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Original Research Paper

Awareness of microbial cross-contamination control among dentists during the fixed prosthodontic treatment at Aljabal Alakhdar region, Libya

Corresponding Author:
Dr. Shoaib Youssef Albahbah, Department of fixed prosthodontics, Faculty of dentistry, Omer-Almukthar university, Libya.

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ABSTRACT:

Background: The transmission of pathogenic micro-organisms in the fixed prosthodontic clinic may occur by injection, inhalation, ingestion, or contact with mucosa or skin. The purpose of cross-contamination control is to avoid or reduce the spread of microorganisms among the dental team & patients. There are fundamental practices which need to be strictly adhered to by fixed prosthodontists to avoid infections in their clinics. These include special disinfecting procedures, use of Personal Protective Equipment (PPE), hand hygiene and immunization, etc. Since most of the fixed prosthodontic patients in Aljabal-Alakhdar region are performing their dental healthcare in private clinics, the purpose of our survey was to assess the level of awareness, attitude, & actual practice of infection control guidelines among the participants during fixed prosthodontic treatment. **Materials and methods:** This survey was performed by the use of well-designed questionnaire. The questionnaire consists of 75 questions in different aspects of microbial cross-contamination control guidelines in fixed prosthodontic practice. Those 75 items are related to infection control knowledge & practices during fixed prosthodontic treatment procedures. The questionnaire was distributed among 103 private clinics dentists in Aljabal Alakhdar region, Libya. For each question, the number of responses received was tabulated and converted to a percentage, and then statistically analyzed. **Results:** Out of 129 dentists surveyed, 103 (79.8%) responded to the questionnaire. The rate of response was 79.8%. Females accounted for 70 (67.9%) of the sample and the remaining 33(32.1%) were male dentists. The majority of the participants have got vaccination against hepatitis B virus (82.1%). The participants have reported hand-washing before (66.3%) and after (83.2%) any fixed prosthodontic procedure. About 87.9% of the participants are wearing pair of gloves & 78.9% of them are wearing face masks during fixed prosthodontic treatment. Heat-sterilization of the contaminated dental instruments by the use of an autoclave & disposal of sharp items in puncture-resistant containers were utilized by 90.5% and 88.4%, respectively. Approximately (81.0%) have stated that they had sharp injuries emergency treatment protocols. 28.6% of the respondents utilized high-volume evacuation. Results from this survey suggest that there is very good knowledge & practice of microbial cross-contamination control.
Conclusion: The awareness & practice of cross-contamination control guidelines of the participating dentists good. Continued dental education & obligatory cross-infection control training programs are required to enhance & update the awareness and practice.

Keywords: Disinfection, Infection control, microbial cross-contamination, fixed Prosthodontists, fixed prosthodontic clinic, sterilization, Aljabal Alakhdar, Libya.

INTRODUCTION:

The dental team must have knowledge & awareness of cross-infection transmission & control procedures. Both the patients as well as the dental team can be the source of infection. Micro-organisms capable of causing disease are present in human blood. Contact with the patient blood may lead to transmission of pathogenic micro-organisms from patients to dental team & vice versa. Transmission may occur by inoculation or inhalation: 1) previously damaged skin or mucous membrane provides

a portal of entry for micro-organisms. 2) contaminated needles, sharp instruments, or flying debris from the oral cavity may penetrate the skin. 3) inhalation of contaminated aerosols is a possible route of transmission.

The purpose of microbial cross-contamination control is to stop the spread of micro-organisms. This may be accomplished in several ways: 1) use of personal barrier equipment. 2) proper handling of sharp instruments. 3) immunization of dental healthcare workers against microbial transmitted diseases, & maintenance of general good health to decrease their susceptibility to infections. 4) correct cleaning & disinfection of equipment & surfaces to eliminate infectious agents. 5) heat-sterilization of the contaminated dental instruments.

The close contact between patients and dental team and sharp instruments occurs under conditions of limited accessibility and poor visibility, during invasive fixed prosthodontic procedures which frequently cause bleeding, and in the mouth which harbours a diverse, abundant and complex pathogenic micro-organisms. This work oral environment exposes dental team to the risk of acquisition of blood-borne pathogens, including hepatitis B, hepatitis C, HIV and other potentially serious infectious diseases .

Dental laboratory technicians should be protected from cross infection because they are frequently exposed to pathogenic micro-organisms from dental impressions, stone casts, and fixed dental prostheses. Items which can become contaminated with the blood of patients are send from dental office to dental lab, & vice versa. Such fluids may contain microorganisms with high potential for transmission of several diseases. Therefore, sterilization and disinfection of all items used during fixed prosthodontic treatment should be an integral part of infection control protocol in fixed prosthodontic practice .

There is high risk of spread of many pathogenic micro-organisms during fixed prosthodontic treatment, & this shows the importance of cross-infection control as the dental healthcare workers are exposed directly or indirectly to a significant risk of acquiring healthcare-associated infections. Continuous trainings of dentists through dental education give them adequate awareness regarding the cross-contamination control measures. The aim of this survey was to assess the awareness & practice of cross-contamination control procedures among dentists during fixed prosthodontic treatment procedures at Aljabal Alakhdar region, Libya.

MATERIALS & METHODS:

This survey has been conducted for evaluation of the awareness & practice of microbial cross-contamination control on dentists during the fixed prosthodontic treatment in Aljabal Alakhdar region with the help of a questionnaire.

The questionnaire was distributed personally to dentists available locally and the results were analyzed. To keep confidentiality, the name & identity of the respondents were not requested. The questionnaire consisted of 75 close-ended "dichotomous" questions (response as "yes" or "no" & was used to collect data about many aspects of cross-contamination control awareness & practices (patient screening, personal hygiene, the utilization of PPE, hepatitis B vaccination status, etc), covering the basic infection control measures to be employed in the fixed prosthodontic clinics . The survey questionnaires were then distributed to n=285 participating dentists who work in private dental clinics in Aljabal Alakhdar region. The feedback was then gathered from the dentists & was analyzed to obtain the survey purposes. 103 usable questionnaires were collected, giving a response rate 79.8%.

Fig: 1. Questionnaire for awareness and practice of microbial cross-contamination control during fixed prosthodontic treatment.

