

Practice of Cross-Contamination Prevention among Dental Laboratory Technicians in the City of Jeddah in Saudi Arabia

Abdulsalam Khalil Ezzat^{1*}, Lulwa Ebrahim Al-Turki², Ibrahim Abdulshakour Yamany³ and Linah Mohammed Ahmed Ashy²

¹Professor, Department of Oral and Maxillofacial Prosthodontics, Faculty of Dentistry, King AbdulAziz University, Jeddah, Saudi Arabia

²Assistant Professor, Department of Oral and Maxillofacial Prosthodontics, Faculty of Dentistry, King AbdulAziz University, Jeddah, Saudi Arabia

³Assistant Professor, Department of Oral diagnostic Sciences, Faculty of Dentistry, King AbdulAziz University, Jeddah, Saudi Arabia

***Corresponding Author:** Abdulsalam Khalil Ezzat, Professor, Department of Oral and Maxillofacial Prosthodontics, Faculty of Dentistry, King AbdulAziz University, Jeddah, Saudi Arabia.

Received: November 01, 2018; **Published:** November 26, 2018

Abstract

Objectives: The aim of this study was to evaluate infection control measures and practice among dental laboratory technicians in the city of Jeddah in Saudi Arabia.

Material and methods: Twenty-six dental technicians participated in this study. Data were collected by means of a questionnaire. The questionnaire-included inquiries about cross contamination infection control protocols practiced among dental laboratory technicians in the city of Jeddah in Saudi Arabia. A total of twenty-six laboratory technicians participated in the questionnaire.

Results: In the present study 61.5% of dental technicians were knowledgeable about proper infection control protocols. The majority of dental technicians demonstrated compliance with standard personal infection control protocols.

Conclusions: Additional compliance with infection control protocols is mandatory among dental laboratory technicians.

Keywords: Cross Infection; Dental Laboratory; Disinfection; Dental Technicians; Cross-Contamination

Introduction

Dental patients receiving treatments may be carriers of various pathogenic organisms which may possibly be cross transferred to the treating dentist, the dental technician, as well as, other patients. The control of cross-contamination infection in dental field is the focus of continuing discussions and debates. Dentists are responsible for taking proper protections to protect their patients and their team from the risk of cross-contamination. Dental laboratory technicians are especially susceptible to microbial cross-contamination as a result of inappropriate handling of contaminated matters, such as dental impressions and dental prostheses received from dental clinics [1,2]. Casts poured from contaminated impressions may as well include pathogenic microorganisms that may be dispersed throughout the dental laboratory. The dental patient may as well be the casualty of cross contamination via contaminated dental items and prostheses received from the lab.

Several guidelines and recommendations were published in an attempt to avoid or minimize the possibility of cross contamination in the dental profession. The following section summarizes the most important highlights of dental cross contamination infection control protocols between the dental clinic and the dental laboratory.

Dental Clinics

All clinical materials sent to dental laboratories must be cleaned and disinfected at the dental office prior to sending to the laboratory. If there is no clear identification of the completeness of the disinfection procedures, all received clinical materials must be disinfected at the dental laboratory. One key element in the cross contamination in the dental field is the dental impression. Contaminated dental impression contaminates the dental cast as well. There are many documentations regarding the transfer of microorganisms to the dental impressions and consequently to the dental casts. Transferred microorganisms may remain viable for up to 7 days. Because of possible damage to the dental cast, it is recommended to disinfect the dental impression before pouring casts [3]. A chemical disinfectant that is compatible with the dental impression material must be used so that it does not alter the dimensional accuracy or surface texture. After washing the impression under running tap water, the impression may be disinfected by spraying or immersing. The spraying technique utilizes less quantity of the disinfectant solution. However, it is likely to result in incomplete coverage of all impression surfaces, undercuts in particular, and also releases chemicals into the air. In contrast, the immersion technique, involves complete coverage of the impression in the disinfectant [3]. Thereby, the dipping technique is more effective and has less potential for occupational exposures. The most common disinfectants solutions and sprays include: 5.25% sodium hypochlorite, 7.5% hydrogen peroxide, and chlorine dioxide. The disinfectant solution must be tuberculocidal and provide a TB kill time on the labeling. The hydrophilicity of these materials with respect to tolerance to immersion in fluids is a significant factor in the disinfection protocols for impression materials. Thereby, the manufacturer's instructions for disinfection must be followed.

Dental Laboratories

Hand sanitation in a dental laboratory is preformed through washing with soap and water. Waterless alcohol-based hand rubs may also be used. Installing automatic hand-sanitation dispensers may be considered for ease of use, as well as, to encourage frequent use [4]. Personal protective equipments including heavy gloves, facemasks and shields must be utilized whenever there is a potential risk of cross-contamination.

Assigned receiving, production, and shipping areas provide organized implementation of an efficient infection control plan. The receiving area handles all incoming items. At the receiving area, all items must be cleaned and disinfected. This area must include running water and hand-washing facilities. In the production area, no contaminated items are allowed. The shipping area is where articles departing the dental laboratory take place. In the shipping area, all case containers must be cleaned prior to using for the next case.

Special precautions must be taken when performing procedures with potential cross-contamination. Protective safety glasses must be worn when using dental lathe. Adding a disinfectant agent to pumice is recommended to minimize cross-contamination. Regular washing and sterilization of finishing and polishing lath, brushes, rag wheels, and other laboratory tools are essential.

