

# Knowledge and Practice Regarding Handling of Extracted Human Teeth for Educational Purposes among the Dental Students of Kathmandu Medical College

Dr. Deepak Kumar Roy,<sup>1</sup> Dr. Punam Basnet Dixit,<sup>2</sup> Dr. Siddharth Ghimire,<sup>3</sup> Mr. Roshan Kumar Roy,<sup>4</sup>  
Dr. Anu Ranjan Maharaj,<sup>5</sup> Dr. Jitendra Ray Yadav<sup>6</sup>

<sup>1,2,3</sup>Department of Conservative Dentistry and Endodontics, Kathmandu Medical College, Kathmandu, Nepal;

<sup>4</sup>Department of Community Medicine, Nepalgunj Medical College, Banke, Nepal;

<sup>5</sup>Department of Pedodontics and Preventive Dentistry, Buddha Institute of Dental Sciences and Hospital, Patna, Bihar, India;

<sup>6</sup>Private Dental Practitioner, Crystal Dental Hospital, Bhaktapur, Nepal

Correspondence:

Dr. Deepak Kumar Roy. Email: drdeepak48@gmail.com

## ABSTRACT

**Introduction:** Extracted human teeth have been used as a common mode to train undergraduate dental students before they step into the clinical year and start practicing on live patients. The sources of infections such as saliva, blood, and body fluids that are present in clinical settings may contaminate and exist in the extracted stored teeth which are used further for preclinical education.

**Objective:** To assess the attitude/knowledge of handling of extracted teeth among the dental students of KMC dental college and hospital, Kathmandu, Nepal.

**Materials and Method:** This is a cross-sectional, descriptive study. A formulated closed-ended questionnaire was used for collecting the data. All the data obtained were entered and tabulated in MS-Excel, and further descriptive calculations like average and total were done using MS-Excel.

**Result:** Altogether 180 students participated in the study. The use of extracted teeth was found to be highest in Conservative Dentistry and Endodontics. Students collected the extracted teeth from the private clinic in a more number compared to the institute and the quacks. Most of the students used sodium hypochlorite for sterilising the extracted teeth before starting the procedure. Students used general garbage bins for discarding the used extracted teeth.

**Conclusion:** The knowledge, performance, and attitude of dental students in relation to sterilisation or disinfection methods of extracted human teeth were quite satisfactory and students in this study displayed a positive level of knowledge regarding sterilisation and infection control practices.

**Keywords:** Dental education; disinfection; extracted teeth; Nepal.

## INTRODUCTION

Dental professionals and students have to handle the extracted teeth in different forms of teaching and learning activities. Extracted human teeth have been used as a common mode to train undergraduate dental students before they step into the clinical year and start practicing on live patients.<sup>1</sup> Extracted human is chosen because it simulates a normal

structure of natural teeth compared to typodont or acrylic teeth.<sup>2</sup> There is a possibility for those extracted teeth to harbor a plethora of pathogens viable in the root canals or decayed portion of enamel and dentin. There is a high chance for the spread of pathogenic organisms while performing any preclinical procedures like tooth preparations or preclinical root canal treatment learning exercise.<sup>3</sup> It is of utmost importance to understand the

disinfection/sterilisation protocol before handling extracted teeth. In spite of the numerous studies carried out to assess the disinfection/sterilisation of extracted teeth, the attitudes and practices of the students who use them most commonly have not been assessed. This study aims to assess the attitude /knowledge of the handling of extracted teeth among the dental students of Kathmandu Medical and Dental College, Kathmandu, Nepal.

## MATERIALS AND METHOD

The study was conducted at Kathmandu Medical College and Dental Hospital. A census sampling technique was used which included all the voluntarily participating dental students from the third year to final year and interns. Ethical clearance was obtained from the Institutional Review Board, Kathmandu Medical College (ref: 100920186). Written consent was obtained from all the individuals before starting the study. This is a cross-sectional, descriptive study. A formulated closed-ended questionnaire was used for collecting

the data. The questionnaire was extracted from the previously published article by Amith and D'Cruz.<sup>4</sup> The questionnaire included 3 sections. First section had information on sociodemographic details, 5 questions (1 – 5) on attitude and 5 questions (6 – 10) on practice of handling of extracted human teeth. All the data obtained were entered and tabulated in Microsoft Excel, and further descriptive calculations like average and total were done using Microsoft Excel.