S.n	Variables	Yes Yes	No No
1	Do you take complete medical history prior to treating patient ?	Yes	No
2	Do you perform a thorough examination of the oral soft tissues before starting any fixed prosthodontic treatment procedure ?	Yes	No
3	Do you wear disposable gloves during fixed prosthodontic diagnosis & treatment ?	Yes	No
4	Do you wear disposable face mask during examination & treatment of fixed prosthodontic patient ?	Yes	No

5	Do you change face mask & gloves for each patients or when torn ?	Yes	No
6	Do you wear protective eyewear & face shields while treating fixed prosthodontic patients ?	Yes	No
7	Do you wear clinic coat or gown while treating fixed prosthodontic patients?	Yes	No
8	Do you use disposable blood/saliva impermeable barriers(e.g. plastic wrap) to cover the light handle & controls, air-water syringe, chair switches, evacuator control, evacuation devices, bracket table, soap dispenser, & other areas in the dental clinic ?	Yes	No
9	Do you change the surface covers between patients ?	Yes	No
10	Do you clean & disinfect the dental unit between patients ?	Yes	No
11	Do you use the spray-wipe-spray technique while disinfecting the dental unit ?	Yes	No
12	Do you clean & heat sterilize the contaminated re-usable instruments before use in treating another patient ?	Yes	No
13	Do you clean, sterilize, & store the used stock metal impression tray until needed ?	Yes	No
14	Do you clean & sterilize instruments (e.g. diamond burs, mouth mirror, excavator etc) following use ?	Yes	No
15	Do you clean & heat-sterilize handpieces in an autoclave after treatment of each patient ?	Yes	No
16	Do you disinfect custom impression trays before inserting them in the patient mouth ?	Yes	No
17	Do you discard the plastic impression trays returned from the dental laboratory ?	Yes	No
18	Do you rinse & disinfect the impressions before sending them to dental laboratory ?	Yes	No
19	Do you rinse the impression before & after disinfection ?	Yes	No
20	Do you clean & disinfect the existing fixed dental prostheses before adjusting them ?	Yes	No
21	Do you disinfect prostheses prior to sending them to the lab, following placement into the oral cavity ?	Yes	No
22	Do you label all items disinfected in your clinic, stating that disinfection of these items have been performed ?	Yes	No
23	Do you disinfect prostheses coming from the lab, prior to placement in to the oral cavity ?	Yes	No
24	Do you clean & disinfect the existing FDPs again following adjustment before delivering them to the patient ?	Yes	No
25	Do you clean & chemical disinfect the dental impressions before sending them to dental laboratory ?	Yes	No
26	Do you keep your hair clear away from the face during the fixed prosthodontic treatment ?	Yes	No
27	Do you remove the jewelry from hands, arms, or facial area during fixed prosthodontic treatment ?	Yes	No
28	Do you keep your finger nails clean & short ?	Yes	No
29	Do you wash your hands with anti-microbial cleaner ?	Yes	No
30	do you use liquid soap rather than bar soap for hand washing ?	Yes	No
31	Do you advise your patient to rinse with a disinfectant solution& wear protective eyewear before the commencement of the fixed prosthodontic treatment ?	Yes	No
32	Do you disinfect the fixed prosthodontic non-sterilizable items, such as face bows, bite registration records etc. ?	Yes	No
33	Does your clinic is well-ventilated ?	Yes	No
34	Do you remove unnecessary items from the fixed prosthodontic procedure area ?	Yes	No
35	Do you preplan the materials needed during fixed prosthodontic treatment?	Yes	No
36	Do you follow the "unit-dose concept" to accomplish any dental treatment procedure prior to patient contact ?	Yes	No
37	Do you utilize disposable items whenever possible ?	Yes	No
38	Do you re-use the anaesthetic needles & cartridges, saliva ejector tips, mouth wash cups, or the patient protective bib ?	Yes	No
39	Do you use pre-arranged tray set-ups for the fixed prosthodontic treatment procedures ?	Yes	No
40	Do you determine the instruments & materials that may get contaminated during fixed prosthodontic procedures?	Yes	No
41	Do you open the drawers with contaminated gloved hands ?	Yes	No
42	Do you realize that every patient in dental clinics must be considered to have infectious disease ?	Yes	No
43	Does your clinic is divided into "clean" area & "contaminated" area ?	Yes	No
44	Do you wrap (bag) the instrument that will not be used immediately after heat sterilization ?	Yes	No
45	Do you dispose all medical waste products properly ?	Yes	No

46	Do you dispose of the used needles & other sharps in a suitable puncture-resistant container which is labelled or colour-coded ?	Yes	No
47	Do you wear rubber utility gloves while cleaning instruments or handling clinical wastes ?	Yes	No
48	Do you report sharp injuries to the member of the dental team who is responsible for follow-up ?	Yes	No
49	Do you have any objection in treating infective patients ?	Yes	No
50	Do you have specific emergency treatment protocol for sharp injuries ?	Yes	No
51	Do you utilize puncture resistant container for sharp items disposal ?	Yes	No
52	Do you have received continuing educational courses in cross-infection control ?	Yes	No
53	When you have to leave a patient during a fixed prosthodontic treatment procedure e.g. to answer the telephone or to carry out an examination on another patient, Do you wear vinyle gloves over latex gloves, & remove it on returning to the patient ?	Yes	No
54	Do you replace the face mask or gown if it becomes wet while treating a patient ?	Yes	No
55	Do you change the saliva ejector tip for each patient ?	Yes	No
56	Have you ever been hepatitis B vaccinated ?	Yes	No
57	Have you completed the minimum required dosage (three doses) of the hepatitis B vaccine needed to obtain adequate immunity ?	Yes	No
58	Did you have a booster dose of hepatitis B ?	Yes	No
59	Do you change the gloves after each patient ?	Yes	No
60	Do you change the face mask after each patient ?	Yes	No
61	Do you change the used handpiece for each patient ?	Yes	No
62	Do you flush the handpiece, ultrasonic scaler, & air-water syringe before re-use (between patients) ?	Yes	No
63	Do you change burs for each patient ?	Yes	No
64	Do you use the autoclave for sterilization of handpieces ?	Yes	No
65	Do you sterilize the handpieces & other dental equipments before sending them for repair ?	Yes	No
66	Do you clean & sterilize the ultrasonic scaler after each use ?	Yes	No
67	Do you use plastic wrappings for sterilized instruments (keeping sterile instruments in pouches) ?	Yes	No
68	Do you heat-sterilize the removable light curing tip & disinfect or cover the handle ?	Yes	No
69	Do you over-load the sterilization (autoclave) tray with instruments before heat-sterilization in the autoclave ?	Yes	No
70	Do you use rubber dam for isolation ?	Yes	No
71	Do you perform pre-cleaning disinfection, using "holding" solutions for the used contaminated instruments ?	Yes	No
72	Do you perform pre-sterilization clean for the used "contaminated" fixed prosthodontic instruments ?	Yes	No
73	Do you clean & disinfect the work surfaces between clinical sessions ?	Yes	No
74	Do you use high-volume aspiration for fluid control ?	Yes	No
75	Do you agree that the most effective method to avoid infection to the dental team is hand washing ?	Yes	No

RESULTS:

103 completed questionnaires were received from the participants. The rate of response was 79.8 % (103 out of 129 potential respondents). Out of 103 responses, there were 33 (32.1%) males and 70 (67.9%) were females. The major age group of participants was (25-45 years) who work in a private dental clinics with less than 25 years of experience, as presented in the following table.

Table 1. Demographic characteristics of participating dentists (N = 103).

