

Assessment of the level of willingness to donate liver and kidney among the general population in Saudi Arabia

Thamer Hadi Thaker Alghamdi ⁽¹⁾, Sarah Radhi A Alibrahim ⁽²⁾, Safa Saleh S Alzahrani ⁽²⁾, Yakain Hussain A Alhaddad ⁽²⁾, Nada Khader M Alghamdi ⁽²⁾, Raghad Ahmed S Alghamdi ⁽²⁾

(1) Ass. Professor and consultant of general, visceral and hepatobiliary surgery, Albaha university, Saudi Arabia

(2) Medical Intern, Albaha university, Saudi Arabia

Corresponding author:

Thamer Hadi Thaker Alghamdi

Ass Professor and consultant of general, visceral and hepatobiliary surger, Albaha university, Saudi Arabia

Email: Thamerhg@hotmail.com

Received: November 2022 Accepted: December 2022; Published: December 15, 2022.

Citation: Thamer Hadi Thaker Alghamdi et al. Assessment of the level of willingness to donate liver and kidney among the general population in Saudi Arabia. World Family Medicine. December 2022 - January 2023; 21(1): 18-33

DOI: 10.5742/MEWFM.2023.95251497

Abstract

Background: For patients with end-stage liver disease and underlying chronic kidney disease or prolonged acute kidney injury, liver and kidney transplantation is a life-saving procedure. As a result, estimating the general population's willingness to donate liver and kidney is critical.

Objectives: To assess the level of willingness to donate liver and kidney and its relationship with different socio demographic factors among the general population in Saudi Arabia.

Methods: This is cross sectional study that was conducted in various regions in Saudi Arabia during March – May 2022. Data were collected through online self-administered questionnaire prepared via Google Form. Participants were selected using a convenient non-probability sampling technique. SPSS was used to perform data analysis.

Results: A total of 983 participants were included in this study. The majority were females. The most common age group was 18-30 years. Our results found that 23.6 % of the participants reported their willingness to donate a liver or a kidney for an unknown patient, whereas 71.1% reported willingness to do so for a close family member or a friend. 58.3% were willing to accept a donated liver or kidney from an unknown donor whereas 67.7% were willing to accept it from a close family member or

a friend. Moreover, gender was significantly associated with willingness of donation for an unknown patient ($P<0.05$) whereas gender was not significantly associated with willingness for donation for a close family member or a friend. Age groups, marital status and occupational status was found to be significantly associated with donation for both unknown patients and close family members or friends ($P<0.05$).

Conclusion: According to our findings, the willingness of participants to donate a kidney or a liver was 23.6 percent for unknown patients and 71.1 percent for close relatives. Gender, marital status, age, income and occupation were observed to be significantly associated with willingness to donate an organ for unknown patients or close family members or friends or both.

Key words: donation, liver, kidney, general population, Saudi Arabia

Introduction

The first effective transplantation in the case of both living and dead donors occurred in 1954 and 1962 in Boston. It was done by Dr Joseph Murray and Dr David Hume. Later on, till the 1970s, there were many successful organ transplantations worldwide, such as lung, kidney, liver, heart and pancreas transplantation. But in 1980, there was an improvement in organ rejection cases due to immune suppression therapies used. The data of the Global Observatory on Donation and Transplantation (GODT) displayed the increasing organ transplantation demand and less transplantations achieved, i.e. 10 percent of the demand. Further, it also displayed the gap between organ availability and demand ratio among developed (Western) and developing countries (African & Asian countries) (1). The GODT constitutes 109 WHO states, covering 85% of the world population. Out of 85%, 74% of member countries have organizations to look at the organ contribution and transplantation; among those, 80% have proper regulatory laws for organ acquirement and transplantation (2).

Liver is a vital body organ which plays an important role in multiple mechanisms of the human body including metabolism, detoxification, nutrient storage, digestion and immune system regulation. Liver in the human body is the largest organ, weighing almost 1.4 kilograms, and comprises approximately 2% of the adult body weight. Blood from the digestive system is carried to the liver through a portal vein for processing of dissolved substances such as nutrients, drugs and toxins. These substances are sorted out in the liver for storage, metabolism or elimination from the body (3, 4).

Liver is anatomically divided into four lobes namely right lobe, left lobe, quadrate lobe and caudate lobe, where right and left lobe are considered the true functional lobes which are divided by the Cantlie line. Hepatocytes are functional units of liver and are distributed in three zones including Zone I or periportal zone with best perfusion, and Zone II or pericentral zone and Zone III which is farthest from portal blood supply and has least perfusion (5).

Liver may fail to perform its functions because of injuries that may have been caused by multiple factors. Inability of liver to perform its function is termed as liver failure and it is characterized into three groups, namely subacute liver failure, acute liver failure and hyperacute liver failure. Subacute liver failure is defined when the interval between jaundice development and encephalopathy onset is within 5 to 12 weeks. On the other hand, if the interval between jaundice development and encephalopathy onset is within 1-4 weeks, it is characterized as acute liver failure, and if this interval is reduced to within 7 days, then the condition is characterized as hyperacute liver failure. The most common cause of acute liver failure is hepatitis induced by viral infection (viral hepatitis) in the developing countries and drug effects (drug induced hepatitis) in the developed countries. Besides, some other infections, e.g. *Amanita phalloides*, may cause liver injury due to hepatotoxic effects. Other common causes of liver failure include

hepatic conditions such as Wilson disease, Budd-Chiari syndrome, acute fatty liver of pregnancy, hemolysis, elevated liver enzymes, low platelet (HELLP) syndrome, autoimmune hepatitis, veno-occlusive disease, sepsis and liver malignancies (6,7).

Liver transplantation is a management strategy for acute and chronic end stage liver disease when other baseline management strategies such as medical therapy do not work. This management option has been evolving since its first attempt in 1963 in terms of surgical procedures, organ donation, and quality of life of both the recipient and donor. Along with acute liver failure, liver transplantation is indicated in decompensated liver disease and cirrhosis due to underlying medical conditions such as chronic hepatitis (hepatitis C and hepatitis B), Primary sclerosing cholangitis (PSC), Alcohol-related liver disease, Nonalcoholic steatohepatitis (NASH), hepatocellular carcinoma (HCC), Alpha-1 antitrypsin deficiency, hereditary hemochromatosis (HH), familial amyloid polyneuropathy (FAP), Primary hyperoxaluria type I, glycogen storage disease and cystic fibrosis (5,8).

