



Application of infection control roles by Iraqi orthodontics

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Introduction :

Orthodontists are exposed to various types of microorganisms in dental practice by contaminated instruments, inhalation of aerosols or through percutaneous injuries with different wires such as ligature wires or arch wires also banding and bonding materials and other sharp cutting instruments⁽¹⁾. Studies found that Orthodontists have the second highest incidence of hepatitis B among dental professionals⁽²⁾. Individuals undergoing treatment in dental office may be undetected hepatitis-B carriers and patients secreting herpes simplex viruses in saliva may be asymptomatic. Such patients have the potential for transmitting diseases. Diseases such as hepatitis-B, HIV and tuberculosis have long incubation period and hence, it is difficult to identify the source of such infections to the dental practitioners and other patients⁽³⁾. Before beginning with work the orthodontist should be clear about his or her goals in infection control criteria⁽⁴⁾. The standards of universal precautions and infection control remain generally unchanged, but technological advancements, new products, material, and data needs constant evaluation and adjustments of the techniques. It is mandatory to apply the most recent disinfection and sterilization practices to achieve the best results.

Sterilization kills all forms of microorganisms including viruses, bacterial and mycotic spores. An instrument will be either sterile or not sterile. Disinfection is the process of destroying or inhibiting most pathogenic microorganisms and inactivating some viruses, hence, reducing microbial contamination to safety levels.⁽⁵⁾ Hepatitis B virus can be transmitted via as little as 0.0004 ml blood while HIV via 0.1 ml blood⁽⁶⁾. 1 ml of gingival crevicular fluid contains 150 billion microorganisms and 6 billion microorganisms can be found in 1 ml of saliva⁽⁷⁾.

There are many studies in literature that emphasize on the effect of sterilization in orthodontics practice however there is no comprehensive research that evaluate the compliance of Iraqi orthodontist to infection control procedures.

Aim of the study In this study we will evaluate sterilization and disinfection methods employed in orthodontic practice in Iraq.

Material and methods:

In the present study, data collection gained by an 17 items questionnaire (Appendix 1) was delivered to a total of 101 Iraqi orthodontists / general practitioners(GP) (who attended intensive orthodontic course), these question covered some infection control guide line.⁽⁸⁾

Statistical analysis was performed by using SPSS version which includes descriptive statistic (frequency and percent) also Z-test were used to test two proportion and chi square for goodness of fit to test more than two proportion. N.S non-significant ($P > 0.05$), S significant at ($P < 0.01$) and highly significant ($P < 0.001$).

The questionnaire deals with the following variables:

- ❖ Educational degree
- ❖ Place of work.
- ❖ Daily patient volume
- ❖ The way in performance of instruments cleaning
- ❖ Sterilization devices used
- ❖ Soaking instruments in disinfectant solution.
- ❖ Packaging method of instruments to be sterilized.
- ❖ Method used to sterile hand piece.
- ❖ Method used to sterile hand instruments and orthodontic pliers.
- ❖ Does the practitioner sterilize molar bands after purchase?
- ❖ The method to sterilize molar bands after trail inside patient mouth.
- ❖ Disposal of brackets, bands and arch wires removed from the patients
- ❖ Whether they use recycled brackets/orthodontic materials
- ❖ Disinfection status of the impressions and appliances delivered to the dental laboratory
- ❖ Place of sharp objects disposal container.
- ❖ Type of gloves used during cleaning instruments, and environmental cleaning.
- ❖ Hepatitis B vaccination
- ❖ If the applicant has any comments about the infection control procedure in dental / orthodontic practice.

