

ORIGINAL ARTICLE

Pledge your teeth! The willingness of dental students to donate their teeth: A pilot study.

Hayati Ishak*, Noorharliana Mohamed Zohdi, Masyitah Mohd Zairi, Sajidah Zaharudin

Faculty of Dentistry, Universiti Teknologi MARA (UiTM), Jalan Hospital, 47000 Sg Buloh, Selangor Darul Ehsan, Malaysia

Abstract

Extracted human teeth is the preferred choice for preclinical training as it simulates the clinical scenario as compared to artificial teeth. However, the increase in the number of dental undergraduates might cause an imbalance in the demand and supply of extracted human teeth. Not only that, extracted human teeth are also needed by researchers for the development of dentistry (e.g. dental pulp stem cells research). This study aimed to evaluate the socio-demographic and preclinical training factors associated with the willingness to donate teeth among dental students of a selected university in Malaysia. The results of this study show that the majority of students were willing to donate their teeth after extraction for educational purposes, followed by keeping their tooth, leaving it behind as clinical waste and donating it to research. Further research is recommended to determine the willingness of the community or public to donate their teeth to meet the demand for dental schools and researchers in Malaysia.

Keywords: teeth donation, preclinical training, Malaysia, dental students

*Corresponding Author

Email address: hayati66@uitm.edu.my

Introduction

The rise of dental schools in Malaysia has led to increasing demand for extracted human teeth required for preclinical training. There are currently thirteen government-funded and private universities in Malaysia offering either Bachelor of Dental Surgery (BDS) or Doctor of Dental Surgery (DDS). The local dental graduates in Malaysia has had a threefold increase in number throughout the years, from 208 graduates in 2007 to 654 graduates in 2016 as reported by the Malaysian Dental Council (2016). Therefore, there is no doubt that logically the demand for extracted human

teeth has escalated tremendously over the years. Apart from dental students, researchers are also in need of human extracted teeth as there are a rising interest in dental pulp stem cells studies (Kabir *et al.*, 2014).

The preclinical training for dental students is crucial for the development of student's dexterity and comprehension of procedures needed to succeed in the clinic (Velayo *et al.*, 2014). Dental students commonly practice their preclinical skills on typodont teeth, artificial teeth or extracted human teeth (Smitha *et al.*, 2015). Extracted human teeth

are the preferred choice as compared to artificial teeth as it simulates the clinical situations (Kumar *et al.*, 2005; Lolayekar *et al.*, 2007). Typodont teeth pose no risk of cross-infection but are much more expensive (Smitha *et al.*, 2015). However, extracted human teeth is considered infective and classified as clinical specimens as they contain blood according to 'CDC Guidelines for infection control in dental health-care settings 2003', and should always be handled with precaution (Kohn *et al.*, 2003). Some studies recommended immersing teeth with 10% of formalin for five days, 5.25% of sodium hypochlorite for five days and autoclaving at 121°C, 15 lbs psi for 20 minutes as a successful method in disinfecting extracted human teeth (Dominici *et al.*, 2001; Sandhu *et al.*, 2012). Among resources for extracted human teeth in Malaysia include government dental clinics, private dental clinics or hospitals. To date, no studies has evaluated on the difficulty and the duration of time needed for dental students to acquire the total amount of extracted human teeth for their preclinical usage as this might highlight the necessity of promoting tooth donation to meet the demand for extracted human teeth.

The extraction of healthy teeth and their donation to dental pulp stem cells is well accepted by both patients and researchers alike (Le Breton *et al.*, 2015). Potential donors need to be adequately informed so that they can give consent freely (Le Breton *et al.*, 2015). When socio-demographic factors are taken into consideration among 500 patients at the Dental Care and Dental Teaching Centre in Jordon, it was found that those with higher education level are more likely to accept tooth donation. Other demographic variables such as age, gender, place of living and income have no statistically significant relationship with the willingness to donate teeth after extraction (Mortadi *et al.*, 2018). There are currently no

known studies associating ethnic and religious beliefs to tooth donation.

