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**Awareness on Fundamentals of Fixed Prosthodontics among Dental
Students in Riyadh Elm University, Saudi Arabia**



Awareness on Fundamentals of Fixed Prosthodontics among Dental Students in Riyadh Elm University, Saudi Arabia

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Abstract

Purpose: Dentists learn the fundamentals of fixed prosthodontics in dental school and many forms of continuous education. However, there is more to fixed prostheses than the fundamentals, such as the technical aspects, laboratory skills, and keeping up with the current developments of dental materials. This study aims to create awareness on fundamentals of fixed prosthodontics among dental students and dental intern in Riyadh Elm University.

Methodology: A descriptive cross-sectional study was done amongst the dental students and dental intern in Riyadh Elm University in Riyadh, Saudi Arabia in 2022. A total of 380 dental students and dental intern were selected randomly. A survey was conducted through online questionnaire composed of 15 multiple-choice questions. Data from the completed questionnaires were analyzed using the SPSS Statistical Software Package (version 25). All statistical analyses were carried out at a significance level of $P < 0.05$. Results were analyzed and compared using the Chi-square test and frequency test.

Results: This cross-sectional study showed that most of participants 231 (60.8%) fabricated study models routinely before starting treatment. 244 (64.2%) of participants always used radiographs for abutment tooth evaluation. 276 (72.6%) of participants always used High speed hand piece and 36 198 (52.1%) use Diamond bur during preparation. Also in our study 253 (66.6%) of the participants were using Putty and wash techniques 134 (35.3%) of dental student and dental intern use Condensation cured silicon material for the final impression. A total of 239 (62.9%) of them always used retraction cord before making final impression. In present study the majority of respondents, 133 (35%) always used Silicon and wax material for bite registration. 146 (38.4%) preferred to use only Written prescriptions and 125 (32.9%) used Both written prescriptions and verbal communications. In the end, 224 (58.9%) of respondents disinfect the final impression chemically before pouring it and sending it to lab.

Conclusion: The Dental student and dental intern of Riyadh Elm University displayed an acceptable level of knowledge and a level of awareness of fixed prosthodontics practicing. However, to further enhance the proficiency, efforts should be made to encourage the practitioners to be aware of the advances in fixed prosthodontics practice through state-of-the-art continuous education programmers.

Unique Contribution to Theory, Policy and Practice: The study's findings could contribute to the theoretical understanding of fixed prosthodontic practices and the knowledge required of dental students and interns. By demonstrating that these students possess an acceptable level of knowledge, the study could support existing theories about dental education and the effectiveness of current curricula.

Keywords: *Bridge, crown, dental practitioners, fixed prosthodontics*

Introduction

In Riyadh Elm University, dental students graduate after completing a six-year curriculum and a seventh year is added as the internship stage. During their education, students are trained through regular practice and instruction to treat patients in an appropriate manner. One of the basic programs in dentistry that plays a major role in the dental education is prosthodontics. This program is divided into two distinct programs for removable and fixed prosthodontics. Before entering clinic, all of the students must pass a preclinical course in which they practice on an artificial patient model for one semester to be prepared to treat actual patients in clinic.

Dentists learn the fundamentals of fixed prosthodontics in dental school and many forms of continuous education. However, there is more to fixed prostheses than the fundamentals, such as the technical aspects, laboratory skills, and keeping up with the current developments of dental materials (Amalina et al, 2021). Some dental restoration types, such as fenestrated crowns or partial coverage crowns, were described as esthetic and in certain ambits demand for these restorations remains high (AgustínPanadero et al, 2014). Dental students must achieve a certain level of theoretical knowledge and complete preclinical and clinical based on training in dental educational programs before being considered competent dentists (Yamalík et al., 2015).

Some studies were conducted in order to study the extent of awareness of dental practitioners about fixed prosthodontics. The Kannan et al, study aimed to assess the private section practitioner's knowledge, awareness level and application in clinical practice; it showed a significant variation in the private section practitioners in their fixed prosthodontics (FPD) practice, definitely deviate from the recommended clinical protocols (Kannan et al, 2018). The dental practitioners (DPs) of Qassim displayed an acceptable level of knowledge and a level of awareness of fixed prosthodontics practicing. However, to further enhance the proficiency, efforts should be made to encourage the practitioners to be aware of the advances in fixed prosthodontics practice through state-of-the-art continuous education programmers (Alhoumaidan et al, 2019). Another Study

made in Saveetha Dental College showed that the knowledge and awareness on the fixed prosthodontics is moderate among the dental students, in which among them the second year undergraduates had a higher knowledge on the fixed prosthodontics (KirthickKumaran et al., 2020).