Scarcity of donated liver is a key challenge in the treatment of liver disease through liver transplantation. Acute hepatic failure incidence is estimated to be less than 10 cases per million population each year in the developed countries. Around 2,800 cases of acute liver failure are reported each year in the United States while the frequency of hepatic failure is much higher in developing countries, mostly affecting the young population (6). Moreover, there is a progressive imbalance between the number of available liver donors and the recipients, as candidates for liver transplant are increasing with passage of time (9). Many countries have been working to design and implement innovative strategies targeting incentivized donation to overcome the hurdle of donor-recipient discrepancies through improving liver allocation, liver utilization from donors with cardiac death and facilitation of living donors (10).

Similarly, the kidney, a vital body excretory organ, has been an important concern for researchers in case of kidney failure. In 2016, 16,315 patients were on hemodialysis due to end-stage renal disease (ESRD) in KSA. By 2020, this number will increase to 20,000. The age of patients with ESRD varies from 26 to 65 years (11). This age limit is younger compared to other illnesses. The small age limit makes ESRD an alarming health concern to be highlighted. That is why ESRD is usually treated by kidney transplantation. Kidney transplantation lengthens the duration of life and provides a quality of life. Moreover, it stabilizes the cognitive health abilities and increases the patient's confidence and self-esteem due to fewer changes in the body (12). But kidney transplantation is not always achievable due to differences in demand and supply of the kidney (13).

Improvements in the KSA donation system and new implementations are considered to regulate the organ donation rate. It is an ultimate need to increase the number of kidney donors to enhance the availability of

kidneys for transplantation and to reduce the number of individuals on the waiting list (14). Not only in KSA, but also in other parts of the world, kidney availability is not meeting kidney demand by kidney transplant patients. In Eastern and Central European countries, the patients who acquire kidney transplantation make up one-third of total patients with kidney failure (15). It is why education and public awareness have become an immense need to increase the availability rate of kidneys from living donors, particularly from family members and immediate relatives (16) along with unfamiliar persons according to paired exchange programs (17).

The willingness of the public to donate kidney organs can be increased by altering the attitude and education of the individuals in the health care sector (18). The need to focus on the health care students is due to their positive influence on the general public regarding the willingness of kidney donation (19). Moreover, health care individuals are an integral part of society. Due to their positive attitude toward the public to enhance willingness for organ donation, they set an ideal example to follow. Many studies establish a relationship between donor groups and health care staff's education and awareness of organ donation (20).

The willingness of living donors to donate the kidney is important in terms of the recipient of the kidney and the protection of the donor. The donor must know the possible risks and advantages of offering the kidney. Several factors should be considered while offering organs, such as health risks, possible side effects of kidney elimination, recovery time and failure to rejoin work immediately after surgery (21). The values and beliefs of donors contribute to the choices of decisions in different life situations they make. Their values have motivational power and guide an individual to adopt an action according to their choices and create a potential donor (22). In the case of living donation, humanity, sympathy, and personal standards are important for a healthy society (23).

This study aims to assess the factors affecting the education and willingness of the general public for liver and kidney donation in Saudi Arabia.

Rationale

The limited availability of liver donors and increasing number of liver transplant candidates pose a big challenge for effective healthcare and management strategies to treat liver diseases. These challenges reduce the effectiveness and utilization of recent advancements in the field of liver transplantation (24). Improvements in public understanding and willingness for liver donation may help to convert potential donors into actual donors, and hence, increase the availability of liver donors (25). Thus, data collection regarding the factors affecting public awareness and willingness for liver donation is necessary to design innovative interventions necessary for an improved number of liver donors.

Literature Review

In a meta-analysis of 1806 items of literature obtained from PubMed, Medline, Google Scholar and other authentic sources, the willingness and education of the general public to donate the organ were analysed. After narrowing down the criteria for selecting articles, 14 studies were selected based on knowledge assessment through a questionnaire including questions about organ donation. It includes general knowledge, awareness, religious and social understandings and knowledge among different races about organ donation. Fourteen studies evaluated the willingness, but ten studies assessed the knowledge, while two investigations focused on both the willingness and education. These studies depicted that increased knowledge improves willingness (26).

Liver donors are very limited in number as compared to the number of candidates waiting for liver transplant. A comprehensive literature survey and a case series report was carried out in the United States (US) by Shan et al., describing that liver donation can be facilitated through improvements in anonymous living liver donation (ALLD) programs at various settings. This program encourages healthy individuals to volunteer for donation of a part of their liver. Different institutions have set up their protocols for ALLD which can be modified to increase the pool of donated livers through improved awareness of AALD and covering the financial risks. In the case series, the researchers recruited more than 40 potential ALLDs of which 5 completed the process and ended up with successful living liver donation. The authors suggested that adoption of institutional policies that should allow ALLD, establishing financial aid programs for donors and sharing this information with the public may improve the general public attitude towards ALLD and may help in saving more lives by reducing the wait for liver transplant in patients affected with acute liver failure (27). Recently, liver donation through an anonymous nondirected live liver donation (ANLLD) program in the US was reported to implement effective and safe protocols for partial liver donation (28, 29).

Ríos et al. reported a favorable attitude towards live liver donation among Spanish medical students after conducting a multicenter, interdisciplinary sociological and observational study. In this study, data was collected from more than 9500 students enrolled in medical schools through a validated questionnaire. Analysis of data revealed that 89% of the study subjects were in favor of living liver donation to relatives while 39% supported unrelated living liver donation. Prominent factors associated with a positive attitude towards liver or other organ donation were age, gender, academic year, geographical area, possibility of facing a need for transplant in future, perception about deceased liver donation, perception about accepting liver donation from a family member, discussions about organ donation with family or friends, partner's opinion about organ donation and having a history of altruistic activity. The most common fear associated with liver or kidney donation among the medical students was risk of body mutilation (30). Moreover, López-Navas et al. reported

that lack of awareness about living liver donation among patients, who are waiting for liver transplant, has limited the potential donor relatives to donate live liver (31).

Similarly, a positive attitude towards living organ donation was reported in another study carried out by Lin et al. from Taiwan. This study recruited 375 healthcare professionals and observed that 65% of them were willing to donate their living liver. Among these, 78.9% of the subjects showed willingness to donate living organs for unknown and unrelated recipients. Factors associated with willingness for living organ donation were motivation to help others, financial support from the authorities, positive attitude towards living organ donation, and reduced concerns for personnel health (32).

