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Original Research Paper

Study of the extent of awareness about fixed prosthodontic procedures among dental students in Omer-Almukhtar university, Libya

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ABSTRACT:

In the dental colleges, dental practitioners learn the basic principles of crown & bridge prosthodontics, but there are many aspects to be considered than its fundamentals, such as the laboratory & technical skills, & awareness of recent advances of dental bio-materials. The purpose of the present investigation was to evaluate knowledge & attitude on the basic principles of crown & bridge prosthodontics among dental students and dental interns in faculty of dentistry, Omer-Almukhtar University, Libya. **Materials & methods**: A cross-sectional study has been conducted among the dental students and interns at faculty of dentistry, Omer-Almukhtar University in Albida city, Libya in the year of 2023. 158 students and interns were chosen. The study has been done by the use of a printed questionnaire consisting of 53 closed-ended questions related to the fundamentals (basic facts) of fixed prosthodontics. After data collection, the SPSS Statistical Software Package (version 25) was used to statistically analyze the completed questionnaires. At a significance level of $P < 0.05$, all statistical analyses were performed. The Chi-square test and frequency test were used to analyze & compare the results. **Results:** The present survey revealed that the majority of the respondents 141 (89.3%) constructed diagnostic casts prior to initiating any fixed prosthodontic treatment. 151 (95.5%) of respondents always used dental radiographs for evaluation of the proposed abutment teeth. 150 (94.9%) of respondents reported using turbine hand piece & 118 (74.6%) use diamond abrasive stones during teeth preparation to receive cast fixed restorations. Also in this survey study 120 (75.9%) of the respondents utilized Putty/reline impression technique, 126 (79.7%) of the respondents used condensation silicon impression material for the fixed prosthodontic impression. 144 (91.1%) of the participants used gingival tissue displacement cord prior to taking impression. In current survey most of the participants, 104 (65.8%) utilized wax & silicon for inter-occlusal record. 9 (5.6%) reported using only written prescriptions for communication with dental laboratory technicians and 148 (93.6%) used verbal communications as well as written prescriptions. Finally, 140 (88.6%) of participants reported disinfection of the crown & bridge impressions prior to transferring to the lab. **Conclusion:** The participants showed satisfactory level of awareness of the basic principles of crown & bridge practice, but further efforts should be made through continuous dental education, to improve their awareness of the recent material & practice in the field of fixed prosthodontics.

Keywords: Fixed prosthodontics, dental students, dental interns, awareness, practice, Aljabal-Alakhdar, Libya.

INTRODUCTION:

In Omer-Almukhtar University, dental students graduate after completing a five-year curriculum and a sixth year is added as the internship stage. During their study course, dental students are trained through continuous regular practice and instruction to treat dental patients in an excellent & appropriate way. Fixed prosthodontics is a branch of dentistry that provide an essential dental education for the dental students. Before entering clinic, all of the students must pass a fixed prosthodontic pre-clinical course in which they practice on an artificial patient model for one year (the second year) to be prepared to treat actual patients in the fixed prosthodontic clinic. The dental students & interns before being considered highly competent dentists, they must gain a certain level of theoretical knowledge and complete preclinical and clinical training in dental educational courses. Dental students are taught all the

fundamentals of fixed prosthodontics to avoid clinical case failures during their years of education. The present survey aims to assess the extent of awareness level & application of clinical aspects in fixed prosthodontics on the participants at the faculty of dentistry, Omer-Almukhtar University.

MATERIALS AND METHODS:

With the help of well-designated questionnaire, the current study was conducted. This questionnaire was distributed to 158 participants of the dental college. After collecting the data from the respondents, statistical analysis was performed to get the survey objectives. 119 (75.3%) out of the total number of the participants were females while 39 (24.7%) were males. The cross sectional survey was conducted to evaluate the awareness of the participants regarding the principles of fixed prosthodontic treatment procedures at the faculty of dentistry, Omer-Almukhtar university with the help of a printed questionnaire.

The self-administered questionnaire consisted of 53 dichotomous close-ended questions (response as "yes" or "no") evaluating the awareness of fixed prosthodontic treatment procedures among the participating dental students & interns. It was used to collect data concerning various aspects of the basic fixed prosthodontic treatment for the construction of fixed dental prostheses. The questionnaires were collected from the participants to analyze the data. The questionnaire was prepared in English languages. The questionnaire consisted of questions related to the demographic data & questions assessing the awareness prosthodontic procedures. Questionnaire was distributed to 162 dental students & interns in the faculty of dentistry. Out of 162 distributed questionnaires, 158 usable questionnaires were accepted, giving a response rate 97.5%. For each question, the responses were tabulated and converted to a percentage. The collected data were subjected to statistical analysis with (SPSS) version 25 software and Pearson's Chi-square test p value < 0.05 was considered as statistically significant.

