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The Knowledge, Attitude and Practice of Fixed Prosthodontics: A Survey amongst Dental Practitioners in Benghazi, Libya

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Abstract: ***Aim: The aim of this study was to evaluate the knowledge, attitude and fixed prosthodontics practice guidelines amongst dental practitioners of Benghazi in Benghazi, Libya. Materials and Methods: A descriptive cross - sectional study was done amongst the Dental Practitioners of Benghazi, Libya in 2023. A total of 152 dentists were selected randomly (from public and private dental clinics and dental schools). A survey was conducted through online questionnaire composed of 20 open and 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 study showed that (82.2%) of the participants always assessed abutment tooth radiographically, also about (27%) of them fabricated study cast before starting crown and bridge procedures. The vitality test for restored abutments was always done by (31.6%) respondents, and (26.3%) of them used poly vinyl siloxane for making final impression, which provides the level of quality of final impression. About (65.1%) of them always used retraction cord before making final impression. Both written prescriptions and verbal instructions were used by (76.3%) of the practitioners for communication with the lab. Conclusion: The dental practitioners (DPs) of Benghazi 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 continuous education programs.***

Keywords: Attitude, Dental Practitioner, Fixed Prosthodontics, Knowledge and Practice

1. Introduction

Loss of teeth due to caries, periodontal pathology, trauma, and other pathologies occur widely[1]. Tooth loss can have a negative impact on facial appearance, speech, and mastication. The replacement of missing teeth by appropriately designed prostheses is in demand, and is required to maintain good health and a normal life. There are several modalities of treatment for rehabilitation of partially edentulous patients [2]. Fixed partial denture (FPD) has been the preferred prosthetic option next to dental implant [3].

Crown and bridge of good quality should be well designed and constructed. It should restore the function and promote the health of the masticatory and provide a long service life[4]. The success of these criteria are influenced by the quality of the clinical procedures, communication with the dental laboratory, and the oral condition prevailing in patient [5].

It is essential that the dental practitioner follows all the fundamental clinical guidelines for longevity of the treatment [6]. Following diagnosis and treatment planning, FPD should be fabricated with meticulous preparation of the abutment teeth, appropriate soft tissue management, precise impression recording of the prepared and unprepared surfaces of the abutment, adequate temporization, critical evaluation of fit in metal trial and proper occlusion during cementation[7].

2. Materials and Methods

A descriptive cross - sectional study was done amongst the Dental Practitioners of Benghazi, Libya in 2023. A total of 152 dentists were selected randomly (from public and private dental clinics and dental schools). A survey was conducted through online questionnaire composed of 20 open and multiple - choice questions. Questionnaire was prepared in English. The questionnaire comprised questions to assess the knowledge, attitude, and practice of fixed prosthodontics among dental practitioners (DP's) of Benghazi, which is adapted to Kannan *et al*[3]. The questionnaire was semi - structured and pre - tested to check the validity and reliability. All the respondents were informed about the aims and objectives of study. After eliciting their consent in participation, the questionnaires were distributed. The questionnaires consisted of two parts. The first part measured gender, level of education, nationality, place of work and number of years of practicing experience. 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.

3. Statistical Analysis

Data from the completed questionnaires were collected and analyzed, the statistical analysis wasdone using 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 frequency statistics Chi – square test.

4. Results

A total of 152 dentists participated in the study; 112 (73.7 %) were females while 40 (26.3%) were males.147 (96.7 %) were Libyan while 5 (3.3 %) were Non - Libyan practitioners (**Table 1).**

Among 152 respondents, 19 (12.5%) were newly graduated dentists (interns) and 71 (46.7%) were general practitioners, 62 (40.8%) were specialist.57 (37.5%) of dentists were practicing crown and bridge for 1 - 5years, 22 (14.5%) of dentists were practicing crown and bridge for 5 - 10 years, 30 (19.7%) of dentist were practicing 10 - 15 years while 43 (28.3%) of them were practicing for more than 16 years. (**Table 1).** Most of respondents 53 (34.9%) worked in More than one place, While, 46 (30.3%) of respondents worked in dental schools and 44 (28.9%) in private clinics and 9 (5.9%) dentists worked in governmental hospitals (**Table 1) (Figure 1).**