Appendix (1)

1. Gp or Specialist?
2. Place of work?
 - a) Private oral and dental health clinic.
 - b) Public oral and dental health clinic/state hospital.
 - c) University clinics.
3. Daily patient volume?
 - a) 0-5.
 - b) 6-10.
 - c) 11-15.
 - d) 16-20.
 - e) >20.
4. How do you perform cleaning of instruments?
 - a) Manually .
 - b) Mechanically (Ultrasonic cleaner).
5. Sterilization devices used?
 - a) Autoclave.
 - b) Dry heat (oven) .
 - c) Glass bead sterilizer.
 - d) None.
6. The instruments are presoaked in disinfectant solution ?
 - a) Yes.
 - b) No.
7. Packing of instruments to be sterilized in the autoclave?
 - a) Metal tray.
 - b) Wrap (pouching).
 - c) I do not pack.
8. How do you sterilize dental handpieces?
 - a) In the autoclave.
 - b) Wiping the outer surface with disinfectant solution.
9. How do you sterilize hand instruments/orthodontic pliers?
 - a) Dry-heat (oven).
 - b) Autoclave.
 - c) glass bead sterilizer.
 - d) Wiping with a disinfectant solution.
10. Do you sterilize molar bands after purchase?
 - a) Yes.
 - b) No.
11. How do you sterilize molar bands after trial in the patient?
 - a) Dry-heat (oven).
 - b) Autoclave.
 - c) glass bead sterilizer.
 - d) Sitting in disinfectant solution.
12. Where do you dispose the bands, brackets, and archwires you remove from the patients during or after treatment?
 - a) Waste basket.
 - b) Sharp bin.
 - c) Metal waste bin.
 - d) Infected waste bin.
13. Do you use recycled brackets/orthodontic materials?
 - a) Yes.
 - b) No.
14. Do you disinfect impressions or appliances to be delivered to an outer laboratory?
 - a) Yes.
 - b) No.

15. Where do you place sharp bins?

- a) At the clinic.
- b) In the sterilization room.

16. Which type of gloves do you use during cleaning of instruments and environmental cleaning?

- a) Examination gloves.
- b) Kitchen-type gloves.
- c) I do not wear.

17. Have you had hepatitis B vaccine?

- a) Yes.
- b) No.

Result

The result of this study shown in the frequency table explained as the following: table 1 describes the percent of GP and specialist who are alligated to the questioner, GP with valid percent (22.8%) while the specialist (77.2%), while table 2 showed that (45.5%) of the total participate work in privet clinic, (38%) work at hospital and 15.8 work at university clinic, those participate have daily patients volume range from 0-5 to more than 20 patients as explained in table 3. Table 4 show the percent of orthodontist who use manual cleaning with rate (57.4%) was significant higher than ultrasonic cleaner (42.6 %), while highly significant shown with autoclave as sterilization device with rate (87%) rather than oven and glass bead sterilizer, also highly significant regarding presoaked the instrument in disinfected solution with rate (85.1%), in addition the orthodontist rate who wrap(pouching) their instrument show significant level (40.6%) rather than metal tray or the other who did not pack as their present was (37.6%) and (19.8%) respectively, but sterilization of dental hand piece in autoclave (41.6%) was significantly lower than wiping the outer surfaces with (57.4%). Percentage of orthodontist who responded to question regarding sterilization of bands and pliers are shown in table 5. The percent of orthodontist who sterilize pliers (80.2%) show highly significant than dry heat or other method mentioned in questioner, while non-significant rate between orthodontist who sterilize band after purchase or not with percent (47.5%) and (52.5%) respectively. The orthodontist who sterilize band after trial in patient's mouth show highly significant with (67.3%), while the disposing of band, bracket and arch wire was highly significant with (49.5%) regarding waste basket and (26.7%) for sharp bin , (16.8%) for infected waste bin and (5.9%) with metal waste bin. Table 6 show high rate of significantly for orthodontist who don't recycled bracket was (90.1%) while non-significant difference between orthodontist who disinfect impression or appliances to be delivered to laboratory. The rate for placing sharp bins at clinic was significant (74.3%) and (21.8%) for placing sharp bins in sterilization room. Highly significant with (96%) showed with orthodontists who use examination gloves during cleaning of the instrument, also highly significant with (82.2%) how hepatitis B vaccine had.