Promoting teeth donation amongst the Malaysian citizens could be considered as an initiative to improve the imbalance of demand and supply of human extracted teeth for dental education and research. To create awareness on tooth donation in the Malaysian society or public, we think it is wise to determine whether the main stakeholders are willing to do the same. Our study aimed to evaluate factors involved in the acquisition of extracted human teeth for preclinical training and to determine whether or not dental students were willing to donate their teeth to meet the escalating demand of teeth for both research or preclinical usage.

Material & methods

A total of 257 dental students who had undergone preclinical training at the selected university participated in this study. Convenient sampling was used to include all students of the faculty from Year 2 to Year 5. Year 1 students were excluded as the preclinical training for most universities in Malaysia starts in Year 2. A response rate of 78% (n=257) out of 329 students was achieved. Ethics approval was granted by University Teknologi MARA Ethics Research Committee (REC/299/18).

The questionnaire consisted of 25 closed-ended questions with three sections. Section 1 included socio-demographic characteristics such as gender, year of study, religion, ethnicity, and hometown. Section 2 were questions related to the acquisition of extracted human teeth for preclinical training. It investigated whether or not the students were aware of the need for finding extracted human teeth, the duration needed for teeth collection and the difficulty in obtaining a specific type of tooth. Section 3 was developed based on an existing validated survey instrument by Le Breton et

al. (2015) on thoughts of donation of teeth to science or research. Part of the questionnaire aimed to explore the students' attitude toward tooth donation, ownership of extracted tooth, and beliefs of students in donating theirs for research purposes. Furthermore, the questions were aimed to explore the students' ethical considerations in terms of obtaining consent for the tooth after extraction for research purposes. The questionnaire was then modified to include the thoughts of tooth donation after death. The survey underwent a content-validation process by two senior researchers to assess its suitability and to ensure the items could be understood and correctly interpreted by the intended respondents.

A questionnaire that used a multiple-choice grid was developed using Google Forms and emailed to the participants. The participants were informed about the aim of the study, and the participation of this study was voluntary.

The quantitative data were analysed using the Statistical Package for Social Sciences (SPSS) software program version 25.0 (IBM Corporation, Armonk, NY, USA). Further analysis was undertaken using the Chi-squared test (Phi and Cramer's) to determine the association between socio-demographic and preclinical training factors to the willingness to donate teeth. The significance value taken was $p < 0.05$.

Results

Socio-demographic characteristics

A total of 257 responses (78%) out of 329 students were collected. The majority of responses belonged to female respondents (86.4%) and Year 4 dental students (31.5%). Socio-demographic characteristics of the participants were summarised in Table 1.

Table 1. Sociodemographic characteristics of participants

Variable	n (%)
Year	
2	71 (27.6)
3	76 (29.6)
4	81 (31.5)
5	29 (11.3)
Gender	
Male	35 (13.6)
Female	222 (86.4%)
Hometown	
Johor	24 (9.3%)
Kedah	20 (7.8%)
Kelantan	29 (11.3%)
Melaka	17 (6.6%)
Negeri Sembilan	9 (3.5%)
Pahang	9 (3.5%)
Pulau Pinang	5 (1.9%)
Perlis	1 (0.4%)
Sabah	10 (3.9%)
Sarawak	6 (2.3%)
Selangor	68 (26.5%)
Terengganu	22 (8.6%)
Kuala Lumpur	14 (5.4%)
Labuan	1 (0.4%)
Putrajaya	-
Perak	22 (8.6%)
Ethnicity	
Malay	248 (96.5%)
Indian	-
Chinese	1 (0.4%)
Others	8 (3.1%)
Religion	
Muslim	251 (97.7%)
Hindu	-
Buddhist	-
Christian	6 (2.3%)
Others	-

Acquisition of extracted human teeth for preclinical training

Participants were asked questions relating to the awareness of the usage of extracted human teeth for preclinical training (Table 2). Students were made aware that they will be using extracted human teeth in their preclinical training before entering the dental course (73.2%) by their seniors (68.9%) in the faculty. Most of the students were informed during orientation week (37.4%) and the beginning of the semester 1 in Year 1 (36.6%). More than half of the students (52.1%) spent about 6 to 12 months to collect extracted teeth (Table 2).

