

Awareness and Knowledge of Dental Students about Sterilization \ Disinfection of Extracted Human Teeth

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Abstract

To assess the awareness and knowledge about sterilization/disinfection methods of extracted human teeth in a selected group of Ajman University dental students.

Descriptive cross-sectional study was carried out among 250 participants of third, fourth, fifth and postgraduate dental students at the College of Dentistry, Ajman University, United Arab Emirates. Collected information was transferred into SPSS program version 22 (SPSS Inc., Chicago, IL, USA).

The result of the study showed that most students were aware that extracted teeth are a source of infections. Majority of them agreed that extracted teeth should be disinfected/sterilized before working on them; also they agreed that they should learn about the various extracted teeth disinfecting methods. Having guidelines by regulatory bodies/institutions to handle extracted human teeth was emphasized by many students. Sodium Hypochlorite was the most disinfection medium used by Ajman University dental students.

Ajman University dental students have a good level of education regarding the awareness and knowledge of sterilization of extracted human teeth. However, dental students need to be updated about the suitable methods for sterilization and disinfection.

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Introduction

Extracted teeth are routinely utilized in dentistry to learn technical and preclinical skills before treating patients in the clinics¹, as these teeth help dental students to gain enough knowledge and hand skills to practice all types of dental procedures. Nowadays universities use typodont teeth and artificial blocks to learn the preclinical skills but these teaching methods are not effective as the natural teeth in giving the dental students hand skills and tactile sensation for their dental practice².

Extracted teeth are considered as potential source of infection transmission to preclinical dental students as they contain bacteria, pathogens and blood which can transmit diseases such as human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV) or other

bloodborne pathogens if they were not used in caution^{3,4}. For that, the appropriate infection control guidelines that are set by regulatory institutions/centers like Center for Disease Control (CDC) should be followed⁵. Various solutions can be used after that to disinfect and clean extracted teeth from debris, blood and bacteria in order to minimize the risk of infection transmission before handling such teeth in preclinical laboratories. The mainly used solutions are formalin, saline, hydrogen peroxide and sodium hypochlorite, as these fluids are easily accessible in dental facilities⁵.

Autoclaving teeth for pre-clinical laboratories can be done after the usage of disinfection materials and it does not affect the physical properties of these teeth⁶. Dental students should use personal protective equipment for handling extracted teeth. They should wear gloves while handling extracted teeth that have not been sterilized yet⁷. Other personal protective equipment such as mask or face shield and protective eyewear should be worn if there is direct contact with teeth debris and blood⁷. The study objective is to assess the

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awareness and knowledge level about sterilization and disinfection of extracted human teeth among Ajman University dental students.

Materials and methods

This descriptive cross-sectional study was carried out among third, fourth, fifth and postgraduate dental students at the College of Dentistry, Ajman University, United Arab Emirates. The questionnaire was related to assess the awareness level, knowledge of dental students about sterilization and disinfection of extracted human teeth, and it was based on the work of other researchers^{3,5,8}. It consisted of 22 questions and the first part included characteristics of the participants like gender and year of study. The second part of the questionnaire was focusing on the student's knowledge about the infectious diseases that can be transmitted through human extracted teeth and about the different disinfection methods. While the third part of the questionnaire was related to dental student's awareness about the protective measures while handling extracted natural teeth. The last part directed toward assessing student's source of information in relation to their knowledge. Participants filled the survey anonymously and voluntarily, as all the questions were fully completed. The raw data generated from this research were systematically collected and organized for analysis. All the collected information were transferred into SPSS program version 22 (SPSS Inc., Chicago, IL, USA). Frequency data were generalized and Chi-square was used to evaluate the difference between different variables.

Results

A total of 250 online based questionnaire were sent to the dental students of Ajman University. Out of 250 students 26.1% were male and 69.7% were female from third, fourth, fifth years and internship students, as responders' characteristics shown in Table1. 85.1% of the Ajman University dental students were aware that extracted teeth are a source of infection. Among 250 participants 54.8%, 45.6% and 41.8% were certain that HBV, HCV, HIV can transmit throughout extracted teeth respectively as shown in table 2, for that 91.2% of dental students pointed out how necessary it is to

disinfect/sterilize extracted teeth before working on them (Table3). The result of our study showed that 85.4 %, 93.9% of students agreed on the importance of wearing masks and gloves while disinfecting extracted human teeth correspondingly. Whereas less percent of students 74.7%, 67.4% wear protective eyewear and white coat while disinfecting correspondingly (Table 3).