Dentures

Dentures are usually covered with saliva, gingival fluid, and dental plaque. All body fluids are contaminated with opportunistic pathogenic microorganisms. Consequently, the denture might become a source of cross-contamination infection between patient, dentist and dental laboratory technician. Contaminated prostheses must be disinfected prior to sending to the dental laboratory. The prosthesis must be cleaned using a brush and an antimicrobial soap to eliminate debris. In case of presence of adherent calculus to the prosthesis; the prosthesis must be sealed in plastic bag containing an ultrasonic cleaning solution or calculus remover, and then placed in the ultrasonic cleansing machine [4]. The ultrasonic machine should be covered to avoid splatter. This is followed by, cleaning with a detergent, rinsing, and drying prior to performing any laboratory work on the prosthesis.

Aim of the Study

The aim of this study was to evaluate infection control measures and practice among dental laboratory technicians in the city of Jeddah in Saudi Arabia.

Materials and Methods

Data were gathered from dental laboratory technicians in response to a questionnaire developed by the authors. A total of twenty-six dental technicians participated in the questionnaire that was distributed at a university-based, as well as, commercial dental laboratories, in the city of Jeddah. The questionnaires were administered between January and February 2016. Feedbacks from dental technicians were collected.

The questionnaire included inquiries about their practice of infection control measures. Participants were asked about their prior infection control education.

Participants were also questioned about their hand sanitization protocol and their use of personal protective equipments. In addition, the questionnaire included questions about the use of disinfectant solution and the protocol used to sanitize dental impressions and polishing tools. Descriptive statistical approach was used to analyze the data. Frequency distribution tables were formulated from participants' responses.

Results

Twenty-six dental technicians with a professional experience ranging from 3 to 30 years have participated in the survey. The twenty-five male and one female technician were coming from five dental laboratories in the city of Jeddah, Saudi Arabia. Fourteen participants were affiliated to university governmental institution and twelve were affiliated to the private sector (Figure 1). Responses to survey questions are summarized in figures 1 through 14. Majority of technicians (61.5%) reported receiving infection control training courses (Figure 2). Fifty percent of participating technicians reported not having infection control manual in their laboratories, whereas, 42.3% reported the presence of such a manual (Figure 3). More than one half of included technicians (57.7%) reported the absence of any infection control leaflets mounted in the laboratories and only 30.7% of them reported the presence of instruction leaflets (Figure 4). Washing with soap and water was the most common cleaning/disinfecting protocol used in the dental laboratories. It is used by 73% of technicians to clean their hands, most commonly in-between cases (Figure 5), by 50% of technicians to clean brushes of lathe cut machines (Figure 6) and by 53.8% of technicians to clean rag wheels of lathe cut machines (Figure 7). Sixty five percent of all technicians use more than one method in cleaning their hands (Figure 5). Figures 6 and 7 demonstrate methods utilized by dental technicians to clean and/or disinfect or sterilize bushes and rag wheels used in the lathe cut. Only one technician reported using more than one method in cleaning lathe cut brushes (Figures 7) and only two technicians practice more than one method in cleaning lathe cut brushes and rag wheels (Figures 6). Changing the pumice solution used in the lathe-cut machine was reported by only 26.9% of dental technicians (Figure 8). The most common protective items worn by dental technicians while working were gloves followed by protective eyewear, with about 76.9% of technicians wearing more than one protective item (Figure 9). 30.7% of technicians were able to identify sodium hypochlorite solution as the disinfectant solution used in their laboratories, whereas 27% of all technicians were unaware of the type of disinfectant solution in-use (Figure 10). Dental impressions were the most common items to be disinfected by 73% of all technicians (Figure 11). Most of the technicians (38.5%) reported occasional reception of dental impressions containing saliva debris from their dentists (Figure 12). Ninety-two percent of the technicians wash the received dental impressions under running water (Figure 13) and 76.9% disinfect the impressions prior to handling (Figure 14).

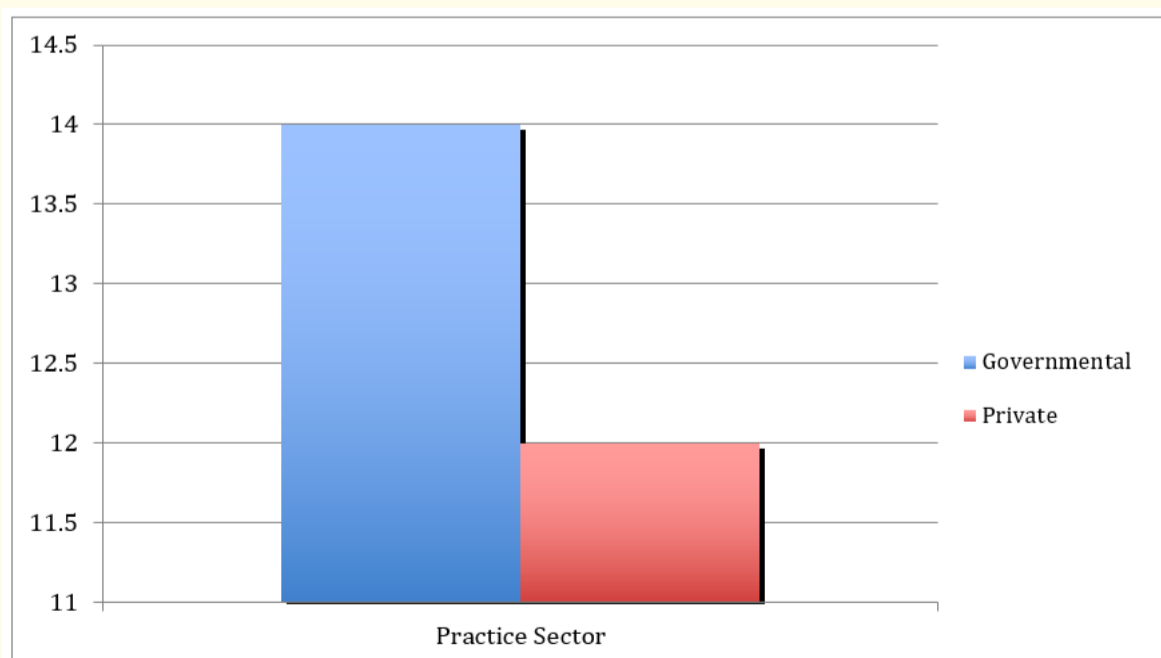


Figure 1: Number of participating dental technicians belonging to governmental institution and private sector.