Majority of students, 94.6% (n=243) experienced difficulty in finding a specific

human tooth needed for their preclinical project (Table 3) and had their work delayed (95.7%) for not having the tooth necessary for a particular project especially molars (85.6%). Most of the extracted teeth collected were unsuitable for the preclinical projects (67.7%). To overcome their problem, most students (74.3%) asked their friends, seniors or juniors to donate some extracted teeth to them.

Attitude and belief towards ownership of extracted tooth and informed consent

When asked about the meaning of tooth to students, 97.7% of students believed their tooth as a part of them and 67.7% considered that their tooth still belongs to them after extraction (Table 4).

Table 2. Acquisition of extracted human teeth (n= 257)

Questions	Choices	n (%)
Did you know that extracted human teeth will be used as part of your preclinical training before entering this course?	Yes	188 (73.2)
	No	69 (26.8)
How did you get to know about the need of collecting extracted human teeth for your preclinical training?	Friend/s	32 (12.5)
	Family member/s	15 (5.8)
	Lecturer/s	18 (7.0)
	Senior/s in the faculty	177 (68.9)
	Relative/s	4 (1.6)
	Social media	4 (1.6)
	Other	7 (2.7)
Were you informed by any faculty member/lecturer on the need of extracted human teeth as part of your training?	Yes	235 (91.4)
	No	22 (8.6)
If Yes, when was this information conveyed to you?	During the interview (student selection process)	34 (13.2)
	During the orientation week	96 (37.4)
	Year 1 Semester 1.1	94 (36.6)
	Year 1 Semester 1.2	8 (3.1)
	Year 1 Semester 2.1	3 (1.2)
Duration of teeth collection	Below 6 months	66 (25.7)
	6 months to 12 months	134 (52.1)
	12 to 24 months	52 (20.2)
	No time at all. Senior dental students provided teeth collection	5 (1.9)

Table 3. Difficulties faced by students and how they managed to overcome the problem (n=257)

Questions	Choices	n (%)
Did you have any difficulty in finding a specific human tooth needed for your project?	Yes	243 (94.6)
	No	14 (5.4)
If Yes, which tooth of the below?	Incisors	20 (7.8)
	Canines	2 (0.8)
	Premolars	1 (0.4)
	Molars	220 (85.6)
Which of the following reasons contributed to the difficulty in finding teeth?	Limited dental clinics around my housing area.	12 (4.7)
	Many students were requesting for extracted human teeth from the same dental clinics.	67 (26.1)
	Friends/classmates refused to trade their collection of extracted teeth.	2 (0.8)
	Most of the extracted teeth collected were unsuitable for the preclinical projects.	174 (67.7)
	Did not bother to find the extracted human teeth myself and depend solely on other students' collection.	1 (0.4)
	Other	0 (0.0)
Does your work get delayed when you do not have the tooth needed for a particular project?	Yes	246 (95.7)
	No	11 (4.3)
If yes, how do you overcome this problem?	Ask from friends, seniors or juniors for extracted human teeth.	191 (74.3)
	Inform my lecturers, and hopefully, they could find a way to help.	1 (0.4)
	Just wait for the next batches of teeth collected from dental clinics.	13 (5.1)
	Offer money/cash to friends for an exchange of the tooth needed.	2 (0.8)
	Avoid attending the preclinical session provided.	0 (0.0)
	Work on other projects until the tooth needed is found.	38 (14.8)
	Other	1 (0.4)

Table 4. Students' attitude and belief towards ownership of extracted tooth and informed consent