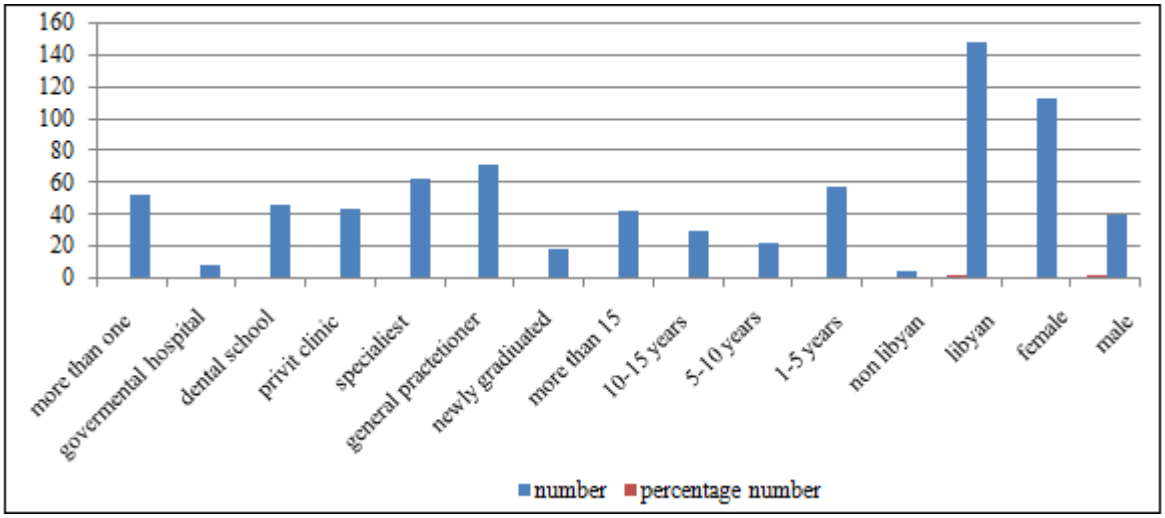

Figure 1: Demographic structure of sample

Table 1: Demographic structure of sample

	No	Percentage %
1 - Gender		
Female	112	73.70%
Male	40	26.30%
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Libyan	147	96.70%
Non Libyan	5	3.30%
3 - Year of practice		
1 1 - 5 years	57	37.50%
sraey10 - 5	22	14.50%
10 - 15years	30	19.70%
More than 16 years	43	28.30%
noitacude leveL - 4		
Newly graduated	19	12.50%
General practitioners	71	46.70%
Specialist	62	40.80%
5 - Place of work		
Private clinics	44	28.90%
Dental schools	46	30.30%
Governmental hospital	9	5.90%
More than one option	53	34.90%

(27.0%) of participants fabricated study models before commencing fixed prosthodontics treatment and (23.0%) them rarely fabricated it and (39.5%) of participants answered that they often fabricate study models and (10.5 %) of participants starts treatment without study models (**Table 2).** There is a significant differences regarding study cast fabrication as P < 0.05. (82.2%) of participants always used radio graphs for abutment tooth evaluation (10.5%) of them used it often and (4.6%) never used any radio graph, (2.6%) rarely used radio graphs before starting treatment (**Table 1**). Vitality tests for restored abutments were performed always by (31.6%), respondents, often by (30.9%) never respondents, by (13.2%) rare respondents (24.3%) (**Table 2**).

The majority of respondents, (59.2%) used high - speed hand pieces during preparation, whereas (2.0%) used low speed, (38.8%) respondents used both high and low speed, there is a significant variation regarding using different speed hand pieces as p<0.05. The diamond burs were utilized much more (64.4%) than carbide during preparation (**Table 2**), there is a significant variation regarding using different Types of burs in preparation as p<0.05 (65.8%) of practitioners utilized Condensation cured silicon to generate final impressions, followed by (26.3%) of practitioners, who used additional cured silicon, and (4.6%) of practitioners, who preferred utilizing alginate, while (3.3%) of practitioners used alternative materials For this point of view different educational levels also had a significant differences as p<0.05.

