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Evaluation of the Application of Undergraduate Pre-Clinical Removable Prosthodontic Laboratory Teaching in General Dental Practice

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ABSTRACT

Background: Pre-clinical removable prosthodontic training is an integral part of the undergraduate curriculum. The objectives of the study were to evaluate the application of pre-clinical removable prosthodontic laboratory training in general dental practice and the relevance of its teaching in the undergraduate curriculum.
Methods: A descriptive questionnaire was developed to assess the extent of the practice of pre-clinical removable prosthodontic lab skills in their dental practice. The responses were evaluated and statistically analyzed with a significance value of $p<0.05$. Three hundred-fifty-seven general dental practitioners participated in the study.
Results: 91% with 20 years of dental practice responded positively to the application of prosthodontic training in their practice. 55.7% with two years of training agreed to dedicate more time to clinical prosthodontics training.
Conclusions: 52.9% of the participants agreed that it would be better to dedicate more time to clinical prosthodontics training rather than pre-clinical removable prosthodontics lab training as a part of the undergraduate prosthodontic curriculum, among which more than 60% of the study participants had two or more years of removable prosthodontics pre-clinical training during dental school.
Practical implications: Clinical expertise of dental graduates is an essential component in the general dental practice. Hence, there is a need to revisit removable prosthodontic curriculum content and time distribution in the undergraduate dental program.

Key words: Undergraduate, Simulation, Pre-Clinical, Laboratory, Training, General Dental Practice.

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Introduction

The motive of the dental curriculum is to upgrade and enhance clinical abilities with consistent expert improvement, basic thinking, and research. Thus, educational modules should be intended to give learning conditions that can be quantified and calibrated. These modules are required to be adjusted according to the current research and its application in dental practice.[1]

Presently in Malaysia, there is no single standard curriculum for all dental schools. The Ministry of Higher Education and the Ministry of Health have been working together to promote scientifically based dental education. The Malaysian dental curriculum consists of two years of mainly preclinical didactic and laboratory training, and three years of mainly clinical training, which is supervised by different faculty members. The third year of the dental program includes lectures and ward-round rotations in a medical hospital as well as an introduction to clinical dentistry. In the fourth year, students undertake didactic clinical and laboratory coursework, and in the fifth-year dental students are mainly involved in patient care in dental clinics.[2]

Malaysian Dental curriculum content is generally like that of the United Kingdom. Further, many of the lecturers and dental specialists in Malaysia are trained in the UK and Ireland.[3] According to National Oral Health Plan for Malaysia, there is a need to manage and track edentulism among young adults 35-44 years of age and the elderly of 60+ years. Edentulism has declined among Malaysian adults, however, in 2000, 2.8% of the 35-44 age group and 32.1% of the 60-70 age group were still reported as edentulous.[4] The National Oral Health Survey of Adults reported 50.8% of elderly aged 60 years and older had some form of oral prostheses and a majority (31.8%) were females (Oral Health Division, 2004).[5] Hence there is a need to tailor the removable prosthodontic curriculum to satisfy the needs of the current population.

The dental curriculum for under-graduates in most dental schools includes pre-clinical training in the initial years followed by clinical training. Pre-clinical removable prosthodontic training ranges from 6 months to 2 years' time frame although the curriculum requirements of all dental schools in Malaysia are the same. The pre-clinical training is

comprised mainly of laboratory procedures needed for the fabrication of both complete and partial removable dentures. This training includes the preparation of models, fabrication of custom trays, record bases, occlusal rims, mounting on articulators, teeth arrangement, and processing of dentures. All these exercises are preceded by a lecture and demonstration following which the students are required to complete these individual exercises.[6,7]

Around the world, there have been reports emphasizing the need for dental educators to reconsider the predoctoral prosthodontics curriculum to make it greatly applicable to scientific practice for the overall practitioner.[8,9] Such a curriculum may be important considering that millions of people without complete dentitions will probably require prosthodontic treatment in the 21st century.[9-13] Techniques that are taught in dental schools are frequently not used in general dental practice.[14] According to the previous surveys, there are differences between what is taught as accepted prosthodontic practices and what is practiced.[15-19]

In some dental schools, students are expected to perform all the laboratory procedures. Hence there is no doubt that these students have a sound knowledge regarding the technical aspect of the prosthodontic course. But this opinion has varied as in some schools the need for such extensive training was considered questionable as the patient's laboratory work was done by the technician and the students graduated with a desirable understanding of the lab procedures.[20,21]

Extensive laboratory hours in some dental schools have compromised the desirable clinical teaching hours hence the training achieved by the graduates in removable prosthodontics is the weakest among the other subject of the undergraduate training program.[22] However, studies exploring and evaluating the usefulness, particularly of preclinical removable prosthodontic learning in general dental practice are scarce.[23,24]

Along these lines, dental training programs should ceaselessly assess their part of the removable prosthodontic educational modules to guarantee that the dental needs of society and the objectives and targets of the population are being met.[25,26] This implies learning and aptitudes in treating patients with edentulism will be essential as the century advances.[26] Prosthodontic educational modules and lab delegation reviews are valuable devices for evaluating prosthodontic education.[25] Hence, the study aimed to evaluate the usefulness of pre-clinical removable prosthodontic laboratory training in dental practice among general dental practitioners in Malaysia and to evaluate the relevance of teaching pre-clinical prosthodontics in the undergraduate curriculum which was done with the help of responses achieved to the developed questionnaire.