Section I: consent statement :

I would be grateful if you could complete this form regarding the detailed the fundamentals of fixed prosthodontics. If you are willing to participate in this study kindly fill in the following information . This form will hardly take 5 minutes.

Section II: demographics

Demographic characteristics of participating dental laboratory technicians (N = 158).

Demographics		N %
Gender	Male	
	Female	
Age		

Section III: Fundamentals of fixed prosthodontic procedures:

Thanks for response regarding this now please fill in the form regarding basic fundamentals of fixed prosthodontic awareness & practice.

Fig. 1: Questionnaire for assessing the fundamentals of fixed prosthodontic procedures among dental students & dental interns.

S.n	Variables	Responses	
1	Do you assess the abutment teeth radiographically prior to starting any fixed prosthodontic treatment ?	Yes	No
2	Do you fabricate diagnostic casts before starting any fixed prosthodontic treatment ?	Yes	No
3	Do you perform vitality test for restored abutment teeth before commencing any fixed prosthodontic treatment (pre-treatment vitality tests) ?	Yes	No
4	Do you use high speed handpiece for teeth reduction to accept fixed dental restorations ?	Yes	No
5	Do you use low speed handpiece for teeth reduction to accept fixed dental restorations ?	Yes	No
6	Do you use diamond abrasive stones for preparation of the abutment teeth ?	Yes	No
7	Do you use carbide burs for preparation of the abutment teeth ?	Yes	No
8	Do you use air-water cooling with high speed handpiece during to preparation to receive cast fixed restoration ?	Yes	No
9	Do you utilize retraction cord for gingival tissue displacement prior to impression making ?	Yes	No
10	Do you use alginate impression material for making the final impression ?	Yes	No
11	Do you utilize condensation silicon impression material for taking crown & bridge impressions ?	Yes	No
12	Do you use additional cured silicon for making the final impression ?	Yes	No
13	Do you use stock impression tray for making the fixed prosthodontic final impression ?	Yes	No
14	Do you use custom-made impression tray for making the fixed prosthodontic final impression ?	Yes	No
15	Do you use both of stock & custom-made impression trays for making the fixed prosthodontic final impression ?	Yes	No
16	If you are using rubber based impression materials, Are you using putty/wash impression technique- Double mix one step ?	Yes	No
17	If you are using rubber based impression materials, Are you using putty/wash impression technique- Double mix two steps ?	Yes	No
18	If you are using rubber based impression materials, Are you using one mix single step ?	Yes	No
19	Do you disinfect dental impressions before transferring them to the lab technician ?	Yes	No
20	Do you make bite registration for the replacement of multiple missing teeth ?	Yes	No

21	Do you use dental wax for making inter-occlusal records ?	Yes	No
22	Do you use silicon for making inter-occlusal records ?	Yes	No
23	Do you use both of wax & silicon for making inter-occlusal records ?	Yes	No
24	Do you make provisional fixed restorations after completing teeth reduction, while a cast restoration is being fabricated ?	Yes	No
25	Are you chemically disinfecting the impression after removal from the oral cavity but before pouring or sending to the lab technician ?	Yes	No
26	Do you make try-in for the fixed dental prostheses instead of direct delivery ?	Yes	No
27	Do you recommend the saddle pontic for replacement of missing teeth ?	Yes	No
28	Do you recommend pressure contact between the pontic & the underlying tissue ?	Yes	No
29	Do you recommend sanitary pontic for replacement of mandibular posterior teeth ?	Yes	No
30	Do you recommend the modified ridge-lap pontic for restoring teeth in the appearance zone ?	Yes	No
31	Do you examine the residual ridge area prior to construction of any fixed dental prosthesis ?	Yes	No
32	Do you recommend conical pontic for replacement of missing teeth in patients with broad residual ridge ?	Yes	No
33	Do you examine the edentulous area radiographically before fabrication of any fixed dental prosthesis ?	Yes	No
34	Do you examine the remote area radiographically ?	Yes	No
35	Do you adjust the over-erupted teeth to the normal occlusal plane before starting any fixed prosthodontic treatment ?	Yes	No
36	Do you make the shade matching under more than one type of light ?	yes	No
37	Do you use the shade guide which matches the porcelain used by the dental laboratory ?	Yes	No
38	Do you make the shade matching before teeth preparation ?	Yes	No
39	Do you request your patient to eliminate all distractions prior to performing teeth matching ?	Yes	No
40	Do you clean the teeth to remove plaque & stains before attempting to match a shade ?	Yes	No
41	Do you come closer than 25 cm from the patient teeth while performing the teeth shade selection ?	Yes	No
42	Do you ask the patient to seat in an upright position with the mouth at your eye level while performing shade selection ?	Yes	No
43	Do you position yourself between the patient & light source during shade selection ?	Yes	No

