



Knowledge, Awareness and Attitudes on Organ Donation among Undergraduate Medical Students in Malaysia: An Analytical Cross Sectional Study

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Authors' contributions

This work was carried out in collaboration between all authors. All authors designed the study, wrote the protocol and wrote the first draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

There is a shortage of organs for transplant globally. Malaysia has one of the lowest deceased organ donation rates in the world. The shortage in organ supply is perceived to be due to a lack of awareness and knowledge among the public and health care providers, particularly the medical students in Malaysia.

Objective: The present study was conducted to assess the knowledge, attitudes and perception, to determine the prevalence of organ donors and establishing a relationship between various socio-demographic data on knowledge, awareness and perception of organ donation among private undergraduate medical students in Malaysia.

Methods: This observational analytical cross-sectional study was carried out by using the questionnaire method. The questionnaire was categorized into four sections (demographic data, Knowledge, Willingness and Attitude). The data was analysed by using Epi Info version 7.0. For inferential statistics, chi-square and independent t-test were used. The socio-demographic data were then compared with the knowledge, awareness and perception data collected and ANOVA

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(analysis of variance) was performed.

Results: This study involved 372 medical students. Only 21.2% have good knowledge on organ transplant. 71.2% of students were willing to register for organ donation but only 14.5% were registered donors. There is a significant positive low correlation ($r=0.346$) between knowledge score and the willingness to donate organs. The older respondents ($P=0.043$), male gender ($P=0.018$) and Indian students ($P=0.018$) are more likely to have higher knowledge score on organ donations. The higher the parent's education level, the more willing are students to donate their organs ($P=0.013$, $P=0.014$). Hindus are 2.37 times and Buddhist are 2.08 times more likely to have a positive attitude towards organ donation when compared against Muslims ($P=0.019$, $P=0.014$).

Conclusion: The prevalence of registered organ donors is higher among medical students compared to the general population in the country. The knowledge of organ donations among medical students is only moderate and hence can be improved through better awareness programs and more structured lectures. High knowledge level on organ donations lead to higher willingness and more positive attitude towards organ donations.

Keywords: Organ donations; knowledge; attitude; perception; medical students; Malaysia.

1. INTRODUCTION

Organ transplantation is arguably one of the greatest scientific advances and remains one of the most challenging and complex field of modern medicine. The World Health Organization (WHO) defines organ donation as the gift of an individual's body parts after their demise for transplantation. Transplantation is a surgical procedure which involves the replacement of a recipient's diseased and defective organs or tissues with healthy ones from a donor [1]. The commonly transplanted organs are kidneys, heart, liver, lungs and pancreas while the transplantable tissues are eyes, bones, skin and heart valves [2].

A total of 114, 690 solid organs were reported to be transplanted in the year 2012 globally. Despite being a 1.8% increase in transplant rate as compared to year 2011, this still only amount to less than 10% of the global organ need [3]. According to the World Health Organization (WHO)'s Global Observatory on Donation and Transplantation (GODT) 2012, Malaysia has one of the lowest deceased organ donation rates in the world at 1.3 organ donor per million population [3,4]. This is an alarming statistic considering the numbers of donors in other countries are much higher with Australia, United States of America and Spain at 11, 26 and 35.1 people per million population respectively [3].

The shortage in organ supply is perceived to be due to lack of awareness and correct knowledge among public and health care providers [5]. There is also an influence of the individual's perception on organ donation. General public opinion surveys have found that most Malaysians

have a negative attitude towards organ donation. This attitude can be a result of many reasons namely the lack of accessibility to information, the lack of trust on the beneficial utilisation of their organ upon donation and religious issues [4]. Another study done showed that ethnicity, age group, education level and household income were the factors associated with not pledging as an organ donor. Those with no formal education and those with lower monthly household income are also less likely to pledge as organ donors [6].

These data supports the need to assess awareness, attitude and perception of Malaysians particularly among the medical students as they play a major role in educating, spreading awareness and motivating the public regarding organ donation. Hence, in this cross-sectional study, we assess the knowledge, attitudes and beliefs of private undergraduate medical students in Malaysia. The objectives of this study is to determine the prevalence of organ donor, to assess the existing knowledge, willingness and attitude on organ and to establish a relationship between the various socio-demographic data on knowledge, awareness and perception donation among private undergraduate medical students in Malaysia.

2. METHODS

We conducted an observational analytical cross-sectional study. The study population consisted of private undergraduate medical students from Melaka Manipal Medical College (MMMC). The total population of MBBS students in Melaka campus is 611 students [7,8]. By using statistics software, Statcalc10, with 95% confidence limit,

5% margin of error, 80% power and an expected prevalence rate of willing organ donors at 44.3% [4], we were supposed to acquire a minimum sample size of 379 students in order to perform this survey. However, we had only managed to obtain a sample size of 372. We prepared the questionnaires for 480 students to accommodate for dropout rate of 20% or more so that our study would not be disrupted. Out of the 480 questionnaires, 372 questionnaires were filled up and all complied to the inclusion and exclusion criteria. The inclusion criterion was all medical students who are currently in clinical year which consists of Semester 6, 7, 8 and 9 students from MMMC. Students in the MBBS programme who refused to sign the written consent form, who were absent on the day of survey and submitted a less than 80% completed questionnaire were excluded from the study.