Material and Methods

A descriptive questionnaire was developed, aiming to assess the extent of the practice pre-clinical removable prosthodontic lab skills in their dental practice. The questionnaire was developed keeping in mind, the common procedures that general dental practitioners encounter in their practice. Hence, this cross-sectional face-to-face survey was conducted among government and private general dental practitioners who attended dental conferences in Malaysia in the year 2017. The questionnaire was validated and pre-tested on the dental officers at the MAHSA University, Malaysia before they were distributed to the participants.

Ethical approval was taken by the Research Management Centre of MAHSA University (RMC/EC10/2015). According to a survey conducted by the Ministry of Health, Malaysia (2013) the dentist-to-population ratio was 1:6346 with the total number of dentists being 4558. The convenience sampling method was used to achieve the sample size of 357 with a confidence level of 95% and a confidence interval of 5. The survey form was prepared in English with closed-ended responses. The purpose of the research and the risks involved were explained to the participants before the commencement of the study. All the participants gave informed consent before answering the questionnaire. Responses were obtained in person from all the participants.

The questionnaire consisted of two parts: In Part 1, the demographic details including age, gender, and years of practice were recorded. Along with this, participants were questioned on the duration of pre-clinical removable prosthodontic lab training during their undergraduate curriculum and do they perform removable prosthodontic procedures in their general practice. If so, are they able to apply the knowledge gained by preclinical training to their general practice? The participants who did not practice removable prosthodontic procedures in their clinic were eliminated from the study.

In part 2 of the questionnaire, a total of nine questions were included based on the commonly taught procedures in undergraduate pre-clinical removable prosthodontics like manipulation of impression material, pouring of impressions, construction of custom trays, record bases, occlusal rims, teeth arrangement and processing of dentures in their clinical practice. Further questions on designing the partial denture, tracking back the technician's work, and willingness to correct the mistakes in the technician's work by themselves were also included. Likert's three-point scale of "always, sometimes, never" was used to record the responses.

The final question was to ask the level of agreement towards the statement "It would be better to dedicate more time to clinical prosthodontic training rather than pre-clinical prosthodontic lab training in the undergraduate curriculum." The response to this last question was recorded using Likert's five-point scale for degree of agreement. Responses were evaluated and data were tabulated and statistically analyzed using the Chi-Square test with a significance value of $p<0.05$.

Results

A total of 357 general dental practitioners participated in the study, out of which 113 were males and 244 were

females. The demographic variables and the response of the participant to pre-clinical removable prosthodontics training based on the years of practice, and period of pre-clinical removable prosthodontic training in their undergraduate curriculum are shown in Table 1. Of all, 94.1% responded positively regarding the application of pre-clinical prosthodontic training in their daily clinical practice. Interestingly, 4.2% (15) of the subjects did not perform removable prosthodontics in their practice at all. The responses of these subjects were eliminated from the statistical analysis. Table 2 and 3 depicts the association between years of practice and duration of training to the application of preclinical removable prosthodontic lab training in their dental practice.

Table 2 depicts a non-significant association between years of dental practice to the application of preclinical removable prosthodontic lab training stating the response range between 91% to 100% irrespective of their years of practice which ranged between less than years and more than 20 years. Table 3 shows that 98.1% of the participants with pre-clinical training longer than 2 years, were able to apply their training knowledge to dental practice.

The next section of the questionnaire was designed to gather information regarding different preclinical procedures performed by dental practitioners during their daily practice as seen in (Table 4). 50.3% of participants manipulated impression materials on their own, 19.3% always poured their patient's impressions, 57.9% of the dentist never fabricated custom trays, 40.6% of the participants never fabricated record base and occlusal rim on their own, only 12% of clinicians always did teeth arrangement by themselves and processing of dentures was never performed by 78.9% of the clinicians. Almost 70% of the participants always designed their patient's partial denture, 41.8% of subjects always corrected it on their own, majority of the subjects always tracked the dental technician's work to their satisfaction. A graphic representation of the participant's response to questions on different preclinical laboratory procedures is presented in Figure 1.

