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Original Research Article

Postgraduate student's perception on preclinical prosthodontics curricula: A web-based survey

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ABSTRACT

Background and Reasons: This study aimed to determine the current background of teaching pre-clinical prosthodontics for post graduate students. It describes the perception of post graduate students regarding the effectiveness of the preclinical prosthodontic curriculum in preparing them to operate efficiently in the clinical setting.

Aim: To assess student's knowledge and perception of preclinical postgraduate prosthodontics course in different dental colleges of India.

Materials and Methods: The study sample was obtained from 148 postgraduate student, both male and female, an anonymous questionnaire consisting of 15 questions regarding knowledge, attitude and practice of the preclinical curriculum. This research was conducted after getting permission from the respective authority and consent from all respondents. Data acquired from structured questionnaires were analysed and compared by simple percentage method.

Result: After careful assessment and graphical representation of responses acquired from participants, results were formulated. Participants expressed through open ended and closed ended questionnaire that exercises conducted for complete denture prostheses and fixed partial denture prostheses were adequate and preclinical curriculum for implantology and maxillofacial prostheses needs to be streamlined.

Conclusions: This paper has found that, while all schools make efforts to ensure that their postgraduate dental students are best prepared for subsequent independent practices, prosthodontic education varies among schools. Although some trends in curricular formats and content are evident. This survey indicated that active and passive learning for preclinical prosthodontics and frequent feedback from students plays a vital role.

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1. Introduction

The objective of contemporary prosthodontics is to restore function, comfort, and aesthetics of patients that primarily involve the replacement of natural teeth with a variety of fixed or removable prosthetic options. In the postgraduate course of prosthodontics, a student undergoes three years of extensive training in several areas of prosthetic

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dentistry, including complete dentures, partial dentures, crowns, bridges, aesthetics, occlusion, dental implants, and rehabilitation of congenital and acquired maxillofacial defects. Curriculum also comprehends training in the technical and technological aspects of laboratory fabrication of the aforementioned complex dental and maxillofacial prostheses.

Preclinical prosthodontics is performed in the first year of the postgraduate course to promote the development

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of competency and expertise before dealing with patients. Students spend the majority of their time in the laboratory performing preclinical exercises with minimal patient contact. Exercises should be viewed as fundamental for clinical practice and not merely technical exercises that are divorced from clinical reality. Assessment of teaching and learning plays a crucial role in curriculum development. Student and faculty feedback is a valuable source of information for curriculum amelioration. Knowledge, attitude, and practice (KAP) studies are highly centered analysis that estimate variance in human knowledge, attitudes and practices in accordance to a definite intervention, demonstration, or education. ¹Limited literature has been published that recognizes the concerns regarding preclinical prosthodontics curriculum from student's perspective especially in Indian context.

Therefore, the purpose of this study was to investigate the current situation regarding the teaching of dental procedures and to determine current educational techniques and materials in use and analyze the feedback given by the postgraduate students.

2. Materials and Methods

2.1. Study design

Theoretical framework: The investigators conducted a cross-sectional prospective population survey among postgraduate students of prosthodontics in India. The questionnaire was then administered using google forms, the link for the same was sent to all postgraduate students of India through messenger and email .The information was then collected and automatically transferred to spreadsheet, then the results were tracked and posted on web eliminating the need for programming and analyzing the data.

2.2. Participant selection

The questionnaire was designed and adapted to suit the context. The questionnaire had a total of 15 questions (Table 1) that were discussed with specialists in the field. The questionnaire was piloted onto a small sample of colleagues and changes were made following feedback from them. During the pilot study, collected data was used to assess the internal reliability of the questionnaire. The final and agreed questionnaire was sent to 180 postgraduate students in India between the time period of March to May 2020 along with invitation letter, information sheet explaining purpose of survey. Anonymity and confidentiality were assured. A total of 148 responses were received within the specified period of time and were included for analysis.