A positive correlation was confirmed between preclinical and clinical performances. This highlights the potential that lies within maximizing the efforts invested in preclinical years, reflecting positively on students' competence in their future clinical practice (Al-Angari et al, 2022). The transitioning into clinical training can be complex. However, the educational and social challenges associated with the transition can provide stimulating developmental learning opportunities that advance students' adjustments to the clinical environment with positive, empowering and motivational outcomes that facilitate a smooth transition (Malau-Aduli et al, 2022). Improvement is required in teaching dental students about laboratory procedures and problem-solving to adequately prepare them for clinical treatment of patients with fixed prosthodontics needs (Barrero et al, 2015). The dental practitioners should have an updated knowledge about the advancement in restorative materials and explain the patients so that the patients will be benefited with recent advances (Ashok et al., 2016).

Dental students are taught all the fundamentals of fixed prosthodontics and to avoid clinical case failures during their years of education. This study aims to create awareness on fundamentals of fixed prosthodontics among dental students and dental intern in Riyadh Elm University.

Materials and Methods

Study setting

This descriptive cross-sectional study was done among undergraduate dental college students (from Level 9 to Level 12) and dental intern of Riyadh Elm University (Riyadh, Saudi Arabia). A total of 380 dental students and dental intern were selected randomly from Al-Mounsiyah and Qurtubah campus for male student and Namudhajiya campus for Female student. The study was approved by

Institutional Review Board of Riyadh Elm University on 21 Mar 2022, "FRP/2021/420/668/652".

Study subjects

A total of 380 dental students and dental intern participated in this study. Of which, 213 (56.10%) were females while 167 (43.90%) were males.

Methodology

A survey was conducted through an online standard questionnaire with 15 multiple choice questions delivered to dental students and dental intern. Questionnaire was prepared in English languages. The questionnaire comprised questions to assess the knowledge, attitude, and practice of fixed prosthodontics among dental students and dental intern of Riyadh Elm University which is adapted to Alhoumaidan et al, 2019. Questionnaires were distributed to dental students and

dental intern of Riyadh Elm University. The questionnaire was semi-structured and pre-tested to check the validity and reliability. The result of the pilot study was evaluated and a reliability coefficient (α) of 0.80 or more was considered adequate. All the respondents were informed about the aims and objectives of the study. After eliciting their consent in participation, the questionnaires were distributed. The online questionnaire was open and unlimited time to provide the participants with the necessary time to respond. The response of the participants were recorded, analyzed for flaws, checked for completeness and were taken up for assessment. The questionnaires consisted of two parts. The first part measured gender and level of education. The second part evaluated the knowledge of standard guidelines to be followed by the practitioner in prosthodontic practice such as pre-treatment vitality tests, radiographic evaluation, type of try used, type of impression, impression material and quality of communication with the dental laboratory technician.

Statistical analysis

The data from Google forms was collected and analyzed, the statistical analysis was done using SPSS statistical software package (Version 25).

Descriptive was analyzed as a number and percent were calculated to summaries qualitative data. All statistical analyses were carried out at a significance level of $P < 0.05$. Chi square test was used to analyses and compare the year of study of the dental students, their knowledge and awareness of fundamentals of fixed prosthodontics. The independent variable of the present study is the gender.

Results

A total of 380 dental students and dental intern participated in the study; 213 (56.10%) were females while 167 (43.90%) were males [Table 1]. Among 380 respondents, 98 (25.80%) were level 9 dental student, 91 (23.90%) were level 10 dental student, 72 (19%) were level 11 dental student, 84 (22.10%) were level 12 dental student and 35 (9.20%) were dental intern [Table 1]. 231 (60.8%) of dental students and dental intern always fabricated study models before commencing fixed prosthodontic treatment, 101 (26.6%) of dental students and dental intern answered that they often fabricate study models, 31 (8.2%) of them rarely fabricated it and 17 (4.5%) of dental students and dental intern starts treatment without study models [Table 2]. 244 (64.2%) of dental students and dental intern always used radiographs for abutment tooth evaluation, 97 (25.5%) of them used it often, 25 (6.6%) rare used any radiograph before starting treatment and 14 (3.7%) never used any radiograph before starting treatment [Table 2].

