

Original Research Article

Evaluation of efficacy of a training module regarding biohazards associated with materials used in prosthodontics for dental students – A cross-sectional study

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ABSTRACT

Objectives: This study aimed to evaluate the efficacy of a training module for dental students on biohazards associated with dental materials.

Material and Methods: Single group pre- and post-test design was used. One hundred undergraduate dental students were enrolled. Ninety-two students responded to the questionnaire.

Results: Post-test score improved significantly after the session.

Conclusion: There was an improvement in the knowledge regarding various aspects of biohazards as a result of this module.

Keywords: Biohazards, Ergonomic hazard, Chemical hazard, Dental materials

INTRODUCTION

A hazard can be defined as a source of potential damage, harm, or adverse health effects on something or someone at work. Biological hazards are biological agents that can cause harm to the human body.^[1]

Prosthodontic practice requires contact with restorative and auxiliary dental materials of widely different compositions, such as metals, resin-based synthetic polymers, cement, and impression materials, and restorative materials, such as dental amalgam, composites, and dental ceramics.^[2] Prosthodontic hazards may affect the patient, the dentist, the dental laboratory technician, or the dental assistant.^[3]

The potential risk of irritant chemicals, inhalation of vapors, dust particles, and injury from high-speed rotary equipment and flammable materials always exists in prosthodontic practice. The students need to be aware of all the hazards and protective measures to avoid them.^[4]

Therefore, this cross-sectional study was conducted to evaluate the efficacy of a training module regarding biohazards associated with materials used in prosthodontics for dental students.

Aims and objective

The objective of this study was to evaluate the efficacy of a training module regarding biohazards associated with materials used in prosthodontics for dental students.

MATERIAL AND METHODS

Approval from the Institutional Ethics Committee of Ranjeet Deshmukh Dental College and Research centre, Nagpur was obtained. IEC/VSPMDCRC/46/2021, dated 17th February 2021.

Study design

This study was a cross-sectional study with pre-post-design.

Study sample

One hundred undergraduate dental students were enrolled. Ninety-two students responded to the questionnaire.

Steps

The first section includes student's demographic data and the second section includes a pre-validated questionnaire. A pre-validated questionnaire is developed and validated for

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checking the knowledge of students regarding biohazards of dental materials in multiple-choice, Likert scale, and open-ended format. This self-administered questionnaire was shared in the form of a Google form and the link was shared on the respective WhatsApp group of students.

The steps in conducting this investigation are as follows:

1. Recording pre-test scores using a questionnaire
2. Conducting training modules on biohazards and their prevention using didactic lectures as well as demonstration
3. Recording post-test scores using the same questionnaire.

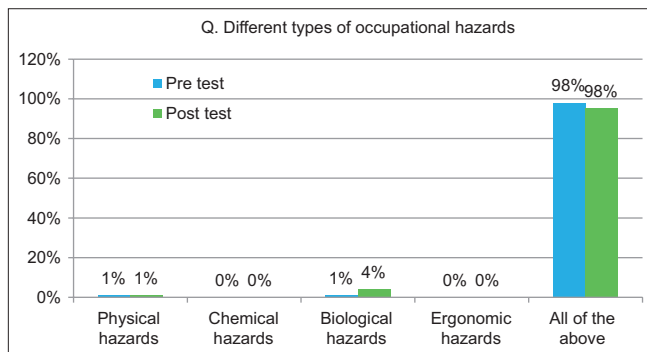


Figure 1: About 98% students were well aware about various types of occupational hazards in both the tests.

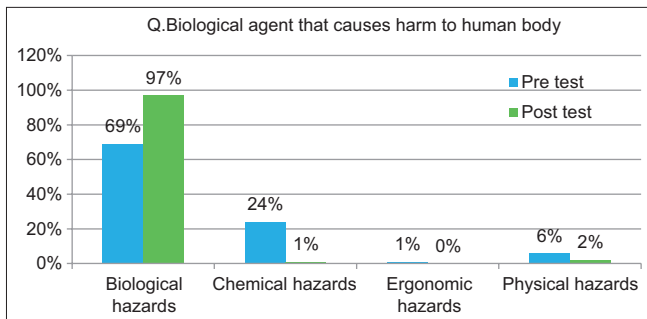


Figure 2: About 69% students were correct in the pretest but the result improved to 97% in the post-test and the *P* value is significant.