Demographics		N %
Gender	Male	33 (32.1%)
	Female	70 (67.9%)
Age	25-45 years .	
Years of experience	Less than 25 years .	

A total of 103 dentists, 33 males (32.1%) and 70 (67.9%) females in 44 private dental clinics signed the informed consent and participated in the current study. Among the 44 selected dental offices, 26 dental practitioners practicing in some dental clinics showed disagreement about the survey participation. Among respondents, 38 (36.8%) of them had less than

five experience years, 46 (44.6%) had more than 10 years of working experience but less than 20 years, and only 19 (18.5%) dentists had more than 20 years of experience.

To identify the persons who are either susceptible to infection or who are at risk of transmitting infection, any fixed prosthodontic treatment procedure has to be done only after a comprehensive assessment of the patient which is done through medical history recording. The current survey showed that most of the respondents reported that they take complete medical history 95 (92.2%) & perform a thorough examination of the oral soft tissues 100 (97.1%) before starting any fixed prosthodontic treatment procedure.

The core element of cross-infection control measures at the clinics is the utilization of PPE to avoid infection transmission from the saliva or blood of patients to the dental team. All the participants 103 (100%) change gloves or masks between patients and all of them wear disposable face mask while examining & treating fixed prosthodontic patients. Almost all of the participants 98 (95.1%) used a gown while handling patients. Unfortunately only 61 (59.2%) of them wear protective eyewear & face shields while treating fixed prosthodontic patients. 96 (93.2%) of the participating dentists followed the "unit-dose concept" to accomplish any dental treatment procedure prior to patient contact.

All the respondents 103 (100%) reported heat sterilization of endodontic files, diamond & carbide burs, & mouth mirrors following use. The used contaminated items were soaked in disinfection holding solutions for pre-cleaning disinfection mainly prior to washing by 100 (97.1%) of the participants. (53.1%). About 100 (97.1%) of the participants used disposable blood/saliva impermeable barriers on the equipments & surfaces e.g. plastic wrap to cover the light handle & controls, suction devices, air-water syringe, etc. Approximately, 100 (97.1%) of the participants changed the surface covers after each patient. The use of spray-wipe-spray technique for wiping of equipment & contact surfaces of the dental unit between patients was reported by all the participants 103 (100%). All of the dentists 103 (100%) clean & heat sterilize the contaminated re-usable dental instruments before use in treating another patient. Also, all the participants clean, heat sterilize, & store the used stock metal impression trays until needed. 92 (89.3%) used procedure of needle stick & other sharp accidents emergency treatment.

PPE such as gloves, protective gowns, and nose and mouth masks should be used to minimize the susceptibility to airborne and blood-borne infections. In this study, 70 (67.9%) of the respondents reported using a rubber dam for isolation & fluid control, and about 81 (78.6%) using high-volume vacuum evacuators. Approximately, 85 (82.5%) advised their patients to rinse with a disinfectant solution (use of pre-operative mouthwash) before the commencement of the fixed prosthodontic treatment procedures.

The majority of the participating dentists 90 (87.3%) used the autoclave to heat-sterilization of the contaminated handpieces, but only 80 (77.6%) store them in sterilization pouches, but unfortunately 23 (22.4%) of participants did not realize the significance of using a new hand piece for each patient. 99 (96.1%) of participants have received continuing educational courses in cross-infection control.

11 (10.7%) of the participating dentists have no awareness of proper management of occupational sharp accidents In the current survey, 83 (80.5%) of dentists have received vaccination against hepatitis B virus. Only 61 (59.2%) of the participants were checked for post HBV immunization serology. Out of 80.5% of the participants who have received hepatitis B vaccination, only 74.7% of them have completed the minimum required dosage (three doses) of the hepatitis B vaccine needed to obtain adequate immunity.

All the participants 103 (100%) reported cleaning & sterilizing the contaminated re-usable dental instruments before use in treating another fixed prosthodontic patient. All the participating dentists reported that they remove their jewelry from hands, arms, or facial area, keep their hair clear away from the face, & keep their finger nails clean & short while working in fixed prosthodontic clinic. Almost all the dentists 103 (100%) in this study had no objection in providing dental healthcare for patients with infectious diseases.

Table 2: Questionnaire responses for awareness and practice of microbial cross-contamination control during fixed prosthodontic treatment .

S.n	Variables	Yes N (%)	No N (%)
1	Do you take complete medical history prior to treating patient ?	95 (92.2%)	8 (7.8%)
2	Do you perform a thorough examination of the oral soft tissues before starting any fixed prosthodontic treatment procedure ?	100 (97.1%)	3 (2.9%)
3	Do you wear disposable gloves during fixed prosthodontic diagnosis & treatment ?	103 (100%)	0 (0%)
4	Do you wear disposable face mask during examination & treatment of fixed prosthodontic patient ?	100%	0 (0%)
5	Do you change face mask & gloves for each patients or when torn ?	103 (100%)	0 (0%)
6	Do you wear protective eyewear & face shields while treating fixed prosthodontic patients ?	61 (59.2%)	42 (40.8%)
7	Do you wear clinic coat or gown while treating fixed prosthodontic patients?	98 (95.1%)	5 (4.9%)
8	Do you use disposable blood/saliva impermeable barriers(e.g. plastic wrap) to cover the light handle & controls, air-water syringe, chair switches, evacuator control, evacuation devices, bracket table, soap dispenser, & other areas in the dental clinic ?	100 (97.1%)	3 (2.9%)
9	Do you change the surface covers between patients ?	100 (97.1%)	3 (2.9%)
10	Do you clean & disinfect the dental unit between patients ?	103 (100%)	0 (0%)
11	Do you use the spray-wipe-spray technique while disinfecting the dental unit ?	103 (100%)	0 (0%)
12	Do you clean & heat sterilize the contaminated re-usable instruments before use in treating another patient ?	103 (100%)	0 (0%)
13	Do you clean, sterilize, & store the used stock metal impression tray until needed ?	103 (100%)	0%
14	Do you clean & sterilize instruments (e.g. diamond burs, mouth mirror, excavator etc) following use ?	103 (100%)	0 (0%)
15	Do you clean & heat-sterilize handpieces in an autoclave after treatment of each patient ?	93 (90.2%)	10 (9.8%)
16	Do you disinfect custom impression trays before inserting them in the patient mouth ?	91 (88.3%)	12 (11.7%)
17	Do you discard the plastic impression trays returned from the dental laboratory ?	103 (100%)	0 (0%)
18	Do you rinse & disinfect the impressions before sending them to dental laboratory ?	94 (91.2%)	9 (8.8%)
19	Do you rinse the impression before & after disinfection ?	103 (100%)	0 (0%)
20	Do you clean & disinfect the existing fixed dental prostheses before adjusting them ?	81 (78.6%)	22 (21.4%)
21	Do you disinfect prostheses prior to sending them to the lab, following placement into the oral cavity ?	78 (75.7%)	25 (24.3%)
22	Do you label all items disinfected in your clinic, stating that disinfection of these items have been performed ?	71 (68.9%)	32 (31.1%)
23	Do you disinfect prostheses coming from the lab, prior to placement in to the oral cavity ?	88 (85.4%)	15 (14.6%)
24	Do you clean & disinfect the existing FDPs again following adjustment before delivering them to the patient ?	90 (87.3%)	13 (12.7%)
25	Do you clean & chemical disinfect the dental impressions before sending them to dental	94	9 (8.8%)

