgroups. That is, results were compared between medical and nursing students, between beginner, and advanced students, between those who were willing or unwilling to donate, between those who did or did not have donor document,s as well as between those who had or had not received some training on organ donation. Spearman correlations were tabulated between the global knowledge score and each factor of the APOD questionnaire.

Lastly, a content analysis was conducted in order to analyze students' open comments. Each comment was read by two coders who generated scoring categories that were constructed according to the content of student's comments. Each category was defined taking into account either the meaning of the exact words used by participants or the meaning of the whole comment. Reliability between the coders was between .94 and 1 using Cohen's kappa values; discrepancies were discussed until consensus was reached.

## Results

There were 188 medical students and 143 nursing students who were willing to donate their organs after death. From them, 66 medical students and 16 nursing students had donor documentation (figure 1).



**Figure 1.** Percentage of students willing to donate organs and who have a donor card

## Knowledge about organ donation

When participants were asked which type of donor more organs could be extracted from, 176 (86%) of medical students and 117 (65%) of nursing students answered correctly that it was from donors who were declared brain dead.

Table 2 presents the frequencies of correct and incorrect responses for the rest of the items. Most students acknowledged that there are patients who die because there are not enough organs available for transplantation (item 1), but only between 10–20% knew that the donation rate in Mexico is lower than the average donation rate for Latin American countries (item 2). In relation to beliefs that can negatively influence donation rates, there were a few participants who believed that organ donation disfigures the body and can get in the way of an open casket funeral (item 3), and more than half of students believed that religions derived from Christianity are opposed to organ donation (item 4). Regarding basic medical aspects of organ donation, most participants recognized the definition of brain death (item 5) including that it is a legally recognized death criterion (item 6). However, nearly 40% of medical students and nearly 50% of nursing students believed that there are people who have recovered from brain death (item 7). Concerning the criteria needed to become a donor, most students knew that organ transplantation is viable among more than just family and relatives (item 8). However, most of them believed that there is an age limitation for organ donation (item 9), and that having a cardiovascular disease is a contraindication for donation (item 10). Lastly, when students checked off organs and/or tissues that can be transplanted, there were many mistakes made.

**Table 2.** Knowledge about organ donation by item (n and %)

Item	Career	Incorrect (%)	Correct (%)
1. There are people on waiting lists for a transplant who die because there are not enough organs available.	Medical	26 (12.7)	179 (87.3)***
	Nursing	17 (9.5)	162 (90.5)***
2. The postmortem donation rate (number of donors per million inhabitants) in Mexico is slightly higher than the average for Latin American countries.	Medical	163 (79.5)	42 (20.5)***
	Nursing	159 (88.8)	20 (11.2)***
3. Organ or tissues donation disfigures the body in such a way that it is not possible to perform a funeral with the coffin open.	Medical	18 (8.8)	187 (91.2)***
	Nursing	39 (21.8)	140 (78.2)***
4. Religions derived from Christianity (including Catholicism) oppose organ and tissue donation.	Medical	117 (57.1)	88 (42.9)*
	Nursing	118 (65.9)	61 (34.1)***
5. Brain death is the irreversible cessation of all brain functions, including the brainstem.	Medical	53 (25.9)	152 (74.1)***
	Nursing	52 (29.1)	127 (70.9)**
6. Brain death is a legally recognized death criterion.	Medical	57 (27.8)	148 (72.2)***
	Nursing	68 (38.0)	111 (62.0)***