(24.3%) of respondents liked to utilize both special and stock trays in their practice, while (52.0%) of respondents chose to use stock trays (**Table 2**).

Dentists (5.3%) who utilize elastomeric impression material primarily employ the One Mix Single step, whereas (18.4%) use wash technique double mix One step, (73.0%) employed the Putty /wash technique double mix two steps. The majority of respondents, (69.1%) always took bite registration for multiple teeth replacements, only (3.9%) never and (5.3%) rarely did so. For bite registration, (50%) of participants used wax, (24.3%) of participants used wax and silicon, and (18.4%) of participants used silicone alone.

(**Table 2**). Before making a final impression, inquire about retractor cord usage. (4.6%) of the respondents never utilized retraction cords, while (65.1%) always did. While (5.9%) of practitioners never provided a temporary crown and bridge, (59.9%) of practitioners always provided a temporary restoration. Before creating the cast and submitting it to the lab, (85.5%). of responders chemically disinfected the final impression, while (0.7%) did not (**Table 2**). (76.3%) of respondents reported that they communicated with the lab both verbally and in writing, while (20.4%) solely provided written instructions (**Table 2**). (77.0%) of practitioners always do try - in for restoration instead direct insertion, (19.1%) often, (2.6%) rare, and (1.3%) never do.

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

	Newly graduated dentists (interns)	General practitioners	Specialist	Total (n%)	Significance
6 - Do you make study cast?					
Always	63.20%	19.70%	24.20%	27.00%	X2=21.413
Often	31.60%	43.70%	37.10%	39.50%	P=0.002
Rare	0.00%	21.10%	32.30%	23.00%	
Never	5.30%	15.50%	6.50%	10.50%	
7 - Do you take a preoperative radiography for the abutment tooth (teeth)?					
Always	84.20%	81.70%	82.30%	82.20%	
Often	10.50%	9.90%	11.30%	10.50%	X2=1.553
Rare	0.00%	4.20%	1.60%	2.60%	P= 0.956
Never	5.30%	4.20%	4.80%	4.60%	
8 - Do you do vitality test for restored abutment?					
Always	36.80%	26.80%	35.50%	31.60%	X2=3.324
Often	26.30%	32.40%	30.60%	30.90%	P= 0.767
Rare	15.80%	28.20%	22.60%	24.30%	
Never	21.10%	12.70%	11.30%	13.20%	
9 - Which type of headpiece do you use in the preparation?					
High speed	68.40%	67.60%	46.00%	59.20%	X2=10.901
Low speed	5.30%	2.80%	%0.00	2.00%	P= 0.028
Both of them	26.30%	29.60%	53.20%	38.80%	
10 - Types of burs you usually use?					
Carbide bur	0.00%	2.80%	1.60%	2.00%	X2=155.11
Diamond bur	73.60%	66.10%	59.60%	64.40%	P= 0.001
Carbide and diamond burs	62.30%	30.90%	38.70%	33.50%	
11 - Which type of impression material do you often use for the final impression?					
Alginate	10.50%	4.20%	3.20%	4.60%	X2=.15.238
Condensation cured silicon	84.20%	56.30%	7.10%	65.80%	P= 0.018
Additional cured silicon	5.30%	38.00%	19.40%	26.30%	
Others	0.00%	1.40%	6.50%	3.30%	
12 - Which type of impression tray do you use for final impression?					
Stock trays	57.90%	56.30%	45.20%	52.00%	X2=.2.726
Special trays	21.10%	23.90%	24.20%	23.70%	P= 0.605
Both of them	21.10%	19.70%	30.60%	24.30%	
13 - If you use elastomeric impression materials, Which type of impression techniques do you use?					
Putty /wash technique double mix One step	31.60%	15.50%	17.70%	18.40%	X2=.4.462
Putty /wash technique double mix two steps	68.40%	73.20%	74.20%	73.00%	P= 0.614
One mix Single step	0.00%	7.00%	4.80%	%5.30	
Other	0.00%	4.20%	3.20%	3.30%	
14 - Do you do interocclusal records (bite) for multiple teeth replacement?					
Always	73.70%	60.60%	77.40%	69.10%	X2=.5.657
Often	21.10%	28.20%	14.50%	21.70%	P=0.463
Rare	5.30%	5.60%	4.80%	%5.30	
Never	0.00%	5.60%	3.20%	3.90%	
15 - If yes, which material do you use?					
Wax	47.40%	66.20%	42.10%	50%	X2=.9.039
Silicon	31.60%	13.80%	22.80%	18.40%	P=0.060
Wax and Silicon	21.10%	20.00%	35.10%	24.30%	
16 - Do you use retracting cord for soft tissue displacement before you take the impression?					
Always	63.20%	69.00%	61.30%	65.10%	X2=3.212
Often	31.60%	21.10%	29.00%	25.70%	P= 0.782