Data was collected on the 8th-12th of September 2014 from students of batch 26, 27, 28 and 29. A self-administered questionnaire with four sections (Demographic data, Knowledge, Willingness and Attitude component) was prepared. The first section consisted of basic demographic data of the students which comprise of age, gender, ethnicity, religion and parental education level. The next section is based on Knowledge on organ donation. This section is to identify the knowledge of medical students on organ donation, views on organs that can be transplanted, current registration system and survival rates. It consists of true or false questions that test the students on the organs available for donation and the current system existing in Malaysia. It consisted of 4 parts where 1 mark will be given for the correct answers and 0 for the wrong. The next component is Willingness of medical students. This section is to identify the idea of organ donation among medical students. They can either be for or against it and their views of donating their own organs are enquired. Besides this, questions on whether they are registered organ donors as well as supporting the system are asked. It consists of 6 questions in which their opinions are obtained. The last section is on Attitude towards organ donation among medical students. This section consists of 21 questions which use the Likert scale. This scale consists of one to five points in which their level of agreement or disagreement on each statement is identified. For questions 1-15 the scale is 1: strongly agree 2: agree 3: neutral 4: disagree 5: strongly disagree, and for the subsequent questions the scale was reversed. We have formulated this

questionnaire and modified it from the various established studies [5,9-11]. Data processing was performed using Microsoft Excel 2010. The data was analysed by using EpiInfo 7 (Centers for Disease Control and Prevention, Atlanta, Georgia, USA) [12]. For descriptive statistics, we used frequency distribution Table and percentage, means and standard deviation as well as median and interquartile range. For inferential statistics, we used chi-square for nominal data and independent t-test for quantitative continuous data to test the hypothesis. We also used ANOVA (analysis of variance) for sections with more than 2 categorical comparison groups. We used odds ratio and 95% confidence interval as the measure of association. Significance level was set at 0.05. P value less than 0.05 was considered as significant. Our study was approved by the Ethics Committee of Melaka Manipal Medical College. All the respondents were voluntary participants. Before the students completed the questionnaire, they were briefed about the objective of the study and a written consent form was attached with the questionnaire for willing respondents to sign. We assured the respondents that all the information gathered will be kept confidential will only be used for the purpose of this study and not be used in any other personally identifiable manner or made available to anyone who was not involved in this study. Anonymity was also maintained.

3. RESULTS

3.1 Demographics

We distributed 480 questionnaires to the medical students of MMMC and we managed to collect 384 questionnaires (80% response rate). However, 12 questionnaires were excluded from this study (3.1% rejection rate) because 8 respondents' submitted questionnaires which were less than 80% completed and 4 did not sign the consent forms.

As shown in Table 1, the age group of 23-24 years among the respondents was the highest at 78.8%, followed by the 21-22 years (14.4%), 25-26 years (5.2%) and the 27-28 years (1.6%). The percentage of female respondents (56.2%) was higher than male respondents (43.8%). The percentage of Malay respondents was the highest (43%), followed by the Chinese (37.6%) and the Indian (19.4%). Our respondents consisted of 43.4% Muslim, 24.8% Buddhist,

13.8% Christian, 15.1% Hindu and 3% from others.

Table 1. Frequency distribution table of demographic data of respondents

Variables	Frequency (%)
Age:	
21-22	53 (14.4%)
23-24	289 (78.8%)
25-26	19 (5.2%)
27-28	6 (1.6%)
TOTAL	367 (100%)
Gender:	
Male	163 (43.8%)
Female	209 (56.2%)
TOTAL	372 (100%)
Ethnicity:	
Malay	160 (43%)
Chinese	140 (37.6%)
Indian	72 (19.4%)
TOTAL	372 (100%)
Religion:	
Muslim	161 (43.4%)
Buddhist	92 (24.8%)
Christian	51 (13.7%)
Hindu	56 (15.1%)
Others	11 (3%)
TOTAL	371 (100%)

In our study, 77% of the respondents have their monthly allowance within the range of RM501 – RM1000 while 15.5% are in the RM0 – RM500 range and 7.5% are in the >RM 1000 allowance group. Next, most of the student’s father have an education level up till degree level at 37.7%, followed by SPM at 32%, Masters/PHD at 15.3% and Diploma level at 15%. Subsequently, most of the student’s mother had an education level up till SPM level at 42%, followed by Degree at 30.7%, Diploma at 19.5% and Masters/PHD at 8% (Table 2).

Out of the 372 participants, 77.7% were aware of the organ donation registry. 71.2% were willing to register for organ donation but only 14.5% of participants were registered donors. However there were a high percentage of people (86.8%) who were willing to be organ donation recipients but only 54.2% supported a mandatory organ donation system (Fig. 1).

The prevalence of registered organ donors in Melaka Manipal Medical College (MMMC) is shown in the Figs. above. 54 students (14.5%) were registered organ donors while 365 students

(85.5%) were not registered organ donors (Fig. 2).

Table 2. Frequency distribution of monthly allowance and parental education level

Variables	Frequency (%)
Monthly allowance (RM):	
0 - 500	56 (15.5%)
501 – 1000	278 (77%)
> 1000	27 (7.5%)
TOTAL	361 (100%)
Father’s education:	
SPM/ O-Level	117 (32%)
Diploma	55 (15%)
Degree	138 (37.7%)
Masters/PHD	56 (15.3%)
TOTAL	366 (100%)
Mother’s education:	
SPM/ O-Level	153 (42%)
Diploma	71 (19.5%)
Degree	112 (30.7%)
Masters/PHD	29 (8%)
TOTAL	365 (100%)

Out of the ethnic groups in our study, Indians are the most willingness to register for organ donations with 78%, followed by Chinese with 77%, Malay with 64% and other ethnicity with 55%. Meanwhile, the ethnic category “Others” were the highest in percentage (45%) of unwillingness to register for organ donation (Fig. 3).

