

Knowledge and Attitude of Undergraduate Students and Interns about Human Tooth Bank: A Cross-sectional Study

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ABSTRACT

Introduction: Human tooth banks (HTBs) are philanthropic institutions that assist to alleviate academic pressure by supplying human teeth essential for preclinical laboratory activities and experimental research. The primary focus of this research was to assess the knowledge and attitude of undergraduate students and interns who have taken up dentistry as their field of study in Jazan University, Saudi Arabia, about HTB.

Materials and methods: An online structured self-explanatory questionnaire containing 16 questions was sent *via* email to the undergraduate students and interns. The Google e-forms questionnaire contained a consent attached for participating in this cross-sectional observational study.

Results: A good response rate of 93.3% was recorded, but the results were surprising as 66.43% of the participants did not have the slightest idea regarding the concept of a tooth bank, while only a meager 17.4% of them supported the idea of getting the teeth preauthorized from HTBs before using it on patients. A majority (80.36%) of students unanimously promoted the idea of having facilities like HTBs, but only 15.36% of students had stored teeth at a teeth bank previously.

Conclusion: There is an overwhelming lack of awareness among students regarding HTBs and the legal procedures involved in procuring teeth from them. It is necessary to do all that's required to create awareness about the perks of linking HTB with various dental institutions and the legal process involved to use human teeth.

Keywords: Attitude, Dental students, Human Tooth Bank, Knowledge.

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INTRODUCTION

Human tooth bank (HTB) is a nonprofit organization affiliated with a college, university, or any other organization aimed at satisfying academic requirements by donating human teeth for research activities and preclinical laboratory training of students. The HTB plays an essential ethical role in this context, thereby putting an end to the illicit tooth trade that persists across dental colleges.¹⁻³ Various *in vitro* studies have been documented in literature whose objective was to develop new innovative methods and products in different fields of dentistry making use of extracted natural teeth to improve the quality of dental services provided to the public. Hence, in this field of research, the use of natural teeth that have been formally donated is crucial for gaining and disseminating knowledge. Adopting extracted teeth for research-related purposes is commonly practiced in academic centers.¹

Human life is invaluable, and hence, before performing procedures on live patients, dental students practice using artificial tooth models, typhodont teeth, and extracted teeth to gain skills and learn intricate dental procedures.^{4,5} Extracted teeth are procured from various sources like private clinics, oral surgery clinics, hospitals, etc. Such teeth must be stored cautiously and preserved for a particular period before using them. Any mishandling of such extracted teeth increases the risk of brittleness, making them unsuitable for use. The stored teeth are widely used on patients as post and core and as natural inlays.^{6,7}

An inept display of processing procedures that include cleaning, disinfection, sterilization, and storage elevates the risk of infection rate. Hence connecting HTBs with the dental institutions not only reduces the risk of cross-infection due to improper handling of the dental tissues but also leads to adherence to legal norms and

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organizes the supply of teeth to undergraduate students and interns for their academic activities.⁸

Besides doing a favor for academic activities, HTBs also reap benefits by grabbing the opportunity for conducting research that promotes their development. There are little researches on HTBs in particular, and this will be the next critical step in determining their functioning. Tooth banks play an important societal function by disseminating information to the public and supporting public awareness efforts/campaigns to encourage people to donate their teeth, thereby halting the illicit tooth trade.¹ The necessity

of utilizing teeth from an HTB is better understood by graduate students and interns of various dental institutions as they are knowledgeable about teeth donation. Providing incentives for the development of HTBs and donation of teeth improves academic performance and scientific research as they have a strong ethical and legal footing. All these make it indispensable to evaluate the knowledge of dental students regarding HTB. The current study was taken up to shed light upon the knowledge and attitude of undergraduate students and interns pursuing dentistry at Jazan University, Saudi Arabia about HTB.

MATERIALS AND METHODS

A cross-sectional observational study was conducted among students and interns in the course of dentistry at Jazan University from April 2020 to May 2021. Ethical clearance was obtained by the Institutional Ethics Committee bearing a registration number CODJU-21015.

Sample size calculation

sample size calculation was done using formula:

$$\text{Sample Size } (n) = Z^2 \times p \times (1 - p) / d^2$$

Where,

$$Z (1-\alpha/2) = 1.96 \text{ for } 95\% \text{ confidence interval}$$

$$p = \text{Proportion of the participants familiarized with HTB (6.4\%)*}$$

$$d = \text{Precision of the study}$$

With a precision of 3 %, the sample size required for the present study is calculated as 266.

10% of the calculated sample size was added to compensate for sampling loss if any,

Thus the final sample size accounted to a total of 300 participants.

Inclusion Criteria

- Students who had regularly participated in clinical and preclinical laboratory activities.
- Students who were willing to give informed consent for participation through Google forms.

Exclusion Criteria

- Students who were not regular for clinical and preclinical laboratory activities.
- Students who did not respond even after sending five reminders through emails with a 2-day interval in between.