Questions	Choices	n (%)
What does your tooth mean to you?	Nothing	6 (2.3)
	A part of me	251 (97.7)
Do you consider that your tooth still belongs to you after extraction?	Yes	174 (67.7)
	No	83 (32.3)
Would you like the practitioner to ask for your consent to conduct research on your extracted tooth?	Yes	227 (88.3)
	No	30 (11.7)
If yes, when?	Before surgery	203 (79.0)
	After surgery	24 (9.3)
Would you like to be informed about the research outcome?	Yes	223 (86.8)
	No	34 (13.2)
If yes, how?	On the phone	39 (15.2)
	Email	159 (61.9)
	By letter	25 (9.7)
If you give your tooth to science, do you consider that it still belongs to you or that it belongs to the researcher?	It will always be mine.	103 (40.1)
	It belongs to the researcher.	154 (59.9)
Who should inform you about the possibility of donating your tooth to science?	The surgeon.	176 (68.5)
	Other members of the health-care team.	81 (31.5)

Participants were also asked regarding the informed consent to research of their extracted tooth. More than half of the participants considered that the donated tooth belongs to the researcher (59.9%), whereas 40.1% of the respondents believed that the donated tooth belongs to them. The majority (88.3%) would like the practitioner to ask for their consent to conduct research on their extracted tooth. Of those who were willing to donate their extracted tooth for research, 79.0% participants preferred to sign the consent form before surgery, and they would like to be informed about the research involved (86.8%). An email was the preferred communication method to inform the donors about the research applied to their donated teeth. Moreover, 68.5% of participants preferred the surgeon to inform them about the possibility of donating their tooth to science.

Association of socio-demographic factors and willingness to donate teeth

Majority of students were willing to donate their tooth after extraction for educational

purposes (49.8%) rather than for research (4.7%). However, most students were not willing to donate teeth after death (60%). There was no statistically significant association between gender, ethnicity and religion with the willingness to donate teeth after extraction and after death (Table 5 and 6).

Association between delayed preclinical work and difficulty in finding teeth with the willingness to donate teeth

About half the students (47.5%) who had difficulty in obtaining teeth for preclinical usage were willing to donate teeth for educational purposes after extraction but not after death (57.2%). Similar findings were noted for those who had their preclinical work delayed due to insufficient extracted human teeth. A total of 48.6% were willing to donate teeth for educational purposes followed by preferring to keep it (31.1%), leave it (11.7%) and donating it to science/ research (4.3%). Refer to Table 7 and 8.

Table 5. Association of socio-demographic variables and willingness to donate teeth after extraction (n=257)

Demo-graphic variables	Willingness to donate teeth after extraction				P-value	Chi-Square test	df
	Prefer to keep it n (%)	Prefer to leave it n (%)	For science/ research n (%)	For educational purposes/ preclinical training n (%)			
Gender							
Male	15 (5.8)	2 (0.8)	4 (1.6)	14 (5.4)	0.060	*7.396	3
Female	70 (27.2)	30 (11.7)	8 (3.1)	114 (44.4)			
Ethnicity							
Malay	79 (30.7)	32 (12.5)	12 (4.7)	125 (48.6)	0.433	**5.916	6
Chinese	1 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)			
Others	5 (1.9)	0 (0.0)	0 (0.0)	3 (1.2)			
Religion							
Muslim	81 (31.5)	32 (12.5)	12 (4.7)	126 (49)	0.323	***3.483	3
Christian	4 (1.6)	0 (0.0)	0 (0.0)	2 (0.8)			

*2 cells (25%) have expected count less than 5. The minimum expected count is 1.63
 ** 8 cells (66.7%) have expected count of less than 5. The minimum expected count is .05
 ***4 cells (50.0%) have expected count of less than 5. The minimum expected count is .28

Table 6. Association of socio-demographic variables and willingness to donate teeth after death (n=257)