The total knowledge which is a score out of 25 has been categorized into levels where a score of 0-5 indicates knowledge needs improvement, 6-15 is average knowledge and 16-25 indicates good knowledge about organ donation. Out of the 265 (71.2%) students who were willing to donate, it can be seen that the highest number of participants willing to donate had good knowledge 149(40%) followed by moderate knowledge with 119 (32%). Among the participants unwilling to donate only 33(8.8%) had good knowledge and 70(19%) had moderate knowledge (Fig. 4).

Based on Fig. 5, we established that there is a significant positive low correlation/association ($r=0.346$) noted between the total knowledge score and the attitude of private undergraduate medical students on organ donation. It is important to note that correlation does not imply causation.

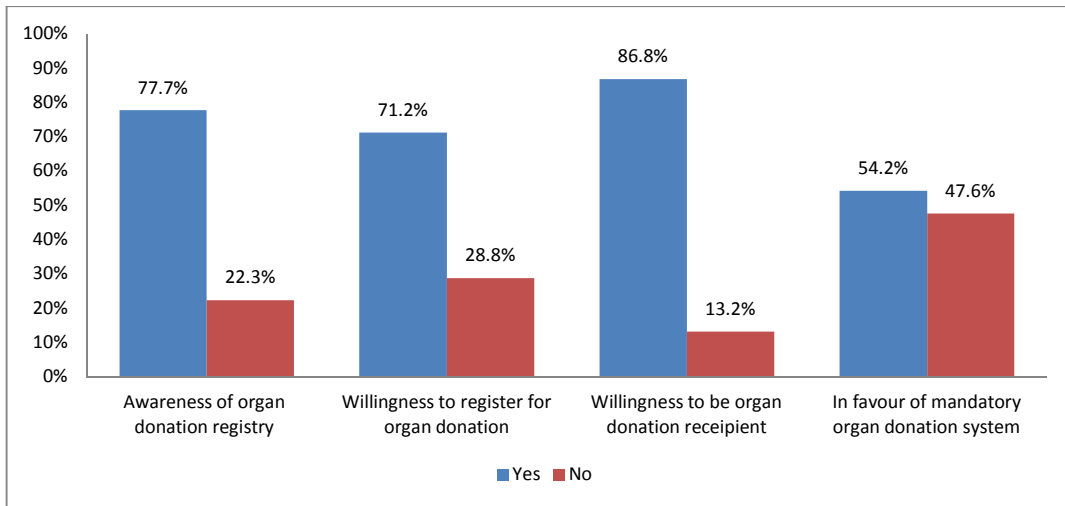


Fig. 1. Willingness component on organ donation

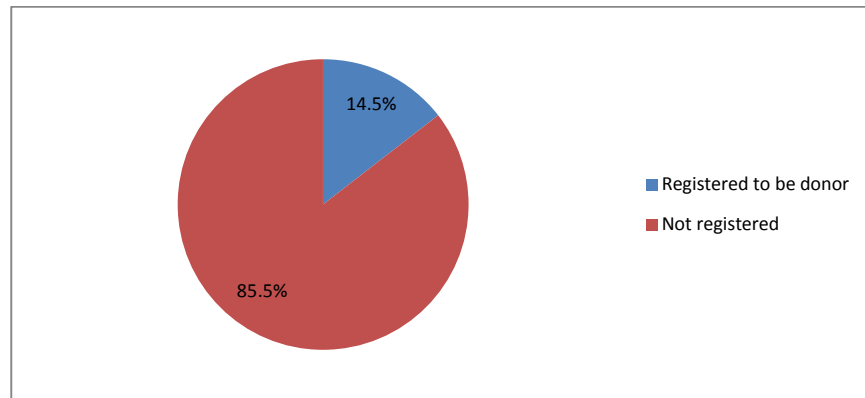


Fig. 2. Prevalence of registered organ donors in MMMC

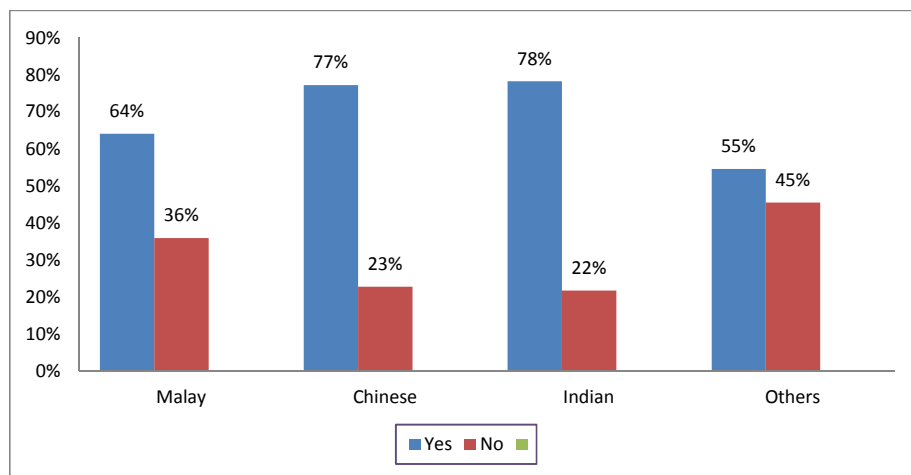


Fig. 3. Willingness to register for organ donations among different ethnicity

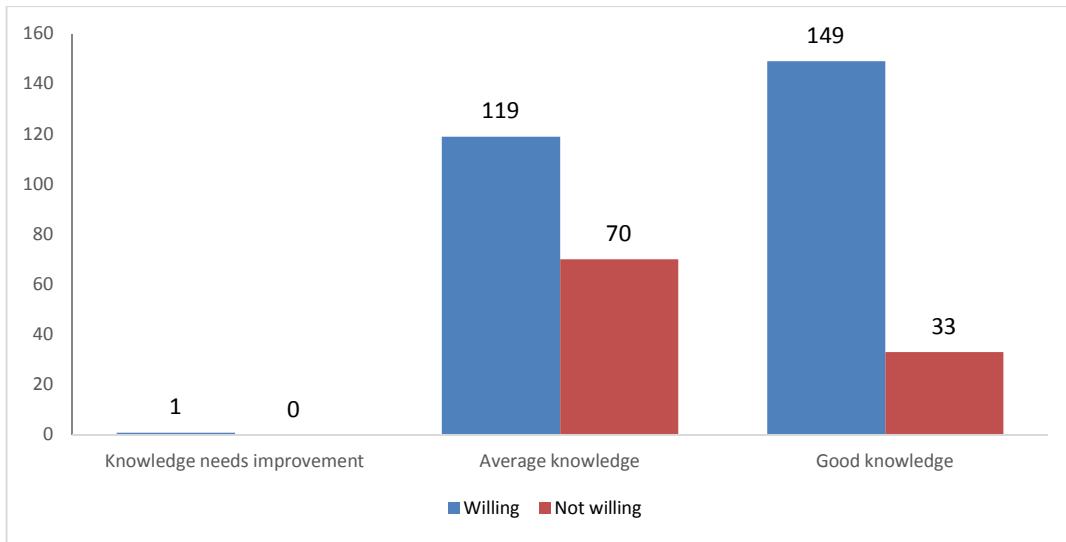


Fig. 4. Knowledge level against willingness to donate their organs

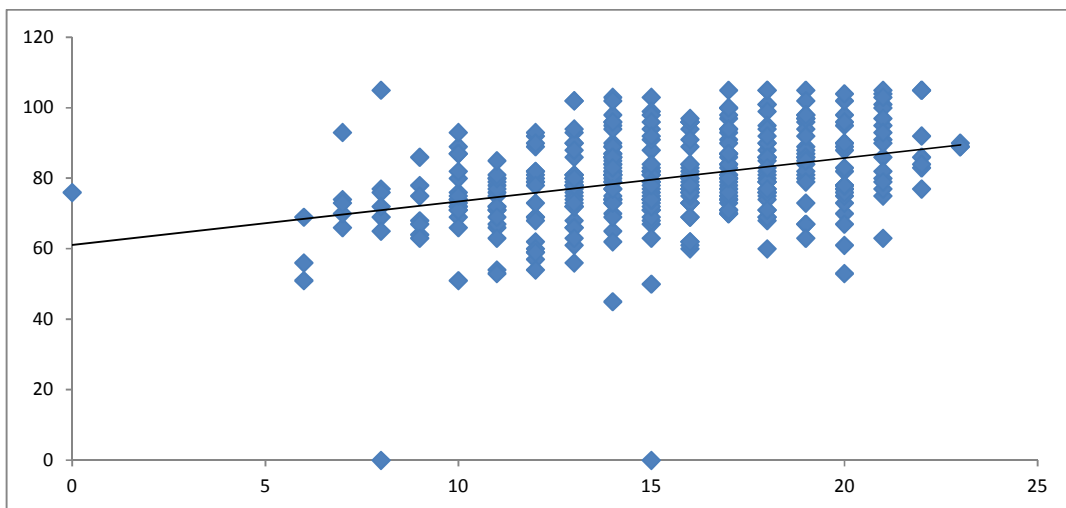


Fig. 5. Linear regression of knowledge against willingness of organ donations

Based on Table 6, there is a positive correlation noted between the sociodemographic data of age, gender, ethnicity and religion on total knowledge on organ donation. The older the respondent, the better the knowledge on organ donation ($p= 0.043$). With regards to gender, males are more likely to obtain a higher score ($p=0.018$). When comparing ethnicity