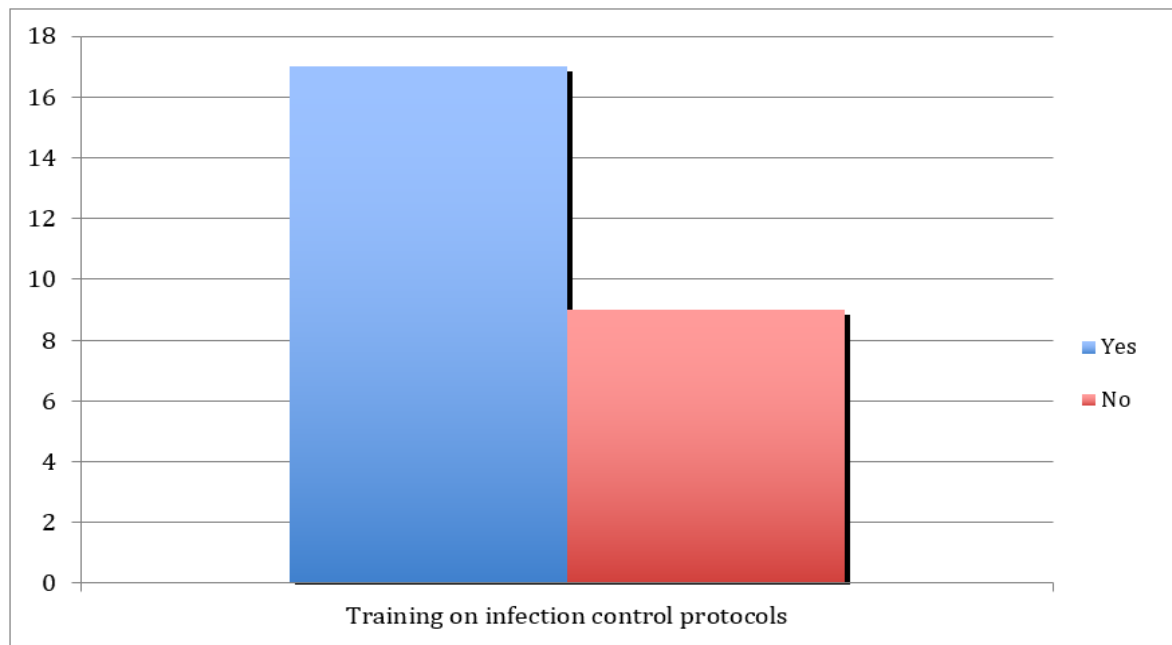


Figure 2: Number of dental technicians who received training courses on infection control protocols.

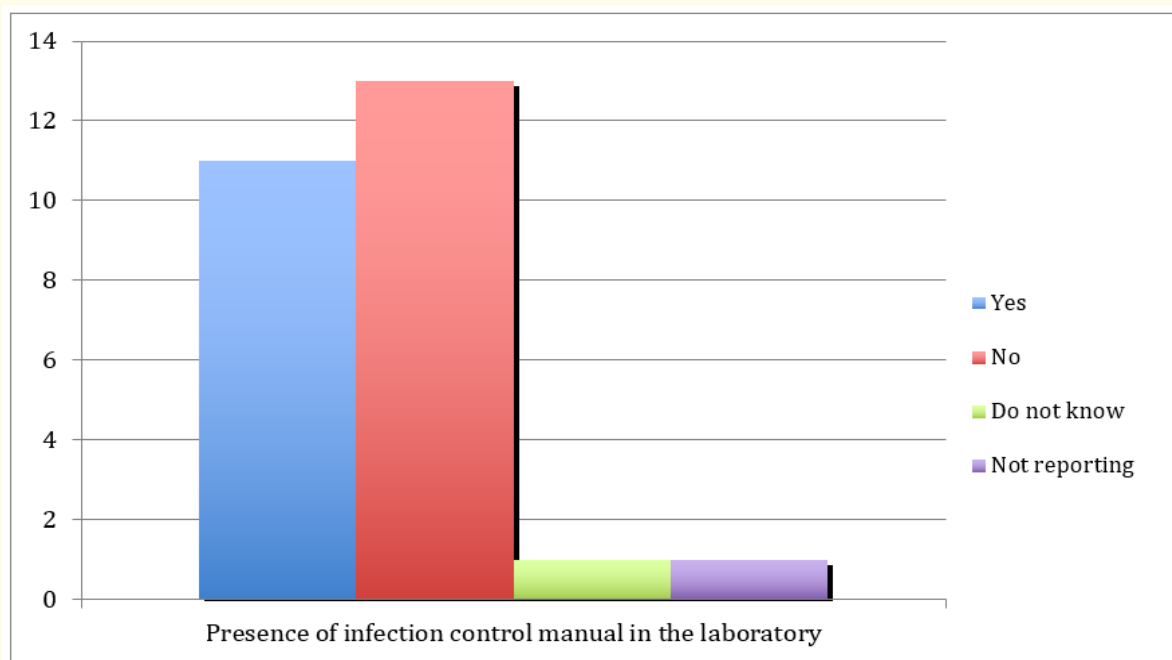


Figure 3: Number of dental technicians reporting on the presence of infection control manual in their laboratory.