Reduced inclination towards liver donation is also a significant challenge for liver transplantation in the Middle Eastern countries and the countries of Arabian Gulf region. Religious and cultural factors, lack of consensus among religious scholars about organ donation, lack of proper health infrastructure, low awareness among medical professionals and general public and lack of support from government are key elements that hinder the expansion of donor pool in this region (33, 34). Liver transplants have been carried out at institutional level in two countries, i.e. Turkey and Iran, while living liver donation is a common source for organ transplant in this region (33). Khder and AlNoaimi reported that the majority of study participants (95.17%) from Bahrain did not register for organ donation while 35.17% did not show willingness to donate organs after death (33). Another study was carried out by Janahi et al. in the United Arab Emirates (UAE) by recruiting more than 490 subjects. The authors reported positive attitude and belief of the public towards organ donation and transplantation (80%) while the knowledge about local laws related to organ transplantation was inconsistent in most of the participants (60%) (35).

Althonaian et al. carried out a retrospective cohort study at a tertiary healthcare center, King Abdulaziz Medical City (KAMC) in Saudi Arabia, recruiting more than 100 participants who donated live liver for transplantation. The researchers reported the procedures to be safe as no life threatening complications were observed in any of the donors while two donors faced Grade III complications and six donors reported Grade II complications after the surgery for donation (36). Moreover, Sadagah et al. observed that the majority (81%) of the total 370 recruited family members of hemodialysis patients were willing for organ donation. However, only 11% of the participants thought their knowledge level about the topic to be high or very high. Male gender and age less than 40 years was found to be associated with increased willingness of organ donation (37). Another study was carried out by Alnasyan et al. to assess the general public awareness about organ donation and transplantation in Saudi Arabia. This study enrolled more than 1450 Saudi adults among whom more than 77% showed willingness for organ donation. Data analysis showed that almost 29% of the study participants were willing to donate organs for their relatives while

only 22.3% refused organ donation. Moreover, 77.4% of the study participants with age more than 40 years were willing to donate organs to unrelated patients while the majority (78%) of younger participants (less than 40 years old) showed willingness to donate organs for unrelated patients (38).

There were 140,993 organs donated in 2018 worldwide. Of the total, 1,350 organs were transplanted in Saudi Arabia, which makes up 0.95% of total transplantations (1). This 0.95 % of surgeries involved kidney donation mainly, i.e., 1006, and then 270 liver transplantations and 96 heart transplantations (39).

Moreover, the literature concluded that the poor organ donation rate is due to social stigma, lack of education and carelessness (40). Further, it is assumed that Saudi Arabia will have to face a shortage of organ donors in the future (38). That is why it is required to assist in educating the general public to enhance willingness for organ donation, particularly among medical staff (41).

Yan et al. and Okita et al. in their studies also highlight the importance of sociodemographic factors such as age, sex, religion, ethnicity, financial, marital and education status (42,43). Certain other factors are essential to making the public ready for a kidney donation, such as religion and socioeconomic status. The factors contributing to organ donation are favoured by a study in Germany that revealed the link between medical staff and education and willingness to donate the organ (44). Other studies revealed the link between education, behaviour and enhanced willingness to donate the organ (45).

Objectives

General:

- Study the level of willingness to donate liver and kidney among general population in Saudi Arabia.

Specific:

- To explore the relationship between Liver and Kidney donation willingness and different socio-demographic factors.

Methodology

Study design: This observational study has a cross-sectional study design.

Study Area: Data collection was done in various cities of Saudi Arabia during March – May 2022.

Study Population: The study population comprised the General Public Population.

Inclusion Criteria: Adult Saudi Arabian resident who agrees to participate in the study, any gender, any nationality, can read and own a social media account.

Exclusion Criteria: Non-Saudi Arabian resident, has no social media account, or refuses to participate and share the requested information.

Sample Size: EPI info program was used to determine the sample size. On the basis of total population of KSA, keeping a 5% margin of error and 95% confidence interval, the sample size came out to be 384.

Due to overwhelming response, the number of questionnaires collected reached 1083, and after enforcing inclusion criteria, a total of 983 responses were finalized to be included in the study.

Data collection tools: A validated self-administered online questionnaire was used to collect information. The most commonly used social media platforms were used to spread the link i.e., WhatsApp, Facebook and Twitter. The objective of the study was mentioned clearly in the preface. The questionnaire consisted of two parts. Part one was reserved for socio-demographic information, and the second part contained questions about participants' willingness for donation of kidney and liver.

Pilot study: A pilot study was accomplished to pretest the questionnaire including over 20 respondents. The results of this pilot study were not counted in the final study. A few changes were made for a better understanding and clarity of the questions.

Sampling Technique: Sampling was done using a convenient non-probability technique.

Data analysis: We used Statistical Package for Social Science (SPSS) version 23 for data analysis. Percentage and numbers were used to express qualitative data. To examine the difference in data in the two groups, we used Chi-square (χ^2) test.

Ethical considerations: Research Ethics Committee in Al-Baha University approved the study. Participants' information and the collected data was solely utilized for research and kept confidential.

Results

Participants' characteristics:

Of the total participants, the majority were females (669, 68.1%). The most common age group was 18-30 (683, 69.5%) whereas participants >70 years accounted for only 0.1%. More than half of the participants were single (596, 60.6%). 95.4% of the participants were Saudi. Regarding the participants' occupation, half of them were students. Most of the participants have average monthly income of less than 5000 (64.7%). Table 1 shows more details of the socio-demographic characteristics of the study participants. Most of the participants are from Al-Baha (33.6%). Other residence details are shown on Figure 1.

Table 1: Socio-demographic characteristics of the study participants (n=983)

Variable	Category	Frequency	Percent
Gender	Male	314	31.9%
	Female	669	68.1%
Age (years)	18-30	683	69.5%
	31-40	149	15.2%
	41-55	121	12.3%
	56-70	29	3%
	> 70	1	0.1%
Marital status	Single	596	60.6%
	Married	359	36.5%
	Divorced	21	2.1%
	Widowed	7	0.7%
Nationality	Saudi	938	95.4%
	Non-Saudi	45	4.6%
Education	Primary	7	0.7%
	Intermediate	19	1.9%
	Secondary	185	18.8%
	Bachelor	707	71.9%
	Other	65	6.6%
Occupational status	Student	491	49.9%
	Employed	237	24.1%
	Unemployed	133	13.5%
	Private business	27	2.7%
	Retired	38	3.9%
	Other	57	5.8%
Average monthly income (SAR)	< 5,000	636	64.7%
	5,000 - 9,999	159	16.2%
	10,000 - 14,999	100	10.2%
	15,000 – 19,999	50	5.1%
	> 20,000	38	3.9%