44	Do you take more than 1 minute (without resting your eyes) to perform the shade selection?	Yes	No
45	Do you advise your patient to replace the missing teeth as soon as possible ?	Yes	No
46	Do you control saliva & water introduced during fixed prosthodontic procedures ?	Yes	No
47	Do you recommend porcelain occlusion to oppose natural teeth ?	Yes	No
48	Do you make porcelain surface treatment (glazing or polishing) after the desired contours & occlusion have been achieved ?	Yes	No
49	Do you use un-modified zinc oxide eugenol cement for temporary cementation ?	Yes	No
50	Do you use zinc polycarboxylate cement for cementation of long-span bridges ?	Yes	No
51	Do you communicate with the dental laboratory technician with written prescriptions only ?	yes	no
52	Do you communicate with the dental laboratory technicians with verbal communication only ?	Yes	No
53	Do you communicate with the dental laboratory technicians with both written prescriptions & verbal communication ?	Yes	No

RESULTS:

The distribution of questionnaire was done among 162 participants, but only 158 of them filled the questionnaire (The rate of response 97.5%). Table 1 shows the male-female distribution of the participants. Approximately, 153 (96.8%) performed clinical examination for the edentulous ridge before the initiation of any fixed prosthodontic treatment procedure. It has been found that about 139 (87.9%) of the participants examined the edentulous area radiographically before fabrication of any fixed dental prosthesis, and 136 (86.1%) performed the examination of the remote area radiographically. About 141 (89.3%) of dental students and dental interns always fabricated diagnostic casts before commencing any fixed prosthodontic treatment. 151 (95.5%) of dental students and dental interns took preoperative diagnostic radiographs for the evaluation of the proposed abutment teeth. Approximately 147 (93.1%) of the participants performed vitality test for restored abutment teeth before commencing any fixed prosthodontic treatment (pre-treatment vitality tests). Almost all the respondents 154 (97.4%) reported that they adjust the over-erupted teeth to the normal occlusal plane before starting any fixed prosthodontic treatment procedure. Almost all of the respondents reported that they advise their patients to replace the missing natural teeth as soon as possible. Majority of respondents 150 (94.9%) were using high-speed handpieces, 25 (15.8%) were using low speed for the preparation of teeth to receive fixed dental restorations. The diamond abrasive stones were used for teeth preparation by about 118 (74.6%) of the respondents, while only 58 (36.7%) were using carbide burs during tooth preparation. About 148 (93.6%) of the respondents used air-water cooling with high speed handpiece during teeth preparation to receive cast fixed restorations, and about 155 (98.1%) controlled saliva & water introduced during fixed prosthodontic treatment procedures. Regarding the shade matching, 149 (94.3%) made the shade selection under more than one type of light using the shade guide that matched the porcelain their technicians is using. About 147 (93.1%) of them made the shade matching before teeth reduction. 146 (92.4%) asked the patients for removal of all distractions prior to performing shade selection, 148 (93.6%) cleaned the teeth to remove plaque & stains before attempting to match a tooth shade, only 2 (1.3%) reported that they come closer than 25 cm from the patient teeth while performing the teeth shade selection. 137 (86.7%) of the respondents positioned themselves between the patient & light source during shade selection, & 149 (94.3%) stated that they take more than 1 minute (without resting their eyes) to perform the shade matching. The most commonly used impression material by the participants was condensation silicone 126 (79.7%) as shown in table 2. In the present study, only 21 (13.3%) of the participating dental students reported that they are using alginate impression material for making final impression. 121 (76.5%) used Putty