Almost half of the subjects, 52.9% either agreed or strongly agreed with the statement "It would be better to dedicate more time to clinical prosthodontic training rather than pre-clinical removable prosthodontic laboratory training in the undergraduate curriculum." (Table 5) while more than 60% of the study participants had two or more years of Prosthodontics pre-clinical training during dental school. Comparing years of preclinical training to response, a statistically significant association (p-value = 0.03) was seen when questioned about the processing of dentures on their own, 86.7% of the participants with two years of preclinical training never performed this procedure on their own. Half of the participants with pre-clinical training of six months and more than two years if not satisfied with the dental technician's work always do the corrections by themselves (p-value = 0.03) and 54.7% of them never performed teeth arrangement with a p-value of 0.02 (Table 6). Regarding the fabrication of record bases and occlusal rims, a statistically significant association (p-value 0.03) was observed between the years of experience of the participants and the response with only 25.3% of the participants with more than twenty years of experience prepared record bases and occlusal rims on their own and 38.7% of them with the same experience never perform this procedure. More than 50% of the participants with experience of more than twenty years strongly agreed/agreed that it would be better to dedicate more time to clinical prosthodontics training rather than pre-clinical prosthodontic lab training in the undergraduate curriculum with a P value of 0.02 (Table 7).

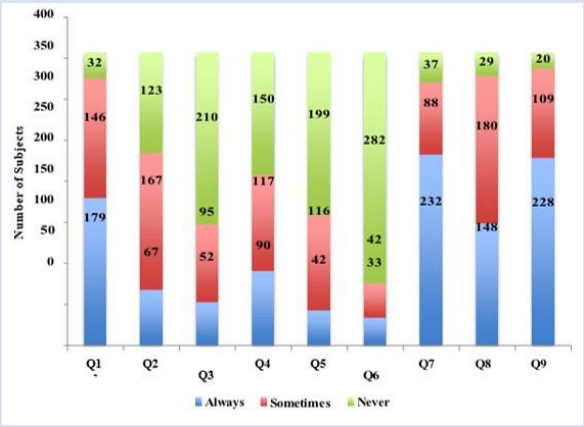

Figure 1. Graphic representation of the participant's response to questions on different preclinical procedures. Kindly refer to Table 2 to read the question statements.

Discussion

The undergraduate dental curriculum is undergoing rapid change and revision in dental schools worldwide. Although the current undergraduate removable prosthodontic curriculum has seen very little change in the past years.[12,27]

As seen in the present study, irrespective of being trained from different dental schools all participants did receive pre-clinical prosthodontics training as a part of their curriculum through the duration of training varied. The reason could be the difference in the number of exercises taught; expected practical assessments and could even be the planned time dedicated to the clinic to satisfy their clinical requirement which may also generally vary from one university to the other. These findings are in accordance with Weider et al who conducted a study among 13 UK dental schools enquiring about the number of hours spent in the laboratory and dental clinic. The results revealed great disparity among them, four schools devoted more time to the laboratory work whereas three dental schools devote more time to the clinic and one school also reported no dedicated clinical time for complete dentures with variation in the quota of complete dentures to be issued to the patient during the program.[28]

Regarding prosthodontic techniques teaching some skills such as pouring casts and making custom trays and wax rims may be beneficial to learn. It is critically imperative that students learn to differentiate between work that is up to standard and fulfills the requirements of the case and that which does not[20] as in the present

study only 47.7% of the practitioners sometimes pour the impressions and 57.9% of them never make custom trays and 40.6% of them never made occlusal rims on their own.

A study was conducted by Rashedi B in 2001 wherein a questionnaire was mailed to the chairpersons of the prosthodontic/restorative departments of 54 U.S. dental schools requesting information on their predoctoral preclinical complete denture curricular content to which 43 schools responded. The overall mean number of months that the complete denture preclinical course is offered was five months whereas in the present study only 9% of the participants had preclinical training of six months which could be inclusive of both complete and partial denture laboratory procedure and 33.3% of participants had training period of two years and 29.7% had training of more than two years. He also reported one school (2%) having no laboratory component, with all teaching occurring in the clinic which is in total contrast with the results achieved in the present study. Twenty-seven schools (63%) reported that students do not process their complete denture setups made during the course and seven schools (16%) indicated processing was done sometimes. The schools that indicated "sometimes'' commented: "if they choose to,'' "first case only,'' "very rarely,'' "if rushed,'' "juniors yes and seniors no,'' and "relines occasionally.'' This was in accordance with the present study wherein 78.9% of dental practitioners don't process their dentures and only 11.4% sometimes process them irrespective of being trained during preclinical years.[12]

The results of the present study reveal most dental practitioners do not perform laboratory procedures such as the fabrication of special trays, record bases, occlusal rims, artificial teeth arrangement, and processing of the dentures on their own. Hence, the preparation of one of these kinds or a demonstration of these steps during the preclinical year could be just enough for the dental student to judge the quality of work produced by the dental technicians. Another reason could be the availability of all the laboratory instruments and equipment in their clinical setup and the time needed for executing these lab procedures, which a dentist would prefer to give in their clinical practice.