Rare	5.30%	5.60%	3.20%	4.60%	
Never	0.00%	4.20%	6.50%	4.60%	
17 - Do you do Provisional or temporary crown or bridge after finishing the preparation?					
Always	78.90%	54.90%	59.70%	59.90%	X2=7.479 P= 0.279
Often	15.80%	38.00%	27.40%	30.90%	
Rare	5.30%	2.80%	3.20%	3.30%	
Never	0.00%	4.20%	9.70%	5.90%	
18 - 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	89.50%	87.30%	82.30%	85.50%	X2=4.354 P=0.629
Often	10.50%	8.50%	9.70%	9.20%	
Rare	0.00%	2.80%	8.10%	4.60%	
Never	0.00%	1.40%	0.00%	0.70%	
19 - What is your communication method with the dental technician?					
Written prescriptions	15.80%	18.30%	24.20%	20.40%	X2=5.032 P=0.540
Verbal communications	0.00%	1.40%	3.20%	2.00%	
Both written prescriptions and verbal communications	78.90%	78.90%	72.60%	76.30%	
Other	5.30%	1.40%	0.00%	1.30%	
20 - Do you usually do try - in for restoration instead direct insertion					
Always	73.70%	77.50%	77.40%	77.00%	X2=1.144 P=0.980
Often	21.10%	18.30%	19.40%	19.10%	
Rare	5.30%	2.80%	1.60%	2.60%	
never	0.00%	1.40%	1.60%	1.30%	

5. Discussion

This cross - sectional study was used to assess knowledge, attitude and fixed prosthodontics practice among Dental Practitioners in Benghazi, Libya. The use of study cast is essential for proper diagnosis and treatment planning before starting any treatment for fixed prosthesis case[8]. And the fabrication of study model is also considered an integral part of evaluation of abutment teeth before deciding to start any fixed treatment[9]. The results of this survey showed that study models were often fabricated by most of the participants before initiating the treatment (39.5%). While (27%) of participant considered it as routinely steps before starting their treatment. (23%) rarely fabricate a study cast and (10.5%) starting their treatment without fabrication of study model. The difference was statistically significant considered ($p < 0.05$). Participants also surveyed about taking radiographs for the abutment evaluation before treatment planning and the result showed that the majority (82.2%) always takes radiographs for the abutment and (2.65%) rarely take radiographs. One of the questions of this survey was about either to do a vitality test of the abutment teeth before preparation participants always do the vitality test about (31.6%). Some of them are often to do or rarely to do vitality test (30.9% and 24.3% respectively) but about (13.2 %) are never performed vitality test for the abutments.

The result was different form another study done in Saudi - Arabia by Alharbi, *et al.*[10]where found that majority of their respondents always fabricate the study model before starting their fixed treatment about (64%.) In contrast, a study by Moldi E *et al*. found that (29%) practitioners do not take diagnostic impressions and proceeded with the tooth preparation after the clinical intraoral examination[11]. Majority of the surveyed practitioners rarely used study casts (38.1%) and (35.6%) are rarely used the radio - graphical examination of the abutments and (46%) of surveyed never used vitality test for abutment teeth. A study done by Mohamed AB *et al.1*[2] has almost close result of present study that (37.2%) fabricated study models routinely before starting treatment and (78.3%) of participants always used radiographs for abutment tooth evaluation and Vitality test for restored abutments were always done by (45.5%) respondents by Alhoumaidan*etal*[13]. Rthi *et al* did similar study in Nepal 2021; the survey showed that most of participants (36%) fabricated study models routinely before starting treatment. (76%) of participants always used radiographs for abutment tooth evaluation. Vitality test for restored abutments were always done by (46%) respondents.[14]