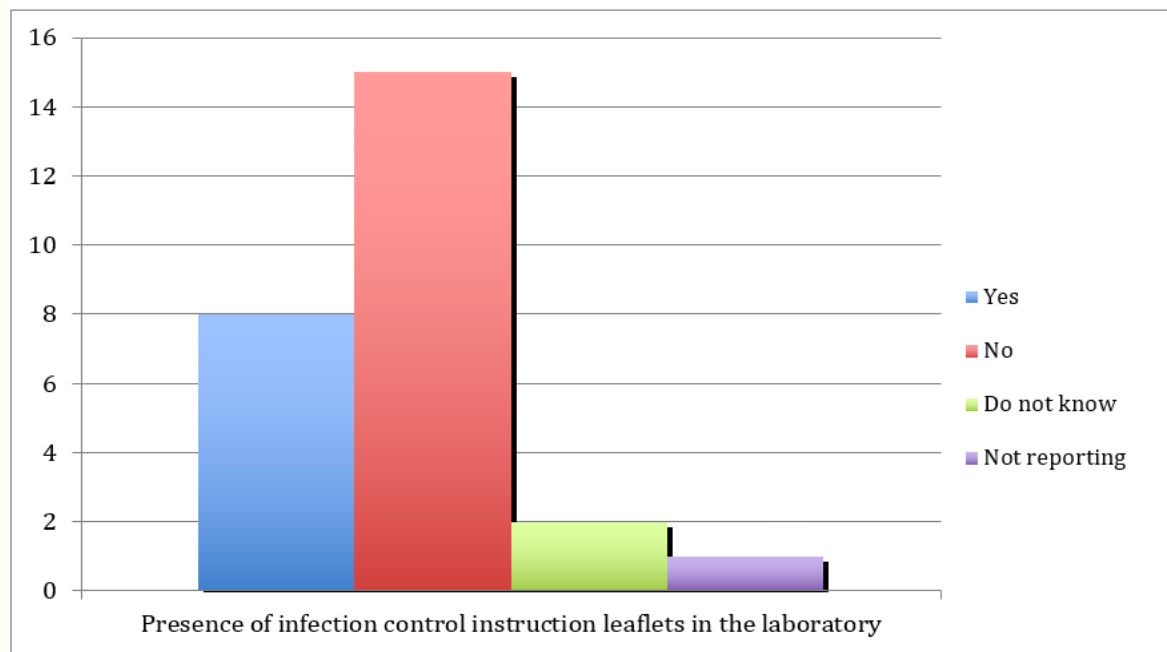


Figure 4: Number of dental technicians reporting on the presence of infection control instruction leaflets in their laboratory.

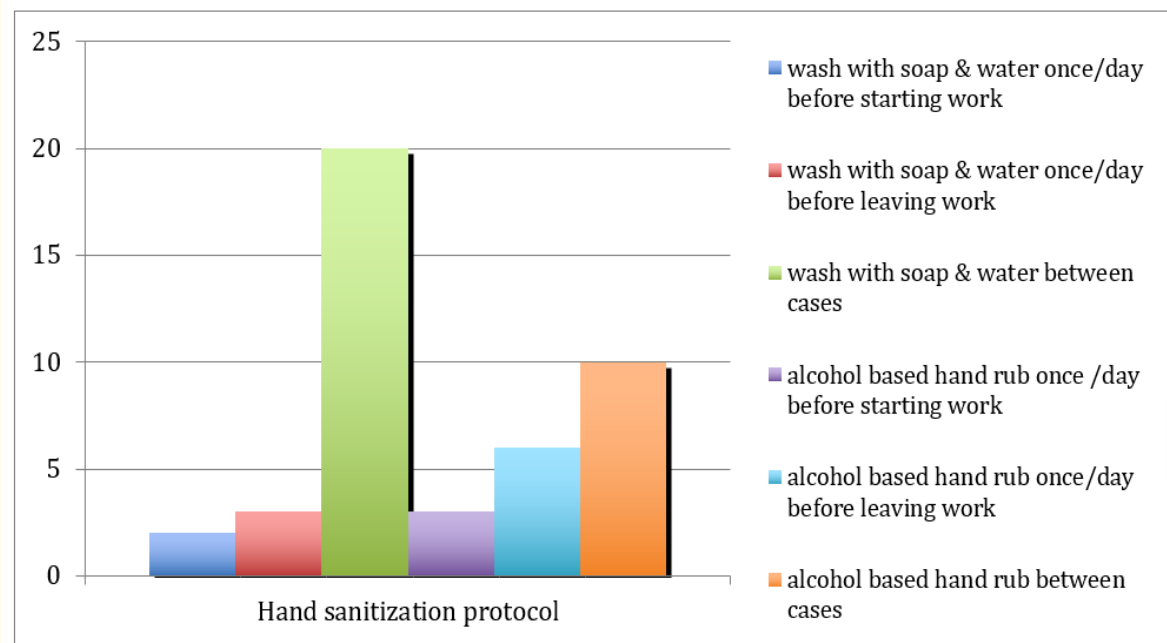


Figure 5: Number of dental technicians using different hand sanitization protocols in their laboratories.