to knowledge score ($p=0.018$), the Indian students are more likely to score a higher score (16.0 ± 3.6), followed by Chinese (15.6 ± 3.8) and Malays (14.7 ± 3.6). There is an association between different religions and knowledge on organ donations ($p=0.038$), with the religion group “others” having the highest mean score for

knowledge 16 out of a total score of 25. The father’s education and mother’s education level does not have any significance when compared to the total knowledge of organ donation ($p>0.05$).

Based on Table 7, we note that there is significant correlation noted between religion and parental education level against awareness on organ donation ($P = 0.0$). ‘Others’ was having the highest willingness score at a mean of 87.6 ± 12.9 followed by the Hindu (86 ± 12.6), Buddhist (81.9 ± 10.5), Christian (79.5 ± 12.9) and Muslim (76.1 ± 13.5). On father’s education, the Masters/PHD group was the most willing with a

score of 82.0+/-11.7. On mother's education, the Masters/PHD group was also the most willing with a score of 84.7+/-13.8. The higher the parent's education level, the more willing are the student to donate their organs (P=0.013, P=0.014). The sociodemographic data of age, gender and ethnicity does not significantly affect the student's willingness to donate their organs.

Based on Table 8, there is significant association between the different religions and attitude on organ donation. Hindus were 2.37 times while Buddhist are 2.08 times more likely to have a positive attitude towards organ donation when compared against the Muslims (p=0.019, p=0.014). There is no significant association between age, gender, ethnicity and parental education when compared to the attitude on organ donation.