As observed in the present study, 54.7% (187) participants did not perform teeth arrangement irrespective of their training, which could be due to the easy availability of trained dental technicians. Singh et al reported 88.6% of the practitioners get their lab work done by technicians and use their expertise to evaluate whether the work done by technicians is acceptable or not.[29]

For many years, fundamental problems have been observed among dental professionals when prescribing, designing, and fabricating removable partial dentures.[30-36] Sykora has doomed the practice of lab technicians designing the removable partial denture frameworks as they cannot make correct decisions without biological knowledge of the oral structures. This is in line with the findings of the present study as only 9.9% of the practitioners' used lab technicians for designing their framework.[37]

The current trend appears toward more work being delegated to the laboratory technician, with student involvement not needed in every laboratory step.[38,39] Weider et al investigated the opinions of a cohort of dental practitioners in the UK regarding their skill and competence in their educational background in complete denture and revealed the average number of dentures made was only three and 37% felt that their training has given them experience and confidence in complete dentures.[40]

General dental practitioners' perceptions of removable – prosthodontics in the undergraduate curriculum in New Zealand supported modifications in the existing removable prosthodontics curriculum to suit the modern general dental practice and to focus more on the clinics by reducing students' exposure time to the laboratory.[41] Similarly in the present study, more than 50 % of the practitioners also agreed to dedicate more time to clinics rather than a lab. This could be due to their clinical perception they foresee that the dentist who graduated are not confident to accept edentulous patients, which was also stated by Clark.[20]

Conclusions

52.9% of the participants agreed that it would be better to dedicate more time to clinical prosthodontics training rather than pre-clinical removable prosthodontics lab training as a part of the undergraduate prosthodontic curriculum, among which more than 60% of the study participants had two or more years of removable prosthodontics pre-clinical training during dental school. As observed in this study, the dental clinician does not perform certain procedures on their own for example, 78.9% of the dental practitioners in the present study never acrylized their patient's dentures and around 50% of the participant never fabricated special trays, record bases, and occlusal rims or performed artificial teeth arrangement irrespective of being trained during preclinical years. Hence, this necessitates an open discussion on removable prosthodontic curriculum content and its allocated time within the undergraduate dental program.

Author Contributions

Conceptualization, S.K and A.K.S.; methodology, S.K and A.K.S.; investigation, S.K.; resources, S.K and A.K.S.; data curation, S.K.; writing–original draft preparation, S.K and S.B.; writing–review and editing, S.K and S.B.; project administration, S.K and A.K.S. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The protocol was reviewed by the Ethics Committee and approved by the Research Management Centre of MAHSA University.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study. Participation in the study was voluntary. The study was performed in accordance with the principles of the Helsinki Declaration regarding anonymity and integrity.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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Conflicts of Interest

The authors declare no conflict of interest.

Table 1. Demographic variables and the response of the participant to pre-clinical removable prosthodontics training

Demographic variables of the participants (n=357)			
		Frequency (n)	**Percentage (%)**
Gender	Male	113	31.7
	Female	244	68.3
Number of years of dental practice	< 5 years	164	45.9
	5 – 9 years	60	16.8
	10 – 14 years	30	8.4
	15 -19 years	25	7.0
	>20 years	78	21.8
Participants' response to pre-clinical removable prosthodontics training			
What was the time allocated for pre-clinical removable prosthodontic lab training in your university?	6 months	32	9.0
	1 year	100	28.0
	2 years	119	33.3
	>2years	106	29.7
Are you able to apply pre-clinical removable prosthodontic training in your daily clinical practice?	Yes	336	94.1
	No	21	5.9
Do you perform removable prosthodontics procedures in your clinic?	Yes	342	95.8
	No	15	4.2

Table 2. Association between years of practice and application of preclinical removable prosthodontic lab training in their dental practice

Years of practice	**Are you able to apply training in your practice**		**Total**	**Fisher's Exact Test**
	No	**Yes**		**p-value**
< 5 years	12	152	164	0.054(NS)
	7.3%	92.7%	100.0%	
5 – 9 years	0	60	60	
	0.0%	100.0%	100.0%	
10 – 14 years	0	30	30	
	0.0%	100.0%	100.0%	
15 – 19 years	2	23	25	
	8.0%	92.0%	100.0%	
>20 years	7	71	78	
	9.0%	91.0%	100.0%	
Total	21	336	357	
	5.9%	94.1%	100.0%	

**p<0.05 Statistically Significant, p>0.05 Non-Significant, NS*

Table 3. Association between duration of training and application of preclinical removable prosthodontic lab training in their dental practice

Duration of training	**Are you able to apply training in your practice?**		**Total**	**Chi-Square Test**	
	No	**Yes**		**Chi-Square Value**	**P-Value**
6 months	6	26	32	13.87	0.003*
	18.8%	81.3%	100.0%		
1 year	4	96	100		
	4.0%	96.0%	100.0%		
2 years	9	110	119		
	7.6%	92.4%	100.0%		
>2 years	2	104	106		
	1.9%	98.1%	100.0%		
Total	21	336	357		
	5.9%	94.1%	100.0%		

**p<0.05 Statistically Significant, p>0.05 Non-Significant, NS*

Table 4. Participants' response to different preclinical procedures, if they perform removable prosthodontics procedures in their daily practice (n=342)