Most of the questions were of closed type in either a dichotomous or in a multiple-choice format, which are very specific and offer the participants a fixed range of answers and some questions were open, to acquire both quantitative and nominal data with freedom based on various topics covered in the post-doctoral prosthodontic curriculum. The study required students to spend about 5-7 min completing a questionnaire. The study was undertaken using the approach outlined by dillman. A completed questionnaire indicated the consent to participate in the study and participants were able to decline any involvement at the outset or withdraw at any time before the submission. There were no personal identifiers on the questionnaire. The participants were told as mentioned in the information sheet that they are free to participate or not, and that choosing not to participate will not be a disadvantage to them in any way. Following questionnaire was used for our survey. (Table 1)

3. Results

The study sample was derived from 148 postgraduate students of prosthodontics in India. In this survey, participants were ensured anonymity. The survey was designed such that particulars regarding demography and social background of the participants was not disclosed so, that responses cannot be linked to individual participants. (Table 2 and Figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13)

As shown in figure 1, 68.9% participants responded that it takes 6 months to complete preclinical exercises, 21.60% responded 9 months and 6.5 % responded 3 months. None of the participants responded curriculum as inadequate.

According to 112 (81%) participants the number of preclinical exercises in the prosthodontics post graduate curriculum were adequate and 26 (18.9%) participants thought that exercises were too extensive. (Figure 2)

In response to question 3, 73% responded that complete denture exercises were easy and simple to understand and work with. Some participants (20.30%) responded that fixed partial denture exercises were easier and simpler to understand as compared to removable partial denture (2.70%), maxillofacial prostheses (1.40%) and TMJ appliance (2.70). (Figure 3)

3.1. Certain aspects taught in the preclinical course in complete dentures

Of all the participants, 62.20% reported that they used Hanau modular type of articulator, 31.10% used mean value articulator for articulation. While Whip Mix, Denar (semi adjustable) and simple hinge articulator were least preferred for articulation. 86.50 % used Hanau modular (semi adjustable) articulator despite the wide variation in the articulator type and commercial brands. (Figure 4 and Figure 5a)

Amongst 148 participants, 67 participants (52.70%) preferred using Hanau modular articulator for complete denture fabrication, acrylic partial denture, cast partial denture and fixed partial denture and 49 participants (37.80%) used Hanau modular articulator only for

fabrication of complete denture fabrication. (Figure 5b)

In response to question 6, 86.50% participants responded positively that, they had achieved knowledge about different occlusal schemes to be incorporated in complete denture. 13.50% participants responded negatively to the question (Figure 6). Amongst the 86.50% participants, 27% understood neutrocentric occlusal scheme and 2.70% understood non balanced occlusion. It was analysed that monoplane, lingualized and balanced occlusal schemes were difficult to understand. 66.20% participants understood all of the aforementioned occlusal schemes. (Figure 7)

3.2. Certain aspects taught in the preclinical course in removable partial dentures

In response to question 8, 30 % participants responded that they used surveyor for designing both cast partial denture as well as acrylic partial denture, 66% participants used surveyor only for designing cast partial denture and 1% participants denied using surveyor for designing. (Figure 8)

3.3. Certain aspects taught in the preclinical course in fixed partial denture

Question 9 was designed to determine which exercises are difficult to understand and perform while fabrication of fixed partial denture. Amongst participants, 36.5% responded that, the procedure for ceramic build up was difficult to perform followed by casting procedure (24%). Few participants responded that procedure of die cutting ditching (18%) and wax pattern (19%) were less perplexing to perform as compared to aforementioned procedures. Finishing and polishing of prostheses (3%) was least difficult to perform. (Figure 9)

3.4. Certain aspects taught in the preclinical fabrication of maxillofacial prostheses

In response to question 10, 41% students used RTV silicone, 24% used polymethyl methacrylate resin, 13% were familiar with HTV silicone and 22% used none of the above-mentioned material for fabrication of maxillofacial prostheses. (Figure 10)

In response to question 11, 74% participants answered that preclinical exercise improved their understanding and handling after exercises and 22% responded that exercises planned were not helpful for them (Figure 11). Majority (71%) of participants replied that it was easier to work in clinic and manage patients in better way after performing preclinical exercises mentioned in curriculum. 23% participants responded negatively and 6% were not sure about the benefits of designed exercises (Figure 12). In response to question 13, 76 participants thought that more topics need to added to the preclinical exercises and 23 %

participants were content with the number of topics covered in course. (Figure 13)

Participants were asked to specify the topics they think need to be covered in more detail. Respondents suggested that, topics such as maxillofacial prostheses and implant prostheses should be covered in more detail in the preclinical curriculum. There is a need to incorporate new methods of training for students to ensure that postgraduate student as equipped to handle clinical situation which demand maxillofacial and implant prostheses.