## RESULT

Altogether 180 students including males and females (3rd year-44, 4th year 75, final year -26 and Intern-35) participated in the study. Females (78.33%) were found to be more than male participants (Table 1). All the students (100%) thought that extracted teeth could be a source of infection. The majority of the students (91.66%) considered that there may be a chance of infection when extracted teeth are used for educational purposes. While a vast majority (93.2%) answered

**Table 1: Gender wise participation of the students.**

Student Batch	Respondents		Total
	Male	Female	
Intern	9 (25%)	26 (75%)	35
Final year	7 (26%)	19 (74%)	26
4th Year	14 (18%)	61 (82%)	75
3rd year	9 (20%)	35 (80%)	44
Total	39 (21.66)%	41 (78.33)%	180 (100%)

**Table 2: Response of the students on attitude of handling extracted teeth.**

SN	Questions	Total
1	Do you think that the extracted human teeth should be considered as a source of infection? a. Yes b. No	180 (100%) 0
2	Is there any chance of infection with the use of extracted human teeth for educational purposes? a. Yes b. No	165 (91.66%) 15 (8.33%)
3	Should the extracted teeth be disinfected/sterilised before use? a. Yes b. No	145 (80.55%) 35 (19.44%)
4	Do you think it's necessary to wear mouth mask and gloves while disinfecting/the extracted teeth? a. Yes b. No	160 (88.88%) 20 (11.11%)
5	Is there any need to wear mouth masks and gloves while working on an extracted human tooth for educational purpose? a. Yes b. No	175 (97.22%) 5 (2.77%)

**Table 1: Gender wise participation of the students.**

Student Batch	Responses									Total
	Paedodontics	Periodontics	Prosthodontics	Oral pathology and microbiology	Conservative dentistry and endodontics	Orthodontics	Oral medicine and radiology	Oral and maxillofacial surgery	Public Health dentistry	
Intern	31	4	20	0	32	0	0	2	0	89
Final year	12	0	11	0	20	0	3	0	20	66
4th year	70	0	5	0	69	0	0	2	65	211
3rd year	40	4	4	2	40	0	5	1	35	131
3rd year	40	4	4	2	40	0	5	1	35	131

**Table 4: Collection of extracted teeth for educational purposes.**

Student Batch	Responses			Total
	Private practitioners	Institutions	Quacks	
Intern	20 (57%)	15 (43%)	0	35
Final year	8 (28%)	17 (68%)	1 (4%)	26
4th year	60 (80%)	10 (13%)	5 (7%)	75
3rd year	34 (77%)	10 (33%)	0	44
Total	122 (68%)	52 (28%)	6 (14%)	180

**Table 5: Methods of sterilisation for extracted teeth.**

Student Batch	Responses					Total
	Hydrogen peroxide	Sodium hypochlorite	Normal saline	Tap water	Others	
Intern	12	22	0	0	1	35
Final year	3	23	0	0	0	26
4th year	11	63	0	1	0	75
3rd year	25	10	9	0	0	44
Total	51	118	9	1	1	170

**Table 6: Disposal of extracted human teeth after their use for educational purposes.**

Student Batch	Responses			Total
	Yellow coded waste bin	General garbage bin	Others	
Intern	5 (14%)	27 (77%)	3 (9%)	35
Final year	10 (35%)	12 (42%)	6 (23%)	28
4th year	7 (9%)	58 (77%)	10 (14%)	75
3rd year	27 (61%)	9 (20%)	8 (19%)	44

that extracted teeth need to be sterilised before use. About 88.88% of them felt that mouth masks were necessary while disinfecting/sterilising extracted teeth and 97.22% of the subjects considered that wearing a mouth mask while working on extracted teeth is beneficial (Table 2). The extracted teeth were used by the 3rd-year students in a maximum number followed by the 4<sup>th</sup> year, interns and final year students. The students use extracted teeth for learning activities in almost every department but the use of extracted teeth was found to be highest in Conservative Dentistry and Endodontics (Table 3).

Students collect the extracted teeth from the private clinic in a more number compared to the institute and the quacks (Table 4). Most of the students use sodium hypochlorite for sterilising the extracted teeth before starting the procedure. Year-wise comparison showed that the 3rd year students use hydrogen peroxide for sterilisation (Table 5). When it comes to disposal of extracted human teeth after their use for educational purposes, it was found that most of the students use general garbage bins for discarding the used extracted teeth (Table 6).