Demographic variables	Willingness to donate teeth after death				
	Yes	No	P-value	Chi-square test	df
Gender					
Male	13 (5.1%)	22 (8.6%)	0.703	*0.145	1
Female	90 (35%)	132 (51.4%)			
Ethnicity					
Malay	100 (38.8%)	148 (57.6%)	0.706	**0.697	2
Chinese	0 (0.0%)	1 (0.4%)			
Others	3 (1.2%)	5 (1.9%)			
Religion			0.733	***0.116	1
Muslim	101 (39.3%)	150 (58.4%)			
Christian	2 (0.8%)	4 (1.6%)			

*0 cells (0.0%) have expected count of less than 5. The minimum expected count is 14.03

**4 cells (66.7%) have expected count of less than 5. The minimum expected count is .40

***2 cells (50.0%) have expected count of less than 5. The minimum expected count is 2.40

Table 7. Association between delayed preclinical work and difficulty in finding teeth with the willingness to donate teeth after extraction of tooth

Delayed pre-clinical work	Willingness to donate teeth after extraction				P-value	Chi-square test	df
	Prefer to keep it	Prefer to leave it	For science/ research	For educational purposes/ preclinical training			
Yes	80 (31.1%)	30 (11.7%)	11 (4.3%)	125 (48.6%)	0.477	*2.488	3
No	5 (1.9%)	2 (0.8%)	1 (0.4%)	3 (1.2%)			
Difficulty in finding extracted teeth (pre-clinical)							
Yes	78 (30.4%)	31 (12.1%)	12 (4.7%)	122 (47.5%)	0.484	**2.453	3
No	7 (2.7%)	1 (0.4%)	0 (0.0%)	6 (2.3%)			

*3 cells (37.5%) have expected count of less than 5. The minimum expected count is .51

**3 cells (37.5%) have expected count of less than 5. The minimum expected count is .65

Table 8. Association between difficulty in finding teeth and delayed preclinical work with the willingness to donate teeth after death

	Willingness to donate teeth after death				
	Yes	No	P-value	Chi-square test	df
Delayed preclinical work	99 (38.5%)	147 (57.2%)	0.797	*0.066	1
	4 (1.6%)	7 (2.7%)			
Difficulty in finding teeth	99 (38.5%)	144 (56.0%)	0.366	**0.816	1
	4 (1.6%)	10 (3.9%)			

* 1 cell (25.0%) 3 cells (37.5%) have expected count of less than 5. The minimum expected count is 4.41

**0 cells (0.0%) 3 cells (37.5%) have expected count of less than 5. The minimum expected count is 5.61

Discussion

Preclinical training is fundamental to ensure that dental students gain adequate experience before treating patients (Robberecht *et al.*, 2017). However, the rising number of dental schools in Malaysia might be contributing to the lack of supply of extracted human teeth. This study was designed to evaluate the socio-demographic and factors associated with the willingness to donate teeth among students for education and research purposes. To date, there are limited studies on tooth donation hence the need to explore this particular area even further.

This pilot study involved a university which had the majority of Malay and Muslim students which could not have represented the actual scenario happening among Malaysian dental students. There was no statistically significant relationship between the socio-demographic characteristics such as gender, ethnicity, and religion with the willingness to donate teeth among dental students in Malaysia. However, from our findings, the Malay and Muslim students were more willing to donate their teeth after extraction for educational purposes (48.6%, 49%) as compared to after death (38.8%, 57.6%). As for other ethnicity and religion, they preferred to keep their tooth after extraction (2.3%, 1.6%) and were not willing to donate their teeth after death (1.2%, 0.8%). A study on organ donation in Malaysia reported that Malay and Muslim were unsure or unwilling to donate their organs as compared to Chinese and Buddhist (Abidin *et al.*, 2013). The Malays face the dilemma of being sceptical of whether their religion permits them to make organ donations (Noordin *et al.*, 2012). As the majority of students were Malay (96.5%) and Muslim (97.7%) in this study, it was quite challenging to justify whether the same scenario applies to tooth donation as there was a small number of students representing

other ethnicities (3.5%) and religion (2.3%). A recent study by Mortadi *et al.* (2018) reported no significant relationship between age, gender, income, and place of living with the willingness to donate teeth after extraction. However, females (61.6%) were more likely to donate their teeth as compared to males (23.4%) (Mortadi *et al.*, 2018) which was similar to our findings. In future, this research should be extended to include more dental universities in Malaysia to omit the imbalance in terms of socio-demographic factors.