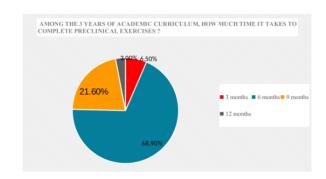


Fig. 1: From the post graduate academic curriculum, time taken to complete preclinical exercise.

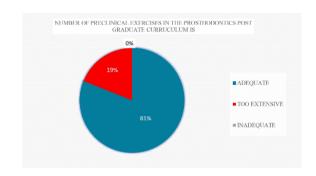


Fig. 2: Number of preclinical exercise in prosthodontics post graduate curriculum

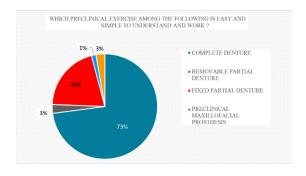


Fig. 3: Various preclinical exercises

Table 1: Questionnaire for survey

S. No.	Questions	Options
1	Among the 3 years of academic curriculum, how much time it	a. 3 months
	takes to complete preclinical exercises?	b. 6 months
		c. 9 months
		d. 12 months
2.	Number of preclinical exercises in the prosthodontics post	a. Adequate
	graduate curriculum is	b. Too extensive
		c. Inadequate
3.	Which preclinical exercise among the following is easy and simple to understand and work?	a. Complete denture
		b. Removable partial denture
		c. Fixed partial denture
		d. Preclinical maxillofacial prostheses
		e. TMJ appliance
4.	Amongst the following which type of articulator do you use?	a. Hanau modular (semi adjustable)
		b. Whip Mix (semi adjustable)
		c. Denar (semi adjustable)
		d. Mean value articulator
		e. Simple hinge
5.1	Do you use Hanau modular (semi adjustable) articulator?	a. Yes b. No
5.2	If yes, in which of the following prosthetic rehabilitation	a. Complete denture
	procedure do you use it?	b. Acrylic partial denture
	k	c. Cast partial denture
		d. Fixed partial denture
		e. All of the above
6.	Have you achieved the knowledge of different occlusal	a. Yes
0.	schemes to be incorporated in complete denture?	b. No
	sometimes to be interpolated in complete definition	c. Don't know
7.	If yes, which of the following occlusal schemes have you	a. Monoplane
7.	understood?	b. Lingualized
	understood:	c. Neutrocentric
		d. Balanced
		e. Non-balanced
		f. All of the above
8.	If you use surveyor for removable partial denture designing,	a. Acrylic partial denture
0.	then for which of the following do you use it?	b. Cast partial denture
	then for which of the following do you use it.	c. All of the above
		d. None
9.	In the fixed partial denture preclinical exercises which step	a. Die cutting and ditching
<i>)</i> .	among the following is difficult to understand and perform?	b. Wax pattern fabrication
	among the following is difficult to understand and perform:	c. Casting procedure
		d. Ceramic build up
		e. Finishing and polishing of the prostheses
10.	Which material have you used for the fabrication of	a. Polymethyl methyl acrylate resin
10.	maxillofacial prostheses?	b. RTV silicone
	maximoraciai prostileses.	c. HTV silicone
		d. None of the above
11.	It would help you in better understanding and handling of	a. Yes
11.	dental materials after this exercise	b. No
	demai materiais after this exercise	c. Don't know
12	Do you feel it would be engine to work in clinics and manage	a. Yes
12.	Do you feel, it would be easier to work in clinics and manage	
	the patient in better way after performing this exercise?	b. No
	De mandhigh mang taging ah 111 11 11 12	c. Maybe
10.1	Do you think more topics should beadded in your course?	a. Yes
13.1	y and a second s	I. NI.
13.1	, , , , , , , , , , , , , , , , , , ,	b. No c. Don't know

 Table 2: Postgraduate student's responses in percentile to the provided questionnaire