Majority of respondents 276 (72.6%) were using high-speed handpieces, 19 (5%) were using low speed and 85 (22.4%) were using both high and low speed during preparation. The diamond bur was mostly used during preparation 58 (15.3%), 198 (52.1%) were using carbide burs and 124 (32.6%) were using carbide and diamond burs during preparation [Table 2]. Table 2 shows that Condensation cured silicon were mostly used by most of the dental students and dental intern 134

(35.3%) for making final impression which provides the level of quality of final impression, followed by Alginate 129 (33.9%) and 96 (25.3%) preferred to make final impressions by Condensation cured silicon while 21 (5.5%) were using other materials. There was a great convergence in the percentage of material selection when asked about If you use elastomeric impression materials, which type of impression techniques do you use 253 (66.6%) used Putty and wash techniques, 46 (12.1%) who used single step, 59 (15.5%) from dental student and dental intern used Monophase elastomeric impression material and 22 (5.8%) choose other. 196 (51.6%) of dental student and dental intern were using stock trays, 60 (15.8%) were using Special trays and 124 (32.6%) preferred to use both special and stock try in their practice to take a final impression [Table 2]. Most of dental student and dental intern 210 (55.3%) and using interocclusal records (bite) for multiple teeth replacement, 107 (28.2%) using interocclusal records (bite) often, 24 (6.3%) of respondents never 39 (10.3%) rarely took bite registration. 128 (33.7%) participants used Silicon for bite registration, 114 (30%) used wax while 133 (35%) used both wax and silicone. [Table 2]. 239 (62.9%) of respondents always used retraction cord, 109 (28.7%) often used retraction cords 35 (9.2%) Rare and 21 (5.5%) Never used retraction cords. 206 (54.2%) practitioners always gave provisional restoration while 14 (20.9%) of practitioners often 42 (11.1%) rare and 23 (6.1%) never give provisional crown and bridges. 224 (58.9%) respondents disinfected the final impression chemically before fabricating cast and sending to lab, while 102 (26.8%) of them often disinfected, 38 (10%) rare and 16 (4.2%) did not disinfect it [Table 2]. dental student and dental intern written prescriptions and verbal communications were used during communication between dentist and lab by 125 (32.9%) respondents while 146 (38.4%) provide only written instructions, 37 (9.7%) used only verbal communication and 72 (18.9%) used other communication methods [Table 2].

Table 1: Demographic structure of sample

	No	Percentage %
1-Gender		
Female	213	56.10%
Male	167	43.90%
2-Level education		
Level 9	98	25.80%

Level 10	91	23.90%
Level 11	72	19%
Level 12	84	22.10%
Intern	35	9.20%

Table 2: Response rate of the participants on different parameters evaluated

	Male, N (%)	Female, N (%)	Total, N (%)	Significance
3-Do you make study cast before commencing fixed prosthodontic treatment?				
Always	113 (67.7%)	118 (55.4%)	231 (60.8%)	X ² = 10.165
Often	36 (21.6%)	65 (30.5%)	101 (26.6%)	P=0.017
Rare	15 (9%)	16 (7.5%)	31 (8.2%)	
Never	3 (1.8%)	14 (6.6%)	17 (4.5%)	
4-Do you take a preoperative radiograph for the abutment tooth (teeth) before commencing fixed prosthodontic treatment?				
Always	115 (68.9%)	129 (60.6%)	244 (64.2%)	X ² = 3.674
Often	37 (22.2%)	60 (28.2%)	97 (25.5%)	P=0.299
Rare	11 (6.6%)	14 (6.6%)	25 (6.6%)	

Never	4 (2.4%)	10 (4.7%)	14 (3.7%)	
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5-Which type of hand-piece do you use in the preparation?	124 (74.3%)	152 (71.4%)	276 (72.6%)	X ² = 0.399
High speed				
Low speed	8 (4.8%)	11 (5.2%)	19 (5%)	P=0.819
Both of them	35 (21%)	50 (23.5%)	85 (22.4%)	
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6-Types of burs you usually use in the preparation? Carbide bur	22 (13.2%)	36 (16.9%)	58 (15.3%)	X ² = 1.435
Diamond bur	92 (55.1%)	106 (49.8%)	198 (52.1%)	P=0.488
Carbide and diamond burs	53 (31.7%)	71 (33.3%)	124 (32.6%)	
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7-Which type of impression material do you often use for the final impression?				
Alginate	80 (47.9%)	49 (23%)	129 (33.9%)	X ² = 27.425
Additional cured silicon	29 (17.4%)	67 (31.5%)	96 (25.3%)	P<0.000
Condensation cured silicon	49 (29.3%)	85 (39.9%)	134 (35.3%)	
Others	9 (5.4%)	12 (5.6%)	21 (5.5%)	
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8-If you use elastomeric impression materials, which type of impression techniques do you use?				
Putty and wash techniques	136 (81.4%)	117 (54.9%)	253 (66.6%)	X ² = 29.790
Monophase	15 (9%)	44 (20.7%)	59 (15.5%)	P<0.000
Single step	10 (6%)	36 (16.9%)	46 (12.1%)	
Other	6 (3.6%)	16 (7.5%)	22 (5.8%)	
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9-Which type of impression tray do you use for final impression?					
Stock trays	87 (52.1%)	109 (51.2%)	196 (51.6%)	X ² = 6.598	
Special trays	18 (10.8%)	42 (19.7%)	60 (15.8%)	P=0.037	
Both of them	62 (37.1%)	62 (29.1%)	124 (32.6%)		