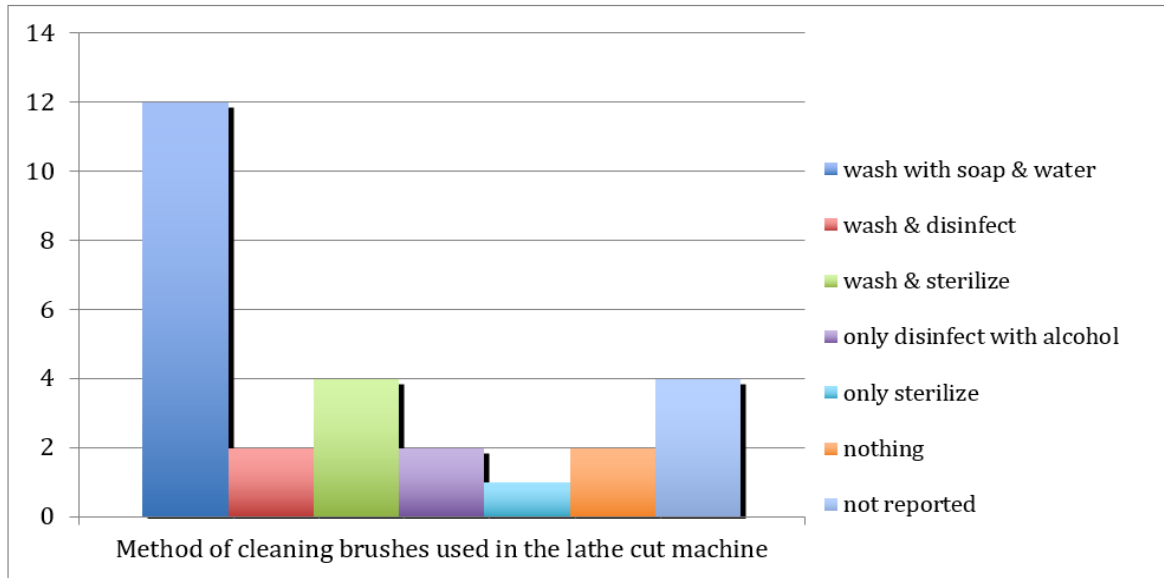


Figure 6: Number of dental technicians reporting on the method of cleaning brushes used in the lathe cut machine in their laboratory.

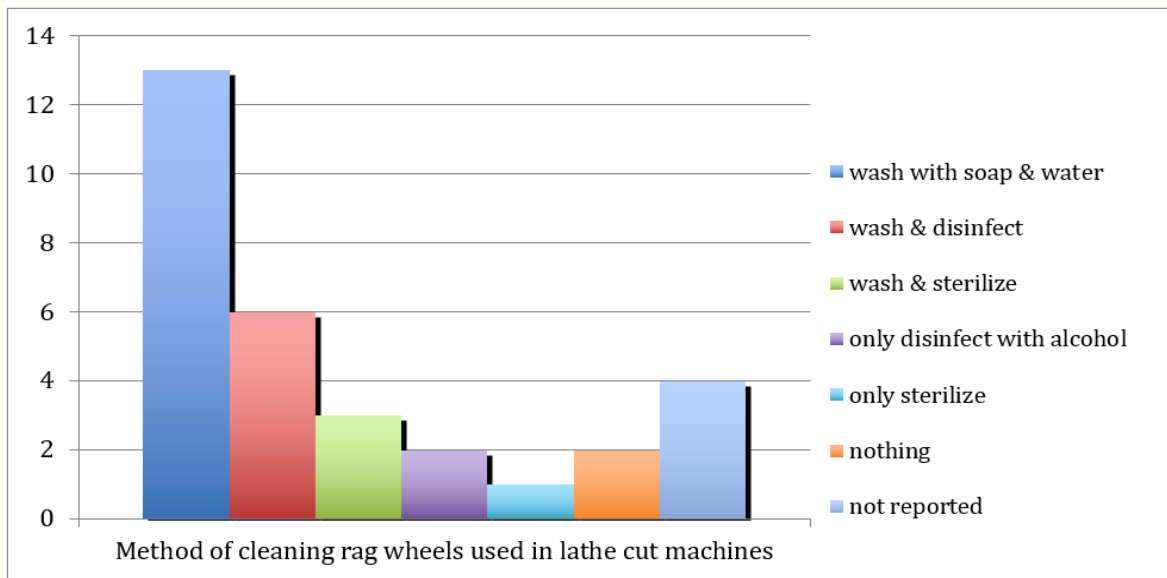


Figure 7: Number of dental technicians reporting on the method of cleaning rag wheels used in the lathe cut machine in their laboratory.