S.No.	Questions	Options	Response
	Among the 3 years of academic	a. 3 months	6.50 %
1	curriculum, how much time it takes to	b. 6 months	68.9%
2.	complete preclinical exercises?	c. 9 months	21.60%
	1 1	d. 12 months	3%
	Number of preclinical exercises in the	a. Adequate	81%
	prosthodontics post graduate curriculum	b. Too extensive	18.90%
	is	c. Inadequate	0%
		a. Complete denture	73%
 4. 	Which preclinical exercise among the following is easy and simple to understand and work?	b. Removable partial denture	2.70%
		c. Fixed partial denture	20.30%
		d. Preclinical maxillofacial	1.40 %
		prostheses	
		e. TMJ appliance	2.70%
		a. Hanau modular (semi	62.20%
		adjustable)	
	Amongst the following which type of	b. Whip Mix (semi adjustable)	3%
	articulator do you use?	c. Denar (semi adjustable)	0%
		d. Mean value articulator	31.10%
		e. Simple hinge	4.0%
	Do you use Hanau modular (semi	a. Yes	86.50 %
5.1	adjustable) articulator?	b. No	13.50%
	adjustation, articulator:		37.80%
	If in I' I cal cal	a. Complete denture	
<i>5</i> 0	If yes, in which of the following	b. Acrylic partial denture	1%
5.2	prosthetic rehabilitation procedure do you	c. Cast partial denture	1%
	use it?	d. Fixed partial denture	6.8%
		e. All of the above	52.70%
_	Have you achieved the knowledge of	a. Yes	86%
6.	different occlusal schemes to be	b. No	14%
	incorporated in complete denture?	c. Don't know	0%
		a. Monoplane	1.40%
		b. Lingualized	1.40%
7.	If yes, which of the following occlusal	c. Neutrocentric	27%
	schemes have you understood?	d. Balanced	1.40%
		e. Non-balanced	2.70%
		f. All of the above	66.20%
		a. Acrylic partial denture	3%
_	If you use surveyor for removable partial	b. Cast partial denture	66%
8.	denture designing, then for which of the	c. All of the above	30%
	following do you use it?	d. None	1%
		a. Die cutting and ditching	18%
9.	In the fixed partial denture prealinised	b. Wax pattern fabrication	19%
	In the fixed partial denture preclinical exercises which step among the following	c. Casting procedure	24%
	is difficult to understand and perform?		
	is difficult to understand and perform:	d. Ceramic build up	36.50%
		e. Finishing and polishing of the	3%
		prostheses	0.467
		a. Polymethyl methyl acrylate	24%
10.	Which material have you used for the	resin	41.07
	fabrication of maxillofacial prostheses?	b. RTV silicone	41%
		c. HTV silicone	13%
		d. None of the above	22%
	It would help you in better understanding	a. Yes	74%
11.	and handling of dental materials after this	b. No	22%
	exercise	c. Don't know	4%
12.	Do you feel, it would be easier to work	a. Yes	71%
	inclinics and manage the patient in better	b. No	23%
	way after performing this exercise?	c. Maybe	6%
		a. Yes	74%
13.1	Do you think more topics should	b. No	26%
	beadded in your course?	c. Don't know	

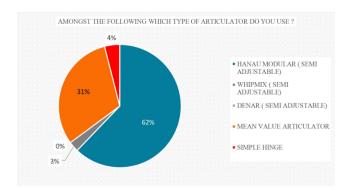


Fig. 4: Different types of Articulator used by post graduate students.



Fig. 5: a: Use of Hanau modular (Semi adjustable) articulator in preclinical exercises; **b:** Use of Hanau modular (semi adjustable) Articulator in various prosthetic rehabilitation procedures.

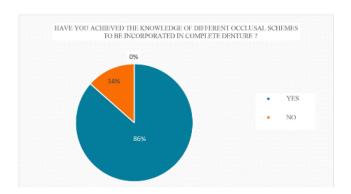


Fig. 6: Training received of different occlusal schemes incorporated in complete denture.

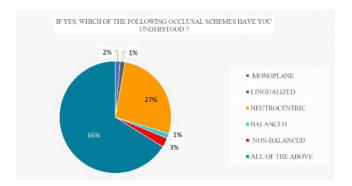


Fig. 7: Understanding of different types of occlusal schemes to be incorporated in complete denture.