4. DISCUSSION

Countless accomplishments have been achieved in the field of organ transplantation over the past few years. However, the dilemma of a persistent shortage of organs and tissues for transplantation still remains. As on a global setting, in Malaysia the number of organ donors still falls short of the number required to provide sustenance of life and improvement of living qualities in a patient requiring transplantation. To date, there are insufficient conclusive data about the factors which may affect the knowledge, readiness and perception for organ donation among private undergraduate medical students in a Malaysian setting. The aim of this survey therefore was to determine the prevalence of organ donor, to evaluate the existing knowledge, willingness and attitude on organ donation and to establish a correlation between the various socio-demographic data on knowledge, awareness and perception donation among the private undergraduate medical students in Malaysia.

With regards to knowledge, we found that most of the private undergraduate medical students have only moderate knowledge (60.5%) while only 21.2% have sufficient or good knowledge on organ donation and the system practiced in Malaysia (Tables 3,4). Similar trends are noted by other studies which also found that medical students have significant gaps in knowledge regarding the organ donation and transplantation system [13-15]. Undeniably, the health care providers should be most informed in the area of organ donation. We believe that the universal

organ scarcities can be tackled by first educating the health care professionals about the organ donation process. Improving the knowledge, willingness and attitudes of those in the health profession could help to promote organ donation and maximize the benefits from the limited donor pool [14,16].

With regards to willingness, we have established that more than three-quarters (77.7%) of the participants are aware of the organ donation registry and 71.2% of them are willing to register for organ donation. When queried about the willingness to be an organ donation recipient, 86.8% of the students answered Yes while from the question 'Are you in favor of a mandatory organ donation system?' we discovered that only slightly more than half the students (54.2%) will support the opt out system currently practiced in most of western countries. The prevalence of registered organ donors in the selected private medical college was 14.5% (54 students). This is much higher than the prevalence of registered organ donor in the general population in Malaysia which is 4.3% [4]. Other similar studies have also found that medical students and physicians are more willing and likely to want or be registered organ donors than the general populace [15,17,18] and this may be because they are more educated and aware on organ donations [14,15,19]. In Table 5, we concluded that the main reason a medical student would want to donate their organs would be that 'It saves lives' (93%) while among those who does not support organ donation, 30.4% are because of the reason 'No control over who my organs would go to' and 15.2% are because of the reason 'Can't be sure I'll really be dead when the decision is made'.

Based on Fig. 3 when comparing willingness among different ethnicity to register for organ donation, Indians are the most willing to register for organ donations with 78%, followed by Chinese with 77%, Malay with 64% and other ethnicity with 55%. Meanwhile, the ethnic category "Others" were the highest in percentage (45%) of unwillingness to register for organ donation. This is in line with the national transplant registry where it noted an increasing trend in the number of donors among the Chinese ethnic group for the past five years while Malays made up only 5% of total donors in the recent years [20]. There is also association between participant's total knowledge being high and a higher willingness towards organ donation where 40% of participants willing to donate had

good knowledge and 32% had average knowledge (Fig. 4). Similarly, using multivariate linear regression analysis (Fig. 5), the willingness to donate one's own organ was significantly and positively associated with a higher knowledge and attitude score as seen in a similar study [2].

There is significant association between the sociodemographic data of age ($p=0.043$), gender ($p=0.018$), ethnicity ($p=0.018$) and religion ($p=0.038$) with knowledge on organ donation (Table 6). When comparing age of participants and knowledge on organ donation, the highest mean score (16.4 ± 3.9) is seen between 25-26 year old participants which mainly consist of Year 4 and Year 5 students. This can be justified by the fact that in our curriculum, lectures that are given on topics pertaining to organ donation all occur during the 4th year of study therefore many participants may recall more from lectures. A similar study was done among Canadian medical students in Queens University Faculty of health science which showed knowledge was higher among the 4th year medical students [21]. Gender shows association with knowledge where males has higher mean score (15.8 ± 3.8) than females (14.9 ± 3.6). However, this finding does not correlate with the findings in other studies where gender was found to be not associated higher with knowledge [14]. There is also significant association between the different ethnicity and religion on the knowledge on organ donation where Indians showed the highest mean score (16.0 ± 3.6) followed by Chinese (15.6 ± 3.8) and Malays (14.7 ± 3.6). This may be due to different interest levels among the race and religion when attending the lecture on organ donation. Parental education however is not significantly associated with knowledge and attitude on organ donation among the medical students (Table 6).

When comparing the various sociodemographic data against willingness to donate organs, we found that there is association between different religions and their willingness to donate organ ($p=0.0$) where the highest is the 'Others' religion group which consists of Sikhs and Atheists with a mean score of 87.6 whereas Muslims has the lowest mean score of 76.1 (Table 7). Between level of father and mother's education and their willingness on organ donation, there is significant association ($p=0.013$, $p=0.014$) where both parents who had Masters and PhD had higher willingness mean score of 82.0 and 84.7 (Table 7). A similar study using multivariate logistic regression analysis showed that education level

higher than a secondary school education has higher willingness [22]. In another study carried out in University Malaya, the less educated and rural groups appeared to have more misconceptions towards organ donation than the well-educated and urban groups thus parents with a higher education level are more likely to transfer positive knowledge regarding organ donation to their children and hence a higher willingness towards organ donation [22]. There is no significant association in age, gender and ethnicity on willingness to donate organs. The ranges of ages between our participants is from 21-28 years old, where there is not much of a wide distribution and hence the insignificant association with knowledge on organ donation. However, in a study done by the European commission, age was shown to be a significant criteria in showing knowledge differences due to the different level of education [23]. Another study have also showed that when it comes to gender, females express a greater willingness and a more favourable attitude towards organ donation [24]. There is also no significance in association between ethnicity and willingness and attitude towards organ donation. This probably can be explained by the fact that our participants are medical students and already have the basic knowledge and also idea regarding organ donation, which may have influenced our results. Similar trends are also shown in another study where education played an important role in realization of the importance to donate compared to the less educated ones [25].