	Always	Sometimes	Never
1. Manipulation of the impression material is done by me	172 (50.3)	142 (41.5)	28 (8.2)
2. Pouring of the impressions is done by me	66 (19.3)	163 (47.7)	113 (33.0)
3. Construction of the custom trays is done by me	52 (15.2)	92 (26.9)	198 (57.9)
4. Fabrication of the record bases and occlusal rims is done by me	89 (26.0)	114 (33.3)	139 (40.6)
5. Artificial teeth arrangement for denture patients is done by me	41 (12.0)	114 (33.3)	187 (54.7)
6. Processing (acrylization) of dentures is done by me	33 (9.6)	39 (11.4)	270(78.9)
7. Designing of the partial denture framework is done by me	224 (65.5)	84 (24.6)	34 (9.9)
8. If you are not satisfied with your dental technician's work, you correct it by yourself	143(41.8)	171(50.0)	28(8.2)
9. Do you track your dental technician's work to your satisfaction?	222(64.9)	101(29.5)	19(5.6)

**p<0.05 Statistically Significant, p>0.05 Non-Significant, NS*

Table 5. Participants' responses to the statement- "It would be better to dedicate more time on clinical prosthodontic training rather than pre-clinical prosthodontic laboratory training in undergraduate

		Frequency (%)
10. To what extent do you agree or disagree with this statement: "It would be better to dedicate more time on clinical prosthodontic training rather than pre-clinical removable prosthodontic laboratory training in undergraduate curriculum".	Strongly agree	49 (13.7)
	Agree	140 (39.2)
	Neutral	82(23.0)
	Disagree	67(18.8)
	Strongly disagree	19(5.3)

Table 6. Comparison of years of preclinical removable prosthodontic lab training to responses, among clinicians who perform removable prosthodontics procedure in their daily practice

		Time allocated to preclinical removable prosthodontic lab training in your university				Total	Chi-square test	
		6 months	1 year	2 years	>2 years		Chi-square value	p-value
Q1	Always	13(43.3%)	47 (48.5%)	56 (49.6%)	56(54.9%)	172(50.3%)	4.17	0.61 (NS)
	Sometimes	13 (43.3%)	41(42.3%)	51(45.1%)	37(36.3%)	142(41.5%)		
	Never	4(13.3%)	9(9.3%)	6(5.3%)	9(8.8%)	28(8.2%)		
Q2	Always	6(20.0%)	20(20.6%)	22(19.5%)	18(17.6%)	66(19.3%)	1.31	0.97 (NS)
	Sometimes	13(43.3%)	48(49.5%)	51(45.1%)	51(50.0%)	163(47.7%)		
	Never	11(36.7%)	29(29.9%)	40(35.4%)	33(32.4%)	113(33.0%)		
Q3	Always	3(10.0%)	19(19.6%)	13(11.5%)	17(16.7%)	52(15.2%)	6.99	0.32 (NS)
	Sometimes	12(40.0%)	27(27.8%)	27(23.9%)	26(25.5%)	92(26.9%)		
	Never	15(50.0%)	51(52.6%)	73(64.6%)	59(57.8%)	198(57.9%)		
Q4	Always	7(23.3%)	29(29.9%)	24(21.2%)	29(28.4%)	89(26.0%)	10.81	0.09 (NS)
	Sometimes	11(36.7%)	38(39.2%)	30(26.5%)	35(34.3%)	114(33.3%)		
	Never	12(40.0%)	30(30.9%)	59(52.2%)	38(37.3%)	139(40.6%)		
Q5	Always	2(6.7%)	17(17.5%)	11(9.7%)	11(10.8%)	41(12.0%)	14.84	0.02*
	Sometimes	11(36.7%)	37(38.1%)	26(23.0%)	40(39.2%)	114(33.3%)		
	Never	17(56.7%)	43(44.3%)	76(67.3%)	51(50.0%)	187(54.7%)		
Q6	Always	1(3.3%)	14(14.4%)	9(8.0%)	9(8.8%)	33(9.6%)	14.24	0.03*
	Sometimes	3(10.0%)	11(11.3%)	6(5.3%)	19(18.6%)	39(11.4%)		
	Never	26(86.7%)	72(74.2%)	98(86.7%)	74(72.5%)	270(78.9%)		
Q7	Always	19(63.3%)	61(62.9%)	72(63.7%)	72(70.6%)	224(65.5%)	9.88	0.13 (NS)
	Sometimes	10(33.3%)	28(28.9%)	23(20.4%)	23(22.5%)	84(24.6%)		
	Never	1(3.3%)	8(8.2%)	18(15.9%)	7(6.9%)	34(9.9%)		
Q8	Always	15(50.0%)	40(41.2%)	37(32.7%)	51(50.0%)	143(41.8%)	13.91	0.03*
	Sometimes	12(40.0%)	49(50.5%)	61(54.0%)	49(48.0%)	171(50.0%)		
	Never	3(10.0%)	8(8.2%)	15(13.3%)	2(2.0%)	28(8.2%)		
Q9	Always	18(60.0%)	61(62.9%)	69(61.1%)	74(72.5%)	222(64.9%)	6.69	0.35 (NS)
	Sometimes	11(36.7%)	31(32.0%)	34(30.1%)	25(24.5%)	101(29.5%)		
	Never	1(3.3%)	5(5.2%)	10(8.8%)	3(2.9%)	19(5.6%)		
Q10	Strongly agree	1(3.3%)	12(12.4%)	19(16.8%)	14(13.7%)	46(13.5%)	9.42	0.67 (NS)
	Agree	15(50.0%)	35(36.1%)	44(38.9%)	38(37.3%)	132(38.6%)		
	Neutral	9(30.0%)	26(26.8%)	22(19.5%)	22(21.6%)	79(23.1%)		
	Disagree	4(13.3%)	18(18.6%)	24(21.2%)	20(19.6%)	66(19.3%)		
	Strongly disagree	1(3.3%)	6(6.2%)	4(3.5%)	8(7.8%)	19(5.6%)		