In general, most of the students were willing to donate their teeth after extraction for educational purposes (49.8%), followed by keeping their tooth (33.1%), leaving it behind as clinical waste (12.5%) and donating it to research (4.7%). Higher education level was associated with the likelihood of donating teeth (Mortadi *et al.*, 2018). Surprisingly, in this study, only a minority of students were willing to donate teeth for research despite considerable expansion on dental pulp stem cells (DPSC) research in recent years. The high percentage of students willing to donate their teeth for educational purposes might be due to their preclinical training experiences whereby 94.6% of students had difficulty in finding teeth, especially molars (85.9%). More than half of them (52.1%) spent a duration of 6 to 12 months for teeth collection, which contributed to the delay in completing their work.

Furthermore, most of the extracted human teeth collected were unsuitable for the preclinical projects (67.7%). To overcome this problem, students opted to ask friends, seniors, or juniors for extracted human teeth (74.3%). However, there was no statistically significant relationship between delayed preclinical work and difficulty in finding teeth with the willingness to donate teeth.

Nonetheless, students who faced these problems were likely to donate teeth for

educational purposes as compared to research. The lack of exposure to DPSC research among dental students might have contributed to the fact that most students did not consider donating teeth to research. With this finding, dental schools should start implementing into their curriculum the current research in dentistry so that students would appreciate it much better.

Furthermore, dental students should also be aware of the current development in dental research (e.g., dental pulp stem cells) to be able to promote tooth donation to the society. A study by Rumsey *et al.* (2003) reported that patients have a more positive attitude towards organ donation if they knew that the doctors were willing to donate organs themselves (Rumsey *et al.*, 2003). Although many students were willing to donate teeth after extraction, 67.7% of students still felt that they had ownership towards the extracted tooth. A study by Le Breton *et al.* (2015) reported that barely more than half of the patients (54.5%) considered the tooth was belonging to them after extraction (Le Breton *et al.*, 2015). Those living in rural areas contributed to the high percentage of refusing to sign the consent form for tooth donation. Thus, this could be related to the misunderstanding among participants on the rationale of the consent form; especially in older people and those with less formal education background (Mortadi *et al.*, 2018). Contrary to our findings, when research on the tooth was considered, 88.3% of students preferred to be asked consent before tooth donation. This might be due to the fact that our study population consisted of dental students who could relate well to the importance of signing consent before any procedures.

Nonetheless, it is best to separate the consent for tooth extraction in the context of routine dental care from the consent for extraction of teeth for research purposes (Le Breton *et al.*, 2015). Besides that, almost half

of the students would like to be informed about the type of research that will be carried out on their teeth after donation similar to the report by Le Breton *et al.* (2015). Emails regarding the result of research on tooth were the preferred approach of contact for most participants in this current study. This similarity in preference is likely to be due to cultural similarity among dental students, where emails, are generally the preferred mode of communication in this faculty.

In this study, we were keen to know whether the dental students were willing to donate teeth after death which was not the case. Unlike organ donation, which has a well-established protocol in harvesting the organs, it does not apply to teeth. We decided that it is best to omit the idea as it is unfair to promote teeth donation after death to the public when the main stakeholders are resistant in doing so. However, promoting tooth donation after extraction is the way to move forward to meet the demand of extracted human teeth.