and wash techniques, 120 (75.9%) who used single step, & 49 (31.1%) from dental student and dental intern used Monophase elastomeric impression material. 151 (95.5%)of the respondents were using stock trays, 135 (85.4%) were using Special trays and 80 (50.6%) used both of them to make a final impression for fixed prosthodontic patients. Most of dental student and dental intern 142 (89.8%) are using bite registrations when restoring many missing teeth. 102 (64.5%)of the respondents utilized Silicon for inter-occlusal records, 145 (91.7%) utilized wax, & 104 (65.8%) used both wax and silicone. 144 (91.1%) of participants utilized gingival tissue retraction cord to displace the gingival tissues laterally prior to final impression making. 141 (89.2%) of the participants gave provisional restorations after completing the teeth reduction, while a cast fixed restoration is being fabricated. 140 (88.6%) of the participating dental students performed impression disinfection after removing it from the oral cavity but before transferring it to the lab technician. before pouring it or sending it to the dental laboratory. Almost all the dental students & interns 153 (96.8%) reported that they made try-in for the fixed dental prostheses instead of direct delivery to the patient. 144 (91.1%) of them did not recommend the saddle pontic design for replacement of missing natural teeth, while only 3 (1.9%) recommended pressure contact between the pontic & the underlying tissue. 139 (87.9%) recommended sanitary pontic for replacement of mandibular posterior teeth, and 153 (96.8%) recommended the modified ridge-lap pontic design for restoration of multiple missing natural teeth in the visible area of the mouth. Approximately 150 (94.9%) did not recommend porcelain occlusion to oppose natural teeth, & about 145 (91.7%) made porcelain surface treatment (glazing or polishing) after the occlusion & desired contours have been established. Regarding the temporary cementation, 143 (90.5%) used un-modified zinc eugenol cement. Only 50 (31.7%) of the participants used zinc polycarboxylate cement for cementation of long-span bridges. About 148 (93.6%) of the responding dental students and dental interns communicated with the dental laboratory technicians with both written prescriptions & verbal communication while only 9 (5.6%) provide only written instructions, & 3 (1.8%) used only verbal communication.

Table 1. Demographic characteristics of participating dental students & interns (N =158).

demographics	N	
Gender	Male 39 (24.7%)	
	Female 119 (75.3%)	
Age	22-26years	

Table 2: Response rate of the participants on different variables evaluated.

S.n	Variables	Yes N (%)	No N (%)
1	Do you assess the abutment teeth radiographically prior to starting any fixed prosthodontic treatment ?	151 (95.5%)	7 (4.5%)
2	Do you fabricate diagnostic casts before starting any fixed prosthodontic treatment ?	141 (89.3%)	17 (10.7%)
3	Do you perform vitality test for restored abutment teeth before starting any fixed prosthodontic treatment ?	147 (93.1%)	11 (6.9%)
4	Do you use high speed handpiece for teeth reduction to accept fixed dental restorations ?	150 (94.9%)	8 (5.1%)
5	Do you use low speed handpiece for teeth reduction to accept fixed dental restorations ?	25 (15.8%)	133 (84.2%)
6	Do you use diamond abrasive stones for preparation of the abutment teeth ?	118 (74.6%)	40 (25.4%)
7	Do you use carbide burs for preparation of the abutment teeth ?	58 (36.7%)	100 (63.3%)
8	Do you use air-water cooling with high speed handpiece during to preparation to receive cast fixed restoration ?	148 (93.6%)	10 (6.4%)

9	Do you utilize retraction cord for gingival tissue displacement prior to impression making ?	144 (91.1%)	14 (8.9%)
10	Do you use alginate impression material for making the final impression ?	21 (13.3%)	137 (86.7%)
11	Do you utilize condensation silicon impression material for taking crown & bridge impressions ?	126 (79.7%)	32 (20.3%)
12	Do you use additional cured silicon for making the final impression ?	135 (85.4%)	23 (14.6%)
13	Do you use stock impression tray for making the fixed prosthodontic final impression ?	151 (95.5%)	7 (4.5%)
14	Do you use custom-made impression tray for making the fixed prosthodontic final impression ?	135 (85.4%)	23 (14.6%)
15	Do you use both of stock & custom-made impression trays for making the fixed prosthodontic final impression ?	80 (50.6%)	78 (49.4%)
16	If you are using rubber based impression materials, Are you using putty/wash impression technique- Double mix one step ?	120 (75.9%)	38 (24.1%)
17	If you are using rubber based impression materials, Are you using putty/wash impression technique- Double mix two steps ?	121 (76.5%)	37 (23.5%)
18	If you are using rubber based impression materials, Are you using one mix single step ?	49 (31.1%)	109 (68.9%)
19	Do you disinfect dental impressions before transferring them to the lab technician ? ?	140 (88.6%)	18 (11.4%)
20	Do you make bite registration for the replacement of multiple missing teeth ?	142 (89.8%)	16 (10.2%)
21	Do you use dental wax for making inter-occlusal records ?	145 (91.7%)	13 (8.3%)
22	Do you use silicon for making inter-occlusal records ?	102 (64.5%)	56 (35.5%)
23	Do you use both of wax & silicon for making inter-occlusal records ?	104 (65.8%)	54 (34.2%)
24	Do you make provisional fixed restorations after completing teeth reduction, while a cast restoration is being fabricated ?	141 (89.2%)	17 (10.8%)
25	Are you chemically disinfecting the impression after removal from the oral cavity but before pouring or sending to the lab technician ?	140 (88.6%)	18 (11.4%)
26	Do you make try-in for the fixed dental prostheses instead of direct delivery ?	153 (96.8%)	5 (3.2%)
27	Do you recommend the saddle pontic for replacement of missing teeth ?	14 (8.9%)	144 (91.1%)
28	Do you recommend pressure contact between the pontic & the underlying tissue ?	155 (98.1%)	3 (1.9%)
29	Do you recommend sanitary pontic for replacement of mandibular posterior teeth ?	139 (87.9%)	19 (12.1%)
30	Do you recommend the modified ridge-lap pontic for restoring teeth in the appearance zone ?	153 (96.8%)	5 (3.2%)
31	Do you examine the residual ridge area prior to construction of any fixed dental prosthesis ?	153 (96.8)	5 (3.2%)
32	Do you recommend conical pontic for replacement of missing teeth in patients with broad	11 (6.9%)	147