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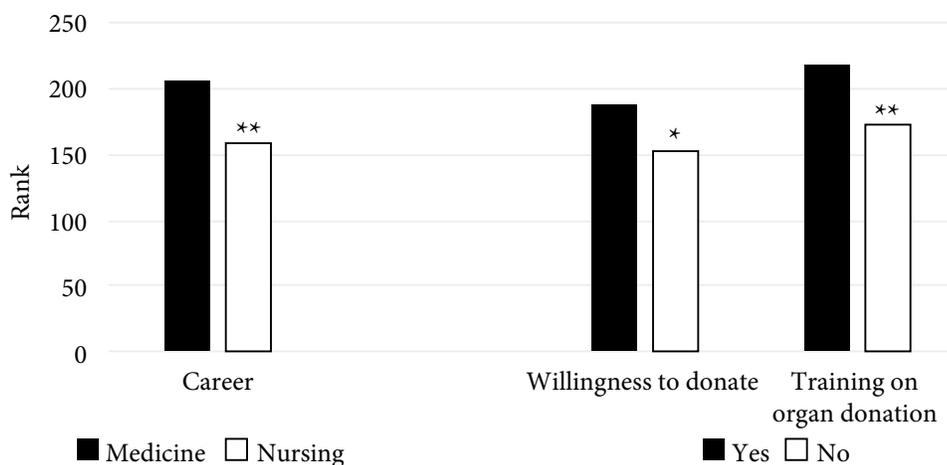
Item	Career	Incorrect (%)	Correct (%)
7. There are people who have recovered from brain death.	Medical	78 (38.0)	127 (62.0)***
	Nursing	96 (53.6)	83 (46.4)
8. Organ transplantation is viable only among family members.	Medical	10 (4.9)	195 (95.1)***
	Nursing	36 (20.1)	143 (79.9)***
9. There is an age-limit to donate organs and tissues.	Medical	145 (70.7)	60 (29.3)***
	Nursing	139 (77.7)	40 (22.3)***
10. Having a cardiovascular disease is a contraindication for being an organ donor.	Medical	154 (75.1)	51 (24.9)***
	Nursing	144 (80.4)	35 (19.6)***

	Career	5–8 mistakes n (%)	1–4 mistakes n (%)	0 mistakes n (%)
Organs that can be transplanted	Medical	38 (18.5)	155 (75.6)	12 (5.9)**
	Nursing	54 (30.2)	113 (63.1)	12 (6.7)**

\*p < .05; \*\*p < .001; \*\*\*p < .0001.

Figure 2 shows the results of students’ global score of knowledge about organ donation. Medical students obtained a higher score than nursing students. Students who were willing to donate, as compared to their peers, showed greater knowledge, but there were not significant differences between those who had or did not have donor documentation. Furthermore, students who had received training about organ donation scored higher than those who had not. There were no significant differences in the knowledge scores between beginners and advanced students, neither in medical students nor in nursing students.



**Figure 2.** Global score of knowledge about organ donation (rank)

Note: Only significant results are shown.

\*p < .05; \*\*p < .0001.

## Attitudes toward organ donation

Favorable attitudes toward organ donations rated highest among study participants, followed by mistrust, and finally by unfavorable attitudes. Table 3 indicates that nursing students were more likely than medical students to show both mistrust and unfavorable attitudes about organ donations, while they were less likely to hold favorable attitudes. Moreover, students who had previous training about organ donation were less likely to have unfavorable attitudes and were more likely to have favorable attitudes compared to their peers. There were no statistical differences in the APOD questionnaire answers between beginners and advanced students.

**Table 3.** Attitudes toward organ donation (rank)

	Favorable attitudes	Unfavorable attitudes	Mistrust
<i>Career</i>			
Medicine	203.18	151.63	164.40
Nursing	161.09**	217.06**	203.20**
<i>Training on organ donation</i>			
Yes	220.87	159.32	163.03
No	171.33**	190.30*	189.15*

*Note:* Only significant results are shown.

\* $p < .05$ ; \*\* $p < .0001$ .

The correlation between knowledge and attitudes toward organ donation yielded one weak but significant result. The greater scores in knowledge were negatively correlated with unfavorable attitudes ( $r = -.269$ ;  $p = .0001$ ).

## Academic training

Eighty-eight participants (23%) claimed that they had received some training about organ donation (30% of medical students and 15% of nursing students). However, most of them ( $n = 78$ ; 89%) had only attended a single talk or a workshop of less than one day. There were only ten students (11%) who had taken a course or a workshop for a longer period of time. Ninety-two students (24%) believed they would know who to consult if someone asked them about the topic (26% of medical students and 22% of nursing students).

## Qualitative analysis

The content analysis of the students' comments revealed that participants were eager to receive training related to organ donation and also acknowledged the need for society to be more informed. Table 4 shows the results of this analysis.