	laboratory ?	(91.2%)	
26	Do you disinfect the non-sterilizable items utilized in the dental clinic e.g. face bows, bite registration records etc. ?	103 (100%)	0 (0%)
27	Do you keep your hair clear away from the face during the fixed prosthodontic treatment ?	103 (100%)	0 (0%)
28	Do you remove the jewelry from hands, arms, or facial area during fixed prosthodontic treatment ?	103 (100%)	0 (0%)
29	Do you keep your finger nails clean & short ?	98 (95.1%)	5 (4.9%)
30	Do you wash your hands with anti-microbial cleaner ?	95 (92.2%)	8 (7.8%)
31	do you use liquid soap rather than bar soap for hand washing ?	85 (82.5%)	18 (17.5%)
32	Do you advise your patient to rinse with a disinfectant solution& wear protective eyewear before the commencement of the fixed prosthodontic treatment ?	99 (96.1%)	4 (3.9%)
33	Does your clinic is well-ventilated ?	103 (100%)	0 (0%)
34	Do you remove unnecessary items from the fixed prosthodontic procedure area ?	89 (86.4%)	14 (13.6%)
35	Do you preplan the materials needed during fixed prosthodontic treatment?	100 (97.1%)	3 (2.9%)
36	Do you follow the "unit-dose concept" to accomplish any dental treatment procedure prior to patient contact ?	96 (93.2%)	7 (6.8%)
37	Do you use pre-arranged tray for the fixed prosthodontic treatment procedures ?	103 (100%)	0 (0%)
38	Do you utilize disposable items whenever possible ?	0 (0 %)	103 (100%)
39	Do you re-use the anaesthetic needles & cartridges, saliva ejector tips, mouth wash cups, or the patient protective bib ?	97 (94.1%)	6 (5.9%)
40	Do you determine the instruments & materials that may get contaminated during fixed prosthodontic procedures?	101 (98.1%)	2 (1.9%)
41	Do you open the drawers with contaminated gloved hands ?	0 (0%)	103 (100%)
42	Do you realize that every patient in dental clinics must be considered to have infectious disease ?	103 (100%)	0 (0%)
43	Does your clinic is divided into operating "clean" area & sterilization "contaminated" area ?	103 (100%)	0 (0%)
44	Do you wrap (bag) the instrument that will not be used immediately after heat sterilization ?	101 (98.1%)	2 (1.9%)
45	Do you dispose all medical waste products properly ?	95 (92.2%)	8 (7.8%)
46	Do you dispose of the used needles & other sharps in a suitable puncture-resistant container which is labelled or colour-coded ?	103 (100%0	0 (0%)
47	Do you wear rubber utility gloves while cleaning instruments or handling clinical wastes ?	91 (88.3%)	12 (11.7%)
48	Do you report sharp injuries to the member of the dental team who is responsible for follow-up ?	71 (68.9%)	32 (31..1%)
49	Do you have any objection to treat patients with infectious diseases ?	0 (0%)	103 (100%)
50	Do you have specific emergency treatment protocol for sharp injuries ?	92 (89.3%)	11 (10.7%)
51	Do you utilize puncture resistant container for sharp items disposal ?	98 (95.1%)	5 (4.9%)

52	Do you have received continuing educational courses in cross-infection control ?	99 (96.1%)	4 (3.9%)
53	When you have to leave a patient during a fixed prosthodontic treatment procedure e.g. to answer the telephone or to carry out an examination on another patient, Do you wear vinyle gloves over latex gloves, & remove it on returning to the patient?	89 (86.4%)	14 (13.6%)
54	Do you replace the face mask or gown if it becomes wet while treating a patient ?	87 (84.4%)	16 (15.6%)
55	Do you change the saliva ejector tip for each patient ?	103 (100%)	0 (0%)
56	Have you completed the minimum required dosage (three doses) of the hepatitis B vaccine needed to obtain adequate immunity ?	83 (80.5%)	20 (19.5%)
57	Did you have a booster dose of hepatitis B ?	77 (74.7%)	26 (25.3%)
58	Do you change the gloves after each patient ?	61 (59.2%)	42 (40.8%)
59	Do you change the face mask after each patient ?	103 (100%)	0 (0%)
60	Do you change the used handpiece for each patient ?	67 (65.1%)	36 (34.9%)
61	Do you flush the handpiece, ultrasonic scaler, & air-water syringe before re-use (between patients) ?	81 (78.6%)	22 (21.4%)
62	Do you use the autoclave for sterilization of handpieces ?	91 (88.3%)	12 (11.7%)
63	Do you change burs for each patient ?	103 (100%0	0 (0%)
64	Do you sterilize the handpieces & other dental equipments before sending them for repair ?	90 (87.3%)	13 (12.7%)
65	Do you clean & sterilize the ultrasonic scaler after each use ?	87 (84.4%)	16 (15.6%)
66	Do you disinfect the non-sterilizable items used in the dental clinic e.g. face bows, bite registration records etc. ?	100 (97.1%)	3 (2.9%)
67	Do you use plastic wrappings for sterilized instruments (keeping sterile instruments in pouches) ?	80 (77.6%)	23 (22.4%)
68	Do you heat-sterilize the removable light curing tip & disinfect or cover the handle ?	97 (94.1%)	6 (5.9%)
69	Do you over-load the sterilization (autoclave) tray with instruments before heat-sterilization in the autoclave ?	0 (0%)	103 (100%)
70	Do you use rubber dam for isolation ?	70 (67.9%)	33 (32.1%)
71	Do you perform pre-cleaning disinfection, using "holding" solutions for the used contaminated instruments ?	100 (97.1%)	3 (2.9%)
72	Do you perform pre-sterilization cleaning for the used fixed prosthodontic instruments ?	103 (100%)	0 (0%)
73	Do you clean & disinfect the work surfaces between clinical sessions?	103 (100%)	0 (0%)
74	Do you use high-volume aspiration for fluid control ?	81 (78.6%)	22 (21.4%)
75	Do you agree that the most effective method to avoid infection to the dental team is hand washing ?	99 (96.1%)	4 (3.9%)

DISCUSSION:

In the field of fixed prosthodontic practices, the transmission of infection may happen either by direct contact with body fluids e.g. saliva & blood, or by indirect contact with contaminated instruments, & for this reason it is very important to strictly follow the cross-infection control measures for prevention of cross-contamination in the dental clinics. Evaluation of

awareness & practice of cross-contamination control procedures among dentists in private clinics, at Aljabal-Alakhdar region, Libya. The cross-contamination control guidelines which prevent transmission of infectious diseases include: Patient screening, Personal hygiene, Personal protection, Instrument processing, Surface asepsis, Patient treatment, & Laboratory disinfection.