	residual ridge ?		(93.1%)
33	Do you examine the edentulous area radiographically before fabrication of any fixed dental prosthesis ?	139 (87.9%)	19 (12.1%)
34	Do you examine the remote area radiographically ?	136 (86.1%)	22 (13.9%)
35	Do you adjust the over-erupted teeth to the normal occlusal plane before starting any fixed prosthodontic treatment ?	154 (97.4%)	4 (2.6%)
36	Do you make the shade matching under more than one type of light ?	149 (94.3%)	9 (5.7%)
37	Do you use the shade guide which matches the porcelain used by the dental laboratory ?	149 (94.3%)	9 (5.7%)
38	Do you make the shade matching before teeth preparation ?	147 (93.1%)	11 (6.9%)
39	Do you request your patient to eliminate all distractions prior to performing teeth matching ?	146 (92.4%)	12 (7.6%)
40	Do you clean the teeth to remove plaque & stains before attempting to match a shade ?	148 (93.6%)	10 (6.4%)
41	Do you come closer than 25 cm from the patient teeth while performing the teeth shade selection ?	156 (98.7%)	2 (1.3%)
42	Do you ask the patient to seat in an upright position with the mouth at your eye level while performing shade selection ?	149 (94.3%)	9 (5.7%)
43	Do you position yourself between the patient & light source during shade selection ?	137 (86.7%)	21 (13.3%)
44	Do you take more than 1 minute (without resting your eyes) to perform the shade selection?	149 (94.3%)	9 (5.7%)
45	Do you advise your patient to replace the missing teeth as soon as possible ?	151 (95.5%)	7 (4.5%)
46	Do you control saliva & water introduced during fixed prosthodontic procedures ?	155 (98.1%)	3 (1.9%)
47	Do you recommend porcelain occlusion to oppose natural teeth ?	8 (5.1%)	150 (94.9%)
48	Do you make porcelain surface treatment (glazing or polishing) after the desired contours & occlusion have been achieved ?	145 (91.7%)	13 (8.3%)
49	Do you use un-modified zinc oxide eugenol cement for temporary cementation ?	143 (90.5%)	15 (9.5%)
50	Do you use zinc polycarboxylate cement for cementation of long-span bridges ?	50 (31.7%)	108 (68.3%)
51	Do you communicate with the dental laboratory technicians with written prescriptions only ?	9 (5.6%)	149 (94.4%)
52	Do you communicate with the dental laboratory technicians with verbal communication only ?	3 (1.8%)	155 (98.2%)
53	Do you communicate with the dental laboratory technicians with both written prescriptions & verbal communication ?	148 (93.6%)	10 (6.4%)

DISCUSSION:

The present survey was conducted to evaluate awareness & practice of crown & bridge prosthodontics among clinical dental students and dental interns of Omer-Almukhtar University, Libya. Accurate examination of both the soft and hard oral tissues of the patient must be first made. Thus to obtain a comprehensive diagnosis in the particular area of fixed prosthodontics, the dentist should first recognize & identify the abnormal conditions present in the stomatognathic system. Approximately, 153 (96.8%) performed clinical examination for the edentulous ridge before the initiation of any fixed prosthodontic treatment procedure. Radiographic examination is an integral part of the diagnosis process as it provides the dental practitioner with informations which help to correlate all of the facts & data that have been gathered from other channels . The following are detected radiographically in the examination of the edentulous ridge: 1) Remaining roots. 2) Residual infection. 3) Any lesion. It is important to be detected since cemented bridge might interfere with surgical interference with the necessity of bridge removal. It has been found that about 139 (87.9%) of the participants examined the edentulous area radiographically before fabrication of any fixed dental prosthesis. It is necessary to consider examination of remote areas in order to detect any existing slow growing infection (e.g cyst) which might affect the final prognosis of the bridge by encroaching on any of the abutments. In the current study, 136 (86.1%) performed the examination of the remote area radiographically. It is very important to transfer appropriate diagnostic casts to a semi-adjustable articulator for proper diagnosis & successful treatment planning in fixed prosthodontics. For successful crown & bridge restorations, the abutment teeth must be properly assessed. In the current study 141 (89.3%) of the respondents constructed diagnostic casts before initiating any fixed prosthodontic case. 151 (95.5%) of dental students and dental interns made intra-oral radiographic films to assess the proposed abutment teeth. Approximately 147 (93.1%) of the participants performed pre-treatment vitality tests for restored abutment teeth prior to commencing any fixed prosthodontic treatment. The diagnostic cast is helpful in gauging of the amount of tooth over-eruption..