In Table 8, we found that only the sociodemographic data of religion have a significant association with attitude on organ donations. We established that Buddhists are 2.08 times (p value= 0.014) and Hindus 2.37 times more likely to have positive attitude on organ donations (p value= 0.019) when compared to Muslims. In another similar study [26], religion-wise, almost two-thirds (66%) of the donors were Buddhists, with Hindus at 24%, Islam at 3%, Christians at 3% and others at 5%. This can be justified by the fact that Muslims face the dilemma of being unsure whether their religion allows them to make organ donations [25-28]. The culture-specific issues among some Muslims arguing against donation including a sense of the sacredness of the body, belief that it is important to have an intact body after passing away and fear of illegal trade in organs and the poor would suffer [29]. On the other hand, there is no law that prohibits the Hindus to donate their organs,

as they believe by donating the organs it would give positive effect for their rebirth process after death [30]. While, in Christianity, donating organs is generally accepted and Pope Benedict XVI shows his support by becoming a donor himself and his predecessor John Paul II had once stated that donating organs is an act of Christian's love and duty [31]. Age, gender, ethnicity and parental education were found not to be significantly associated with attitude on organ donations among the undergraduate medical students. We find that the however other studies showed that with higher parent's education level, there will be more positive attitude towards organ donation as the quality of discussion between the potential donor and their family will be better. Their parents or family members will stimulate their interest to seek knowledge, debunk myths and bolster positive attitudes about donation [32].

Recommendations: Our study showed that there are only 14.5% registered donors among the

participants although the willingness to donate is higher. This shows that there is a great need to have awareness programs to motivate people to donate organs. We found that despite being medical students, almost one-tenth of the students are not aware of the organ donor registry. Different strategies like health campaigns and comprehensive lectures on organ donations need to be applied to further raise awareness of organ shortage. As we also found that many of the participants had no motivation to donate their organs, there is a great need to educate students in all fields. Better understanding of the medical students in the field of organ donation will help them to become pro-organ donation disseminators in our society. The lectures in its current form may not be effective enough and it may have to be modified as we believe that the knowledge and understanding of the subject can change significantly after a comprehensive lecture. Our findings may also assist organ donation and transplantation organizations to reach diverse

Table 3. Percentage of responses against knowledge component

Items (Knowledge about organ donation)	True	False/Don't know
It is possible for a brain dead person to recover from their injuries	74.5%	25.5%
Racial discrimination prevents minority patients from receiving the transplant they need.	31.5%	68.6%
The same doctors who look after you when you are seriously ill performs transplant.	61.8%	38.2%
Only the organs of younger people are good for transplantation.	77.2%	22.9%
If you are on the organ donation registry, you are kept alive until your organs are removed.	45.2%	54.8%
What do you think is the current registration system used in Malaysia?		
Carry a donor card.	41.9%	58.1%
Opt in/register.	26.3%	73.7%
Use organs from those who have died.	63.2%	36.8%
Permission from the family decides.	79.8%	20.2%
Opt out (everyone is presumed to be a donor unless stated otherwise).	42.7%	57.3%
Transplant survival rates and results:		
Transplant survival rates today are very high	41.9%	58.1%
Transplant recipients can live more than years	38.4%	61.6%
The patients chances of surviving a transplant operation today is pretty low	38.4%	61.6%
A transplant operation has <50/50 chance of allowing the recipient to return to normal activities	59.7%	40.3%

Table 4. Percentage of level of organ transplant knowledge

Views of organs/tissues that can be transplanted:	Percentage
a. Knowledge can be improved	18.3%
b. Moderate knowledge	60.5%
c. Good knowledge	21.2%

socio-demographic and ethnic communities with religious leaders will be critical in improving culture-specific information about organ donation. The involvement of community and organ donor numbers.

Table 5. Reasons for supporting and not supporting organ donation

Reasons for supporting organ donation	Frequency (%)
It saves lives	338 (93)
It is unacceptable not to donate your organs	14 (4)
Others	11 (3)
Reasons for not supporting organ donation	Frequency (%)
No control over who my organs would go to	14 (30.4)
Can't be sure i will really be dead when the decision is made	7 (15.2)
Would be tempting fate	4 (8.7)
Don't want my body to be experimented on	6 (13.0)
Doctors wouldn't fight too hard to save me if i'm a donor	3(6.5)
Don't believe my organs are good enough	2 (4.4)
I'm too young	2 (4.4)
I'm too unwell	3(6.5)
Others	5 (10.9)

Table 6. Comparison of sociodemographic data with knowledge on organ donation

Independent variables	Mean (+/- SD)	T-test/ANNOVA	P-value
Age:			
21-22	14.1 (3.7)	2.75	0.043 **
23-24	15.4 (3.7)		
25-26	16.4 (3.9)		
27-28	14.2 (2.4)		
Gender:			
Male	15.8 (3.8)	-2.37	0.018 **
Female	14.9 (3.6)		
Ethnicity:			
Malay	14.7 (3.6)	4.08	0.018 **
Chinese	15.6 (3.8)		
Indian	16.0 (3.6)		
Religion:			
Muslim	14.6 (3.6)	2.57	0.038 **
Buddhist	15.8 (3.6)		
Christian	15.6 (3.7)		
Hindu	15.9 (3.6)		
Others	16.0 (4.9)		
Father's education:			
SPM/O-level	14.8 (3.5)	0.95	0.415
Diploma	15.6 (3.4)		
Degree	15.4 (3.9)		
Masters/PhD	15.4 (3.9)		
Mother's education:			
SPM/O-Level	15.1 (3.5)	0.36	0.152
Diploma	15.0 (3.5)		
Degree	15.52 (4.0)		
Masters/PhD	15.6 (4.5)		