Data Collection Instrument

The questionnaire was formed on two domains: the first domain consisted of questions assessing the knowledge of students and interns in the course of dentistry in Jazan University about HTB and the second domain consisted of questions assessing the attitude of students and interns in the course of dentistry in Jazan University about HTB.

Validation of the Tool

A set of 20 questions in English about various domains were prepared based on a literature review. These questions were emailed to five experts in the field to perform content validation on a five-point Likert scale. Each question was assessed for its relevance by calculating Aiken's index. Questions that obtained a score of ≥ 0.6 were included in the proforma. The reliability of the questionnaire was assessed by Cronbach's α value which ranged between 0.72 and 0.891, with a median of 0.84 showing good reliability.

Study Procedure

An online structured self-explanatory questionnaire with a consent form attached to it was developed. The link of the questionnaire comprising of 16 questions was sent *via* email as Google e-forms, and every student was allowed to respond only once. Soon after obtaining informed consent, participants were automatically directed to the study details which contained a sequence of questions. Every piece of information collected was checked for completeness and consistency adherence.

Statistical Analysis

Using IBM SPSS (Statistical Package for Social Sciences) Version 21.0, Chicago, the response of students to descriptive statistics of various questions was assessed.

RESULTS

Among the 300 participants, 280 fully answered the questionnaire, yielding a response rate of 93.3%. A majority of the participants were males (50.4%), and a major proportion of the participants belonged to the 5th year (27.5%). Analyzing the students' knowledge about HTB revealed that 82.86% of them valued tooth as an organ and a majority (72.14%) of them willingly agreed that human tissues and organs could be stored in a facility. While 73.21% agreed that human teeth could be preserved, a majority (66.43%) of them shockingly remained unaware of the concept of a tooth bank. A major proportion (84.29%) of the students realized the need to disinfect the teeth before storing them, the risk of contamination of pulp and periodontal tissues by pathogens, and the risk these imposed on the dental personnel handling them (86.07%). Most of the participants were ignorant whether or not teeth stored in a tooth bank could be used on other patients, while only 17.4% knew that prior authorization was needed to use teeth from tooth banks on patients. Almost 64.64% of students did not know about the application of the preserved tooth, and a meager 19.29% responded that it could be used for experimental studies (as shown in Table 1).

Almost 80.36% of students supported the need for a facility like the HTB realizing its importance, 15.36% of the students had experience in storing teeth at a tooth bank previously, and among them, 15% of them had disinfected the teeth before storage. Almost 79.64% of students had no experience in manipulating teeth without using a PPE. While 63.9% of students had extended a desire to use human teeth in laboratories, 58.93% of them had requested the same for dental college research. Though 91.79% of the students strongly upheld the notion of organ donation only 51.07% of them were ready to donate their own teeth to HTBs. Almost 26.43% of students readily accepted to inform their patients that a tooth is an organ and its transplantation is well within the law. Almost 53.57% of the students looked forward to storing the permanent teeth in HTBs as shown in Table 2.

DISCUSSION

The concept of HTB emerged in 1981 when the requirement for good-quality dental organs for research purposes was in demand. It was theorized that introducing HTB would eliminate the illegal procurement of teeth and ensure the safe handling of extracted teeth. Frequently, teeth were purchased from the black market, and this proposed a critical risk factor for those manipulating it. Per the law of transplants, we can never neglect the source of origin of human teeth, especially when it is recognized as an organ. So, using extracted human teeth without producing proof of origin is wrongful and illegal.^{9,10}

Though established as an organ, the awareness regarding the same and its promising role in general health was almost

Table 1: Analysis of knowledge regarding HTB among undergraduate students and interns

1	Do you consider the tooth as an organ?	Yes	232 (82.86)
		No	30 (10.71)
		I don't know	18 (6.43)
2	In your opinion, can human tissues and organs can be stored in a facility?	Yes	202 (72.14)
		No	23 (8.21)
		I don't know	55 (19.64)
3	In your opinion, can human tooth /teeth be preserved?	Yes	205 (73.21)
		No	22 (7.86)
		I don't know	53 (18.93)
4	Do you know what human tooth bank is?	Yes	94 (33.57)
		No	186 (66.43)
5	In your opinion, is it necessary to disinfect the teeth before storing them?	Yes	236 (84.29)
		No	10 (3.57)
		I don't know	34 (12.14)
6	Do you know that pulp and periodontal tissues may be contaminated by pathogens and risk of exposure to the dental personnel handling them?	Yes	241 (86.07)
		No	39 (13.93)
7	a) Can tooth stored in a tooth bank be used in other patients? b) If yes, do you feel that authorization is required to use teeth from tooth bank on patients?	Yes	63 (22.5)
		No	84 (30)
		I don't know	133 (47.5)
		Yes	48 (17.14)
		No	5 (1.79)
8	a) Do you know where the preserved tooth can be used? b) If yes, tick all that apply	I don't know	10 (3.57)
		Yes	99 (35.36)
		No	181 (64.64)
		Post and core	6 (2.14)
		Crown	2 (0.71)
		Experimental or lab studies	54 (19.29)
		Crown and experimental or lab studies	8 (2.86)
Post and core, crown	2 (0.71)		
Post and core, experimental or lab studies	3 (1.07)		
Post and core, crown and experimental or lab studies	23 (8.21)		

nonexistent until the establishment of HTBs. Such widespread recognition enhanced tooth donations as a gesture of supporting performed activities.¹¹ Complying with laws governing the handling of human teeth; encouraging the adoption of procedures aimed at preventing cross-infection during the manipulation of donated teeth; preserving donated human teeth, and fulfilling the teaching requirements of undergraduates and teachers regarding the development of preclinical and technical-lab procedures were the goals of HTB as proposed by Freitas AB.^{10,12}