Table 7. Comparison of years of experience and responses, among clinicians who perform removable prosthodontics procedures in their daily practice

		Years of practice					Total	Chi-square test	
		<5 years	5-9 years	10-14 years	15-19 years	>20 years		Chi-square value	p-value
Q1	Always	75(47.5%)	29(50.0%)	10(37.0%)	14(58.3%)	44 (58.7%)	172(50.3%)	8.46	0.39 (NS)
	Sometimes	68(43.0%)	26(44.8%)	14(51.9%)	10(41.7%)	24 (32.0%)	142 (41.5%)		
	Never	15(9.5%)	3(5.2%)	3(11.1%)	0(0.0%)	7(9.3%)	28(8.2%)		
Q2	Always	32(20.3%)	7(12.1%)	3(11.1%)	4(16.7%)	20(26.7%)	66(19.3%)	11.98	0.15 (NS)
	Sometimes	77(48.7%)	33(56.9%)	9(33.3%)	12(50.0%)	32(42.7%)	163(47.7%)		
	Never	49(31.0%)	18(31.0%)	15(55.6%)	8(33.3%)	23(30.7%)	113(33.0%)		
Q3	Always	22(13.9%)	11(19.0%)	3(11.1%)	5(20.8%)	11(14.7%)	52(15.2%)	3.30	0.91 (NS)
	Sometimes	40(25.3%)	15(25.9%)	7(25.9%)	8(33.3%)	22(29.3%)	92(26.9%)		
	Never	96(60.8%)	32(55.2%)	17(63.0%)	11(45.8%)	42(56.0%)	198(57.9%)		
Q4	Always	36(22.8%)	24(41.4%)	6(22.2%)	4(16.7%)	19(25.3%)	89(26.0%)	16.23	0.03*
	Sometimes	47(29.7%)	20(34.5%)	8(29.6%)	12(50.0%)	27(36.0%)	114(33.3%)		
	Never	75(47.5%)	14(24.1%)	13(48.1%)	8(33.3%)	29(38.7%)	139(40.6%)		
Q5	Always	24(15.2%)	8(13.8%)	1(3.7%)	3(12.5%)	5(6.7%)	41(12.0%)	6.68	0.57 (NS)
	Sometimes	50(31.6%)	17(29.3%)	10(37.0%)	10(41.7%)	27(36.0%)	114(33.3%)		
	Never	84(53.2%)	33(56.9%)	16(59.3%)	11(45.8%)	43(57.3%)	187(54.7%)		
Q6	Always	19(12.0%)	5(8.6%)	1(3.7%)	3(12.5%)	5(6.7%)	33(9.6%)		0.71 (NS)#
	Sometimes	22(13.9%)	6(10.3%)	3(11.1%)	1(4.2%)	7(9.3%)	39(11.4%)		
	Never	117(74.1%)	47(81.0%)	23(85.2%)	20(83.3%)	63(84.0%)	270(78.9%)		
Q7	Always	108(68.4%)	42(72.4%)	19(70.4%)	16(66.7%)	39(52.0%)	224(65.5%)	9.34	0.32 (NS)
	Sometimes	35(22.2%)	11(19.0%)	6(22.2%)	7(29.2%)	25(33.3%)	84(24.6%)		
	Never	15(9.5%)	5(8.6%)	2(7.4%)	1(4.2%)	11(14.7%)	34(9.9%)		
Q8	Always	70(44.3%)	17(29.3%)	9(33.3%)	8(33.3%)	39(52.0%)	143(41.8%)	13.83	0.09 (NS)
	Sometimes	73(46.2%)	39(67.2%)	16(59.3%)	14(58.3%)	29(38.7%)	171(50.0%)		
	Never	15(9.5%)	2(3.4%)	2(7.4%)	2(8.3%)	7(9.3%)	28(8.2%)		
Q9	Always	100(63.3%)	35(60.3%)	19(70.4%)	14(58.3%)	54(72.0%)	222(64.9%)		0.61 (NS)
	Sometimes	49(31.0%)	20(34.5%)	6(22.2%)	7(29.2%)	19(25.3%)	101(29.5%)		
	Never	9(5.7%)	3(5.2%)	2(7.4%)	3(12.5%)	2(2.7%)	19(5.6%)		
Q10	Strongly agree	20(12.7%)	10(17.2%)	1(3.7%)	5(20.8%)	10(13.3%)	46(13.5%)	19(5.6%)	0.02*
	Agree	71(44.9%)	19(32.8%)	12(44.4%)	6(25.0%)	24(32.0%)	132(38.6%)		
	Neutral	42(26.6%)	11(19.0%)	9(33.3%)	6(25.0%)	11(14.7%)	79(23.1%)		
	Disagree	19(12.0%)	13(22.4%)	3(11.1%)	5(20.8%)	26(34.7%)	66(19.3%)		
	Strongly disagree	6(3.8%)	5(8.6%)	2(7.4%)	2(8.3%)	4(5.3%)			