Table 7. Comparison of sociodemographic data with willingness on organ donation

Independent variables	Mean (+/- SD)	T-test/ANNOVA	P-value
Age:			
21-22	82.0 (11.7)	0.74	0.115
23-24	79.6 (13.5)		
25-26	79.3 (9.0)		
27-28	83.8 (10.8)		
Gender:			
Male	79.6 (11.8)	0.36	0.719
Female	80.1 (14.0)		
Ethnicity:			
Malay	76.2 (13.5)	14.8	0.139
Chinese	81.2 (11.2)		
Indian	85.6 (13.0)		
Religion:			
Muslim	76.1 (13.5)	8.59	0.0 **
Buddhist	81.9 (10.5)		
Christian	79.5 (12.9)		
Hindu	86.0 (12.6)		
Others	87.6 (12.9)		
Father's education:			
SPM/O-Level	79.1 (13.9)	0.90	0.013 **
Diploma	78.4 (9.9)		
Degree	80.3 (14.1)		
Masters/PhD	82.0 (11.7)		
Mother's education:			
SPM/O-level	80.5 (13.0)	2.77	0.014 **
Diploma	76.8 (10.0)		
Degree	79.7 (14.4)		
Masters/PhD	84.7 (13.8)		

Table 8. Comparison of sociodemographic data with attitude on organ donation

Independent variables	Yes (%)	No (%)	OR (95% CI)	Chi square	P value
Age:					
21-22	38 (14.6)	15 (14.1)	1.0		
23-24	207 (79.3)	82 (77.4)	0.99 (0.52-1.91)	0.00	0.991
25-26	12 (4.6)	7 (6.6)	0.68 (0.22-2.05)	0.48	0.488
27-28	4 (1.53)	2 (1.9)	0.79 (0.13-4.77)	0.56	1.000
Gender:					
Male	116 (43.8)	58 (45.3)	0.94 (0.61-1.44)	0.08	0.773
Female	149 (56.2)	70 (54.7)	1.0		
Ethnicity:					
Malay	109 (39.9)	51 (51.5)	1.0		
Chinese	108 (39.6)	32 (32.3)	1.58 (0.94-2.65)	3.03	0.085
Indian	56 (20.58)	16 (16.6)	1.63 (0.86-3.13)	2.25	0.133
Religion:					
Muslim	102 (38.6)	59 (55.1)	1.0		
Buddhist	72 (27.3)	20 (18.7)	2.08 (1.15-3.76)	2.08	0.014 **
Christian	37 (14.0)	14 (13.1)	1.53 (0.76-3.06)	1.53	0.229
Hindu	45 (17.0)	11 (4.2)	2.37 (1.14-4.93)	2.37	0.019 **
Others	8 (14.0)	3 (2.8)	1.54 (0.39-6.04)	1.54	0.531
Father's education:					
SPM	84 (32.3)	33 (31.1)	1.0		
Diploma	37 (14.2)	18 (17.0)	0.81 (0.40-1.61)	0.37	0.545

Independent variables	Yes (%)	No (%)	OR (95% CI)	Chi square	P value
Degree	100 (38.5)	38 (35.9)	1.03 (0.60-1.79)	0.01	0.905
Masters/PhD	39 (15.0)	17 (16.0)	0.90 (0.45-1.81)	0.09	0.770
Mother's education:					
SPM	113 (43.5)	40 (38.1)	1.0		
Diploma	44 (16.9)	27 (25.7)	0.58 (0.32-1.05)	3.27	0.071
Degree	83 (31.9)	29 (27.6)	1.01 (0.58-1.77)	0.00	0.963
Masters/PhD	20 (7.7)	9 (8.57)	0.79 (0.33-1.87)	0.30	0.586

5. CONCLUSION

The prevalence of registered organ donors is higher among medical students compared to the general population in the country. The knowledge of organ donations among medical students is only moderate and hence can be improved through better awareness programs and more structured lectures. High knowledge level on organ donations lead to a higher willingness and more positive attitude towards organ donations.

CONSENT

Informed and written consent was obtained from the institution and the students.

ETHICAL APPROVAL

The ethical and research committee of the institution of the researchers went through the study proposal and approved the same.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

- Human Organ Transplantation [Internet] [Cited 2014 Sept 15]. Available:<http://www.who.int/transplantation/organ/en/>
- Organ Donation - What Can Be Donated [Internet] [Updated 2012 Oct 19; cited 2014 Sept 15]. Available:<http://www.nhs.uk/Conditions/Organ-donation/Pages/Definition.aspx>
- Organ Donation and Transplant Activities; 2012. Global Observatory on Donation and Transplantation [Internet] [Updated Jan 7; cited 2014 Sept 15]. Available:<http://issuu.com/o-n-t/docs/2012ad>
- Makmor T, Abdillah N, Raja Noriza Ra NM, Sook-Lu Y, Soo-Kun L, Kok-Peng N. Low organ donation rate in Malaysia: A survey. *Journal of Health and Translational Medicine*. 2014;17(1).
- Sucharitha ST, Siriki R, Dugyala RR. Mullai, Priyadarshini, Kaavya, Roshini. Organ donation: Awareness, attitudes and beliefs among undergraduate medical students in South India. *Journal of Research in Community Medicine*. 2013; 2(2):79-148.
- Riyanti S, Hatta M, Norhafizah S, Balkish MN, Siti ZM, AH, HA, Normawati A. Organ donation by sociodemographic characteristics in Malaysia. *Asian Social Science*. 2014;10(4):264.
- Melaka Manipal Medical College. Fact Sheet. Available:<http://www.mmmc.edu.my/content.php?id=9&sid=1&lang=1> (Accessed on 22nd of September 2014)
- Manipal University Official Website. Melaka Manipal Medical College History. Available:<http://www.manipal.edu/instituti/ns/medicine/mmmcmelaka/knowmmmc/pages/factsandfigures.aspx> (Accessed on 22nd of September 2014)
- McCay N, Millman C. Organ donation: Public attitudes and stakeholder engagement in Northern Ireland. Public Health Agency, Belfast, Northern Ireland; 2013.
- Nolan BE, Spanos NP. Psychosocial variables associated with willingness to donate organs. *CMAJ: Canadian Medical Association Journal*. 1989;141(1):27.
- Pham H, Spigner C. Knowledge and opinions about organ donation and transplantation among Vietnamese Americans in Seattle, Washington: A pilot study. *Clinical Transplantation*. 2004;18(6): 707-715.