In our research, the majority of the students were oblivious of the existence of tooth bank whereas most of them considered the tooth as an organ which was per the study conducted by Valadas et al.⁸ where only 6.4% of the students were aware of the existence of tooth bank, and 96.8% of them considered tooth as an organ. In the same study, a major proportion of participants used human teeth during the graduation of which almost half of them used it without the donor's authorization.

Our study reported similar findings in which only a meager 22% supported using teeth from HTBs on other patients, and among these students, a majority of them disagreed that authorization

was necessary before using it. Our study showed that 91.79% of students backed the idea of organ donation, but only 51.07% were interested in donating their teeth, which is approximately only half the percentage of those who agreed to organ donation. Our study was not per the study conducted by Valadas et al.⁸ and Pinto et al.,¹³ in which a majority of the students favored both organ donation and donation of teeth to an HTB. A study conducted by Freitas et al.¹² reported that 99.1% of the participants understood the importance of having an HTB. Our study also reported similar results where a majority of the students supported the need for facilities like HTB. But, a large number of them were unfamiliar with the potential uses of HTB and this was per the study conducted by Zucco et al.¹⁴ where the undergraduates from the school of dentistry, Univille, remained unaware of the activities performed in HTBs. In our study, most participants preferred to store the permanent teeth. According to Miranda et al.¹ relevance of donations in the case of deciduous teeth is not just limited to the availability of teeth for laboratory practices and research but also personifies the child's true awareness regarding organ donation, thereby shaping a better-prepared generation.

Table 2: Analysis of attitude regarding HTB among undergraduate students and interns

Sl. No	Attitude	Responses	n (%)
1	Do you consider it is important to have facility like human tooth bank?	Yes	225 (80.36)
		No	55 (19.64)
2	a) Did you ever store teeth at human tooth bank? b) If yes, do you disinfect the teeth before storing them?	Yes	43 (15.36)
		No	237 (84.64)
		Yes	42 (15)
		No	1 (0.36)
3	Have you ever manipulated teeth without using PPE?	Yes	57 (20.36)
		No	223 (79.64)
4	a) Have you ever been requested to use human teeth in laboratories and research? b) If yes, in which way?	Yes	179 (63.9)
		No	101 (36.07)
		Dental college	165 (58.93)
		Private office	8 (2.86)
		Public health unit	5 (1.79)
5	Do you believe in organ donation?	Yes	257 (91.79)
		No	23 (8.21)
6	Would you donate your own teeth to a human tooth bank?	Yes	143 (51.07)
		No	137 (48.93)
7	Do you inform patients that the tooth is an organ, and it is under the transplantation law?	Yes	74 (26.43)
		No	206 (73.57)
8	Which type of tooth do you prefer to be stored in the tooth bank?	Primary	111 (3.93)
		Permanent	150 (53.57)
		Both	119 (42.50)

There is no replacement for extracted teeth in the field of dentistry as it is an indispensable material, in both preclinical and research activities. Rather than obtaining extracted teeth of unknown origin which is not properly decontaminated, it is always better to procure them from authorized institutions like HTBs. Appropriate awareness and thorough knowledge regarding the overall functioning of HTBs should be provided to the students as well as to the public. Though a majority of students understood the need for organizations like HTBs, only a handful of them had prior experience in storing teeth, and almost half of them were reluctant to donate their teeth to HTBs. In reality, this is a concerning issue, and we need powerful and informative campaigns that highlight the importance and potentials of HTBs, both at the college and societal levels. Only then we can expect that the extracted human teeth are obtained by abiding by legal protocols.

Results of this study should be discussed and interpreted with caution due to the paucity of studies in published literature. However, this study is a first of its kind conducted in Saudi Arabia that assesses the knowledge and attitude of undergraduate students and interns about HTBs. One major limitation to this research is that the study doesn't include the knowledge and attitude of dental faculties regarding HTBs. We recommend further studies with greater sample sizes involving more students and teachers from various dental institutions to come to a definitive conclusion.

CONCLUSION

As per the findings obtained, only some participants possessed knowledge about HTBs even though most of them had prior experience in using illegally obtained teeth for various dentistry-related activities. Though a majority of the participants strongly supported the idea of having facilities like HTBs, only some of them felt the need for

obtaining authorization before using the teeth from them. The need of the hour is to create awareness in obtaining human teeth legally, and all the benefits acquired when dental institutions come forward to collaborate with organizations such as HTBs.

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