Patient screening (identifying high risk patients): A thorough medical history must be recorded and reviewed before starting the dental treatment and updated at subsequent visits [3]. It may help in detection of infectious diseases and provides clues about what precautions are necessary for patients having medical problems that require pre-medications or modifications of treatment applied [5]. In this study, 95 (92.2%) of the participants recorded the medical history of their patients before commencing dental treatment. A thorough examination of the oral soft tissues may reveal oral manifestations of HIV infection, which may identify a previously unknown carrier of the disease. The oral signs & symptoms of HIV infection are often the first recognizable features of the disease. Almost all of the respondents reported that they have performed a thorough examination of the oral soft tissues before starting any fixed prosthodontic treatment procedure.

Personal hygiene: To gain the confidence & acceptance of patients to the fixed prosthodontic treatment, dentists must take a lot of care for their personal hygiene The following guidelines of personal hygiene should be followed by all dental team: (1) Hair should be short or kept away from the face. (2) Jewelry should not be worn on the hands while performing fixed prosthodontic procedures. (3) Fingernails must be kept clean & short. (4) Hand washing removes debris, blood, & potentially pathogenic transient micro-organisms from the hands. We should always use liquid soap during hand washing, bar soap should never be used because it may transmit cross-contamination. [25] All the participating dentists 103 (100%) reported that they remove their jewelry from hands, arms, or facial area, keep their hair clear away from the face, & keep their finger nails clean & short while working in fixed prosthodontic clinic. Almost all the dentists 103 (100%) in this study have no objection to treat patients with infectious diseases & realized that every patient in fixed prosthodontic clinic must be considered to have infectious disease.. About 98 (95.1%) of them washed their hands with anti-microbial cleaner, out of which 95 (92.2%) used liquid soap rather than bar soap for their hand washing, but all of them 103 (100%) agreed that hand washing is the most effective method to avoid spread of cross-contamination to the dental team.

Personal protective equipment: They act as a shield, protecting the skin and mucous membrane of the eyes, nose and mouth of the dental healthcare workers from contact with the patients' blood or saliva contaminated with blood. They include gloves, face masks, face shields, protective eyewear and protective clothing such as gowns. Wearing gloves while treating fixed prosthodontic patients demonstrates to patients that the dental healthcare workers are taking precautions to implement cross-infection control measures. Gloves should be worn for each patient and changed when punctured or torn. When cleaning contaminated instruments, disinfecting hard surfaces, or handling clinical wastes, thick, rubber utility gloves should always be worn. Almost all the respondents constantly wearing gloves while performing fixed prosthodontic treatment procedures, changing gloves between patients (100%), but only 61 (59.2%) respondents wore face shields and protective eye glasses. This shows poor awareness among dentists about the probability of disease transmission via aerosols and blood splashes. Most of respondents changed the clinic coat when it was visibly contaminated.

Vaccination against HBV: The virus causing hepatitis B may be transmitted by contact with body fluids (blood, saliva, etc) of an infected person, & therefore all the dental team must be vaccinated against it. The following should be vaccinated: 1) dentists. 2) dental hygienists. 3) dental surgery assistant. 4) dental laboratory technicians. 5) engineers who repair dental equipment. After a period of time, the number of antibodies against a particular antigen may decrease. A booster is an additional dose of vaccine administered to increase the number of antibodies. The American dental association (ADA), Centers for disease control (CDC), British dental association (BDA), & the majority of dental association throughout the world strongly recommend that dental healthcare providers are vaccinated against hepatitis B, as the immunization against it is very important for prevention of infection transmission & personal protection. Dentists be immunised before their employment. In the current survey, 80% of the respondents have received a vaccination for hepatitis B virus.

Only 61 (59.2%) of the participants were tested for post HBV immunization serology. Out of 80.5% of the participants who have received hepatitis B vaccination, only 74.7% of them have completed the minimum required dosage (three doses) of the hepatitis B vaccine needed to obtain adequate immunity.

Covering or disinfecting environmental surfaces: There is evidence that, following dental treatment procedures, dental clinic environmental surfaces are contaminated & pathogenic micro-organisms may survive on these surfaces for long periods of time. In order to avoid cross-contamination, surfaces in the dental clinic should be either covered, or left uncovered & disinfected after dental treatment. During fixed prosthodontic treatment procedures, flying debris, aerosols, droplet splatter, & contaminated hands & dental instruments cause widespread surface contamination of the operating area. Surface asepsis can be achieved by cleaning & disinfecting contaminated surface, or by preventing surface from becoming contaminated by use of surface covers. Surfaces that are likely to become contaminated may be de-contaminated after treatment or protected with disposable coverings before they become contaminated. Sodium hypochlorite & phenolic compounds are used for surface asepsis. Between clinical sessions, work surfaces should be thoroughly cleaned and decontaminated with ethyl alcohol (70%). About 100 (97.1%) of the surveyed dentists applied disposable blood/saliva impermeable barriers on clinical contact surfaces e.g. plastic wrap to cover the light handle & controls, chair switches, evacuator control, air-water syringe, saliva ejector tip, bracket table, soap dispenser, & other areas at the operator discretion. Approximately, 100 (97.1%) of the participating dentists reported that they change the surface covers between patients. Routine wiping of working surfaces & dental unit between patients with surface disinfectant by using the spray-wipe-spray technique was reported by all the participants 103 (100%).

The use of high volume aspiration will reduce any risk of cross-infection from aerosols. The risk is further reduced by good ventilaton. All dental team must wear gloves, a face mask, & eye-protective glasses while examining and treating fixed prosthodontic patients. The face & eyes must be protected when undertaken routine dental treatment procedures. If a mask becomes wet during fixed prosthodontic treatment procedures, then it should be replaced immediately, as otherwise it will collapse against the face & may not provide a barrier to micro-organisms. Eyes may be damaged & infected during dental treatment procedures. Protective eyewear has been shown to reduce the likelihood of eye injury. Protective eye wear must be worn by both the patient & dental team members during dental treatment procedures. Gowns and head covers, should be worn to prevent contamination of street clothing and to protect the personal body parts of dental team. **Covering surfaces**: A disposable, water-proof covering, for example: Clear plastic wrap, aluminium foil, paper with impervious plastic backing, or commercially available, polyethylene sheets & tubing can be used for this purpose. After each dental treatment: 1)Remove the soiled covering while still gloved. 2) Remove gloves & wash hands. 3) Recover the surface with clean material before the next dental procedure. This option may be expensive but has been found to be less time-consuming than surface disinfection. **Surface disinfection:** Environmental surfaces may become contaminated during any dental treatment procedure. If these surfaces were not covered, they must be cleaned & disinfected after each dental treatment procedure. When disinfecting the dental clinic surfaces, wear heavy rubber utility gloves, a face mask, protective eyewear, & a waterproof apron. Spray the surface with disinfectant & wipe thoroughly with a strong gauze sponge. The sponge should be renewed frequently if heavily soiled. Re-spray & leave the disinfectant on the surface for the recommended contact time. Wipe off the residual disinfectant using a fresh paper towel.