Figure 1: Residence of study participants (n=983)

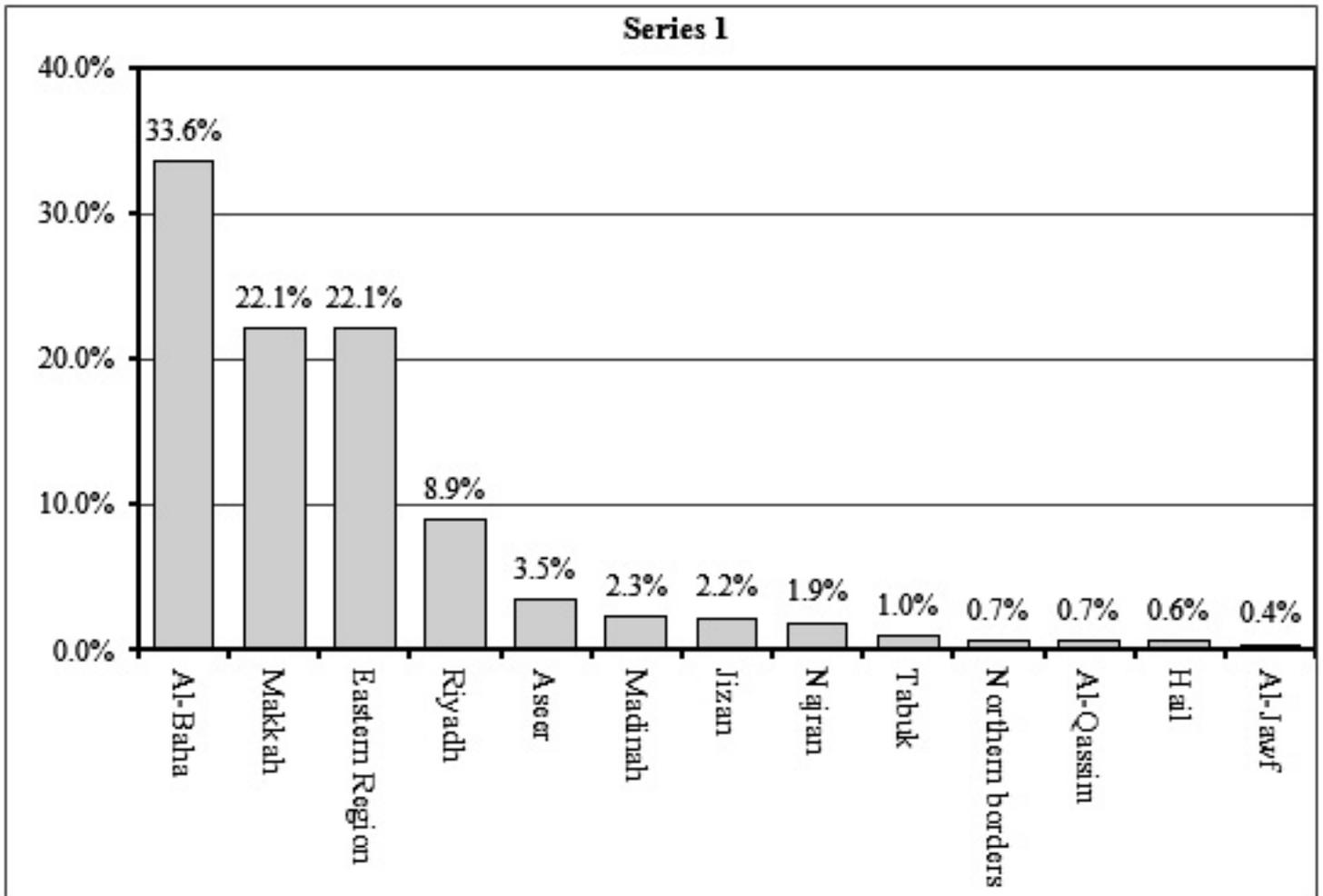
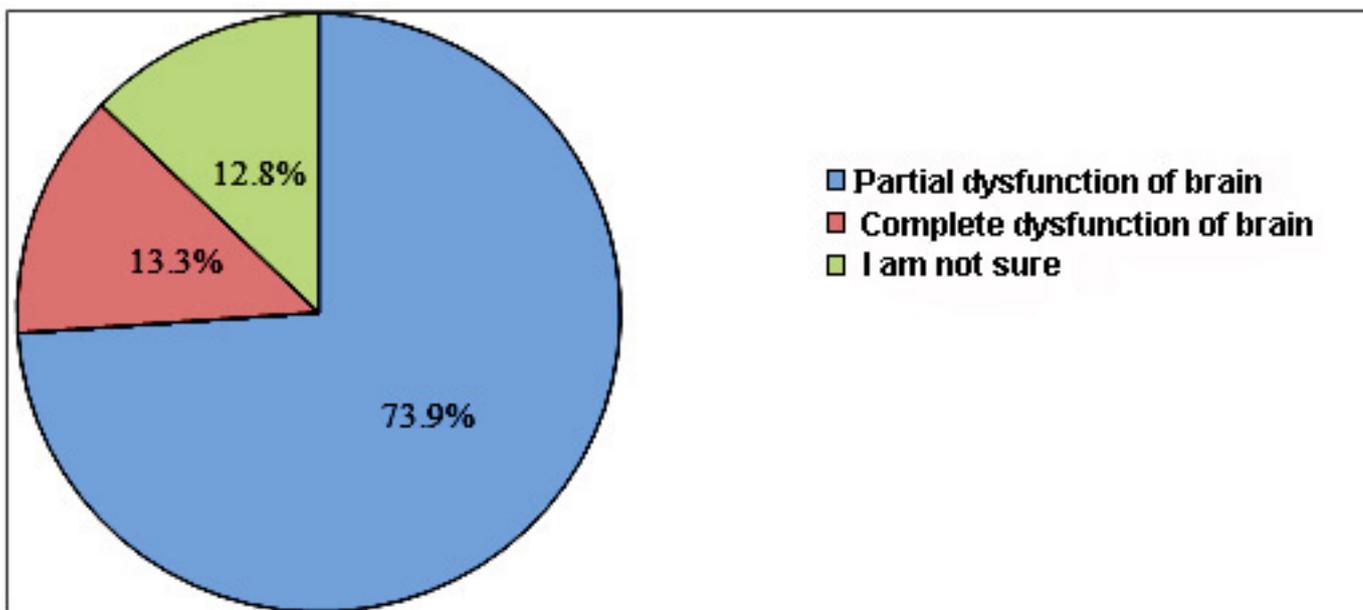


