

A comparative study of practicing cross-infection control of dental prostheses and implant components among prosthodontists and dental technicians in Qassim province, Saudi Arabia

Nabila A Sedky

Community and Preventive Dentistry, College of Dentistry, Qassim University, Saudi Arabia

doi: 10.3396/ijic.v15i4.016.19

Abstract

The objectives were to compare the performance of infection control practices among prosthodontists and dental technicians in Al-Qassim Province, Kingdom of Saudi Arabia with regard to dental prostheses, impression copings, implant analogs and customized implant abutments (implant components). Self-administered questionnaires were submitted to 48 prosthodontists and 46 laboratory technicians in three cities. The questionnaires consisted of 19 questions for prosthodontists and 21 questions for laboratory technicians. All questionnaires were reviewed in situ to make sure they were fulfilled completely.

A statistically significant difference was found between participants regarding receiving refresher infection control courses, while there was no statistical difference concerning disinfection protocols as well as communication regarding disinfection of prosthesis. For disinfection of different types of prosthesis before sending to lab/clinic, higher percentage of dentists applied this procedure (42.55% and 40.43%) compared to technicians (17.02% and 18.09%), while disinfection after return was higher among technicians (43.62% and 46.81%). Concerning implant components, dentists registered a low percentage for disinfection/sterilization of sent and returned items (13.83% and 7.45%), whereas 46.81% of technicians disinfect/sterilize implant components upon return from clinic.

In conclusion, there was shortage of appropriate practice of infection control procedures in prosthodontic clinics and labs regarding the disinfection of dental prostheses as well as the disinfection/sterilization of implant components upon sent/returned to the dental lab/clinic.

Keywords: infection control, dentistry, dental laboratories, dental prosthesis, Saudi Arabia

Corresponding Author

Nabila A Sedky

Community and Preventive Dentistry, College of Dentistry, Qassim University, Buraidah, Saudi Arabia

E-mail: prof.nabila.sedky@qudent.org; nasedky@yahoo.com

Introduction

There is growing worry concerning cross-infection issue in dental clinics and laboratories, particularly after discovering that transmission of infection to dental technicians is chiefly through contaminated impressions and also via inappropriate management of clinical items received in the dental laboratory.¹

The human oral cavity is a rich environment for several infectious and harmful microorganisms to be transmitted, inoculated, and grow through blood and saliva, which are the common means for spread of these microbial agents in the dental clinic as well as the dental laboratory.²⁻⁴ On a daily basis, dentists and dental laboratory technicians are exposed to a wide variety of microorganisms that can produce infectious diseases. Findings of a previous study revealed that out of ten sterile complete dentures that were fractured and delivered to various dental laboratories for repair, nine were contaminated with potentially pathogenic microorganisms.⁵

Dental impressions, bite registration, trial dentures and final prostheses are prone to contamination in the patient's mouth which can promote the spread of infectious agents to the clinician, patients as well as to the dental technicians.⁶⁻⁸ The Centers for Disease Control and Prevention (CDC) and World Health Organization (WHO) recommend cleaning and disinfection of all patients' prostheses prior to delivery to the dental lab and upon return to the dental clinic.^{9,10} In a survey conducted by Hatzikyriakos *et al.*,¹¹ 26% of laboratories did not disinfect the impressions, while 56% of participants reported that they have no training about infection control in laboratories. These outcomes denote that infection control programs should be developed and implemented by dental technicians prior to handling any clinical items from dental clinics.¹

Although rinsing under running water was the recommended procedure for cleaning impressions,¹² that proved to reduce about 90% of the count of microorganisms on their surfaces. However, a measurable bacterial load still remains on impressions that can be transferred to casts.^{13,14} Casts poured from impressions can also hide infectious microorganisms that can spread in the laboratory during trimming

the casts.¹⁵ Casts can be disinfected by immersing or spraying them with disinfecting solutions¹⁶⁻²¹ and also by adding chemical disinfectants directly to the dental stone.^{17,22}