Over-erupted teeth should be adjusted to the normal occlusal plane so that the dentition can be restored to complete function & free of interferences, . In severely over-erupted opposing teeth, intentional endodontic therapy might be necessary to allow adequate reduction to adjust the plane of occlusion. Almost all the respondents 154 (97.4%) reported that they adjust the over-erupted teeth to the normal occlusal plane before starting any fixed prosthodontic treatment procedure. Almost all of the respondents reported that they advise their patients to replace the missing natural teeth as soon as possible. Majority of respondents 150 (94.9%) were using high-speed handpieces, 25 (15.8%) were using low speed for the preparation of teeth to receive fixed dental restorations. The diamond abrasive stones were used for teeth preparation by about 118 (74.6%) of the respondents, while only 58 (36.7%) were using carbide burs during tooth preparation. About 148 (93.6%) of the respondents used air-water cooling with high speed handpiece during teeth preparation to receive cast fixed restorations.

To execute fixed prosthodontic treatment procedures accurately in the oral cavity, the fluids must be controlled. For the patient comfort & safety, and for the operator access & clear visibility, saliva, as well as water introduced during instrumentation, must be removed from the mouth. About 155 (98.1%) controlled saliva & water introduced during fixed prosthodontic treatment procedures. Metamerism is the phenomenon of an object appearing to be different colors when viewed under different light sources. Two colors appear to be matching under a certain lighting condition, but when the lighting condition is changed, the metamers no longer match, for this reason any shade should be matched under more than one type of light to overcome the problem of metamerism. For example : A natural tooth & restorative material shade guide are identical under the dental operating spot light, & the same metameric pair may no longer cross match in out-door day light or business office fluorescent lighting. Regarding the shade matching, 149 (94.3%) made the shade selection under more than one type of light using the shade guide which matched the porcelain their technicians is using. For successful color selection, the shade matching must be performed before reduction of the tooth to be taken as abutment. Not only can teeth become dehydrated & change color during preparation, but the debris generated in the form of enamel, metal , & cement grindings can coat everything in the mouth. About 147 (93.1%) of them made the shade matching prior to preparation of the teeth to be restored. A good suggestion would be to select the shade in the diagnostic appointment after the decision for a ceramic restoration is reached. The shade selection should never be postponed to the end of the tooth preparation

appointment. Because the eye will be fatigued as a result of concentrated focusing required for the reduction of abutment teeth.. Any distraction factor which disturbs the eye from the intended focus of attention on the teeth should be eliminated. Ask the patient to remove all distractions before attempting to match a shade. About 146 (92.4%) asked the patients to remove all distractions before starting to select the appropriate color. The true color characteristics & the appearance of depth & translucency in a natural tooth cannot be correctly perceived unless the tooth is free from plaque & surface stains.. Oral prophylaxis should be done & then rinse the mouth to eliminate any traces of the prophylactic paste; otherwise, the prophylaxis will do more harm than good. Approximately 148 (93.6%) cleaned the teeth to remove plaque & stains before attempting to match a tooth shade. The novice dentists are under the impression that coming closer while performing the selection will enhance vision. The close-up view is very treacherous & should be avoided. The distant view increases the ability to discriminate color & it also increases the ability to values . A viewing working distance of approximately 25 cm should be adopted. only 2 (1.3%) reported that they come closer than 25 cm from the patient teeth while performing the teeth shade selection. For successful shade selection, the operator position should be between the patient & the light source. About 137 (86.7%) of the respondents positioned themselves between the patient & light source during shade selection. The human eye fatigues very quickly to continuous color perception & becomes color blind . The first choice is usually the best choice. The eye should be rested by looking on blue-gray surface for some time so that balance happens to all color sensors of the retina by resensitizing the eye to the yellow shades of human teeth. In this study 149 (94.3%) of the respondents stated that they take more than 1 minute (without resting their eyes) to perform the shade matching.