Table 1 Gp or Specialist		Frequency	Percent
Valid	GP	23	22.8
	Specialist	78	77.2
	Total	101	100.0

Table 2 Place of work		Frequency	Percent
Valid	Private oral and dental health clinic	46	45.5
	Public oral or dental health clinic / state hospital	39	38.6
	University clinic	16	15.8
	Total	101	100.0

Table 3 Daily patient volume		Frequency	Percent
Valid	0-5	40	39.6
	6-10	18	17.8
	11-15	14	14.9
	16-20	15	14.9
	> 20	13	12.9
	Total	100	99.0
Total		101	100.0

Question	Choice	Frequency	%	P-value [¥]
How do you perform cleaning of instruments	Manually	58	57.4	0.033
	Mechanically (Ultrasonic cleaner)	43	42.6	
Sterilization devices used	Autoclave	88	87.1	0.001
	Dry heat (oven)	12	11.9	
	Glass bead	0	0.0	
	none	1	1.0	
The instruments are presoaked in disinfectant	Yes	86	85.1	0.001
	No	15	14.9	
Packing of instruments to be sterilized in the autoclave	Metal tray	38	37.6	0.021
	Wrpa (Pouching)	41	40.6	
	I do not pack	20	19.8	
How do you sterilize dental hand pieces	In the autoclave	42	41.6	0.022
	Wiping the outer surface with disinfection solution	58	57.4	

Table 4: percentage of cleaning and sterilization of the instrument
 N.S, not significant (P >0.05) , * significant at (P < 0.05), ** significant at (P < 0.01), *** significant at (P < 0.001).
 Table 5: percentage of sterilization of orthodontic pliers, bands and disposed method

Question	Choice	Frequency	%	P-
How do you sterilize hand instruments / or orthodontic pliers	Dry heat (oven)	12	11.9	0.001
	Autoclave	81	80.2	
	Glass bead sterilizer	1	1.0	
	Wiping with a disinfectant	6	5.9	
Do you sterilize molar bands after purchase	Yes	48	47.5	0.617
	No	53	52.5	
How do you sterilize molar bands after trial in the patient	Dry heat (oven)	10	9.9	0.001
	Autoclave	68	67.3	
	glass bead sterilizer	2	2.0	
	Sitting in disinfectant	17	16.8	
where do you dispose the bands , brackets, and arch wires you remove from patient during or after treatment	Waste basket	50	49.5	0.001
	Sharp bin	27	26.7	
	Metal waste bin	6	5.9	
	Infected waste bin	17	16.8	

N.S, not significant (P >0.05) , * significant at (P < 0.05), ** significant at (P < 0.01), *** significant at (P < 0.001).

Table 5: the response of orthodontist to different question related to infection control roles

Question	Choice	Frequency	%	P-value [¥]
Do you use recycled brackets/ orthodontic materials	Yes	9	8.9	0.001
	No	91	90.1	
Do you disinfect impressions or appliances to be delivered to an outer laborotary?	Yes	48	47.5	0.670
	No	51	50.5	
Where do you place sharp bins	at the clinic	75	74.3	0.001
	In the sterilization room	22	21.8	

Which type of gloves do you use during cleaning of instruments and environmental cleaning	Examination gloves	97	96.0	0.001
	Kitchen - type gloves	3	3.0	
Have you had hepatitis B vaccine	Yes	83	82.2	0.001
	No	16	15.8	

N.S, not significant ($P > 0.05$), * significant at ($P < 0.05$), ** significant at ($P < 0.01$), *** significant at ($P < 0.001$).

Discussion

Spaulding system classifies instrument into three categories which are critical, semicritical and least critical⁽⁹⁾. According to Rutala and Weper, the semicritical considered the most important one that should be highlighted in order to prevent disease transmission⁽¹⁰⁾. Orthodontic instruments, orthodontic supplies and accessories considered as the semicritical since they touch mucous membrane and non-intact skin^(11,12).