10-Do you do interocclusal records (bite) for multiple teeth replacement?					
Always	99 (59.3%)	111 (52.1%)	210 (55.3%)	X ² = 4.526	
Often	45 (26.9%)	62 (29.1%)	107 (28.2%)	P=0.210	
Rare	17 (10.2%)	22 (10.3%)	39 (10.3%)		
Never	6 (3.6%)	18 (8.5%)	24 (6.3%)		

11-If yes, which material do you use?					
Wax	58 (34.7%)	56 (26.3%)	114 (30%)	X ² = 10.266	
Silicon	43 (25.7%)	85 (39.9%)	128 (33.7%)	P=0.016	
Wax and Silicon	65 (38.9%)	68 (31.9%)	133 (35%)		

12-Do you use retracting cord for soft tissue displacement before you take the impression?					
Always	110 (65.9%)	129 (60.6%)	239 (62.9%)	X ² = 10.165	
Often	39 (23.4%)	46 (21.6%)	85 (22.4%)	P=0.198	
Rare	13 (7.8%)	22 (10.3%)	35 (9.2%)		
Never	5 (3%)	16 (7.5%)	21 (5.5%)		

13-Do you do Provisional or temporary crown or bridge after finishing the preparation?

Always	100 (59.9%)	106 (49.8%)	206 (54.2%)	$X^2 = 8.771$
Often	41 (24.6%)	68 (31.9%)	109 (28.7%)	$P=0.032$
Rare	21 (12.6%)	21 (9.9%)	42 (11.1%)	
Never	5 (3%)	18 (8.5%)	23 (6.1%)	

14-Do you chemically disinfect the impression after your remove it from the patient mouth and before you pour it or send it to the lab?

Always	104 (62.3%)	120 (56.3%)	224 (58.9%)	$X^2 = 3.228$
Often	44 (26.3%)	58 (27.2%)	102 (26.8%)	$P=0.358$
Rare	15 (9%)	23 (10.8%)	38 (10%)	
Never	4 (2.4%)	12 (5.6%)	16 (4.2%)	

15-What is your communication method with the dental technician?

Written prescriptions	76 (45.5%)	70 (32.9%)	146 (38.4%)	$X^2 = 9.439$	Verbal communications	10 (6%)	27 (12.7%)	37 (9.7%)	$P=0.024$
Both written prescriptions and verbal communications	54 (32.3%)	71 (33.3%)	125 (32.9%)						
Other	27 (16.2%)	45 (21.1%)	72 (18.9%)						

Discussion

This cross-sectional study was used to assess knowledge, attitude and fixed prosthodontics practice among undergraduate dental college students (from Level 9 to Level 12) and dental intern of