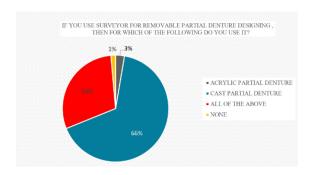


Fig. 8: Surveyor used for removable partial denture designing exercises.

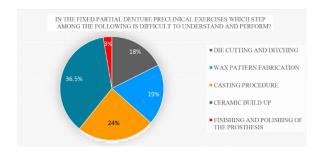


Fig. 9: Identification of difficult steps to understand and perform in fixed partial denture designing.

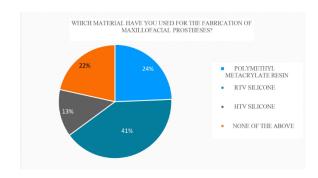


Fig. 10: Materials used for the fabrication of maxillofacial prostheses.

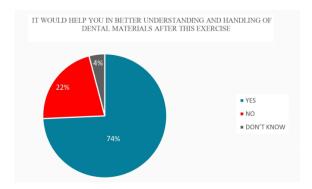


Fig. 11: Assessment of improvement in understanding and handling of dental materials.

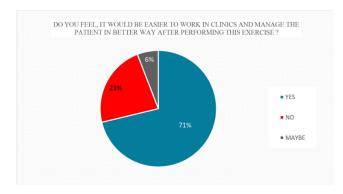


Fig. 12: Clinical work and management of patients.

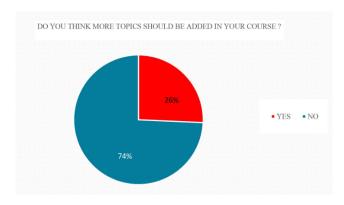


Fig. 13: Opinion on addition of topics to course.

4. Discussion

In recent years, great progress has been made in reforming dental education. However, greater changes are needed because of the revolutionizing education model, including dental education, is now experiencing paradigm shift from a teacher-centered pattern to a student- centered pattern. ^{3,4}Thus, the knowledge, attitudes and perception of post graduate dental students have become an important guide to improve dental education. This study describes the perspectives of postgraduate students, which enables a better understanding of issues in preclinical curriculum of prosthodontic course and helps to develop strategies to improve the standard of dental education.

5. Complete Denture

Information obtained from participants included quantitative curriculum structure, materials and educational techniques were used. In 1970, Sharry reported that there is concern over the fact that importance of complete and partial edentulism is diminishing in its importance. ⁵Dental schools must continuously analyse and upgrade the construction of removable dentures to ensure that practitioners meet the dental health needs of society. Participants found that, complete denture prostheses were easier to understand and work. The traditional preclinical

curriculum should be modified by inclusion of newer techniques to adequately prepare students for transition in removable complete denture prosthodontics. 6 In terms of materials and procedures, most participants reported using semi-adjustable articulator. Around 30% used mean value articulator which is significantly high. The type of articulator as reported by participants was Hanau modular. This survey is related to preclinical teaching and hence further research should address whether this widely recommended procedure is also systematically applied in clinical teaching. In new age dentistry, various designs of articulators and models are available, although many of these require knowledge and training to be used effectively. Balancing of occlusion should be a primary consideration of the clinician when considering the forces that act on the occlusal surface and the denture bases. A key component for denture stability is balanced occlusion and stable base. Majority of participants responded that occlusal schemes such as monoplane, lingualised, neutrocentric, balanced and non-balanced were understood by them. Consequently, preclinical curriculum should ensure that students are trained and capable to deliver ideal complete dentures.

5.1. Fixed partial dentures

The most commonly taught preclinical fixed prosthodontic techniques included: tooth preparation, full-arch impressions with polyvinylsiloxane, the use of the die system for master model fabrication, mounting and programming of the semi adjustable articulator, die cutting and ditching, wax pattern fabrication, casting procedure, ceramic build up and finishing and polishing. Since, the amount of time for learning is limited along with the vast nature of subject, dental schools need to make learning more efficient. Recent advances in technology in the area of medical and dental training, legitimate and safe use of these adaptations have come under close scrutiny by educators. ⁸

Tooth preparation is an irreversible procedure; hence it will be highly unethical to allow the students with less proficiency to learn on live human patients. Hauser stated that, students who performed well in preclinical courses may not excel at clinical procedures due to various factors involved. Procedures such as ceramic build up and casting procedures are technique sensitive and need practice. Improvements can be made by detailed demonstration of procedures and increasing staff to student ratio. It is necessary on the part of instructors to continuously evolve the course to prepare students to practice safely and efficiently on the patients. ¹⁰