## DISCUSSION

Extracted human teeth have been used as a common mode to train undergraduate dental students before they step into the clinical year and start practicing on live patients. Compared to typodont and acrylic teeth, extracted teeth are preferred because it simulates the normal structure of the natural teeth.<sup>5</sup> The infection sources such as saliva, blood, and body fluids which are present in clinical settings may contaminate and exist in the extracted stored teeth which are used further for preclinical education and therefore there might be a possibility for those extracted teeth to harbor number of pathogens viable in the root canals or decayed portion of enamel and dentin.<sup>1,2</sup> Every individual who handles extracted teeth may be at risk of being exposed to various bloodborne diseases. Shreds of evidence<sup>1-6</sup> support that many blood-borne pathogens, including HIV, HBV, HCV, and bacterial pathogens, may exist in the pulp and peri-radicular tissue of extracted human teeth. There is a high chance for the spread of pathogenic organisms while performing any preclinical procedures like tooth preparations or preclinical root canal treatment learning exercise.<sup>4</sup> The tooth preparation in the extracted tooth is done with the aid of rotary instruments, which leads to the spread of aerosols, and sometimes, accidental injuries might occur to the operators while working on those extracted teeth. The Occupational Safety and Health Administration states that all the extracted human teeth, which are being used in research and teaching purposes should be considered as potential sources of infection.<sup>7</sup> The operator should be aware of the common terms such as disinfection and sterilisation. Disinfection is a process that removes or deactivates all the pathogenic microorganisms, except bacterial spores. While Sterilisation describes a process that destroys or eliminates all forms of microbial life. Sterilisation of extracted teeth should be carried in such a way that the normal structure is not hampered and can better simulate the live teeth while performing the task. Various new methods of sterilisation have been introduced, with a negligible effect on the tooth structure, such as gamma radiation sterilisations at low temperatures, high pressure, chemicals, or gases.<sup>6</sup> Dominici et al.<sup>8</sup> in their study concluded that teeth immersed in 10 percent formalin for one week or autoclaved at 240°F at 20 psi for forty minutes were the only methods that prevented the growth of *B. stearothermophilus* spores. Only autoclaving for forty minutes at 240°F and 20 psi or

soaking in 10 percent formalin for one week were 100 percent effective in preventing growth.<sup>9</sup> White and Hays demonstrated the inefficiency of ethylene oxide against *B. subtilis* spores when placed in the pulp chamber of extracted human molars.<sup>10</sup> White et al. in their study evaluated the sterilisation of extracted teeth by comparing gamma radiation with autoclaving, ethylene oxide, and dry heat. It showed that gamma radiation sterilises teeth and endodontic filling materials without altering the structure and function of dentin. For complete sterilisation, a dose of 173 k-rad with the help of a cesium radiation source was required. Furthermore, no detectable changes were found with gamma irradiation, but all other methods introduced some detectable change in the spectra.<sup>11</sup> In spite of the numerous studies carried out to assess the disinfection/sterilisation of extracted teeth, the attitudes and practices of the students who use them most commonly have not been assessed. This study makes an effort to assess the students' knowledge and practices regarding disinfection and sterilisation of extracted human teeth being used for educational purposes. Several authors<sup>7-12</sup> have discussed the problems associated with the use of extracted human teeth as these teeth are grossly contaminated and difficult to sterilise because of their structure, and furthermore, these teeth might be damaged or altered by sterilisation procedures used for it. Kumar et. al.<sup>6</sup> studied the knowledge of dental students about the infectious risk of extracted teeth used in preclinical practical's and concluded that about 90% of students knew that extracted teeth were the source of infection but only 75% of them performed a disinfection method to eliminate contamination from these teeth. The present study imparted that all the students (100%) thought that extracted teeth could be a source of infection. This is similar to the study done by Amith and D'cruz<sup>4</sup> where almost (88.3%) had a similar type of agreement. The majority of the students (91.66%) considered that there may be a chance of infection when extracted teeth are used for educational purposes. while a vast majority (93.2%) answered that extracted teeth need to be sterilised before use. About 88.88 % of them felt that mouth masks were necessary while disinfecting/sterilising extracted teeth and 97.22% of the subjects considered that wearing a mouth mask while working on extracted teeth is beneficial. One of the reasons for having knowledge regarding sterilisation and disinfection is that microbiology is a part of curriculum in dental schools. Most of the students were unaware

about the correct methods to dispose the extracted teeth after use. The findings were consistent with the study done by Smitha, et al.<sup>13</sup> where only 24.5% answered correctly that these teeth be disposed in yellow colour-coded disposal bags. The majority of the students used the extracted teeth for learning in the department of Conservative Dentistry and Endodontics. The findings were similar to the study done by Amith and D cruz<sup>4</sup> and Smitha, et. al.<sup>13</sup> One of the reasons may be that students have to complete their quotas for all the preclinical operative and endodontic exercises. Although dental colleges have all the settings for teaching and learning activities but the majority of the students obtained extracted teeth from the private clinics. The study done by Smitha et al.<sup>13</sup> had similar findings where half of the students collected the extracted teeth from a private practitioner. Tate and White studied the effect of concentration of antimicrobial effect in pulp space and. emphasized that formaldehyde was the only antiseptic solution that can achieve an effective antimicrobial concentration.<sup>14</sup> The effect of formalin storage on apical seal integrity of obturated canals was studied by George et al.<sup>15</sup> It showed that the rate of apical microleakage in the case group stored in formalin were much less than the control group. The cutting characteristics of extracted teeth were investigated by Parsell et al.,<sup>16</sup> Chandler<sup>17</sup> and Soares et al.<sup>18</sup> Chandler<sup>17</sup> showed that autoclaving produced significant softening of bovine enamel, the changes in microhardness recorded being similar to those produced by some experimental cariogenic substrates. Gamma irradiation caused no significant changes in enamel hardness. Soares et al.<sup>18</sup> elaborated that the mineral and organic dentin contents were more affected

in autoclaved teeth than in the specimens stored in thymol. It was reported that dentin hardness decreases by autoclaving; dentin of teeth autoclaved becomes softer in comparison to the control group.