Bacterial species lodging in the internal surfaces of the implant analogs and customized implant abutments as well as the impression copings are not surprising.²³ According to the guidelines of the American Dental Association (ADA) these items are classified as semi-critical medical devices,²¹ that should be sterilized after each use if they are heat tolerant.²¹ The European Union (EU) demands that medical devices, including implant components and impression copings, be reesterilizable and be sterilized as recommended by the manufacturer;²⁴ thus, decontamination/sterilization recommendations for surgical instruments should be employed.²⁵ For heat-sensitive abutments including ceramic, resin, or resin composite veneered abutments,²⁶⁻²⁹ high-level disinfection would be appropriate.

Appropriate performance of cleaning, disinfection and sterilization procedures both in the dental office and the laboratory will be ensured through effective communication and organization between them, so as to guarantee these procedures, where all aspects of dental activities should be covered by infection control practices, however duplication should be avoided.³⁰

Previously, many studies have been conducted on infection control in dental clinics and also in dental laboratories.^{3,4,7,31-34} Yet, these studies did not cover some of the important infection control procedures in prosthodontic clinics and some crucial items in the dental lab. Based on these considerations, the aim of this study was to compare the performance of infection control practices among prosthodontists and dental technicians in Al-Qassim Province, Saudi Arabia with regard to dental prostheses, impression copings, implant analogs and customized implant abutments (implant components). The information obtained from this study will assist in the development of infection control guidelines to be implemented in dental laboratories and prosthodontic clinics on a large scale in the field of dentistry.

Material and Methods

The current cross-sectional study constituted anonymous pre-tested self-administered questionnaires that were formulated and submitted to 48 prosthodontists and 46 laboratory technicians randomly selected from those employed with the Ministry of Health (MoH), in three cities from Al-Qassim Province (Buraidah, Unaizah, and Arrass). According to the annual statistical book of MoH 2017, the total number of dentists and dental technicians appointed by MoH was 3991 dentists and 3153 dental technicians.³⁵

All questionnaires were applied by only one operator, who was always present during filling out the forms, to avoid variations on the data-base collection. The questionnaires consisted of 18 questions for prosthodontists and 20 questions for laboratory technicians which aimed to gather information about the intended subjects. The questions were directed to each of the dentists in the dental clinic and for the dental technicians in the dental laboratory. All questionnaires were reviewed in situ to make sure they were fulfilled completely.

The English version of the questionnaires was translated into Arabic language and filled by the investigator then pre-tested on randomly selected 6 dentists and dental technicians to ensure its comprehension, practicability, validity, interpretation of responses, and reliability (Cronbach's α for dentists and dental technicians=0.813 and 0.861, respectively).

Ethical considerations

Ethical approval was obtained from the Ethics Committee of the Dental Research Centre of Qassim University (Code #: EA/5/2018). Data were collected after written consent from each participant with a brief description about the importance of the study.

Statistical Analysis

Statistical analysis was conducted using the SPSS program (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.). All statistical analyses were carried out at a significance level less than 0.05 and 0.001. Results were analyzed and compared by means of cross-

tabulation and statistical association tests. The chi-square test was used to test associations between the studied groups and the different investigated variables. Finally, regression analysis was conducted to figure out which factors that have the main effect on the studied condition.

Results

Forty-eight prosthodontists and forty-six dental technicians completely filled the submitted questionnaires with mean age of 38.67 (SD \pm 10.65) years for dentists and 37.39 (SD \pm 9.06) years for dental technicians.

On enquiry about whether the participating subjects had undergone any refresher courses on infection control for the past year, 41.49% of the dentists and 26.60% of the dental technicians reported they had, with a statistically significant difference between them. Additionally, a statistically significant difference was found between the contributors concerning the products commonly used for disinfection. On the other hand, there was no statistically significant difference with regard to having a written infection control policy for incoming prostheses, as well as for any communication regarding the disinfection of prostheses sent/received to/in the laboratory (Table I).