Table 2 shows that Condensation silicon impression were the most commonly utilized by the majority of participating dental students & interns 126 (79.7%) as shown in table 2. The advantages of condensation silicone impression material: 1) It is available in all viscosities (putty-heavy-medium-light) allowing a variety of impression techniques to be used. 2) It is easy to mix & to handle. 3) Having reasonable tear strength but lower than polysulfide. 4) Relatively short setting time (6 – 8 minutes). The disadvantages of condensation silicone: 1) Poor dimensional stability owing to the by-product therefore its pouring should not be delayed. To overcome this the putty-wash impression technique is used so that the impression pouring could be delayed for up to several hours. 2) It is hydrophobic in nature, poor wetting characteristics, so the gingival sulci must be free of moisture. Addition silicone impression material is supplied as two paste tubes (paste & catalyst), mixing two equal amounts of the base & catalyst results in an addition polymerization reaction with no by-product. The advantages of addition silicone: 1) Excellent dimensional stability (no by-product). 2) Impression pouring may be postponed up to seven days without dimensional change. 3) Easy to mix & to handle. 3) Hydrophilic brands are easier to wet the tissues & are easier to pour. Approximately (85.4%) of participants reported that they have used additional cured silicone impression material for making the final impressions. Several manufacturers of addition silicone supply the material in prepackaged cartridges . The cartridges are available in the light & medium consistencies (for syringe & tray) . These cartridges are placed into a gun-like device into which a disposable mixing tip is attached . The disposable mixing tip contains spirals which force the base & catalyst to be folded over each other, & will become automatically mixed when they are extruded to the tip . In the present study, only 21 (13.3%) of the participating dental students reported that they are using alginate impression material for making final impression. The disadvantages of alginate: 1) It undergoes synersis & imbibition therefore it is dimensionally unstable. 2) It has low tear strength. 3) It has poor flow, thus it cannot record fine details. 121 (76.5%) used Putty and wash techniques, 120 (75.9%) who used single step, & 49 (31.1%) from dental student and dental intern used Monophase elastomeric impression material. The single-mix impression technique uses a single viscosity always in a custom tray e.g. regular (medium) body of polyether (only one mix is used to load the syringe & fill the tray). Double-mix one step impression technique is usually used with two different viscosities of the same impression material e.g. light & heavy body of either polysulfide, condensation silicone, or addition silicone. Both stock & custom trays may be used for taking the impression, however utilizing a custom impression tray is more recommended. Double-mix two step (putty/reline) impression technique is usually used with the putty & light bodies of the same impression material e.g. condensation silicone & addition silicone . Because of putty viscosity a stock impression tray is always used Here a primary impression is made with a stock tray & a final impression is made using the primary impression as the custom tray.

Stock impression trays are off the shelf trays either metallic or plastic usually perforated, supplied either for sectional or for full arch . Their advantages: 1) They are time conserving eliminating the need for fabrication of a special tray. Their disadvantages: 1) They consume more impression material. 2) They require sterilization. About 151 (95.5%)of the respondents were using stock trays, 135 (85.4%) were using Special trays and 80 (50.6%) were using special as well as stock tray to make a final impression for fixed prosthodontic patients. The custom impression trays have the following advantages: They limit the impression material volume to a thin section (2-4mm), thus reducing the stresses induced from polymerization shrinkage & thermal contraction of the tray. This leads to improvement in the impression accuracy.

Most of dental student and dental intern 142 (89.8%) are using bite registrations for restoring several missing teeth. 102 (64.5%)of the respondents utilized Silicon for inter-occlusal records, 145 (91.7%) utilized wax & 104 (65.8%) used both wax and silicone. 144 (91.1%) of participants utilized cords for gingival tissue displacement laterally prior to final impression making. Provisional restorations must be made to protect the prepared teeth & to make the patient comfortable while a fixed dental prosthesis is being fabricated. The prepared abutment tooth should be protected temporarily while the cast restoration is being fabricated in order to provide protection, positional stability, mastication & esthetics. 141 (89.2%) participants gave temporary restorations after completing the reduction of the abutment teeth while a cast fixed restoration is being fabricated. It is essential to prevent transmission of infection to the dental laboratory. In this study, most of the participants [140 (88.6%)] have disinfected the crown & bridge impressions before transferring them to the lab. Almost all the dental students & interns 153 (96.8%) reported that they made try-in for the fixed dental prostheses instead of direct delivery to the patient. The saddle pontic design has a concave fitting surface that overlaps the residual ridge buccolingually . This design is unclean & uncleanable (it is impossible to clean & causes tissue inflammation. It has the advantage of good esthetic, but it decreases the oral hygiene measures which leads to tissue inflammation, & therefore this pontic design should be avoided (it should not be recommended). About 144 (91.1%) of them did not recommend the saddle pontic design for replacement of missing natural teeth. To prevent ulceration & inflammation of the underlying soft tissue, pressure free contact between the pontic & the underlying tissue is indicated . There should be passive contact rather than making pressure, to stimulate bone health & decrease bone resorption. Pressure leads to tissue hyperplasia due to inability of the patient to clean under the pontic . Blanching of the soft tissue indicating pressure area which is identified by pressure indicating paste. So recontouring of the pontic until passive contact should be done . When pontic rests on mucosa, some ulcerations may appear as a result of normal movement of the mucosa & for this reason the Passive contact should be on keratinized attached tissue. Only 3 (1.9%) recommended pressure contact between the pontic & the underlying tissue. Sanitary(hygienic) pontic design It has no contact with the edentulous ridge (2mm away from the ridge), allowing easy cleaning & removal of dental plaque by permitting dental floss or super floss to enter between the edentulous ridge & the fitting surface of pontic. It is convex all around (faciolingually & mesiodistally). Approximately 139 (87.9%) recommended sanitary pontic for replacement of mandibular posterior teeth. The modified ridge lap(modified saddle) pontic overlaps the edentulous ridge on the facial surface to get the appearance of a tooth coming out from the gum but remains away from the ridge on the lingual surface to allow easy plaque removal. This type of pontic design have the features of the sanitary & saddle pontic designs (combining esthetics with easy cleaning). In this study 153 (96.8%) recommended the modified ridge-lap pontic design for restoring several missing natural teeth in the visible of the oral cavity. Dental porcelains are not the ideal restorative materials for occlusal surface of posterior teeth when opposed by natural teeth because it causes destructive enamel wear of the opposing natural teeth. Approximately 150 (94.9%) did not recommend porcelain occlusion to oppose natural teeth. The ceramic restorations should receive a surface treatment after the occlusion & the desired contours have achieved. About 145 (91.7%) made porcelain surface treatment (glazing or polishing) after achieving the desired occlusion & contour.