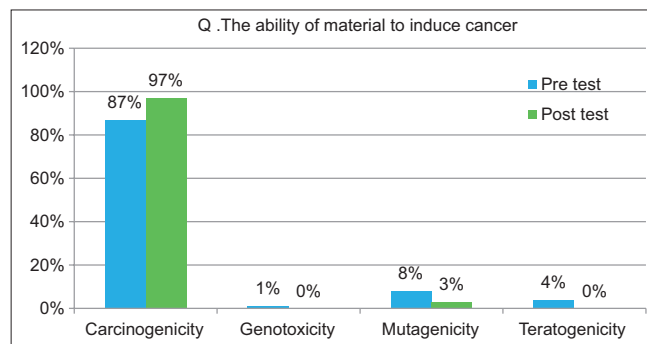


Figure 3: About 87% students were correct in pre-test and result improved by 10% in post-test to 97%.

RESULTS

Statistical Software: IBM SPSS 2020

Tools: Descriptive statistics was expressed in terms of frequencies and percentages. McNemar test was used to test the significant difference between pre-test and post-test responses. Results are depicted in Figures 1-10 and Table 1.

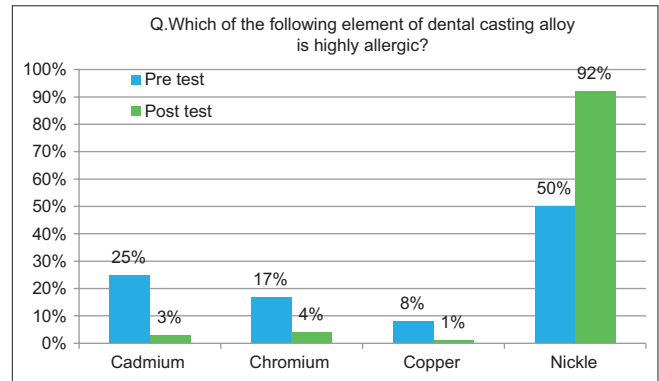


Figure 4: About 50% students gave incorrect answer in pretest and result improved by 42% in post-test to 92% and *P* value is significant.

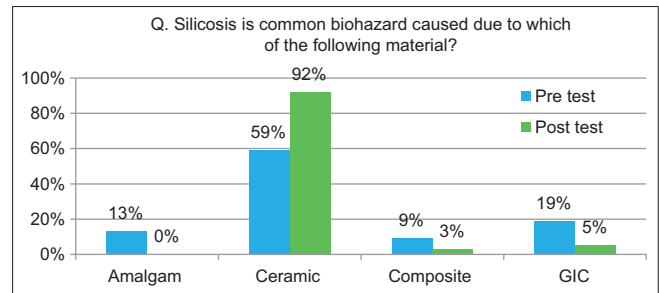


Figure 5: About 59% students gave correct answer in pre-test and value improved in post-test by 92%. GIC: Glass ionomer cement

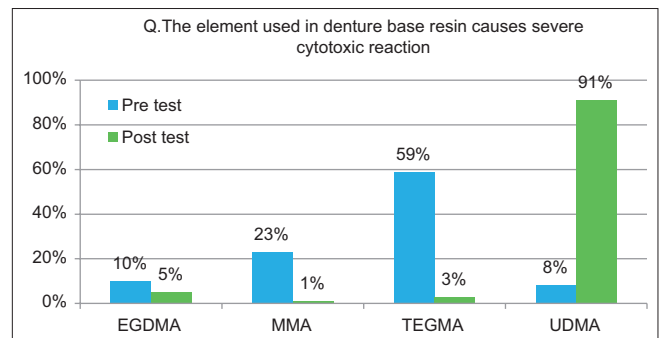


Figure 6: About 92% students gave incorrect answer in the pre-test and result improved significantly 91% student gave correct answer in their post-test. EGDMA: Ethylene glycol dimethylacrylate, MMA: methylmethacrylate, TEGMA: Triethylene glycol dimethacrylate, UDMA: Urethane dimethacrylate

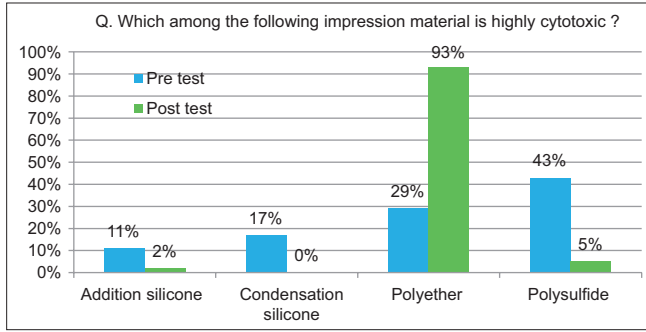


Figure 7: Pretest only 29% students were correct and result improved to 93% in post-test.