This study mainly depended on experience, place of work as well as, daily patient capacity of the GP and orthodontist. The sterilization process is important to orthodontists as well as, dentists, even though they do not perform surgical procedures⁽¹³⁻¹⁴⁾. In another hand Starnbach & Akçam⁽¹⁵⁻¹⁶⁾ indicate, sterilization is less abundance to orthodontists than dentists since they usually deal with children, with loss of time, money and the corrosion of orthodontic instruments in addition they did not deal with deep tissues.⁽⁸⁾ Professional agencies like Center of Disease Control (CDC) and Occupational Safety and Health Administration (OSHA), have a specific recommendations representing standard infection control which considered as keywords to be followed in order to prevent cross infection⁽¹⁷⁾. Despite of these rules mentioned above, this study showed that (57.4%) of participate orthodontists depends on the manual cleaning procedure more significantly than the ultra-sonic devises (42.6%). This percentage could be resulted due to the lack of knowledge about advantage of ultra-sonic devises in the granting the proper removing of debris from the orthodontic instrument⁽¹⁸⁻¹⁹⁾. However, the manual cleaning is also an important step in ensuring the debris removal after mechanical cleaning and before autoclaving⁽²⁰⁾. This study showed that (85.1%) of participated presoaked the instrument in disinfected solution before starting the sterilization process. This prevents the dryness and adherence of bioburden to instruments that protect microorganism from sterilization⁽²¹⁾. In addition to that it begins to dissolve organic debris and in some instances begin microbial kill. This solution should discard at least once a day⁽¹⁷⁾. This study showed high percentage of participates who used autoclave whether used for orthodontic pliers, band purchases and molar bands after trying in patient mouth⁽²²⁾. This concurred with the significant findings of participates who pouch their instruments. This could be explained by the high education level and interest in sterilization of orthodontists and according to recommendations of Iraqi Dental Association (IDA). Although most of orthodontist (87%) using autoclave but the result showed that high percentage of them only wipes the hand piece which is not recommended as the hand piece represents a hallow instrument that may contain blood drops contamination inside the internal lumen and this can be only sterilize by using autoclave class B⁽²³⁻²⁴⁻²⁵⁾ and (26-27-28-29). This could be the result of old believes that heat could ruin the hand piece leading to a financial lost. As a matter of fact the hand piece sterilization is obligatory according to the CDC guidelines. This can be achieved neither by providing clinics with an enough amount of hand piece in order to match the number of patients who daily visit the clinics, nor by applying advanced sterilization programs⁽³⁰⁾. Since hand pieces are available in the Iraqi market with an affordable cost. Bracket, wire and bands represents a dangerous source since they are removed from oral cavity in which they had been contaminated with body fluid (saliva and blood) also wire's end considered as a sharp end that may prick the orthodontist, so the sharp pin represent the better choice for disposing⁽³¹⁻³²⁾. This study showed that (74.3%) of participant have sharp bin in their clinics, despite of the importance value of having it in the clinics, only (26.7%) who are really using it while (49.5%) of the participant use waste basket. This approved a week point in disposal. This study showed a highly significant percentage (90.1%) of the participant who do not use recycle brackets and orthodontic materials since the process of recycling alters the mechanical and physical properties also it is nor granted that they are not contaminated^(33,34) also, the brackets and orthodontic

materials are available in the Iraqi market with a reasonable cost. In this study, a non-significant value (50.5% -47.5%) have been shown between the participants who disinfected their impression or appliances to be delivered to an outer laboratory. Standers showed that all impression and model must be disinfected before delivering to the laboratory and vice versa ⁽³⁵⁾. Now a day, this complicated issue has been solved by introducing the digital scan in the dental filed ⁽³⁶⁾.

Kitchen gloves considered as a heavy duty gloves that protect the operator from accidental puncher by sharp dental tools and cross infection ⁽¹⁷⁾. Unfortunately, this study showed a high rating of (96%) who use examination gloves which considered a thinner and easy tearing gloves as compared to the kitchen gloves ⁽⁸⁾.

Dentists and assistances are always mandatory to be vaccinated against hepatitis B virus ⁽³⁷⁾, this coincide with the result of this study which revealed the highly significant rating (82.2%) who had been vaccinated.

Conclusion

The result of this study reveals good behaviors by Iraqi orthodontist for most of infection control steps although some behaviors need to be improved following world wide infection control guide lines.