Precautions to avoid injuries when handling sharp instruments: All the sharp instruments used in the field of fixed prosthodontics are potentially infective & should be used with extreme caution, to avoid occupational injuries. If an injury happens which was due to a blood-contaminated sharp object, then it should be treated by washing the injury with soap & water to encourage the wound to bleed. If the eyes are exposed, flood them with plain water. The injury should be reported to the member of the dental team who is responsible for follow-up. The risk from exposure to infected blood should be evaluated. If a risk is identified, laboratory tests & vaccination with immunoglobulin & hepatitis B vaccine may be necessary. In our survey 71 (68.9%) accidental injuries were reported. Because of the limited operating area & frequent movements of the

patient, Sharp injuries are more common during dental treatment procedures than in other medical healthcare treatment procedures. About 71 (68.9%) of the participants reported sharp injuries to the member of the dental team who is responsible for follow-up & 92 (89.3%) used the appropriate emergency treatment of needle stick & other accidental injuries at dental offices. 99 (96.1%) of participants have taken infection control courses.

Sterilization and disinfection of patient-care items (surface &equipment asepsis): It is impossible to sterilize all dental instruments, items, surfaces etc. that become contaminated during dental treatment procedures. The choice of decontamination regimes are selected according to how an item or instrument will be utilized. Patient-care items are generally categorized into critical, semi-critical or non-critical instruments. Critical dental instruments are used to penetrate tissue or to touch bone, they must be heat-sterilized, taking care not to overload the sterilization tray, as free circulation of steam is essential. Sterilization pouches are very useful for the sterilization & aseptic storage of single instruments, or small sets of instruments which are infrequently used, e.g. forceps & elevators. Semi-critical instruments are used to touch mucous membranes, but will not be used to penetrate tissue or to touch bone, they should be sterilized or subjected to high-level disinfection. Of particular concern are dental handpieces which should be heat-sterilized between patients despite the fact that they are classified as semi-critical items. Non-critical instruments are equipments & surfaces which contact intact skin, such as mixing slabs & spatulas, they are decontaminated by using intermediate-level disinfection.[18]

Sterilization of the dental instruments: Critical & semi-critical items & instruments are sterilized, if possible, by heat. Sterilization is the process by which all forms of micro-organisms are destroyed, including bacteria, viruses, fungi, & spores. There are four distinct stages which achieve safe instrument sterilization: 1) Pre-cleaning disinfection, using "holding" solutions. 2) Pre-sterilization cleaning. 3) sterilization. 4) Aseptic storage.

The sterilization area: The area for cleaning & sterilization needs careful planning, with a generous amount of room allowed for wide workshops, a sink, an ultrasonic cleaner, & sterilizer(s). The sterilization area should be situated away from the operating area. The layout of the sterilization area is illustrated in the following figure:

Dirty area sink cleaning area ultrasonic bath	packing area sterilizer	clean area
Area of high contamination	**Area of medium contamination**	**Area of low contamination**

Pre-sterilization disinfection: The contaminated fixed prosthodontic instruments should be kept into a disinfectant detergent solution in a container. Keeping the contaminated fixed prosthodontic instruments in disinfectant solutions immediately after use has the following advantages: i) There is minimal drying of blood, pus, & saliva on instruments, which makes them easier to clean. ii) Instruments are safer to use during the subsequent sterilization stages because of the disinfectant action of the holding solution. A synthetic phenolic solution, diluted 1:32, is an ideal holding solution. Approximately, 100 (97.1%) of the dentists performed pre-cleaning disinfection, using "holding" solutions for the used contaminated dental instruments.

Pre-sterilization cleaning: Micro-organisms on the surface of the fixed prosthodontic instruments are protected by proteinaceous material from heat & other sterilization conditions. Pre-sterilization cleaning can be done by: i) Hand scrubbing. ii) Ultrasonic cleaning. iii) Dishwasher instrument cleaning. Heavy rubber utility gloves, protective eyewear, a face mask, & a plastic apron should be worn when decontaminating dental instruments in the sterilization area. All the participants performed pre-sterilization cleaning for the used "contaminated" fixed prosthodontic instruments.

British dental association (BDA) & DOH guidelines state that handpieces should be sterilized in an autoclave between patients. Before re-use, handpieces & water line tubing must be effectively flushed to remove contaminated water. Flushing the air-water lines between dental patients for 20 seconds, then fitting a sterile turbine handpiece, sterile ultrasonic scaler tip, or sterile air-water syringe tip reduces the discharge of contaminated water from air lines. It has been recommended that air-water lines, which have stood unused overnight, should be flushed for 2 minutes before re-use.[19] In the present survey, all the participants (100%) utilized sterilized hand instruments, dental burs,

& changed saliva ejectors between patients. 81 (78.6%) changed the handpieces after each patient.

Light curing units are a potential source of transmission of infectious diseases. In the current study, 97 (94.1%) heat-sterilized the removable light curing tip & disinfected or covered the handle. After use, air-water syringes become contaminated & their re-use can lead to cross-infection.

Ultrasonic scaler, & especially its tips, becomes very contaminated during use. Clean & sterilize the ultrasonic scaler after each use. If it is not possible to sterilize the ultrasonic scaler, the tip must be detached, cleaned, & sterilized after each use. The handle of the scaler should be thoroughly disinfected. The dentist has an obligation to decontaminated any equipment which is to be repaired or serviced by an engineer. Handpieces which are sent for repair must be sterilized if possible. In this study, 91 (88.3%) reported that they flushed the handpiece, ultrasonic scaler, & air-water syringe before re-use in treating another fixed prosthodontic patient.

Impressions disinfection:

All the fixed prosthodontic impressions should be rinsed & disinfected prior to transferring them to the dental technician. The addition silicone & polysulfide impressions are disinfected by immersion in a 5.25% sodium hypochlorite solution for 10 minutes, while irreversible hydrocolloid Alginate and polyether impressions are disinfected by spraying with a 5.25% sodium hypochlorite solution and sealed in a plastic bag for at least 10 minutes. In our survey, 94 (91.2%) of the respondents rinsed the impression to remove traces of saliva, blood, & debris and then chemically disinfect it prior to transferring it to the technician.