5.2. Removable partial denture

Raquel Castillo stated that, rehabilitation of partially dentate adults by the provision of removable partial dentures is important form of dental treatment in which one would expect newly qualified dentists to be competent. Evidence from dental practice suggests that, dentists do not always use a surveyor when designing their removable partial dentures resulting in either inferior quality prostheses or adversely affecting the patients receiving this treatment. 11 Packer concluded that, within the frame of evolution towards self- directed student learning, videotaped recordings have been reported to be as effective as live demonstrations for understanding the principal subjects of removable partial dentures treatments, such as impression making. 12 It is reported that surveying of the diagnostic cast is mandatory for fabricating cast partial denture. Most of the problems which the practitioners faced during the removable partial denture treatment are related to the callous attitude of the practitioners toward the patients as well as lack of proper knowledge and expertise for the required treatment.

5.3. Maxillofacial prostheses (MFP)

Maxillofacial prosthetics is a subspecialty of prosthodontics that is concerned with rehabilitation of patients with defects or disabilities caused as a result of trauma, tumour, or congenital disorders. 13 Because of growing number of head and neck cancers diagnosed each year, the demand for both intraoral and extraoral prosthetic rehabilitation continues to rise. Training and recognition of maxillofacial prostheses is not uniform globally. There were wide range of responses to the question about the type of materials, participants preferred to use for fabricating MFP. Dental schools included fabrication maxillofacial prostheses in their curricula, but there are considerable variations in the experience gained by students. Discrepancies in polymerization, curing temperatures and time suggest that silicone polymerization can be technique sensitive and user-influenced. Practitioners should be trained to use various materials such as acrylic resin, room temperature vulcanizing silicone, high temperature vulcanizing silicone taking into consideration the advantages and disadvantages of materials. In our study, significant number of participants were not confident enough to manipulate these materials. Therefore, variable teaching methods such as demonstrations, discussion, tutorials, seminars, peer teaching, projects, clinical involvement and exposure, video media can be implemented to ensure that adequate training is received by the students.

5.4. Implant

A comprehensive well designed, postgraduate implant curriculum is need of hour as a result of increasing prevalence and high demands of implant therapy. ¹⁴ It is important to scrutinize current implant education to identify challenges and propose solution for further improvement in curricula. Adequate training will allow

new postgraduates to provide successful implant treatments to their patients. Many surveys have been published on the implant curriculum. However, survey to assess implant education that included preclinical laboratory exercises are very few. ¹⁵ Our respondents identified the need to modify the structure and content of implant education as well as methods of training that incorporate simulation systems should be explored.

6. Conclusions

This paper has found that while all schools make efforts to ensure that, their postgraduate dental students are best prepared for subsequent independent practices, although trends in curricular formats and content are evident, some variations are seen in prosthodontic education among schools. Such variations are a reflection of the pressures on contemporary dental education. The course should be reviewed and adapted frequently so that the most competent teaching methods can be implemented. This survey indicated that active and passive learning for preclinical prosthodontics and frequent feedback from students plays a vital role. This survey is related to preclinical teaching and hence further research should address whether widely recommended procedures in curriculum are systematically applied in clinical teaching.

7. Limitation

The results of this survey cannot be generalized. There are chances of acquiescence bias during survey. To overcome it, the students were put at ease, confidentiality was assured. They were told that there are no right or wrong answers to the queries being put across and each one can share their experience/opinion without fear. The group was reassured that contradictory opinions were welcome too.

8. Future Implications

Present study encourages future research on various issues such as preclinical training in maxillofacial prostheses and implantology in postgraduate curriculum. Yearly feedback of students and faculty about their perceptions of the curriculum is necessary to improve the system. The present study sheds light on the problems that students face during their prosthodontic post graduate dental training. It also underscores the need for changes in the dental curriculum that might facilitate enhanced learning experiences of postgraduate students in developing nations like India.

9. Acknowledgement

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10. Source of Funding

The authors received no specific funding for this work.

11. Conflicts of Interest

There are no conflicts of interest.

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