#Fishers exact test

**p<0.05 Statistically significant, p>0.05 Nonsignificant*

References

1. Ditmyer MM, Mobley CC, Davenport WD. Evaluation of an integrative model for professional development and research in a dental curriculum. J Dent Educ 2014;78(3):368-379.
2. Komabayashi T, Razak AA, Bird WF. Dental education in Malaysia. Int Dent J 2007; 57(6):429-432.
3. Ngeow WC. Dental fellowship training in Malaysia- A personal experience. J Irish Dent Assoc 1997;43:82-84.
4. Oral Health Division, Ministry of Health Malaysia. National Oral Health Plan for Malaysia 2011-2020. February 2011. Serial No. MOH/K/GIG/ 7.2011(BK).
5. Oral Health Division, Ministry of Health Malaysia. National Oral Health Survey of Adults 2000 (NOHSA 2000). Oral health status, impacts and treatment needs of Malaysian adults, Nov 2004.
6. Morrow RM, Rudd KD, Rhodes JE. Complete Dentures, 2nd edition. St. Luois: The CV Mosby Company; 1986.
7. Rudd KD, Morrow RM, Eissmann HF. Dental Laboratory Procedures - Removable Partial Dentures, Vol. III 2nd Edition. St. Louis, Missouri: CV Mosby; 1986.
8. Institute of Medicine (US) Committee on the Future of Dental Education. Dental Education at the Crossroads: Challenges and Change. Field MJ, editor. Washington (DC): National Academies Press (US); 1995.
9. Meskin LH, Brown LJ. Prevalence and patterns of tooth loss in US employed adult and senior populations 1985-86. J Dent Educ 1988;52(12):686-691.
10. Taylor TD, Aquilino SA, Matthews AC, et al: Prosthodontic survey. Part II: Removable prosthodontic curriculum survey. J Prosthet Dent 1984;52(5):747-749.
11. Budtz-Jorgensen E: Treatment of Edentulous Patients, in Prosthodontics for the Elderly: Diagnosis and Treatment. Chicago, IL, Quintessence, 1999, pp. 203-228.
12. Rashedi B, Petropoulos VC. Preclinical complete dentures curriculum survey. J Prosthodont 2003;12(1):37-46.
13. Douglass CW1, Shih A, Ostry L. Will there be a need for complete dentures in the United States in 2020? J Prosthet Dent. 2002;87(1):5-8.
14. Graser GN. Predoctoral removable prosthodontics education. J Prosthet Dent. 1990;64(3):326-333.

15. Hyde PT, McCord JF. Survey of prosthodontic impression procedures for complete dentures in general dental practice in the United Kingdom. J Prosthet Dent. 1999;81(3):295-259.

16. Jaggers JH, Javid NS, Colaizzi FA. Complete denture curriculum survey of dental schools in the United States. J Prosthet Dent.1985;53(5):736-739.

17. Mendes AJ. Application of prosthodontic techniques in private practice. J Prosthet Dent. 1985;54(5):730-735.

18. Murphy WM, Bates JF, Huggett R. Complete denture construction in general dental practice: A Survey. Br Dent J 1971;130(12):514-521.

19. Murphy WM, Bates JF Stafford GD. Complete denture construction in dental schools and hospitals of the United Kingdom and Ireland. A survey. Br Dent J 1972;133(5):179-184.

20. Clark RKF. The future of teaching of complete denture construction to undergraduates, Br Dent J 2002;193(1):13-14.

21. Clark RKF, Radford DR, Juszczyk AS. Current trends in complete denture teaching in British dental schools. Br Dent J. 2010;208(5):214-215.

22. Cabot L B. The dental vocational training experience: a transition from novice dentist to competent practitioner. pp 84. UK: Open University, 2004. D.Ed. Thesis.

23. Dantas AK, Shinagawa A, Deboni MCZ. Assessment of preclinical learning on oral surgery using three instructional strategies. J Dent Educ. 2010;74(11):1230-1236.

24. Grober ED, Hamstra SJ, Wanzel KR, et al. The educational impact of bench model fidelity on the acquisition of technical skill: the use of clinically relevant outcome measures. Ann Surg 2004; 240(2):374–381.