In this study (59.2%) of the DPs using high speed for the tooth preparation and (38.8%) using low speed headpiece, while only (2%) of participants using both high and low speed headpiece. The result was statistically significant. Regarding the burs, the majority of participants used Diamond burs about (64.4%) more than using carbide burs for abutment preparation, there is a significant variation regarding using different Types of burs in preparation as $p<0.05$. In comparison with Alharbi, *et al.*[10] were (53%) of the DPs used both carbide and diamond burs for tooth preparation. A survey conducted in North American dental schools regarding recommendations for rotary instrumentation for fixed prosthodontic and operative procedures at the predoctoral and postgraduate level. Completed surveys were received from 58 of 64 dental schools, a response rate (>90%). Medium grit burs predominated in predoctoral education for gross tooth reduction for fixed prosthodontics, whereas coarse grit burs predominated at the graduate level ($p< 0.05$). The use of the diamond bur alone predominated for axial wall refinement, whereas the use of carbide burs or carbide burs in combination with diamond burs prevails for marginal refinement ($p<0.05$). In predoctoral operative dentistry,

recommendations for cavity outline form were similar at all dental schools (p >0.05) and were principally tungsten carbide (WC) burs. Carbide burs were the instrument of choice for internal walls, but the WC bur alone or in combination with diamond burs were preferred for refining composite margins (p <.05) [15.]

In this survey most of dentist were using stock trays for final impression (52%) while (24.3%) using both special and stock trays for final impressions. And the most common final impression materials used by participants were condensation silicon (65.8%). Some are preferred to use additional condensation for final impression about (26.3%) followed by alginate (4.6%) or alternative impression materials about (3.3%). The level of education make the result is statistically significant. Mohamed AB *et al.*[12]study revealed that additional cured silicon was mostly used, (38.3%) for making final impression followed by condensation cured silicon, (26.9%) and (20.3%) preferred to make final impression using alginate, the results of study done in Maharashtra state (2016); (43%) of participants used irreversible hydrocolloid, (26%) used Condensation silicone, (23%) used addition silicone, (5%) use polyether, (2%) uses polysulfide impression material[16]. Another study conducted in India (2013), they found that (55.46%) use irreversible hydrocolloid and (44.54%) use elastomeric impression materials to make final impression[11]and compared to Alharbi et al.[10] the study revealed that additional cured silicon was mostly used (76%) for making final impression followed by condensation cured silicon, (13%) and (5%) preferred to make final impression using alginate, while the result of Nepal 2021 by Rthi *et al*. study revealed that addition silicon impression material was mostly used (44%) for making final impression followed by condensation cured silicon, (32%) and (40%) preferred to make final impression using alginate.[14]

Regarding type of Impression technique used for final impression, Putty and wash technique double mix two steps were mostly used by dentist who used this technique (73.0%) in present study. Among the impression techniques used in the dental clinic, putty wash technique seems to have superior accuracy than the other multiple mix and single mix. Because the putty wash technique compensates for dimensional changes on setting [4]. The results from other study, the one - step technique was less accurate (significantly different) than the two - step and modified two - step techniques and the latter techniques produced the best results in terms of dimensional accuracy[17.] Based on the observation of the present study, two - step putty - wash technique with 1 and 2 mm spacer thickness is more acceptable and viable alternative to obtain accurate impressions [18]. Hung *et al* and Idris *et al* investigated the importance of impression techniques and reported that impression accuracy is not technique dependent [19, 20].

An accurate interocclusal record minimizes the need for intraoral adjustments during prosthesis insertion. They are essential in providing high - quality restoration and reducing treatment time and cost[21]. Dwivedi *et al*. The aim of their study was to evaluate and compare the accuracy and the three dimensional stability offered by three different types of interocclusal recording materials, their result showed that Polyvinylsiloxane or addition silicone was more accurate and more dimensionally stable interocclusal recording material than wax [22]. While in current study the majority of respondents (69.1%) always took interocclusal records (bite) for multiple teeth replacement, and wax was the most used material for bite (50%), whereas Silicon (18.4%) and (24.3%) used wax and silicone. In 2021, similar study conducted in Nepal, they found same this study result, the wax was the most used material for bite registration (66%) [14].