Figure 2: Perceptions of the participants regarding the definition of brain death



Liver and kidney donation willingness:

Our study showed that 87.1% and 95.8% of the participants had heard about liver and kidney donation respectively. Only 13 (1.3%) participants reported a previous donation of an organ whereas 18 (1.7%) reported receiving an organ from a donor. 23.6 % of the participants reported their willingness to donate a liver or a kidney for an unknown patient, whereas 71.1% reported doing so for a close family member or a friend. 58.3% were willing to accept donated liver or kidney from an unknown donor whereas 67.7% were willing to accept it from a close family member or a friend. When participants were asked about their familiarity with brain death 92.8% thought they are familiar with it, with only 12.6% thinking it is reversible. 73.9% of the participants reported brain death as a partial dysfunction of the brain (Figure 2). Most of the patients (36.4%) defined deceased liver or kidney as its donation after the brain stops functioning (Figure 3) whereas 44.6% defined living kidney or liver as its donation during the person's life (Figure 4). 89.6% of the participants think that the most important reason for donation is to save another human's life (Figure 5) whereas 59.5% think the most important reason for not donating is the fear of health issues (Figure 6). Further details of the liver and kidney donation willingness are shown in Table 2.

Figure 3: Perception of the participants about deceased liver or kidney donation

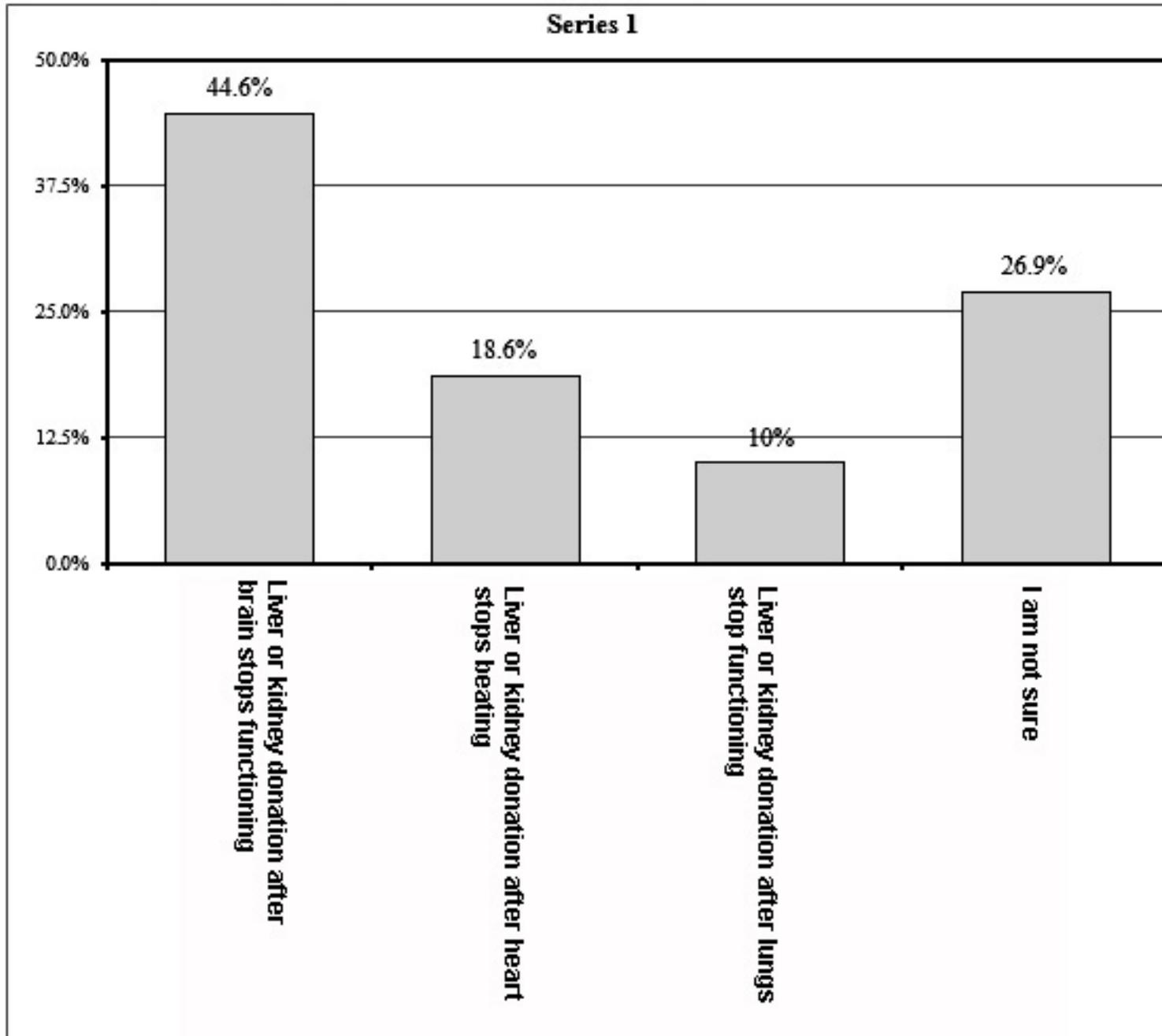


Table 2: Liver and kidney donation willingness

Question	Yes	No	Not sure
		n (%)	
1. Have you ever heard about liver donation?	856 (87.1)	81 (8.2)	46 (4.7)
2. Have you ever heard about kidney donation?	942 (95.8)	26 (2.6)	15 (1.5)
3. Have you ever donated an organ?	13 (1.3)	970 (98.7)	-
4. Have you ever received an organ from a donor?	18 (1.8)	965 (98.2)	-
5. Are you registered with any program for organ donors?	169 (17.2)	814 (82.8)	-
6. Would you be willing to donate your liver or kidney for unknown patients?	232 (23.6)	307 (31.2)	444 (45.2)
7. Would you be willing to donate your liver or kidney for a close family member or friend in need?	699 (71.1)	73 (7.4)	211 (21.5)
8. Would you be willing to donate the liver or kidney of your family member for unknown patients?	303 (30.8)	261 (26.6)	419 (42.6)
9. Would you be willing to donate the liver or kidney of a family member for a close family member or friend in need?	560 (57)	124 (12.6)	299 (30.4)
10. Would you be willing to accept donated liver or kidney (if needed) from an unknown donor?	573 (58.3)	122 (12.4)	288 (29.3)
11. Would you be willing to accept donated liver or kidney (if needed) from a close family member or friend donor?	665 (67.7)	87 (8.9)	231 (23.5)
12. Do you think liver or kidney donation is allowed in Islam?	720 (73.2)	53 (5.4)	210 (21.4)
13. Do you think liver or kidney donation is allowed by your country's law?	897 (91.3)	14 (1.4)	72 (7.3)
14. Liver can only be donated before the death of a donor?	672 (68.4)	70 (7.1)	241 (24.5)
15. Liver can only be donated after the death of a donor? (False)	478 (48.6)	140 (14.2)	365 (37.1)
16. Kidney can only be donated before the death of a donor?	680 (69.2)	73 (7.4)	230 (23.4)
17. Kidney can only be donated after the death of a donor?	460 (46.8)	151 (15.4)	372 (37.8)
18. Are you familiar with brain death?	912 (92.8)	34 (3.5)	37 (3.8)
20. Is brain death reversible? (No)	124 (12.6)	531 (54)	328 (33.4)
23. If you are given a chance to donate part of your liver or kidney during your life, would you donate?	423 (43)	168 (17.1)	392 (39.9)
26. Do you think there should be more awareness campaigns about liver or kidney donation for the community?	791 (80.5)	55 (5.6)	137 (13.9)
27. Would you be interested to attend an educational session to increase your knowledge about liver or kidney donation options?	534 (54.3)	230 (23.4)	219 (22.3)