Table II shows results relating to disinfection of prostheses and implant components BEFORE sending to the lab/clinic. The majority of dentists (42.55%) disinfect the metal try in, porcelain and ceramic crowns and bridges in their clinics, compared to only 17.02% of the dental technicians ($p < 0.001$). Statistically significant differences were identified related to how this procedure is performed. Differences were also identified related to the disinfection of bite registration, trial dentures and complete dentures, and the details of how these procedures were performed (Table II). On the other hand, no statistically significant difference was identified when asking about disinfection/sterilization of the impression copings, implant analogs and customized implant abutments, where most of the prosthodontists and technicians replied that they didn't perform this issue, though a statistically significant difference was observed related to the methods used (Table II).

Table I. Infection control system in dental office and prosthodontic lab

Variable		Group			χ^2 (P)
		Dentists	Dental Technicians	Total	
Refresher courses on infection control for the past year	Yes	41.49%	26.60%	68.09%	7.823** (0.005)
	No	9.6%	22.34%	31.91%	
Total		51.06%	48.94%	100.0%	
Written infection control policy [disinfection protocol] for incoming prosthesis	Yes	42.55%	37.23%	79.79%	0.765 (0.269)
	No	8.51%	11.70%	20.21%	
Total		51.06%	48.94%	100.0%	
Communication regarding the disinfection of prosthesis sent/received to/in the laboratory	Yes	28.72%	29.79%	58.51%	0.206 (0.403)
	No	22.34%	19.15%	41.49%	
Total		51.06%	48.94%	100.0%	
Products commonly used for disinfection	Glutaraldehyde	19.15%	1.06%	20.21%	27.471** (<0.001)
	Iodophor	5.32%	8.51%	13.83%	
	Quaternary ammonium	0.00%	9.57%	9.57%	
	Sodium hypochlorite	18.09%	15.96%	34.04%	
	Phenolic	0.00%	2.13%	2.13%	
	None	8.51%	11.70%	20.21%	
Total		51.06%	48.94%	100.0%	

*P<0.05

**P<0.001

Table II. Disinfection/sterilization of prosthesis and implant components BEFORE sending and when RETURN to/from the lab/clinic

Variable	BEFORE SENDING				WHEN RETURN			
	Dentists	Dental Technicians	Total	χ^2 (P)	Dentists	Dental Technicians	Total	χ^2 (P)
Disinfection of prosthesis [metal try in, porcelain and ceramic crowns and bridges]	Yes	42.55%	17.02%	59.57%	29.79%	43.62%	73.40%	11.412** (0.001)
	No	8.51%	31.91%	40.43%	21.28%	5.32%	26.60%	
	Total	51.06%	48.94%	100.00%	51.06%	48.94%	100.00%	
Cleaning in running water only		10.71%	0.00%	10.71%	5.80%	1.45%	7.25%	18.042** (0.003)
	Spray with disinfectant only	17.86%	5.36%	23.21%	11.59%	2.90%	14.49%	
	Immerse in disinfectant only	0.05%	0.00%	0.00%	0.00%	14.49%	14.49%	
	Spray and immerse with disinfectant	1.79%	7.14%	8.93%	2.90%	0.00%	2.90%	
	Cleaning in running water and spray with disinfectant	26.79%	8.93%	35.71%	14.49%	28.98%	43.47%	
Cleaning in running water and spray and immerse with disinfectant		14.29%	1.79%	16.07%	0.00%	7.25%	7.25%	29.316** (<0.001)
	Cleaning in running water and immerse in disinfectant	0.00%	5.36%	5.36%	5.80%	4.35%	10.15%	
	Total	71.43%	28.57%	100.00%	40.58%	59.42%	100.00%	
Disinfection of prosthesis [bite registration, trial dentures and complete dentures]	Yes	40.43%	18.09%	58.51%	26.60%	46.81%	73.40%	17.240** (<0.001)
	No	10.64%	30.85%	41.49%	24.47%	2.13%	26.60%	
	Total	51.06%	48.94%	100.00%	51.06%	48.94%	100.00%	