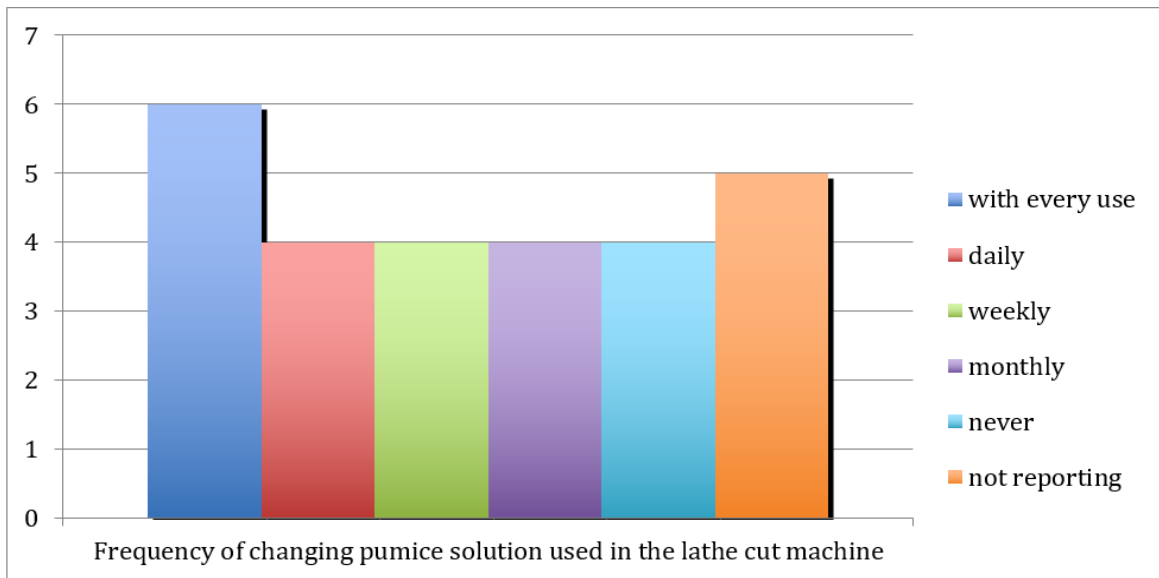


Figure 8: Number of dental technicians reporting on the frequency of changing pumice solution used in the lathe cut machine.

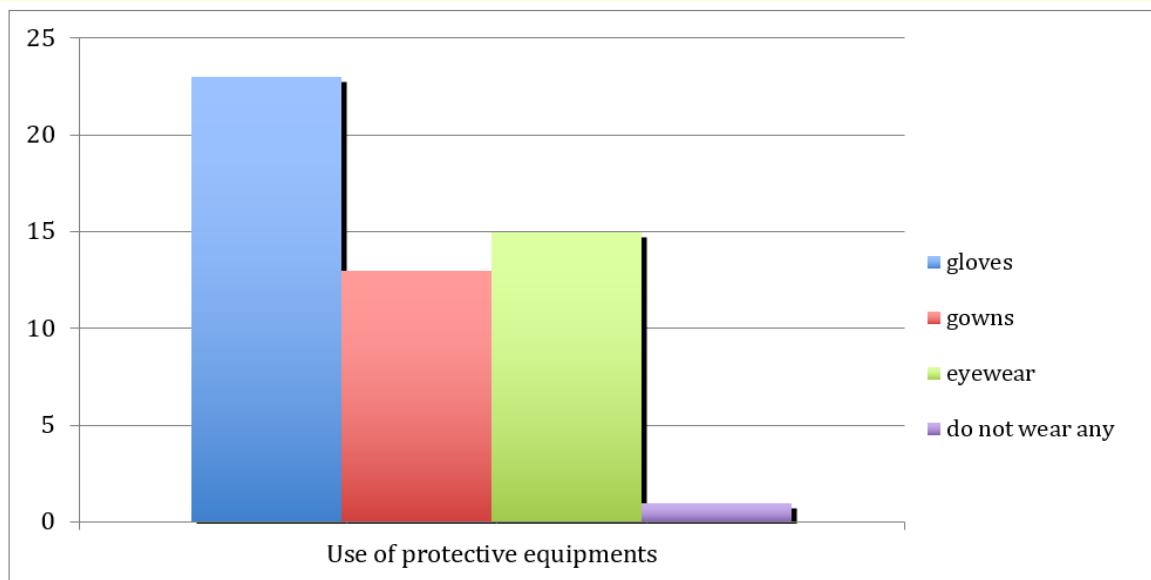


Figure 9: Number of dental technicians using different types of protective equipments in their laboratory.

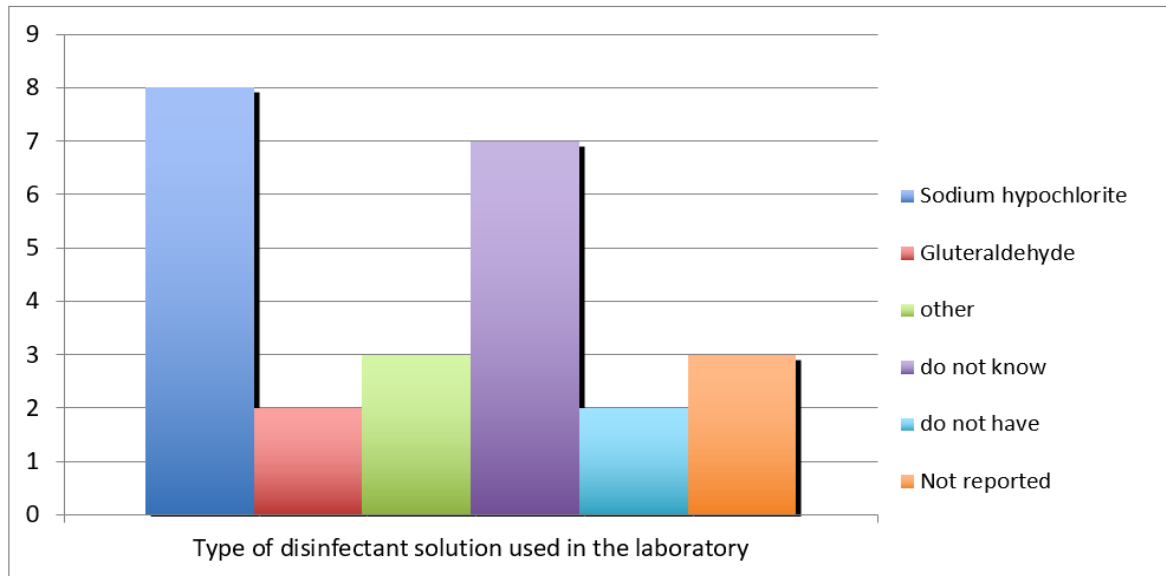


Figure 10: Number of dental technicians using different types of disinfectant solution in their laboratory.