12. Centers for disease control and prevention. Epi Info. 7.1.3.
Available:<http://www.cdc.gov/epiinfo/7/index.htm>
(Accessed on 24th of September 2014)
13. Essman C, Thornton J. Assessing medical student knowledge, attitudes, and behaviors regarding organ donation. In *Transplantation Proceedings*. 2006;38(9): 2745-2750. Elsevier.
14. Schaeffner ES, Windisch W, Freidel K, Breitenfeldt K, Winkelmayer WC. Knowledge and attitude regarding organ donation among medical students and physicians. *Transplantation*. 2004;77(11): 1714-1718.
15. Symvoulakis EK, Tsimtsiou Z, Papaharitou S, Palitzika D, Markaki A, Stavroulaki E, Jones R. Kidney organ donation knowledge and attitudes among health care professionals: Findings from a greek general hospital. *Applied Nursing Research*. 2012;25(4):283-290.
16. Radunz S, Juntermanns B, Heuer M, Frühauf NR, Paul A, Kaiser GM. The effect of education on the attitude of medical students towards organ donation. *Annals of Transplantation*. 2012;17(1):140-144.
17. Figueroa CA, Mesfum ET, Acton NT, Kunst AE. Medical students' knowledge and attitudes toward organ donation: Results of a dutch survey. In *Transplantation Proceedings*. 2013;45(6):2093-2097. Elsevier.
18. Li AHT, Dixon S, Prakash V, Kim SJ, Knoll GA, Lam NN, Garg AX. Physician registration for deceased organ donation. *JAMA*. 2014;312(3):291-293.
19. Bener A, El-Shoubaki H, Al-Maslamani Y. Do we need to maximize the knowledge and attitude level of physicians and nurses toward organ donation and transplant? *Experimental and Clinical Transplantation*. 2008;6(4):249-253.
20. Hooi LS, Lela Yasmin Mansor (Eds). *Seventh report of the national transplant registry Malaysia 2010*. National Transplant Registry Kuala Lumpur; 2013.
21. Bardell T, Hunter DJ, Kent WD, Jain MK. Do medical students have the knowledge needed to maximize organ donation rates?. *Canadian Journal of Surgery*. 2003;46(6):453.
22. Wong LP. Knowledge, attitudes, practices and behaviors regarding deceased organ donation and transplantation in Malaysia's multi-ethnic society: A baseline study. *Clinical Transplantation*. 2011;25(1):E22-E31.
23. Special eurobarometer 333a organ donation and transplantation publication: June 2010 Conducted by TNS Opinion & Social at the Request of Directorate General Health and Consumers Survey co-ordinated by Directorate General Communication; 2010.
24. Thompson TL, Robinson JD, Kenny RW. Gender differences in family communication about organ donation. *Sex Roles*. 2003;49(11-12):587-596.
25. Noordin N, Zakaria Z, Aminuddin A, Sawal MZHM, Daud MS, Yusof ASM, Ngah K. Organ donation among Malaysian: The malay dilemma toward social development. *Asian Social Science*. 2012;8(10):8.
26. Wong LP. Factors limiting deceased organ donation: Focus groups' perspective from culturally diverse community. In *Transplantation Proceedings*. 2010;42(5): 1439-1444. Elsevier.
27. Tokalak I, Kut A, Moray G, Emiroglu R, Erdal R, Karakayali H, et al. Knowledge and attitudes of high school students related to organ donation and transplantation: A Cross-sectional survey in Turkey. *Saudi J Kidney Dis Transplant*. 2006;17:491-6.
28. Noordin N, Zakaria Z, Aminuddin A, Sawal MZHM, Daud MS, Yusof ASM, Ngah K. Organ donation among Malaysian: The malay dilemma toward social Development. *Asian Social Science*. 2012;8(10):8.
29. Bhandary S, Khanna R, Rao KA, Rao LG, Lingam KD, Binu V. Eye donation—awareness and willingness among attendants of patients at various clinics in Melaka, Malaysia. *Indian Journal of Ophthalmology*. 2011;59(1):41.
30. British Broadcasting Corporation. (2003, October 15th). *Hinduism and organ donation*; 2014. Retrieved on the 28th September 2014, from BBC Religion. Available:<http://www.bbc.co.uk/religion/religions/hinduism/hinduethics/organdonation.shtml>

31. Badrolhisam NI, Zakaria Z. Knowledge, religious beliefs and perception towards organ donation from death row prisoners from the perspective of patients and non-patients in Malaysia: A Preliminary Study; 2012.
32. Morgan SE, Miller JK. Beyond the organ donor card: The effect of knowledge, attitudes, and values on willingness to communicate about organ donation to family members. Health Communication. 2002;14(1):121-134.

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