	Cleaning in running water only	9.09%	0.00%	9.09%	5.80%	0.00%	5.80%
	Spray with disinfectant only	18.18%	1.82%	20.00%	10.14%	2.91%	13.05%
	Immerse in disinfectant only	0.00%	12.73%	12.73%	0.00%	14.49%	14.49%
	Spray and immerse with disinfectant	1.82%	0.00%	1.82%	2.90%	0.00%	2.90%
If "Yes", how?	Cleaning in running water and spray with disinfectant	29.09%	7.27%	36.36%	31.745**	33.33%	32.727**
	Cleaning in running water and immerse in disinfectant	0.00%	7.27%	7.27%	(<0.001)	10.14%	10.14%
	Cleaning in running water and spray and immerse with disinfectant	10.91%	1.82%	12.73%	4.35%	2.90%	7.25%
	Total	69.09%	30.91%	100.00%	36.23%	63.77%	100.00%
Disinfect/sterilize the impression copings, implant analogs and customized implant abutments	Yes	13.83%	17.02%	30.85%	7.45%	46.81%	54.26%
	No	37.23%	31.91%	69.15%	43.62%	2.13%	45.74%
	Total	51.06%	48.94%	100.00%	0.653	51.06%	62.201**
	Cleaning in running water, spray and immerse in disinfectant for 10 minutes	13.79%	10.34%	24.13%	9.81%	32.45%	42.26%
If "Yes", how?	Cleaning in running water and immerse in disinfectant overnight (cold sterilization)	0.00%	41.38%	41.38%	0.00%	46.18%	20.284**
	Cleaning in running water, disinfect and sterilize in autoclave (heat sterilization)	31.04%	3.45%	34.49%	19.469**	7.64%	11.56%
	Total	44.83%	55.17%	100.00%	0.002	86.27%	100.00%

*P<0.05

**P<0.001

On the other hand, asking about disinfection/sterilization of prosthesis and implant components upon RETURN, a statistically significant difference between dental technicians and dentists, as well as the methods used, was noted (Table II). There were also differences related to disinfection of bite registration, trial dentures and complete dentures, as well as the methods used for these (Table II). Finally, a statistically significant difference was noted between the studied groups related to disinfection/sterilization of impression copings, implant analogs and customized implant abutments and the methods used for this (Table II).

Asking about the evaluation and satisfaction with performance of infection control measures in the prosthodontic clinic/lab, no statistical difference was recorded between the studied subjects concerning both the implementation of infection control measures and satisfaction with performance in infection control. Only 21.28% of the prosthodontists and 15.96% of the dental technicians evaluated

their implementation of infection control measures as "good", while for satisfaction with performance in infection control 20.21% of the dentists were "almost satisfied" and 15.96% of the technicians were "fairly satisfied" (Table III).

Table IV shows the precautions taken by the dental technicians during trimming and when making metal framework castings for fixed and removable prostheses. 39.13% of the technicians apply all precautions during trimming and the 69.57% follow these precautions when making metal framework castings for fixed and removable prostheses.