Riyadh Elm University (Riyadh, Saudi Arabia), Study models are essential for proper diagnosis and treatment planning (Pruden et al, 1960). Evaluation of the abutment is considered as an integral part in diagnosis and treatment planning for fixed prosthodontic restorations (Talabani et al, 2016). The current survey showed that most of participants 231 (60.8%) fabricated study models routinely before starting treatment. 244 (64.2%) of participants always used radiographs for abutment tooth evaluation. Compared with Al Qassim study, we find that most of participants (108) 37.2% fabricated study models routinely before starting treatment. (78.3%) 227 of participants always used radiographs for abutment tooth evaluation (Alhoumaidan et al, 2019). A majority of program directors teach the use of air coolant alone for high-speed preparation of teeth (Kupietzky et al, 2010). This was confirmed by the results of our research, as 276 (72.6%) of participants always used High speed hand-piece and 198 (52.1%) used Diamond bur during preparation. On the other hand, the results in the Al-Humaidan study were 230 (79.3%) used High speed hand-piece and 156 (53.8%) used Diamond bur (Alhoumaidan et al, 2019). The majority of UK dentists use a one-stage puttywash technique with the advantages of simplicity, reasonable economy, predictability and dimensional accuracy (Hung et al, 1992). Also in our study 253 (66.6%) of the participants were using Putty and wash techniques and 134 (35.3%) dental student and dental intern used Condensation cured silicon material for the final impression. The results of the Alhoumaidan study revealed that additional cured silicon was mostly used, 111 (38.3%) for making final impression (Alhoumaidan et al, 2019). Similar study done in Khartoum state show that The putty and wash impression technique was the most recommended technique and it was selected by 38 DP's (80%) (Mohamed et al, 20210). Regarding using retraction cord before taking final impression, Gadhavi et al., the aim of their study was to evaluate the use of various gingival displacement techniques prior to impression making in fixed partial dentures by the Prosthodontists in Vadodara, the result of their study show that 62% prefer the use of gingival displacement technique for successful clinical practice while 38% of them do not follow the procedure believing it does not make major difference in clinical practice (Gadhavi et al, 2018). also Moldi et al. found that 72.8% of practitioners use gingival retraction cord (Moldi et al, 2013). Other study found that, 51% do not used gingival retraction, 46% of practitioners use gingival retraction cord, 2% do rotary curettage, 1% use laser and electro-surgery seems rarely used for gingival retraction by private dental practitioners (Jankar et al, 2016). while in the Alhoumaidan study 117 (40.3%) of respondents always used retraction cord and 15 (5.2%) never used retraction cord (Alhoumaidan et al, 2019). Our study result was 239 (62.9%) of respondents always used retraction cord and 21 (5.5%) never used retraction cord. Regarding to using of inter-occlusal record. Maru K et al., showed that most commonly use inter-occlusal recording material was wax (54.6%) (Maru et al, 2018), In Al Qassim study the majority of respondents, 242 (83.4%) always took bite registration for multiple teeth replacement and wax was the most used material for bite registration 179 (61.7%) (Alhoumaidan et al, 2019). In present study the majority of respondents, 133 (35%) always used both Silicon and wax material for bite registration. Prevention of cross infection in dental practice in general and dental laboratory specifically should now be a routine in practice. In Khartoum state, 73% of the surveyed dental practitioners never disinfect the impression before being send to the dental

laboratory and they recommended that provide continuous dental education programmers for all DP's especially in the practice of crown and bridge work (Mohamed et al,2010) In 2014, Sedky study found that the majority of Qassim Prosthodontists participating routinely rinses and disinfects the preliminary/working impressions prior to sending them to the dental laboratory (Sedky et al,2014) Also in present study 224 (58.9%) of respondents disinfect the final impression chemically before pouring it and sending it to lab. Study conducted in Khartoum showed that both verbal and written prescriptions (54%) were selected as a communication method between DP's and technicians (Mohamed et al,2010). Another study showed that the Qassim dentists, 209 (72.1%) communicated well with the labs by giving both written and verbal instructions (Alhoumaidan et al, 2019). While the current study 146 (38.4%) preferred to use only Written prescriptions and 125 (32.9%) used Both written prescriptions and verbal communications. In the end, 206 (54.2%) of respondents to used Provisional or temporary crown or bridge after finishing the preparation and 23 (6.1%) answer never. Compared with 132 (45.5%) in Al Qassim study and (36%) in Khartoum which used the Provisional crown (Alhoumaidan et al, 2019) (Mohamed et al,2010).

Conclusion

With marginal variation observed in various parameters in this study, most practitioners fabricated study models and took preoperative diagnostic radiographs for abutment evaluation. Dental student and dental intern used the high speed hand-piece with diamond burs to prepared teeth. The Condensation cured silicon with wash techniques were mostly used for making final impression and most of them used the Stock trays. The majority of dentists were using retraction cord before taking final impression. Most respondents always used inter-occlusal records for multiple teeth replacement and bite registration both Wax and Silicon was the most used material for records. 58.9% of dentists disinfected their final impression chemically before fabricating cast and send it to lab and written prescriptions only were used during communication between dentist and lab. Provisional restorations were always given by practitioners. This is how dental students and dental intern in Riyadh Elm University showed up an acceptable level of knowledge in fixed prosthodontic practices. However, to further enhance the proficiency; efforts should be made to encourage the practitioners to be aware of the advances in fixed prosthodontic practice through state-of-the-art continuous education programs.

Recommendations

As the study has shown that most dental students and dental intern in Riyadh Elm University have an acceptable level of knowledge in fixed prosthodontic practices, efforts should be made to encourage them to stay up-to-date with the latest advances in the field. One way to achieve this is by introducing state-of-the-art continuous education programs that will enable practitioners to improve their skills and knowledge.

Conflicts of interest

The authors declare they have no conflicts of interest

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