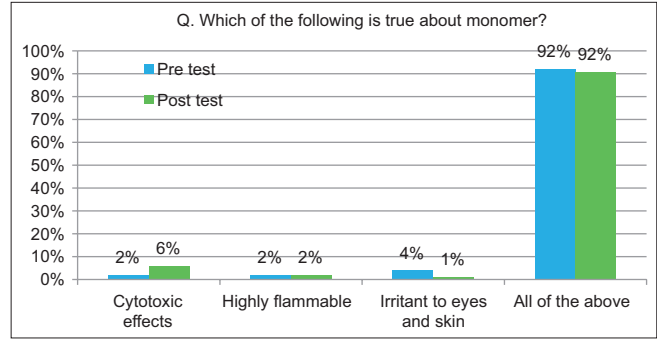


Figure 9: Got similar result in both pre- and post-test.

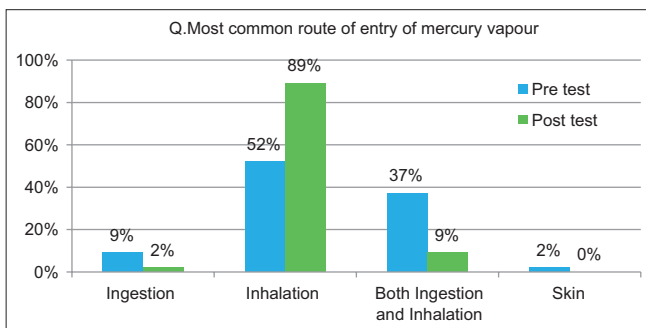


Figure 8: About 52% students were correct in the pre-test and result improved by 89% in the post-test.

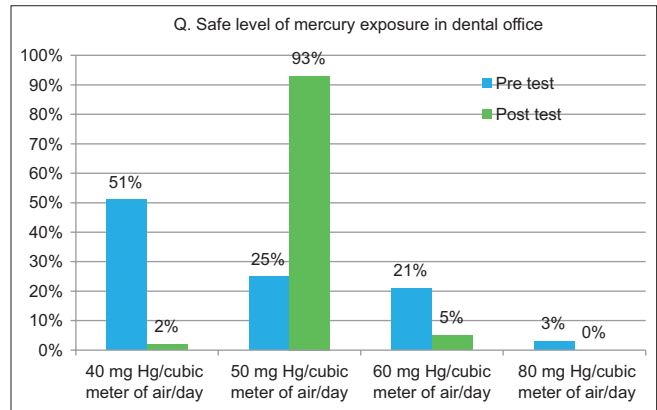


Figure 10: In pre-test score was very less as it is a factual question but score increased significantly to 93%.

Table 1: Descriptive statistics.

Categories	Pre test		Post test		P-value
	Frequency	Percentage	Frequency	Percentage	
Are you aware about biohazards caused by various dental materials?					
No	4	4	16	16	
Not sure	6	6	10	10	
Yes	90	90	74	74	
Have you ever experienced any biohazard (e.g., allergic reaction) in your pre-clinical practice?					
No	73	73	54	54	
Not sure	4	4	20	20	
Yes	23	23	26	26	
I feel confident while using various dental materials?					
Strongly agree	10	10	24	24	
Agree	78	78	63	63	
Strongly disagree	0	0	8	8	
Disagree	12	12	5	5	
There should be special emphasis on biohazards during regular teaching-learning and assessment?					
Strongly agree	56	56	47	47	
Agree	43	43	38	38	
Can't say	1	1	13	13	
Disagree	0	0	2	2	

(Contd...)

Table 1: (Continued).