Table V depicts the effect of each independent variable in relation to application of infection control measures assessed by undergoing refresher courses of infection control, based on linear regression analysis. Out of the 17 variables studied, only two variables were statistically associated with the application of infection control measures. The first and best predictor variable was "the evaluation of implementation of

Table III. Evaluation and satisfaction with performance of infection control measures in the prosthodontic clinic/lab

Variable		Group		Total	χ^2 (P)
		Dentists	Dental Technicians		
Evaluation of implementation of infection control in prosthodontic clinic/ lab	Very poor	2.13%	3.19%	5.32%	7.441 (0.114)
	Poor	4.26%	9.57%	13.83%	
	Fair	9.57%	14.89%	24.47%	
	Good	21.28%	15.96%	37.23%	
	Very good	13.83%	5.32%	19.15%	
Total		51.06%	48.94%	100.0%	
Satisfaction with performance in infection control measures	Not satisfied	2.13%	3.19%	5.32%	6.452 (0.168)
	Little satisfied	4.26%	8.51%	12.77%	
	Fairly satisfied	9.57%	15.96%	25.53%	
	Almost satisfied	20.21%	13.83%	34.04%	
	Totally satisfied	14.89%	7.45%	22.34%	
Total		51.06%	48.94%	100.0%	

*P<0.05

**P<0.001

Table IV. Precautions taken by the technicians during trimming and when making metal framework castings for fixed and removable prostheses

Variable		Frequency	Percent
Precautions taken during trimming	clinic attire	5	10.87
	protective eyewear	2	4.35
	exam gloves	4	8.70
	clinic attire and protective eyewear	4	8.70
	clinic attire, mask and exam gloves	13	28.26
	All Precautions	18	39.13
Total		46	100.0
Precautions taken when making metal framework castings for fixed and removable prostheses	clinic attire	4	8.70
	protective eyewear	3	6.52
	mask	1	2.17
	clinic attire and protective eyewear	6	13.04
	All Precautions	32	69.57
	Total		46

Table V. Significant variables related to application of infection control measures assessed by undergoing refresher courses of infection control based on linear regression analysis

Model	Variables	Unstandardized Coefficients B	Standardized Coefficients Beta	R ²	R ² Change	t	P-value
1	(Constant)	2.484		0.622	0.622	25.045	<0.001
	Evaluation of implementation of infection control measures	-0.332	-0.789			-12.316	<0.001
2	(Constant)	2.328		0.643	0.020	19.575	<0.001
	Evaluation of implementation of infection control measures	-0.322	-0.765			-12.023	<0.001
	Products commonly used for disinfection	0.033	0.144			2.265	0.026

Dependent Variable: Refresher courses on infection control for the past year

infection control measures”, where those subjects who received refresher courses of infection control during the previous year were 62.2 times considering the implementation of infection control procedures as “good” and “very good” than those who didn’t attend those courses. Furthermore, “the products commonly used for disinfection” was the second predictor variable that was likely to affect the application of infection control measures in dental lab/clinic, where those subjects who received refresher courses evaluated the implementation of infection control processes as “good” and “very good” as well as being recognizable, experienced and dedicated to use the different types of commonly used disinfectants by two times more than the studied subjects who didn’t get refresher courses of infection control in last year. Table VI shows the effect of each independent variable in relation to written infection control policy for incoming prostheses. Out of seventeen variables studied, only three variables were statistically associated with the application of infection control measures. The first and best predictor variable was “disinfect the prosthesis [metal try in, porcelain and ceramic crowns and bridges] BEFORE sending”. The dentist/technician who had a written disinfection protocol for incoming prosthesis, disinfects prostheses 25.3 times more than those who didn’t have a written policy. The second predictor variable was “disinfect the casts and the prosthesis of the complete dentures upon RETURN after jaw relations and wax trial”. The subjects who do disinfect the metal try in, porcelain and ceramic crowns and bridges BEFORE sending to the lab/clinic, committed seven times more to do this for the casts and the prosthesis of the complete dentures upon RETURN after jaw relations and wax trial. The last predictor was “the products commonly used for disinfection”; those subjects who disinfect the prosthesis before sending as well as disinfect the casts and the prosthesis of the complete dentures upon RETURN are 4.2 times familiar, knowledgeable and committed to use the different types of commonly used disinfectants in the clinic/lab.