Figure 4: Familiarity of the participants with living liver or kidney donation

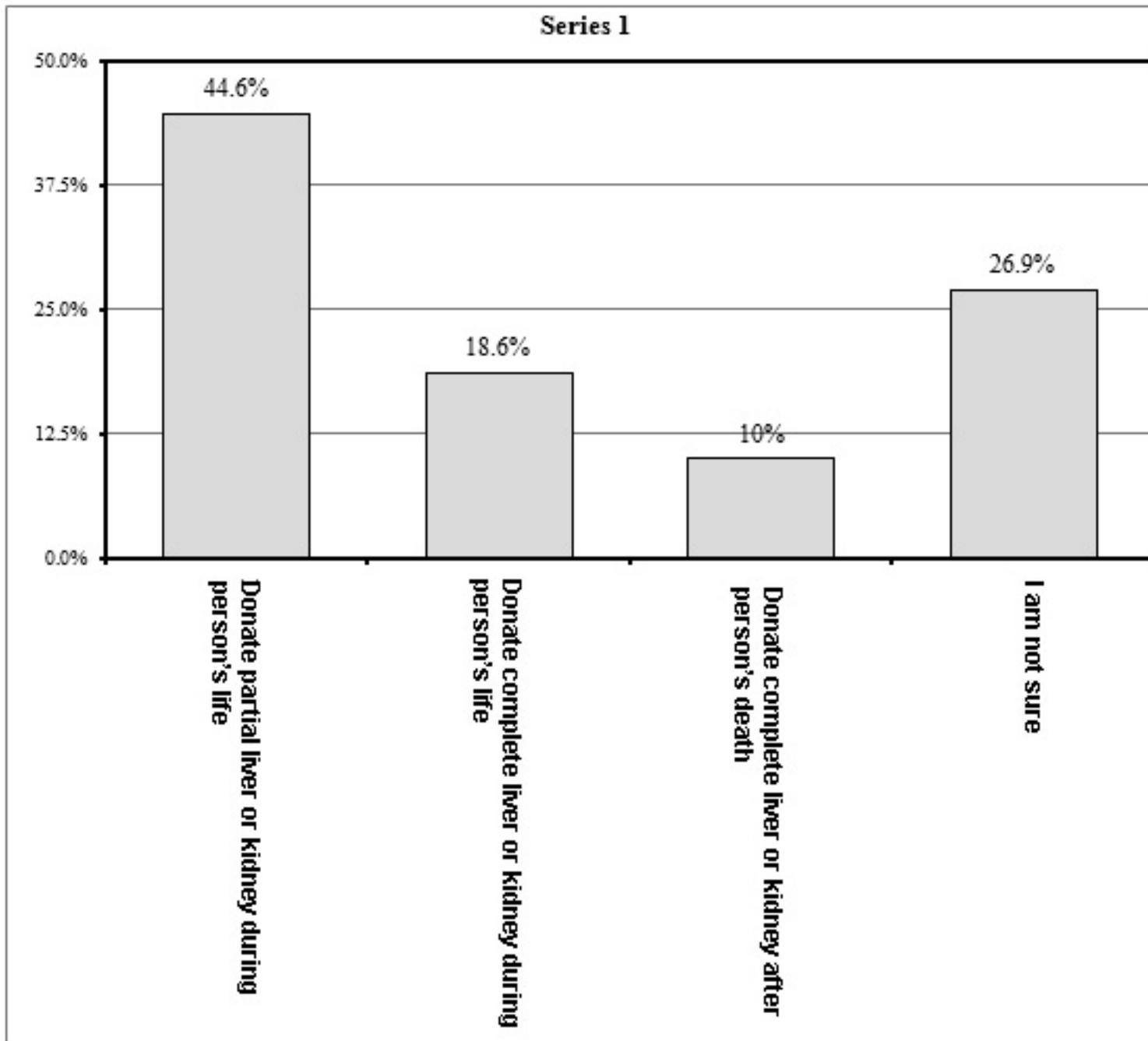


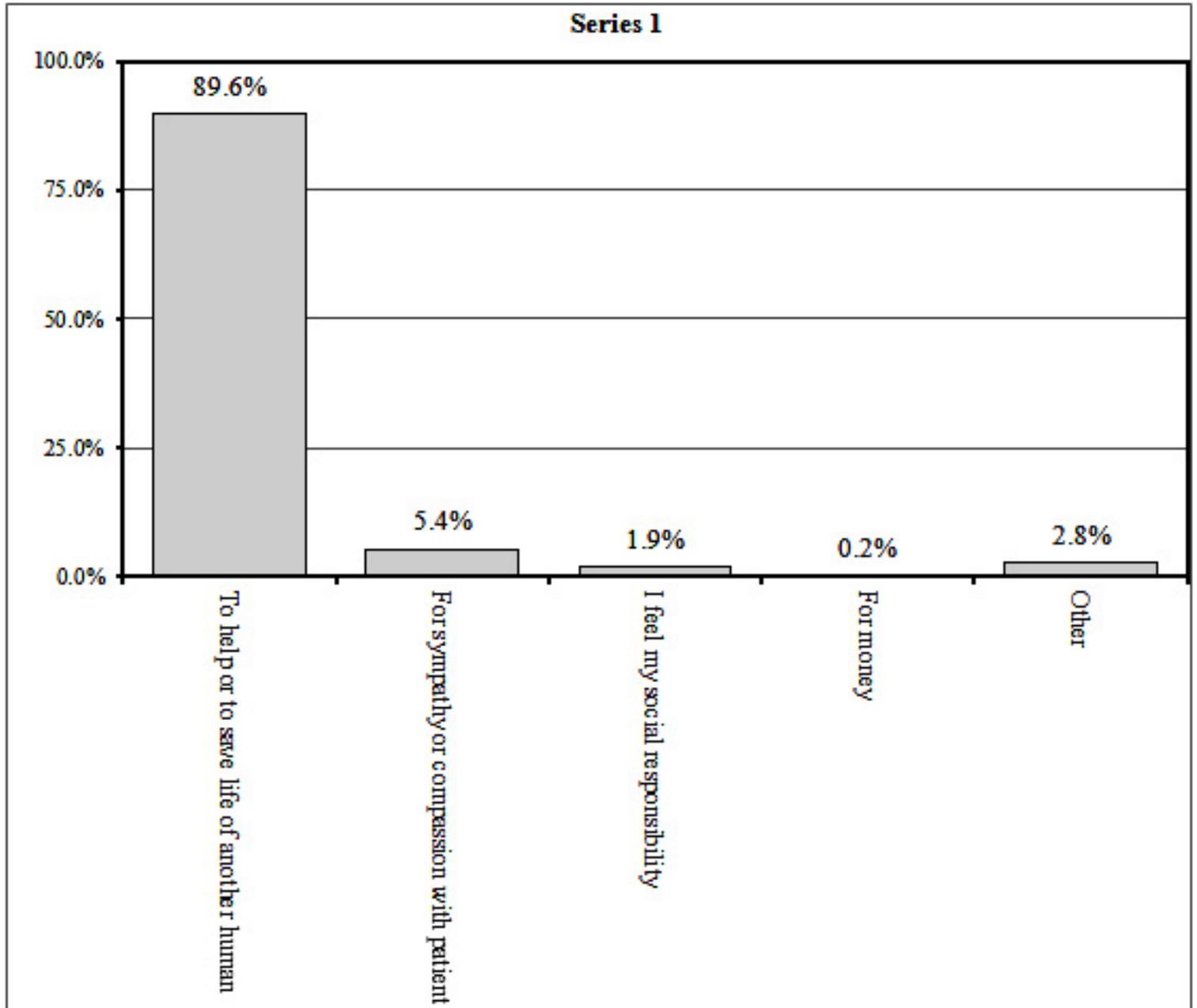
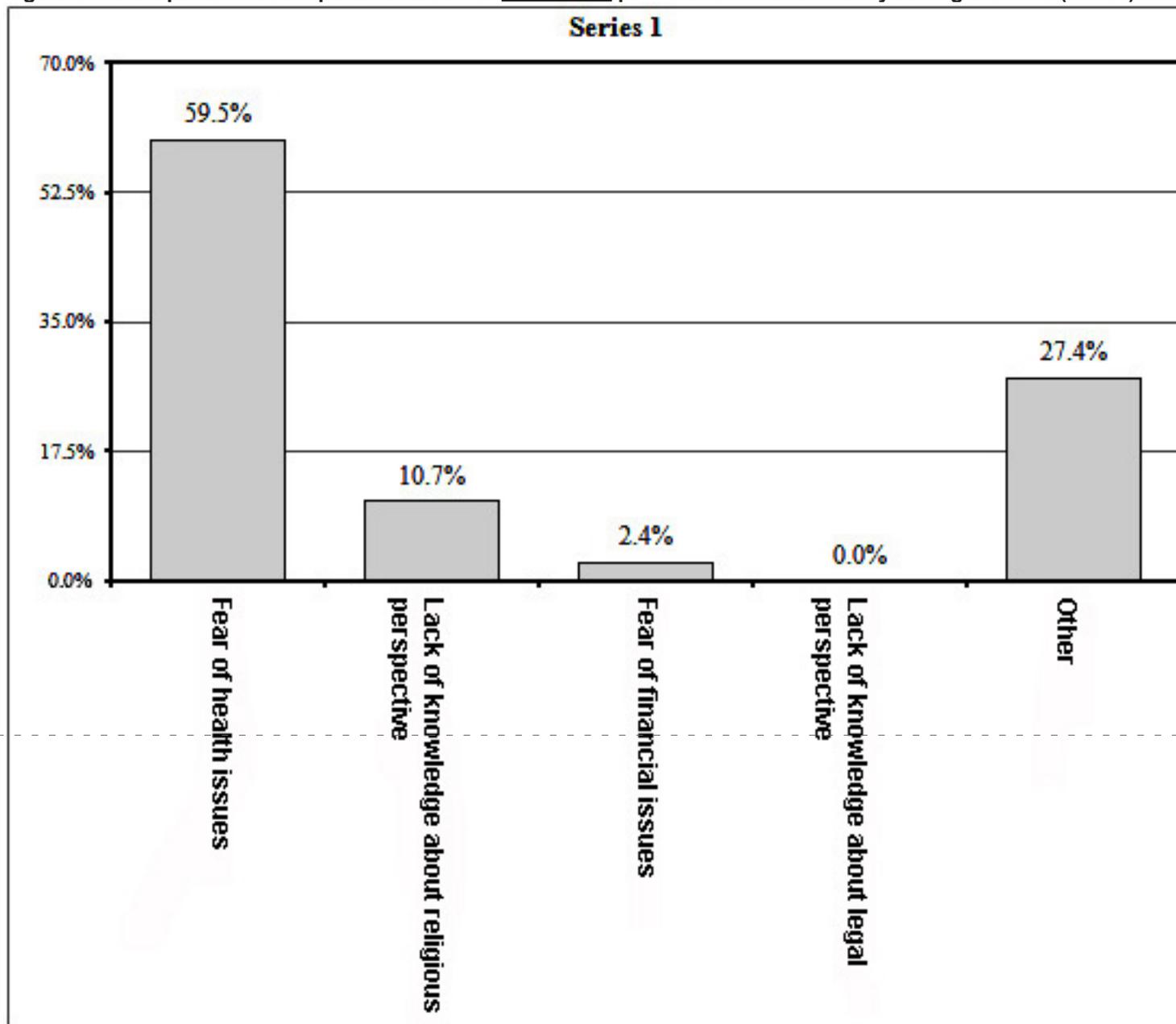
Figure 5: Participants' most important reason for donating part of their liver or kidney during their life (n=423)

Figure 6: Participants' most important reason to not donate part of their liver or kidney during their life (n=168)

Factors associated with Liver and Kidney donation willingness

Gender was significantly associated with willingness of donation for an unknown patient ($P < 0.05$); females had higher willingness to donate for unknown patients compared to males whereas gender was not significantly associated with willingness of donation for a close family member or a friend. Age groups, marital status and occupational status were found to be significant with donation for both unknown patients and close family members or friends ($P < 0.05$). Average monthly income was found to be significant with donation for unknown patients ($P < 0.05$).