Conclusion

Promoting tooth donation to meet the demand for dental schools and researchers in Malaysia could be considered. The usage of extracted human teeth for preclinical training is still significant as it mimics the actual tooth in terms of its anatomy and structure of hard tissue. Further research is recommended to determine the willingness of the community in Malaysia to donate teeth before promoting tooth donation to the public. And perhaps with a higher number of participants, the association between the sociodemographic characteristics and willingness to donate teeth would differ from our findings. Besides that, the results from the public might guide us towards identifying the need of the developing a tooth bank to receive, disinfect and organise teeth from donors systematically and safely for the

usage of both dental students and researchers.

References

- Abidin, Z. L., Ming, W. T., Loch, A., Hilmi, I., & Hautmann, O. (2012). Are health professionals responsible for the shortage of organs from deceased donors in Malaysia? *Transplant International: Official Journal of the European Society for Organ Transplantation*, 26(2), 187-194.
- Kohn, W. G., Collins, A. S., Cleveland, J. L., Harte, J. A., Eklund, K. J., & Malvitz, D. M. (2003). Guidelines for infection control in dental health-care settings. *Centers for Disease Control and Prevention*, 52(RR17), 1-61.
- Dominici, J. T., Eleazer, P. D., Clark, S. J., Staat, R. H., & Scheetz, J. P. (2001). Disinfection/sterilization of extracted teeth for dental student use. *Journal of Dental Education*, 65(11), 1278-1280.
- Kabir, R., Gupta, M., Aggarwal, A., Sharma, D., Sarin, A., & Kola, M. Z. (2014). Imperative role of dental pulp stem cells in regenerative therapies: A systematic review. *Nigerian Journal of Surgery: Official Publication of the Nigerian Surgical Research Society*, 20(1), 1-8.
- Kumar, M., Sequeira, P. S., Peter, S., & Bhat, G. K. (2005). Sterilisation of extracted human teeth for educational use. *Indian Journal of Medical Microbiology*, 23(4), 256-258.
- Le Breton, A., Chaussain, C., Herve, C., & Pirnay, P. (2015). Thoughts on donation of a tooth to science, in the course of dental care. *The Journal of Forensic Odonto-stomatology*, 33(1), 27-37.
- Lolayekar, N., Bhat, V., & Bhat, S. (2007). Disinfection methods of extracted human teeth. *Journal of Oral Health and Community Dentistry*, 1(2).
- Mortadi, N. A., Khabour, O. F., & Alzoubi, K. H. (2018). Considerations and beliefs in tooth donation to research in Jordan. *Clinical, Cosmetic and Investigational Dentistry*, 10, 263-268.
- Noordin, N., Zakaria, Z., Aminuddin, A., Yaacob, M. A., Sawal, M. Z., Daud, M. S. *et al.* (2012). Organ donation among Malaysian: The Malay dilemma toward social development, *Asian Social Science*, 8(10), 8-15.
- Robberecht, L., Hornez, J. C., Dehurtevent, M., Dufour, T., Labreuche, J., Deveaux, E. *et al.* (2017). Optimization and preclinical perception of an artificial simulator for endodontic training: a preliminary study. *Journal of Dental Education*, 81(3), 326-332.
- Rumsey, S., Hurford, D. P., & Cole, A. K. (2003). Influence of knowledge and religiousness on attitudes toward organ donation. *Transplantation Proceedings*, 35(8), 2845-2850.
- Sandhu, S. V., Tiwari, R., Bhullar, R. K., Bansal, H., Bhandari, R., Kakkar, T. *et al.*, (2012). Sterilization of extracted human teeth: a comparative analysis. *Journal of Oral Biology and Craniofacial Research*, 2(3), 170-175.
- Smitha, D., Tijare, M. S., Hv A., Gujjar, K. R. & Sharma, R. (2014). Knowledge, attitude and practice regarding handling of extracted human teeth among students of a dental college in Bhopal. *Journal of Indian Association of Public Health Dentistry*, 12(4), 276-282.
- Velayo, B. C., Stark, P. C., Eisen, S. E., & Kugel, G. (2014). Using dental students' preclinical performance as an indicator of clinical success. *Journal of Dental Education*, 78(6), 823-828.