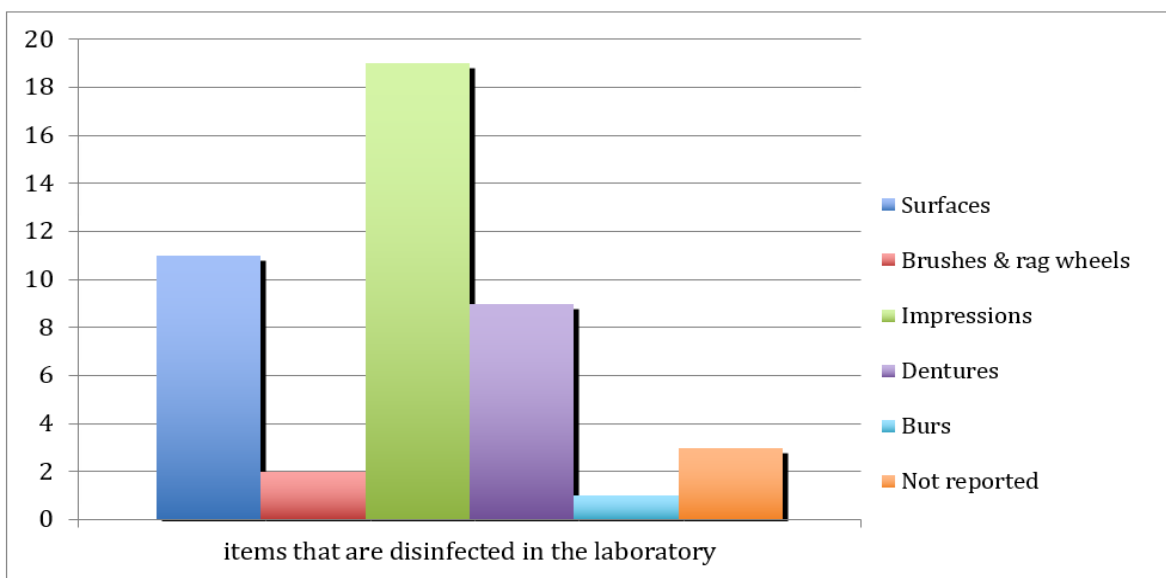


Figure 11: Number of dental technicians reporting on the type of items disinfected in their laboratory.



Figure 12: Number of dental technicians reporting on the frequency of receiving impressions containing saliva debris from their dentists.

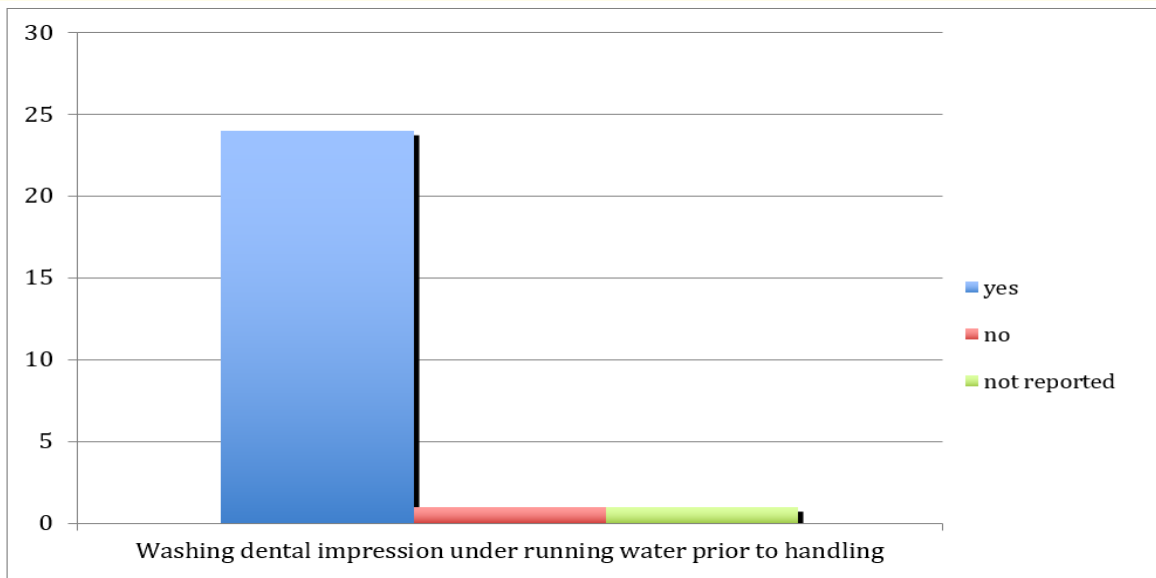


Figure 13: Number of dental technicians reporting on washing dental impression under running water prior to handling.