Participants within the age group of (18 – 30) had the highest willingness to donate for unknown patients while participants aged more than 70 years had the highest level of willingness to donate for close family members or friends. Single participants had the highest level of willingness to donate for both unknown patients and close family members or friends. In regards to occupational status; students had the highest level of willingness to donate for both unknown patients and close family members or friends. Participants with monthly income of less than 5,000 SAR or more than 20,000 SAR had the highest level of willingness to donate for unknown patients. Education and nationality were not found to be with any of it. Table 3 shows the details of the association between socio-demographic characteristics and the willingness to donate a kidney or a liver (Table 3).

Table 3: Association between Liver and Kidney donation willingness and different socio-demographic factors

Variable	Category	Willingness to donate your liver or kidney?			
		For unknown patients	P value	For a close family member or friend	P value
		% of answer (Yes)			
Gender	Male	17.2%	< 0.001	71%	0.749
	Female	26.6%		71.2%	
Age (years)	18-30	28.1%	< 0.001	77.5%	< 0.001
	31-40	13.4%		66.4%	
	41-55	13.2%		46.3%	
	56-70	13.8%		48.3%	
	> 70	0%		100%	
Marital status	Single	29%	< 0.001	78.7%	< 0.001
	Married	15.9%		60.2%	
	Divorced	9.5%		57.1%	
	Widowed	0%		28.6%	
Nationality	Saudi	23%	0.154	70.9%	0.294
	Non-Saudi	35.6%		75.6%	
Education	Primary	0%	0.451	42.9%	0.089
	Intermediate	15.8%		63.2%	
	Secondary	18.9%		64.3%	
	Bachelor	25%		73.7%	
	Other	26.2%		67.7%	
Occupational status	Student	28.3%	< 0.001	79.6%	< 0.001
	Employed	17.7%		67.9%	
	Unemployed	22.6%		67.7%	
	Private business	25.9%		51.9%	
	Retired	10.5%		39.5%	
	Other	17.5%		49.1%	

Table 3: Association between Liver and Kidney donation willingness and different socio-demographic factors (continued)

Average monthly income (SAR)	< 5,000	26.4%	0.017	74.7%	0.067
	5,000 - 9,999	19.5%		65.4%	
	10,000 - 14,999	15%		64%	
	15,000 - 19,999	16%		60%	
	> 20,000	26.3%		68.4%	

Discussion

This study aimed at investigating the level of willingness to donate liver and kidney among the general population in Saudi Arabia.

In our study, we found that participants' willingness to donate a kidney or a liver was 23.6 percent for unknown patients and 71.1 percent for close relatives. These figures are comparable to previous estimates from Japan (41.9%) (46), Syria (62%), and the Middle East (49.8%) (48). Overall, the general public's willingness to donate organs is not particularly high in this study, and policymakers and scientists should take targeted measures to improve the situation.

We also wanted to emphasize that people are more willing to donate for a close relative than for an unknown patient. In their report, Crouch and Elliott concluded that living organ donation for related family members, particularly children, can never be considered an autonomous decision because the family is a social structure that does not absolve its members of responsibility (49).

The vast majority of patients stated that organ donation is permissible in Islam (73.2 percent). Many Muslims are still divided on the issue. Despite numerous rulings in support of organ donation, there is still a lack of agreement among Muslims in their communities about its compatibility with Islam.

Gender was found to be strongly related to someone's willingness to donate a kidney or a liver, with females reporting a higher percentage. Gender stereotypes may influence gender influence. This may be because women are more empathic, sensitive, and caring by nature. As a result, emotional quotient may play a larger role in women's responses, especially during adversity or crisis. Women are thought to be more willing to make sacrifices and to respond more positively to organ donation, particularly if a need arises within their families. Men are generally thought to be more hesitant to donate their organs than women, whose decision is heavily influenced by their parents, spouses, or both.

Marital status was also observed to be significantly related to willingness for transplantation, with married participants being less willing than unmarried participants. This finding is consistent with Abukhaizaran and Yan's (50, 51) research, but not with Iliyasu's (52). More research is required to investigate this connection.

The desire to help was the most common reason for organ donation, with financial considerations motivating only 0.2 percent of those polled. This could be explained by the belief that getting paid to do good diminishes the good deed and that profiting from organ donation is a form of organ trafficking. Religious beliefs (36%) and a lack of financial incentives (44%), according to a Jordanian study, are important reasons for people to refuse organ donation (53). According to another Saudi Arabian study, the most important reasons for accepting organ donation are humanitarian (68%) and religious (62%) reasons, with money accounting for only 0.6 percent (54). Religion was cited as a reason for refusal to donate organs by 27.5 percent of respondents in the same study.

87.1 percent and 95.8 percent of participants said they had heard about organ and tissue donation, respectively. This is consistent with previous research findings (55-56). According to an Egyptian study, 89 percent of participants have heard of organ donation, and 53 percent can identify the organs that could be transplanted (55).

The most significant limitation of this study is the results' generalizability to the Saudi population. Because the sampling method used does not guarantee generalizability, further research using a randomized sampling approach is required.

Conclusion

Our study showed that the willingness of the participants to donate a kidney or a liver was 23.6% and 71.1% for unknown patients and close ones, respectively. Gender, marital status, age income and occupation were found to be associated significantly with willingness to donate an organ. Further studies are needed to confirm the relationship between donation willingness and above listed socio demographic factors.

Recommendations:

We recommend conducting more research with different types to establish a causal relationship between gender, marital status, age, income, occupation and donation willingness. Furthermore, we need to investigate other factors rather than socio demographic variables, like health status of participants.

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