Regarding the temporary cementation, 143 (90.5%) used un-modified zinc eugenol cement. This cement has the following advantages: 1)It is weak cement providing easy removal & allowing the provisional restoration to be reused when additional service is needed. 2) It has sedative effect on the pulp in addition to its acceptable sealing properties. Only 50 (31.7%) of the participants used zinc polycarboxylate cement for cementation of long-span bridges. Zinc polycarboxylate cement has an extremely short working time about 2.5 minutes, which makes the cementation of a long-span bridge difficult . It

is not used for cementation of long-span bridges due to its short working time & low strength properties . About 148 (93.6%) of the responding dental students and dental interns communicated with the dental laboratory technicians with both written prescriptions & verbal communication while only 9 (5.6%) provide only written instructions, & 3 (1.8%) used only verbal communication.

With marginal variation observed in various parameters in this study, most respondents constructed diagnostic models & made diagnostic radiographs of the abutment teeth. Dental student & dental intern used the high speed hand-piece with diamond burs to prepared teeth. The Condensation cured silicon with putty-reline impression techniques were the most commonly performed for taking impressions & most of them utilized the stock trays. The majority of the participating dental students & interns utilized cords for gingival tissue displacement prior to making impression to fabricate any fixed dental prosthesis. The bite registration is an essential aspect of the successful fixed prosthodontic treatment procedures for fabricating fixed dental prostheses which occlude & function properly through relating working & opposing casts on articulator in a manner simulating that of the maxilla & mandible existing intraorally . Inaccurate inter-occlusal record will be incorporated into the whole laboratory procedure producing inaccurate inter-occlusal relationship between the finished restoration & the opposing arch. Accurate bite registration minimizes the need for intra-oral adjustments & can therefore reduce overall treatment time & cost . Wax is widely used & accepted as an inter-occlusal recording material because it is easily manipulated, but unfortunately its records are inaccurate, unstable. Wax is inconsistent because they can interfere with mandibular movements. Silicones as an inter-occlusal recording materials have the following advantages: 1) They record the fine details accurately. 2) They have high stability after setting. 3) They have minimal resistance to closure (suitable fluidity). 4) They can be used without carrier. Most respondents 142 (89.8%) utilized bite registration records for restoring several missing teeth. All the impressions must be disinfected before sending them to the dental technician to avoid spread of infection to the dental lab staff. 88.6% of the participants reported that they disinfect their impressions before transferring them to the lab, & 93.6% of the respondents communicated with both written prescriptions & verbal communication with the dental technicians. Provisional restorations were always given by 89.2% of the respondents after completion of the teeth preparation, while the fixed dental prostheses are being fabricated. It is clear that most of the participating dental students & interns in Omer-Almukhtar University showed up satisfactory awareness in this field, but continuous education programs are required to update their knowledge in crown & bridge prosthodontics.

CONCLUSION:

The awareness among the participants on the crown & bridge prosthodontic procedures was satisfactory, but care should be taken by encouraging 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. The dental students should have an updated knowledge about the advancement in restorative bio-materials , so that the patients will be benefited with recent advances.

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