In the present study, students chose sodium hypochlorite to disinfect extracted teeth. This finding was almost similar to the study done by Kumar et al.<sup>6</sup> and Smitha et al.<sup>13</sup> as in their study most of the students' used sodium hypochlorite as the first option. Most of the students who participated in this study were aware of the safety protocols regarding how to handle the pathogenic specimens and were putting in practice those standardised guidelines so as to protect themselves, others and the environment from the pathogenic clinical specimens.

## CONCLUSION

In the present study the knowledge, performance, and attitude of dental students in relation to sterilisation or disinfection methods of extracted human teeth were quite satisfactory and students in this study displayed a positive level of knowledge regarding sterilisation and infection control practices. However, the knowledge acquired must be practically administered into daily practice. Compliance can be improved by upgrading students' knowledge through educational programmes and making them aware of the various health hazards that can occur following malpractice of sterilisation and infection control measures.

**Conflict of Interest:** None

JNDA

## REFERENCES

1. Moscovich H, Creugers NH. The novel use of extracted teeth as a dental restorative material – The “natural inlay”. *J Dent.* 1998;26:21-4.
2. Smitha D, Tijare MS, Amith HV, Gujjar KR, Sharma R. Knowledge, attitude and practice regarding handling of extracted human teeth among students of a dental college in Bhopal. *J Indian Assoc Public Health Dent.* 2014;12:276-82.
3. Tabrizzadeh M, Abrisham M, Dehghan MF. Comparison of different techniques for disinfection of teeth internal space in preclinical teaching. *J Dent Med.* 2009;22:120-4.
4. Amith HV, D'cruz AM. Attitude and practice on handling of extracted teeth for educational use among the students of a dental college in southern India. *Int J Med Dent.* 2014;4:147-53.
5. Sethi AK, Samal R, Lahiri B, Das A, Kumar G, Behera S. Awareness, attitude and practice regarding disinfection and handling of extracted teeth among the students in a dental college in India. *J Int Soc Prevent Communit Dent.* 2018;8:488-94.
6. Kumar M, Sequeira PS, Peter S, Bhat GK. Sterilisation of extracted human teeth for educational use. *Indian J Med Microbiol.* 2005;23:256-8.
7. Occupational Safety and Health Administration. 29 CFR 1910.1200. Hazard communication. Fed Regist. 1994;59:174-9.
8. Dominici JT, Eleazer PD, Clark SJ, Staat RH, Scheetz JP, authors. Disinfection/sterilization of extracted teeth for dental student use. *J Dent Educ.* 2001;65:1278-80.

9. Pantera EA, Schuster GS. Sterilization of extracted human teeth. *J Dent Educ.* 1990;54:283-5.
10. White RR, Hays GL. Failure of ethylene oxide to sterilise extracted human teeth. *Dent Mater.* 1995;11:231-3.
11. White JM, Goodis HE, Marshall SJ, Marshall GW. Sterilization of teeth by gamma radiation. *J Dent Res.* 1994;73:1560-7.
12. Hope CK, Griffiths DA, Prior DM. Finding an alternative to formalin for sterilization of extracted teeth for teaching purposes. *J Dent Educ.* 2013;77:68-71.
13. Smitha D, Tijare MS, Amith HV, Gujjar KR, Sharma R. Knowledge, attitude and practice regarding handling of extracted human teeth among students of a dental college in Bhopal. *J Indian Assoc Public Health Dent.* 2014;12:276-82.
14. Tate WH, White RR. Disinfection of human teeth for educational purposes. *J Dent Educ.* 1991;55:583-5.
15. George SW, Pichardo MR, Bergeron BE, Jeansonne BG. The effect of formalin storage on the apical microleakage of obturated canals. *J Endod.* 2006;32:869-71.
16. Pashley EL, Tao L, Pashley DH. Sterilization of human teeth: Its effect on permeability and bond strength. *Am J Dent.* 1993;6:189-91.
17. Chandler NP. Preparation of dental enamel for use in intraoral cariogenicity experiments. *J Dent.* 1990;18:54-8.
18. Soares LE, Brugnara A Junior, Zanin FA, Pacheco MT, Martin AA. Effects of treatment for manipulation of teeth and Er:YAG laser irradiation on dentin: A Raman spectroscopy analysis. *Photomed Laser Surg.* 2007;25:50-7.