Categories	Pre test		Post test		P-value
	Frequency	Percentage	Frequency	Percentage	
What are the different types of occupational hazards?					
Physical hazards	1	1	1	1	0.000**
Biological hazards	1	1	4	4	
All of the above	98	98	95	98	
Biological agent that causes harm to human body are					
Biological hazards	69	69	97	97	0.000**
Chemical hazards	24	24	1	1	
Ergonomic hazards	1	1	0	0	
Physical hazards	6	6	2	2	
The ability of material to induce cancer is					
Carcinogenicity	87	87	97	97	0.022*
Genotoxicity	1	1	0	0	
Mutagenicity	8	8	3	3	
Teratogenicity	4	4	0	0	
Which of the following elements of dental casting alloy is highly allergic?					
Cadmium	25	25	3	3	0.000**
Chromium	17	17	4	4	
Copper	8	8	1	1	
Nickel	50	50	92	92	
Silicosis is a common biohazard caused due to which of the following materials?					
Amalgam	13	13	0	0	0.000**
Ceramic	59	59	92	92	
Composite	9	9	3	3	
Glass Ionomer Cement	19	19	5	5	
Which element used in denture base resin causes a severe cytotoxic reaction?					
Ethylene glycol dimethylacrylate	10	10	5	5	0.000**
Methylmethacrylate	23	23	1	1	
Triethylene glycol dimethacrylate	59	59	3	3	
Urethane dimethacrylate	8	8	91	91	
Which among the following impression materials is highly cytotoxic?					
Addition silicone	11	11	2	2	0.000**
Condensation silicone	17	17	0	0	
Polyether	29	29	93	93	
Polysulfide	43	43	5	5	
Most common route of entry of mercury vapor is					
Both "a" and "b"	37	37	9	9	0.000**
Ingestion	9	9	2	2	
Inhalation	52	52	89	89	
Skin	2	2	0	0	
Which of the following is true about monomers?					
Cytotoxic effects	2	2	6	6	0.998
Highly flammable	2	2	2	2	
Irritant to eyes and skin	4	4	1	1	
All of the above	92	92	91	91	
Safe level of mercury exposure in dental office is					
40 mg Hg/cubic meter of air/day	51	51	2	2	0.000**
50 mg Hg/cubic meter of air/day	25	25	93	93	
60 mg Hg/cubic meter of air/day	21	21	5	5	
80 mg Hg/cubic meter of air/day	3	3	0	0	

Bold values: *significant ($P < 0.05$), **highly significant ($P < 0.01$)

DISCUSSION

There are various types of occupational hazards, namely, physical hazards, chemical hazards, biological hazards, and ergonomic hazards. It is important for the students to be aware regarding the same so that their deleterious effects can be prevented.^[5-10] Thus, we conducted this study for evaluation of efficacy of a training module regarding biohazards associated with materials used in prosthodontics for dental students. A pre-test was conducted. A comprehensive didactic session was conducted, followed by post-test. Results of both the tests were compared. The majority of students became aware of biohazards caused by various dental materials after the session, and results improved significantly in post-test. Many students acknowledged the importance of knowledge about biohazards and relevant precautionary measures to avoid them in routine practice.

CONCLUSION

This module was effective in improving the understanding of the students regarding various biohazards and strategies to overcome the same.

Ethical approval

The research/study is approved by the Institutional Ethics Committee at Ranjeet Deshmukh Dental College and Research centre, Nagpur, number IEC/VSPMDCRC/46/2021, dated 17th February 2021.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

Financial support and sponsorship

Nil.

Conflicts of interest

Dr. Saeed Deshpande is on the Editorial Board of the Journal.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

REFERENCES

1. Asal SA, Abdel Fattah FE. Hazards of prosthodontic devices and materials. *Tanta Dent J* 2017;14:7-11.
2. Padmaja S. Biohazards associated with materials used in prosthodontics. *Niger J Clin Pract* 2013;16:139-44.
3. Chugh A. Occupational hazards in prosthetic dentistry. *Dentistry* 2017;7:410.
4. Valli B, Anand S. Biohazards associated with the materials used in dentistry. *Res J Pharm Tech* 2015;8:1048-50.
5. Van Noort R, Gjerdet NR, Schedle A, Björkman L, Berglund A. The current status of national reporting systems for adverse reactions to dental materials. *J Dent* 2004;32:351-8.
6. Tillberg A, Järholm B, Berglund A. Risks with dental materials. *Dent Mater* 2008;24:940-3.
7. Melchart D, Vogt S, Köhler W, Streng A, Weidenhammer W, Kremers L, *et al.* Treatment of health complaints attributed to amalgam. *J Dent Res* 2008;87:349-53.
8. Cobos-Fuentes MJ, Martinez-Sahuquillo-Marquez A, Gallardo-Castillo I, Armas-Padron JR, Moreno-Fernandez A, Bullon-Fernandez P. Oral lichenoid lesions related to contact with dental materials: A literature review. *Med Oral Patol Oral Cir Bucal* 2009;14:514-20.
9. Schweikl H, Hiller KA, Bolay C, Kreissl M, Kreismann W, Nusser A, *et al.* Cytotoxic and mutagenic effects of dental composite materials. *Biomaterials* 2005;26:1713-9.
10. Becher R, Kopperud HM, Al RH, Samuelsen JT, Morisbak E, Dahlman HJ, *et al.* Pattern of cell death after *in vitro* exposure to GDMA, TEGDMA, HEMA and two compomer extracts. *Dent Mater* 2006;22:630-40.

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