	Frequency	Percent
Gender		
Male	68	26.1%
Female	182	69.7%
Year of study		
3 rd year	78	29.9%
4 th year	52	19.9%
5 th year	81	31%
Intern	39	14.9%

Table 1. Sociodemographic distribution of sample.

Knowledge statement	Frequency	Percent
Do you Consider extracted human teeth a source of infection?		
Yes	222	85.1%
No	19	7.3%
Don't know	9	3.4%
Is there a chance of HBV transmission through these teeth?		
Yes	143	54.8%
No	48	18.4%
Don't know	59	22.6%
Is there a chance of HCV transmission through these teeth?		
Yes	119	45.6%
No	54	20.7%
Don't know	77	29.5%
Is there a chance of HIV transmission through these teeth?		
Yes	109	41.8%
No	94	36.0%
Don't know	47	18.0%

Table 2. Percentage and Frequency of students' answers regarding disease transmission.

Knowledge statement	Frequency	Percent
Is there a need to wear mouth masks while disinfecting/sterilizing extracted human teeth?		
Yes	223	85.4%
No	15	5.7%
Don't know	12	4.6%
Is there a need to wear gloves while disinfecting/sterilizing extracted human teeth?		
Yes	245	93.9%
No	2	0.8%
Don't know	3	1.1%
Is there a need to wear protective eyewear while disinfecting/sterilizing extracted human teeth?		
Yes	195	74.7%
No	36	13.8%
Don't know	19	7.3%
Is there a necessity to wear white coat while disinfecting/sterilizing extracted human teeth?		
Yes	176	67.4%
No	59	22.6%
Don't know	15	5.7%
Do you think it is necessary to disinfect/sterilize extracted teeth before using them?		
Yes	238	91.2%
No	6	2.3%
Don't know	6	2.3%

Table 3. Percentage and Frequency of students' answers regarding personal protective measures.

Knowledge statement	Frequency	Percent
Disinfection/ sterilization medium used by you to store extracted human teeth		
Formalin	19	7.3%
Hydrogen peroxide	14	5.4%
Sodium Hypochlorite	106	40.6%
Alcohol	6	2.3%
Glutaraldehyde	0	0%
Normal Saline	12	4.6%
Chlorohexidine	22	8.4%
All of the Above	71	27.2%

Table 4. Percentage and Frequency of students' answers regarding the sterilization mediums.

Sodium hypochlorite was the most disinfection/sterilization medium used by 40.6% of Ajman University dental students to store extracted human teeth. 27.2% of students considered the usage of a variety of mediums to disinfect extracted teeth. Meanwhile 8.4% of responders chose chlorhexidine, and 7.3% of dental students chose formalin as their preferred

medium (Table 4). According to Dispose of extracted teeth, yellow color-coded disposable bags were mainly used among 49% of students, also the red color-coded disposable was chosen by 21.1% and the dust bin was used among 3.8% of these students. 78.5% of the students in Ajman University preferred using human extracted teeth over typodont tooth models to learn and practice dental preclinical skills. Source of information regarding dealing with natural teeth was mainly obtained from staff members instructions by 60.2% of the students. Students should give more effort and attention to self-reading & articles to improve their knowledge and perceptions as only 13% of the students depend on it, followed by other sources.

Discussion

Most dental students use extracted human teeth for educational and practicing purposes before entering the clinical environment. According to Occupational Safety and Health Administration (OSHA) these extracted teeth are considered potential sources of infectious disease transmission^{1,2}. Many evidences emphasized that HBV, HCV, HIV, and bacterial pathogens are present within teeth structures such as pulp, radicular and periradicular tissues^{9,10}.

Infection control guidelines by the American dental Association (ADA) stressed on the necessity of disinfecting and sterilizing extracted teeth in order to prevent spread of infections⁹. Moreover, these guidelines are not limited to disinfection and sterilization of extracted teeth, personal protective equipment such as gloves, mask and protective eyewear should also be used during handling of these teeth^{2,10}. In the present study, the awareness and knowledge of dental students were evaluated in relation to disinfection/sterilization of extracted teeth. Ajman university dental students have good knowledge regarding transmission of infectious diseases through extracted teeth. Similar findings had been observed by other researchers, Sethi et al.¹² and Deogade et al.³.