**Table 4.** Qualitative analysis of the student’s comments

Categories	Number of comments revealed		Examples
	Medical students	Nursing students	
<p>“Academic Training” Students believed they had inadequate training on organ donation. They would like to have curricular activities on the issue.</p>	196	71	<p>“I would like to receive formal training about organ donation before I finish my bachelor” <i>(Fourth year medical student).</i></p> <p>“I know almost nothing about organ donation, I would like some teachers talk of the subject” <i>(Third year nursing student).</i></p>
<p>“Create awareness in people” Students thought that greater diffusion of information would increase the public’s willingness to donate organs.</p>	3	8	<p>“There should be campaigns for people to be informed, so they could want to be donors” <i>(Third year nursing student).</i></p>

## Discussion

This study explored the knowledge and attitudes of both medical and nursing students on organ donation using objective data concerning a situation that has scarcely been explored in Mexico. Of all the students approached to take part in this study, no one declined to participate, which may also reflect growing interest in the topic.

Knowledge about organ donation in the nursing student group was lower than in the medical student group, a finding consistent with earlier studies (19, 28), which may be because medical students are more exposed to the topic since the organ donation-transplant process is often seen as a medical matter. In this study, medical students had also taken part in more conferences and/or workshops on the topic. However, this difference highlights an underlying problem in that both nursing and medical professionals should be involved in the organ donation process equally in clinical practice rather than one over the other which is currently the norm. In the national health institutes of Mexico, organ donation coordinators include both physicians and nurses. In fact, other health professionals are also involved, although to a lesser extent, including psychologists and social workers who attend to specific aspects of the process.

Some answers to the questionnaire of knowledge are also worth commenting on, starting with the concept of brain death, which is frequently misunderstood by healthcare professionals (24). Although most students knew the definition of brain death, it can be assumed that they did not fully understand the concept, since many believed that patients could still recover from brain death. This can be problematic because if medical students carry this belief forward as physicians, they are likely to believe that a patient is still alive when he/

she is not. Moreover, if future health professionals hold this false knowledge, it is highly possible that other individuals, especially those who do not possess a medical background will also fail to understand that a patient with brain death is, by all definitions, dead. In a study conducted in the United Kingdom, it was found that most medical students understood that patients with brain death are truly dead (27). It is worth noting that the British have a posthumous organ donation rate that is above the world median, which suggests that there is a relationship between complete understanding of the concept behind brain death and a higher prevalence of organ donation (4). It is essential that physicians and nurses are given the resources and knowledge to fully comprehend this concept so that they are in a position to clarify any misconceptions to other individuals including relatives of a potential donor in order to help them make informed end-of-life decisions (24).

It has been shown that ignorance about religious rulings on organ donation is one of the main reasons cited for lack of organ donations (35). This study was no exception; it was found that more than half of students, medical and nursing, believed that prevailing religions in Mexico are opposed to organ donation. It is important to dispel this inaccurate religious assumption. Religious leaders are in a powerful position not only to do this, but to influence their congregations about the importance of becoming organ donors.

Most of the students in this study also believed there was an age limitation for organ donation, as was also found to be the case with Puerto Rican medical students (20). In a recent study sampling the general Mexican population, it was noted that the main reason for unwillingness to donate organs among people who were aged 65 or older was the belief that their organs were no longer useful (36). This misconception should be corrected in order to increase the rate of organ donations among the older population. In fact, more than 50% of organ donors in Spain in 2014 were older adults (37).

Organ donation campaigns might become more successful if healthcare students and professionals were registered as donors, and thus became examples for the general public to follow (22). The study found that donor registration was associated with higher levels of knowledge about organ donation, as has been reported previously by Terbonssen et al. (31). The author gave informative material about organ donation to medical students who did not have organ donor documentation and found that some of them stated that reading it prompted them to complete a donor card.

Study results indicate that although most students are willing to donate, especially medical students, only 25% are registered as organ donors, a major disparity between willingness and action. Studies from other countries have found a higher percentage of organ donor card holders among medical students compared to the general population (38). Similar statistics are currently unknown in Mexico and would be worthy of investigation.

Willingness to donate among individuals does not necessarily imply that they will become donors. People frequently say what they perceive as socially desirable, but there may be a

disparity between their words and actions (39, 40). This is why it was considered necessary to study attitudes as part of this study as well.