For fabricating an accurate final impression, appropriate and proper reversible gingival displacement and tissue management are required with utmost care to the soft tissue for recording the proper margin with a uniform finish line and the remaining unprepared tooth surface[23]. In 2018, Gadhavi MA *et al*. evaluated from their study that (62%) of practitioners prefer the use of gingival displacement technique for successful clinical practice[24]. also in 2013, Moldi *et al*. found that (72.8%) of practitioners use gingival retraction cord[11.] In contrast, other study in Khartoum state showed that Only (9.4%) used retraction cord while (53.7%) of the surveyed dentist never applied the use retraction cord in crown and bridge practice [12]. Whereas the results of the present study revealed that (65.1%) of dentist always use retraction cord befor final impression and only (4.6%) never use retraction cord.

Provisional restorations are used in the interim between tooth preparation and fitting a definitive restoration[25]. The utilization of properly fabricated provisional prostheses will permit a higher rate of success of the definitive treatment [26.] In the current study more than half of the surveyed dentist participated (59.9%) always do provisional restoration after preparation which reveals their knowledge in standard practice guidelines and only (5.9%) never used it. Similar study done in Qassim (2019) showed that (45.5%) practitioners were routinely used provisional restorations whereas just (2.1%) never made it[13]. In other hand, A. B. Mohamed et al conducted that only (8.2%) of the surveyed dentists always used temporary crown and bridge after tooth preparation[12].

Recently, prevention of cross infection in dental practice in general and dental laboratory specifically should now be a routine practice. In 2010, A. B. Mohamed *et al.* found that (73.6%) of Sudanese Dental Practitioners never disinfect the impression before send it to the dental laboratory [12]. Whearse there are two study conducted in Saudi Arabia, they found that the majority of Qassim Prosthodontists participating routinely rinses and disinfects the impressions prior to sending them to the dental laboratory [13, 27]. Also the current survey showed that most of surveyed participants (85.5%) disinfect the final impression chemically before sending it to lab. Fabrication of a clinically successful dental prosthesis requires clear and effective communication between dentists and dental technicians. Afzal H *et al*., aim of their study was to evaluate the quality of communication between dentists and dental technicians via work authorization for fixed and removable dental prosthesis in Pakistan. The result of their study show that Poor communication between dentists and technicians was observed, as the majority of the design decisions were left to the dental technicians [28]. Another

study in Ireland revealed that lower level of communication between dental practitioners and dental technicians for fixed prosthodontics[29]. A study conducted in Qassim by Alhoumaidan, *et al*. in 2019 (72.1%) of the investigated dentist participated have acceptable communication with dental technicians[13]. Also this study reported majority of the surveyed Benghazi dentist (76.3%) communicated well with the labs by giving both written and verbal instructions.

Regarding try - in stage, it is not difficult, but a successful outcome needs as much care as the crown preparation stages. Once a restoration is cemented there is no scope for modification or repeat. You have to get it right first time[30]. According to current study, the majority of respondents (77.0%) have well knowledge and awareness by how important this step before final cementation and only (1.3%) never did it.

6. Conclusion

Within the limitation of the study it can be concluded from the present investigation that most practitioners often fabricated study models, used vitality test and took preoperative diagnostic radiographs for abutment evaluation. The condensational cured silicon; stock trays and putty and wash techniques one step were mostly used for making final impression. The majority of participates make bite registration with wax, fabricate provisional restorations and use retraction cords. The high speed hand - piece is mostly used for preparation with diamond burs and always prefer to try their abutment before final insertion. Disinfection of impression is common and communication with lab via both written and verbal instructions. So we can conclude that the dental practitioners (DP's) of Benghazi displayed an acceptable level of knowledge in fixed prosthodontic practices. However, to further improve the proficiency; efforts should be made to encourage the practitioners to be aware of the advances in fixed prosthodontic practice through continuous education programs. We recommend that more surveys should be conducted involving a greater number of dental practitioners.

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