25. Goodacre CJ: Predoctoral fixed prosthodontics education. J Prosthet Dent 1990;64(3):319-325.

26. Lang BR: A review of traditional therapies in complete dentures. J Prosthet Dent 1994;72(5):538-542.

27. Petropoulos VC, Rashedi B. Complete denture education in U.S. dental schools. J Prosthodont. 2005;14(3):191-197.

28. Wieder M, Faigenblum M, Eder A, Louca C. An investigation of complete denture teaching in the UK: Part 1. A survey of undergraduate teaching. Br Dent J 2013; 215(4):177-181.

29. Singh G, Kapoor V, Gambhir R, Bansal V. Application of prosthodontic techniques by private practitioners in Northern India - A Survey. The Internet Journal of Epidemiology. 2010;9(2):1-7.

30. Rashedi B, Petropoulos VC. Preclinical removable partial dentures curriculum survey. J Prosthodont 2003;12(2):116-123.

31. Basker R M, Davenport JC. A survey of partial denture design in general dental practice. J Oral Rehabil 1978;5(3):215-222.

32. Basker RM, Harrison A, Davenport JC, Marshall JL. Partial denture design in general dental practice - 10 years on. Br Dent J 1988;165(7):245-249.

33. Lynch CD, Allen PF. A survey of chrome-cobalt removable partial denture design in Ireland. Int J Prosthodont 2003;16(4):362-364.

34. Lynch CD, Allen PF. Quality of materials supplied to dental laboratories for the fabrication of cobalt chromium removable partial dentures in Ireland. Eur J Prosthodont Restor Dent 2003;11(4):176-180.

35. Lynch C D, Allen P F. Quality of written prescriptions and master impression for fixed and removable prosthodontics: a comparative study. Br Dent J 2005;198(1):17- 20.

36. Lynch C D, Allen P F. Why do dentists struggle with removable partial denture design? An investigation of educational and financial issues. Br Dent J 2006;200(5):277-281.

37. Sykora O, Calikkocaoglu S. Maxillary removable partial denture designs by commercial dental laboratories. J Prosthet Dentist 1970;23(6):633-40.

38. Lynch CD, Allen PF. The teaching of removable partial dentures in Ireland and the United Kingdom. Br Dent J 2007;203(8):E17.

39. Weintraub AM, Weintraub GS. The dental student as technician: An 18-year follow- up of preclinical laboratory programs. J Prosthodont 1997;6(2):128-136.

40. Wieder M, Faigenblum M, Eder A, Louca C. An investigation of complete denture teaching in the UK: Part 2. The DF1 experience. Br Dent J 2013; 215(5):229-236.

41. Ong CT, Pan N, Tiang R, et al. General dental practitioners' perceptions of removable prosthodontics in the undergraduate curriculum. N Z Dent J. 1999;95(421):80-83.

Appendix A

Questionnaire:

Please (√) wherever applicable.

Demographic variables

Gender: Male ☐ Female ☐

Age:

Nationality:

No. of years in dental practice: < 5 yrs ☐ 5-9 yrs ☐

10-14 yrs ☐ 15-19 yrs ☐ >20yrs ☐

What was the time allocated for pre-clinical removable prosthodontic training in your university?

6 months ☐ 1 year ☐
2 years ☐ > 2 years ☐

Are you able to apply your pre-clinical removable prosthodontic training in your clinical practice?

Yes ☐ No ☐

Do you perform removable prosthodontics procedures in your clinic?

Yes ☐ No ☐

If yes, answer the questions below:

1. Manipulation of the impression material is done by me.
   a. Always ☐
   b. Sometimes ☐
   c. Never ☐

2. Pouring of the impressions is done by me.
   a. Always ☐
   b. Sometimes ☐
   c. Never ☐

3. Construction of the special trays is done by me.
   a. Always ☐
   b. Sometimes ☐
   c. Never ☐

4. Fabrication of the record bases and occlusal rims is done by me.
   a. Always ☐
   b. Sometimes ☐
   c. Never ☐

5. Artificial teeth arrangement for denture patients is done by me.
   a. Always ☐
   b. Sometimes ☐
   c. Never ☐

6. Processing (Acrylization) of the denture is done by me.
   a. Always ☐
   b. Sometimes ☐
   c. Never ☐

7. Designing of the partial denture framework is done by me.
   a. Always ☐
   b. Sometimes ☐
   c. Never ☐

8. If you are not satisfied by your dental technician's work, you correct it by yourself.
   a. Always ☐
   b. Sometimes ☐
   c. Never ☐

9. Do you track your dental technician's work to your satisfaction?
   a. Always ☐
   b. Sometimes ☐
   c. Never ☐

10. To what extent do you agree or disagree with this statement: "It would be better to dedicate more time on clinical prosthodontic training rather than pre-clinical removable prosthodontic lab training in undergraduate curriculum".
    a. Strongly agree ☐
    b. Agree ☐
    c. Neutral ☐
    d. Disagree ☐
    e. Strongly disagree ☐