Discussion

Infection control is an essential part of practice for all healthcare providers and is considered as one of the most cost-beneficial available interventions.³⁶ In prosthodontics, objects that are potentially

contaminated with pathogenic microorganisms are transferred to and from the dental clinic and lab. While laboratory technicians do not have the initial responsibility in controlling cross-infection, they are in charge of applying the disinfection procedures of appliances received from and sent back to the dental office.³⁷

Efficient communication and coordination between the dental clinic and dental lab will guarantee that proper cleaning and disinfection procedures are implemented either in the dental clinic or lab so that disinfection is ensured, but duplication of procedures should be avoided.³⁰ Findings of the current study revealed that communication between dentists and the dental technicians regarding the disinfection of prosthesis sent/received to/in the laboratory was poor as only 28.72% of the participating dentists and 29.79% of the technicians reported that they do communicate with each other for this item, meaning that there is deficiency in the communication between them. This is not in accord with the recommendations of Kohli and Puttaiah³⁸ as they stated that adequate communications should be organized between the dental lab and the clinic concerning decontamination of the items that have been delivered. Also, these results are in contrast to that reported by Gupta *et al.*,³⁹ who found that 71.15% of the dental technicians communicate with the dentists. On the other hand, the current findings agreed with that of Al-Kheraif *et al.*,⁴⁰ who concluded that 90.6 % of the laboratories did not have any communication with the clinics with regard to the disinfection procedures of prosthesis.

Infection control training courses are considered one of the main reasons for maintaining infection control practices in dental clinics and laboratories. In the current study 41.49% of the dentists had undergone refresher courses on infection control for the past year compared to only 26.60% of dental technicians. These results may explain the poor compliance of dental technicians to apply infection control measures with regard to prosthesis and implant components upon receiving these from the dental clinics, while the majority of them reported that they do comply with the infection control guidelines for the returned prosthesis as well as the impression copings, implant analogs and customized implant abutments to the

Table VI. Significant variables related to application of infection control measures assessed by having written infection control policy for incoming prosthesis based on linear regression analysis

Model	Variables	Unstandardized Coefficients B	Standardized Coefficients Beta	R ²	R ² Change	t	P-value
1	(Constant)	0.624				5.690	<0.001
	Disinfect prosthesis [metal try in, porcelain and ceramic crowns and bridges] BEFORE sending	0.412	0.503	0.253	0.253	5.583	<0.001
2	(Constant)	0.303				2.042	0.044
	Disinfect prosthesis [metal try in, porcelain and ceramic crowns and bridges] BEFORE sending	0.423	0.517			5.990	<0.001
	Disinfect casts and prosthesis of complete dentures when RETURN after jaw relations and wax trial	0.241	0.265	0.323	0.070	3.064	0.003
3	(Constant)	0.335				2.310	0.023
	Disinfect prosthesis [metal try in, porcelain and ceramic crowns and bridges] BEFORE sending	0.313	0.382			3.793	<0.001
	Disinfect casts and prosthesis of complete dentures when RETURN after jaw relations and wax trial	0.197	0.217	0.365	0.042	2.513	0.014
	Products commonly used for disinfection	0.049	0.249			2.440	0.017

Dependent Variable: Written infection control policy [disinfection protocol] for incoming prosthesis

dental clinics. Prosthodontists revealed lack of commitment towards the disinfection/sterilization of the implant components in their clinics BEFORE sending to the lab as well as after RETURN, also this non-compliance was applied to disinfection of prosthesis upon RETURN from lab. These suggest that dental technicians and dentists are in urgent need of workshops and refresher training courses in measures of infection control so that they can practice these measures efficiently and continuously. Results of this study are somewhat better than that of Sammy *et al.*,⁴¹ who found that 93.3% of the participating technicians had not undertaken any refresher infection control courses/training in the past year.