In concordance with previous studies in other countries, our findings revealed that students had positive attitudes toward organ donation although this was less evident in nursing students who had less knowledge about the topic (19, 41). An association between knowledge and attitudes toward organ donation has been previously suggested in many studies (19, 24, 30). In this study, more knowledge correlated with a decrease in unfavorable attitudes, which in turn predicts behaviors that precede donation (42). It is important to improve students' knowledge base, not so much as to influence their own attitudes, which were already quite positive, but in order for them to help their future patients and their relatives have a better understanding of the organ donation process.

There was no significant correlation between knowledge and mistrustful attitudes. This was not surprising since a recent study, also conducted in Mexico within the general population, found that corruption, which causes distrust, was the most frequent explanation given for unwillingness to be donors, regardless of the educational level of respondents (36). Mexicans tend to distrust public institutions including those in the health sector.

Another important finding to note was that students' knowledge on organ donation did not improve as they progressed through medical or nursing school. This indicates a lack of allotted time in the curriculum for teaching the topic. There were too few participants who had received training in organ donation, especially among nursing students. However, even those who reported having received training that lasted less than one day had significantly higher knowledge scores than those who had received no training at all. If this scant training was useful, it is essential to encourage more training so that students may reach the appropriate level of knowledge surrounding this subject. In fact, most of the comments given by students expressed the need to increase their training regarding organ donation. Without it, it remains unclear as to how these future health professionals will be prepared to deal with basic issues such as approaching the families of potential donors (27). Improving the knowledge base of health professionals, along with putting appropriate communication tools in place, is essential to increasing organ donation rates. It is worth mentioning that since the 1990's, the National Transplant Organization of Spain (the world leader in organ donation) has created a course entitled "Communication in critical situations: Influence on the donation process" which is aimed at health professionals and has also been used in some Latin American countries with good results (43).

Student training should include the development of competence so that future health professionals are prepared to communicate adequately with society, as well as with potential donors and their relatives (44). Zampieron et al. highlighted the importance of implementing a mandatory course in the undergraduate bachelors curriculum that should include information about organ donation, brain death diagnosis, policies, and responsibilities

during the process, how to maximize donation rates and ethical issues, and the addition of role play scenarios to improve students' knowledge and communication skills. In India, the curriculum in the Bachelor of Medicine, Bachelor of Surgery (MBBS) was recently changed, implementing a course entitled "Attitude, Ethics and Communication," to teach students how to emphatically communicate with patients, to counsel people for organ donation, and to obtain consent (28, 45). We expect that this curriculum change will result in an increase of organ donations in India.

Although this study confirms the need for increased education on the topic, its findings should be interpreted within the context of its limitations and some suggestions should be taken into consideration. Firstly, the sample size was not wholly representative of the Mexican medical or nursing student population, and therefore, the results cannot be generalized. Secondly, despite all the information obtained with the instruments used in this study, it may be useful to delve more deeply into some of the responses given to facilitate interpretation. Thirdly, future research should include additional variables and explore student opinions and attitudes about end-of-life care, since discomfort concerning death has proven to be an obstacle in retaining adequate communication with patients and their families (46).

In conclusion, the findings from this study highlight the need for a review of nursing and medical school curriculum to ensure that future health professionals are adequately prepared to promote donation and reduce the shortage of organs, as has been already proposed (47,48). However, it is important to take into consideration that knowledge does not necessarily prepare students to manage the organ procurement process in a sensitive way. Healthcare professionals are often not comfortable approaching bereaved relatives due to a fear of adding to their distress. Therefore, they should receive training about how to approach relatives of potential donors to positively influence their consent to organ donation (49).

## Authors' Contribution

**M**a. Luisa Marván: Design of the study, analysis and interpretation of the data, article planning, and final approval of the version to be published.

Fabiola Orihuela-Cortés: Design of the study, data collection, article planning, and final approval of the version to be published.

Asunción Álvarez del Río: Data collection, analysis and interpretation of the data, article planning, and final approval of the version to be published.

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## Disclaimer

The opinions expressed in this article are our own and do not constitute an official position of the institution.

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