Majority of dental students in our study and other studies^{5,11,12,13,14} agreed that sterilization of extracted teeth is a crucial step before using/working on them, to prevent further dissemination of diseases. Working on the extracted teeth helps in getting the same tactile

sensation as working in the real case scenario, this is what makes these teeth preferable. The results of other studies^{5,11,12,14} highlighted that a high number of students preferred human extracted teeth to learn dental preclinical skills. A few Ajman University dental students chose typodont teeth to learn the needed skills in consistent with Amith & D'Cruz¹¹ and Smitha et al.⁵ studies as typodont are not hazard and they do not cause infections. Having regulatory bodies guidelines help in ensuring protection and safety of these students as well as in committing these standards and guidelines with their patients in the future. From this point most dental students in some studies^{5,12} including our study emphasized on the importance of knowing all the guidelines.

There's obvious variety in the information sources about how to deal with natural extracted teeth. Several studies^{3,5,8,11} showed that human extracted teeth are a source of infection, as well as Ajman dental students totally agreed on this point as extracted teeth have a high amount of saliva, blood, and tissue residue on their surface, that's why they are considered potentially infectious sources. On the other hand, few students in our study, Deogade et al.³ and Sethi et al.¹² studies did not consider these teeth as an infection source. Based on our study results', the majority of dental students agreed on the importance of wearing personal protective equipment while disinfecting extracted human teeth, as these students learned about how necessary it is to follow and use all the protective measures before starting the preclinical year. Regarding dispose of human extracted teeth, differences were seen between our study and other studies, as variance in results could be due to the presence of different color-coding systems as each university works with one of these systems, also it can be related to students' knowledge about protocols of how to dispose of extracted teeth. As the extracted teeth that the students' works on can cause infection, variable solutions can be used to disinfect/sterilize these teeth. Disinfection is the action that minimizes the microbial load present on the surface of an object, whereas sterile refers to an object without a detectable microbial load⁵. In our study, sodium hypochlorite was the most used medium by dental students as CDC recommends that the teeth used for educational and research purposes should be disinfected with sodium hypochlorite or liquid chemical germicides¹³. As

Dominici et al.² and Sandhua et al.¹⁰ studies showed that sodium hypochlorite has a high level of efficiency. However, it can increase the porosity of human enamel by deproteinization which is consistent with the findings of Silva et al.¹⁵ study and other researchers^{3,5,11,12,13} showed that hydrogen peroxide was the best used sterilization method. In conclusion as sodium hypochlorite is available in our university and recommended by the lab instructors, most of the dental students use it as it is simple, cheap and suitable for preclinical work and training purposes¹⁰. Even though 10% formalin is considered as one of the effective antimicrobial solutions in Dominici et al.², Nawrocka & Szymanska⁴, Smitha et al.⁵, Hashemipour et al.¹³, Kumar et al.¹⁶ and Chandki et al.¹⁷, studies, it was not broadly used among Ajman University dental students. In addition, 10% formalin is the only disinfectant solution that has the ability to penetrate the pulp chamber decreasing the apical microleakage of obturated teeth compared to other teeth stored in non-fixed specimens¹⁸.

According to our study, Ajman University dental students agreed that extracted teeth can be autoclaved before using them. The American dental Association (ADA) and Centers of disease control and prevention (CDC) considered autoclaving as one of the best sterilizations methods¹⁹. Moreover, White et al.²⁰ found that autoclave does not lead to any color changes in the teeth but it causes an increase in the rate of light attraction by dentine, also they observed that autoclaving causes some changes in the organic material and minerals of the dentine.

Limitations

Several limitations have been found in our study, as the design of our study is descriptive cross sectional. Sample size included only 250 participants who are in the third, fourth, fifth and internship year dental students of Ajman University, without including dental students from other universities in the United Arab Emirates.

Conclusions

Our study concluded that the awareness and knowledge level about sterilization\disinfection of extracted human teeth in Ajman University dental students was good as well as the students were aware about the importance of the protective measures. However,

dental students need to be more updated about the suitable sterilization solutions.

Recommendations

As human extracted teeth transmit infections and diseases, universities should give the updated CDC and ADA guidelines and the principles to dental students. Moreover, additional teaching sessions about the best sterilization methods should be given.

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Declaration of Interest

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