Forty three percent of the prosthodontists and 37.23% of the technicians confirmed that they have written disinfection protocols for incoming prosthesis. Results of the present study are somewhat lesser than what was registered by Jagger *et al.*,⁴² who found that 49% of the dental laboratories in UK had a cross-infection policy. On the other hand, findings of this study are slightly higher than that of Gupta *et al.*,³⁹ who discovered that 25% of the dental technicians had infection control protocol and they were aware about it.

Khon *et al.*,² reported that proper disinfection for impressions, dental casts, denture prosthesis, cast metal framework, bite registration as well as wax rim, should be strictly performed before sending these items to the laboratory. Moreover, the guidelines of the CDC for infection control in dental health-care settings recommended specific strategies to control cross-contamination in the dental clinic and dental laboratory.⁴³ In the present study, enquiry about the method of disinfection of interchanged prostheses between the clinic and lab revealed that cleaning in running water and spray with disinfectant was the most common method of disinfection applied by the dentists and the dental technicians to disinfect the different prostheses BEFORE sending to and after RETURN from the lab/clinic. Whereas, 12.73% of the technicians reported that they immerse bite registration, trial dentures and complete dentures in disinfectant only BEFORE sending to the clinic. Regarding the disinfectants used, glutaraldehyde and sodium hypochlorite (19.15%

and 18.09%, respectively) were the most commonly used disinfectants by dentists, while 15.96% of the technicians reported that they used sodium hypochlorite as a disinfectant material and 11.70% of them didn't use any disinfectants. However, regarding the method of disinfection of different types of prostheses and the most commonly used disinfectant materials, findings of the current study are in agreement with that of previous studies.⁴⁴⁻⁴⁹

Aldosari concluded that sterilizing the implant components did not affect the accuracy of the impressions.⁵⁰ This outcome denotes that impression copings and implant analogs can be safely sterilized without affecting the quality of the impressions made. On the other hand, Alikhasi *et al.*,⁵¹ stated that it is better not to reuse the implant analogs as their removal from dental casts may lead to their distortion which could affect the transfer accuracy, while impression copings can be successfully used without compromising the impression accuracy after being cleaned and sterilized up to 10 times. Additionally, Shafie declared that implant abutments should be cleaned, disinfected, and, in particular clinical cases and procedures, be sterilized, following carefully all procedural instructions to avoid any accountability.⁵² Questioning about disinfection/sterilization of the implant components BEFORE sending to the lab, the majority of prosthodontists and dental technicians in our study did not perform disinfection/sterilization for the impression copings, implant analogs and customized implant abutments (Table II). Further, while 46.81% of the technicians reported that they disinfect/sterilize these items after RETURN from the clinic, the majority of dentists did not, indicating inadequacy in the performance of infection control measures with regard to implant components.

In the current study, a minority of the dentists evaluated their implementation of infection control in the prosthodontic clinics as being "good" and "very good", and 20.21% of them were "almost satisfied" with their performance in infection control in their prosthodontic clinics (Table III). Also a small percentage of the dental technicians stated that they are "fair" and "good" at implementing infection control measures in their laboratories, with "fair satisfaction" about their performance in infection control measures (Table

III). Only 39.13% of technicians apply all personal protective equipment as protective precautions during trimming.

These results reflect the perception of the participants concerning the implementation of infection control measures in the prosthodontic clinic/lab, and indicate the need for additional educational efforts to intensify the efforts to enhance their awareness and attitudes towards the application of infection control in their clinics/labs.

Conclusion

There is a lack of proper application of infection control measures in prosthodontic clinics and labs with regard to the disinfection of dental prostheses and the disinfection/sterilization of implant components upon sent/returned to the dental lab/clinic. As the study has been performed with dentists and dental technicians in only three cities of Qassim province in Saudi Arabia, and as the sample size is considered small in relation to the whole number of dentists and dental technicians belonging to MoH which are limitations in the current study, further studies are recommended to be directed to the prosthodontists and dental technicians in other areas of Saudi Arabia to offer a wider picture about the compliance and commitment of the target group with the recommended infection control programs.

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