Impression trays:

1) Aluminum & Chrome-plated impression trays: Heat sterilize via autoclave. **2) Custom acrylic resin trays:** Discard after intraoral use in a patient; disinfect with tuberculocidal hospital disinfectant for reuse during the same patient's next visit. **3) Plastic trays:** should be discarded. Approximately, 91 (88.3%) disinfected custom impression trays before inserting them in the patient mouth. All of the participants 103 (100%) discarded the plastic impression trays returned from the dental laboratory. 71 (68.9%) of them reported that they label all items disinfected in their clinics, indicating that such items have been disinfected.

The inter-occlusal records made by wax or ZOE are disinfected by spraying with a 5.25% sodium hypochlorite solution and placed in a plastic bag for 10minutes. Approximately, 99(96.1%) of the dentists performed disinfection for inter-occlusal records. Stone casts are disinfected by spraying with a 5.25% sodium hypochlorite solution and left for 10 minutes.

All the fixed prosthodontic prostheses that are received or sent from the dental laboratory should be disinfected by immersion in a 5.25% sodium hypochlorite solution for a minimum of 10 minutes. In our survey, 94 (91.2%) of the participants performed impression disinfection prior to transferring them to the lab technician. However, only 88 (85.4%) of them performed prosthesis disinfection prior to checking in the oral cavity.

Limiting the spread of blood to surfaces: During dental treatment & clean-up procedures, blood may be transmitted by anything that has been in the oral cavity. Blood may be spread around the operating zone either by contaminated gloved hands, or by splashes & splatter &, possibly, aerosols.

Limiting surface contamination by good operating technique: It is necessary to remove unnecessary items & unused or seldom used equipment from the operating area, leaving only necessary items on worktops. This can decrease the items which could become contaminated, consequently making post-treatment clean-up easier. About 89 (86.4%) of the dentists reported that they remove unnecessary items from the fixed prosthodontic treatment area. In this study, 100 (97.1%) pre-planned the material needed during the fixed prosthodontic treatment procedure. Items & instruments which will be required for the dental treatment of each patient should be planed ahead, & anticipated. Instruments & materials which are over-looked are usually those obtained from packages in drawers or cupboards. During the dental treatment procedure, this spreads pathogenic micro-organisms to surfaces that should remain clean & that are difficult to disinfect. Plan carefully & put out instruments, materials, & medication that will be required for each dental procedure. Preparation is very important. Think ahead & place everything required for the dental treatment procedure in pre-determined positions. The majority of the respondents 97 (94.1%) used pre-arranged tray set-ups for frequently performed fixed prosthodontic treatment, & 101 (98.1%) of them identified those items that will become contaminated during the fixed prosthodontic procedures. An empty, solid-based "waste" tray should be placed near the dental practitioner, in which the used, contaminated materials

are placed during the dental treatment procedures. This prevents the spread of contamination from these instruments to wider areas around the operating zone.

Covering or disinfecting environmental surfaces: There is evidence that, following dental treatment procedures, dental clinic environmental surfaces are contaminated & pathogenic micro-organisms may survive on these surfaces for long periods of time. To prevent cross-contamination, surfaces in the operating area should be either covered, or left uncovered & disinfected after dental treatment. Surfaces likely to be contaminated can be covered while they are still clean. Some surfaces such as light handles, hand-operated chair controls, suction hoses, chairs, & bracket tables are time-consuming & difficult to disinfect adequately. Routine wiping of working surfaces & dental unit between patients with surface disinfectant by using the spray-wipe-spray technique was reported by all the participants 103 (100%). **Covering surfaces**: A disposable, water-proof covering, for example: Clear plastic wrap can be used for this purpose. This option may be expensive but has been found to be less time-consuming than surface disinfection. About 100 (97.1%) of the participating dentists used disposable blood/saliva impermeable barriers on clinical contact surfaces e.g. plastic wrap to cover the light handle & controls. Approximately, 100 (97.1%) of the participants changed the surface covers at the end of clinical session. Environmental surfaces may become contaminated during any fixed prosthodontic treatment procedure. If these surfaces were not covered, they must be cleaned & disinfected after each dental treatment procedure. Spray the surface with disinfectant & wipe thoroughly with a strong gauze sponge. The sponge should be renewed frequently if heavily soiled. Re-spray & leave the disinfectant on the surface for the recommended contact time. Wipe off the residual disinfectant using a fresh paper towel.

Limiting contaminated aerosols & splatter: During dental treatment procedures & the clean-up period, aerosols, splatter of blood, & blood-contaminated saliva can be limited by: 1) pre-treatment tooth brushing & the use of a pre-treatment mouthwash "to reduce the concentration of pathogenic bacteria in dental aerosols". 2) high-velocity aspiration. 3) the use of rubber dam, when possible. 4) efficient air filtration & ventilation.

Instruct the patient to brush the teeth shortly before attending for dental treatment. Provide a 0.2% chlorhexidine mouthwash which is used by the patient for 2 minutes immediately before dental treatment begins. These precautions reduce the concentration of the bacteria in dental aerosols. About 85 (82.5%) advised their patients to rinse with a disinfectant solution before the commencement of the fixed prosthodontic treatment procedure. It has been found that when high-velocity aspiration is correctly used with the turbine handpiece, air-water syringe, or ultrasonic scaler, contamination from aerosols is reduced. This study shows that approximately 81 (78.6%) of the participants frequently use high volume evacuators for fluid control.

The rubber dam can significantly reduce bacterial contamination of the atmosphere during fixed prosthodontic treatment procedures. unfortunately, only 70 (67.9%) of the dentists used a rubber dam for fixed prosthodontic treatment procedures. It has been shown that there is a significant reduction of pathogenic micro-organisms generated in aerosols & splatter, if a rubber dam is used with the turbine handpiece, air-water syringe, or the ultrasonic scaler.

Disposables: In an ideal world, everything within reason that is used in dental clinical practice should be disposable. Dental supply companies advertise a vast range of disposable products, some of which would prove very expensive over a period of time to the dentist. There are certain items used in the dental clinical practice which it is suggested may be disposable. A few are listed: 1) Anaesthetic needles & cartridges: It is mandatory that these items are never re-used as they cannot be satisfactorily sterilized. 2) Mouthwash cups: They become very contaminated & plastic disposable cups are available at a low cost. 3) Saliva ejector tips: These are difficult to clean & sterilize & low-cost disposable tips should be used. 4) The patient protective bib: It becomes splattered with blood & debris during dental treatment procedures & difficult to clean & disinfect. Disposable bibs are available. 5) Disposable impression trays: They are now widely used in prosthodontics. If metal trays are used, they should be thoroughly cleaned & heat-sterilized (autoclaved) before they are re-used. 6) Prophylactic polishing cups & brushes: They are highly contaminated after use. Brushes & prophylactic polishing cups cannot be effectively decontaminated & sterilized without damage & should be regarded as disposable. All the participating dentists in this study 103 (100%) reported that they utilized disposable items whenever possible, & they

never re-used the anaesthetic needles & cartridges, saliva ejector tips, mouth wash cups, or the patient protective bib.

Instruments that will not be used immediately after sterilization should be wrapped or bagged before sterilization in a material recommended by the manufacturer of the sterilizer. Nearly, 80 (77.6%) used plastic wrappings for sterilized instruments (kept sterilized instruments in pouches).

Cross-contamination control measures should be followed in the dental clinic as well as in the dental laboratory to prevent transmission of infection, as the fixed prosthodontic impressions & prostheses are contaminated with micro-organisms of varying degrees of pathogenicity. The unit dose concept is a cross-contamination control measure that can be applied to some fixed prosthodontic materials. It means dispensing, before patient contact, an adequate amount of dental material needed to make the scheduled fixed prosthodontic treatment. It reduces the chances of cross-contamination during fixed prosthodontic treatment procedures. About 96 (93.2%) of the participating dentists reported that they follow the "unit-dose concept" to accomplish any fixed prosthodontic treatment procedure prior to patient contact. To minimize potential health hazard, the stock metal impression trays should be cleaned, sterilized, & stored in sealed bags until needed. All the respondents 103 (100%) reported that they clean, sterilize, & store the used stock metal impression trays until needed. All instruments used in the field of fixed prosthodontics such as wax knives, wax spatulas, & wax carvers should be cleaned and sterilized after their use. Disinfection of custom impression trays & record bases should be performed using sodium hypochlorite solution.

Disinfection of dental prostheses: New fixed dental prostheses should be washed thoroughly with a brush and germicidal soap, then rinsed using clean tap water. Individual fixed dental prostheses should be sprayed with a dilute sodium hypochlorite solution and allowed to stand undisturbed for 2 minutes. Prostheses then should be sealed in watertight bags containing clean tap water. Prostheses that have been worn by the patient should be disinfected prior to modification. These prostheses should be disinfected in the same manner as new prostheses. Following modification, fixed dental prostheses should be disinfected again. Temporary restorations should be disinfected by immersion in a 5.25% sodium hypochlorite solution for 10 minutes. Metal framework of the metal-ceramic restorations should be disinfected by spraying with 2% gluteraldehyde solution and held in a plastic bag for 10 minutes. Nearly, 81 (78.6%) of the participating dentists cleaned & disinfected the existing fixed dental prostheses before adjusting them, 78 (75.7%) disinfected prostheses before returning them to a dental laboratory following insertion into the patient mouth, 88 (85.4%) disinfected prostheses returned from a dental laboratory, before insertion into the patient mouth, & 90 (87.3%) cleaned and disinfected the existing fixed dental prostheses again following adjustment before delivering them to the patient.

The division of the dental clinic into two separate clean & contaminated areas will reduce the number of areas contaminated & hence maintain asepsis. Fortunately in the present study, all the participating dentist stated that their clinics are divided into "clean" area & "contaminated" area.

The working area is sprayed with the recommended disinfectant & left for 10 mins before any procedure starts along with the wiping of the operatory and chair with a disinfectant solution. The chair is covered with a disposable plastic sheath which has to be removed subsequent to the treatment. Before the commencement of any crown & bridge treatment procedure, all the patient should be asked to rinse with chlorhexidine gluconate 0.12% and wear protective eye wear.

The crown & bridge impressions are contaminated with the patient’s saliva & blood, & therefore they can transfer microorganisms from patients to dental team including the dental technician placing them at a higher risk of cross-infection. For this reason, all the fixed dental prosthesis impressions should be cleaned and disinfected immediately after their removal from the mouth & before being sent to the laboratory.

Thorough rinsing of the impression is necessary before & after disinfection. Rinsing of the impression before removes the bioburden present, which may prevent exposure of the surface to the disinfectant. Rinsing of the impression after disinfection removes residual disinfectant which may affect the stone surface after casting. In the current study, all the dentists 103 (100%) reported that they rinse the impressions before & after disinfection.

All items disinfected in the dental office should be labelled, indicating that such items have been

decontaminated to avoid duplicating disinfection procedures. Approximately, 71 (68.9%) of the participants labelled all items disinfected in their clinic, indicating that such items have been disinfected.

Bite registration Wax rims should be disinfected by the spray-wipe-spray method using an iodophors or phenolics. After the second spray, they can be enclosed in a sealed plastic bag for the recommended time. The fixed prosthodontic clinic should be well ventilated to prevent pollution by aerosols generated during teeth preparation. Fortunately, all the fixed prosthodontic clinic sample 100% were well-ventilated.

The unnecessary materials should be removed from the fixed prosthodontic treatment area. Preplan the materials needed during treatment, thinking ahead minimizes the need to search for additional items or to enter cabinets and drawers once gloves have become contaminated. All the participating dentists reported that they do not open the drawers with contaminated gloved hands, & utilize disposable items whenever possible. In this study, 97 (94.1%) used pre-arranged tray set-ups for routine or frequently performed fixed prosthodontic treatment procedures. prior to starting any fixed prosthodontic treatment procedure, a decision must be made whether to use a barrier e.g. plastic wrap to prevent contamination of these surfaces and items that may become contaminated, or to disinfect them. About 101 (98.1%) of the dentists identified those items that will become contaminated during the crown & bridge procedure.

Disposal of clinical waste materials & sharps

Disposable sharp objects: Used & contaminated sharp items should be carefully placed into a solid puncture-resistant container, & later incinerated.

Contaminated solid medical waste: Materials that are soaked in blood, e.g. blood contaminated gauze, cotton rolls, gown, patient bibs, face masks, & gloves should be carefully placed into a waste receiver containing a strong bin liner. Waste should not remain in the waste receiver overnight. These wastes should be sealed & discarded in sturdy, impervious plastic bags & later incinerated.

Liquid waste: Liquid waste includes bulk blood & suctioned or waste-trap fluids. Small quantities of these liquids may be poured into a drain & then flushed with water. Waste materials must be handled carefully and discarded to minimize human contact. In this study, all the participating dentists 103 (100%) used puncture-resistant containers for disposal of sharp instruments. Waste items contaminated with body fluids and tissues harbor human pathogens and considered one of the major potential sources of infection. Improper management of health-care waste poses a significant risk to patients, healthcare workers, the community and the environment. Almost all of the participating dentists in this study stated that they dispose all the medical waste products properly, but only 91 (88.3%) of them reported that they wear rubber utility gloves while cleaning fixed prosthodontic instruments or handling clinical wastes.

CONCLUSION:

The results of this study demonstrated that the overall cross-infection control awareness & practices among dentists in Aljabal-Alakhdar private dental clinics are very good & in compliance with infection control standards especially in the field of fixed prosthodontics. Educational programs and training strategies should be implemented to maximize and enhance the compliance of the dental team with infection-control guidelines. The awareness and knowledge of dentists must be increased by educational interventions in order to prevent infection transmission and to increase the level of safety during the oral health care.

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