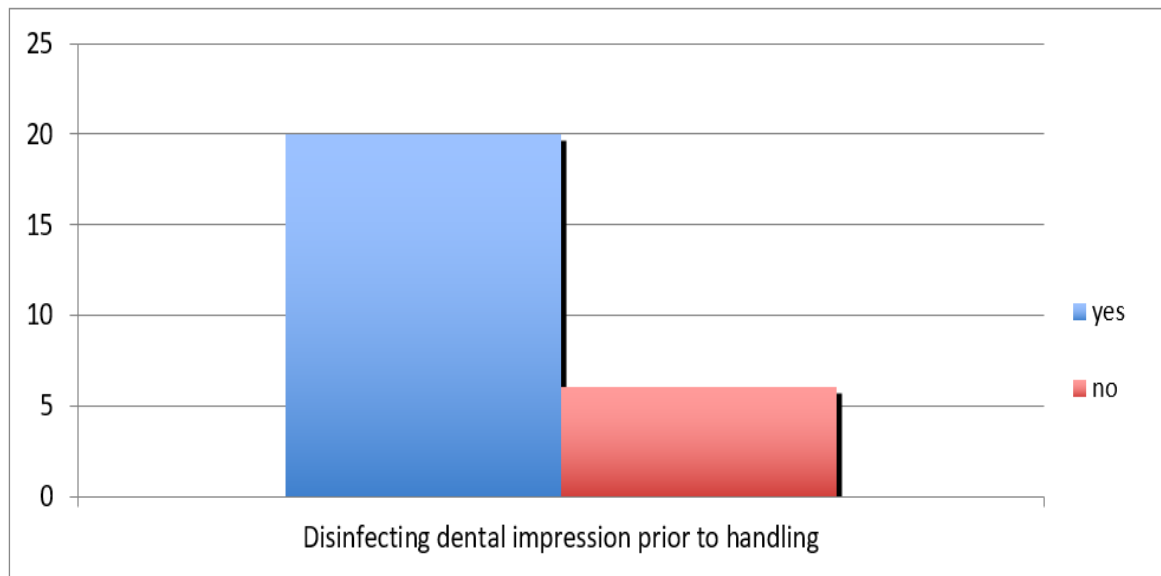


Figure 14: Number of dental technicians reporting on disinfecting dental impressions prior to handling.

Discussion

Possible routes of cross contamination include direct and/or indirect cross-contamination. Direct contact with contaminated saliva or blood occurs through skin abrasions. An important potential cross-contamination risk for dental laboratory technician is through indirect contact [4]. Indirect cross-contamination infection may occur through airborne microbial aerosols splatter during laboratory procedures.

Powell, *et al.* [5] emphasized the importance of adequate infection control procedures to prevent possible cross-contamination. The recommendation was based on their findings, which revealed a 76% contamination of materials received from dental clinics to dental laboratories in four cities. The most frequently recognized microorganisms were *Streptococcus*, *Staphylococcus*, *Escherichia coli*, *Actinomyces* species, *Antitratrus* species, *Pseudomonas* species, *Enterobacter* species, *Klebsiella pneumonia* and *Candida* species [6]. Taking this into account, efforts must be made to eliminate these microorganisms and decrease the frequency of cross contamination infection in dental laboratories.

This survey evaluated infection control measures and practice among dental technicians in the city of Jeddah, in Saudi Arabia. In the present study 61.5% of dental technicians were knowledgeable about proper infection control protocols. The majority of dental technicians demonstrated compliance with standard personal infection control protocols. Hand washing supplemented with alcohol disinfection was reported by 69% of the technicians. 80% and 76.9% of the dental technicians demonstrated the wear of gloves and protective eyewear, respectively.

A study by Mary, *et al.* [7] at the dental colleges in Karachi evaluated the attitude of dentists in Karachi towards the disinfection of dental impression. The results of the survey revealed that only 29% of the dental practitioners did utilize a disinfect solution to disinfect the dental impressions. 58.5% of practitioners did not utilize any disinfectant solution to disinfect the impression and 15.6% did not rinse their dental impressions after they are made. Unavailability of disinfectant solutions in clinical practices and lack of awareness of the importance of the issue, were among the most common reasons of their disregard. 14.7% of dental practitioners considered disinfecting

the dental impression is time consuming and unnecessary process. 9.9% of practitioners reported that disinfection of impression is not necessary, as it has to be poured. 13.4% of the dentists did not purchase the disinfectants, as they are expensive. Only very few dentists believed that the disinfectant solution might result in corrosion of metallic impression trays. 13.5% were also concerned about dimensional instability of the dental impression material.

In contrast to the Marya, *et al.* [7] study which focused on cross-infection prevention protocols by dentists, our study focused on the role of the dental technician to prevent cross-contamination. As stated earlier, unless there is clear understanding between the treating dentist and the dental technician regarding the disinfection of the dental impression or the dental prostheses, the dental technician must disinfect received dental impression and prostheses prior to handling. Marya, *et al.* study indicated that 15.6% of dentists do not rinse the dental impression after they are made. In contrast, our study indicated that 38.5% of the dental technicians reported occasional reception of dental impressions containing salivary debris. Nevertheless, the potential hazards associated such a violation of infection control standards via transporting contaminated dental impression seem to have been minimized by the fact that in this study dental impressions were the most commonly disinfected items as reported by 73% of the dental technicians.

Jagger, *et al.* [8] surveyed cross-infection control in registered dental laboratories. 49% of participants had a cross-infection policy. 30% of laboratories receive identified un-disinfected matters from the dental clinics. 44% of the respondents reported wearing gloves when handling received dental items. 74% reported wearing protective eye shield during trimming and/or polishing dental prostheses. 51% reported disinfecting received dentures. 61% no disinfectant solution was mixed with the pumice and 93% did not disinfect the polishing tools. In contrast in our study, 34.6% of the dental technicians reported disinfecting received dentures, and 7.7% of the dental technicians reported disinfecting finishing and polishing laboratory brushes and rag wheels. The reported ratio of disinfecting denture in this study is less than that reported by Jagger, *et al* [8].

Wakefield [9] evaluated laboratory potential pathogenic microbiologic cross-contamination of dental prostheses through the dental laboratory. The study reported receiving 9 contaminated complete dentures out of 10 sterile one that were sent to dental laboratories for repair. The author assumed possible pathological microbial attribution from other patients. Agostinho, *et al.* [10] evaluated microbial contamination in the dental laboratory throughout the polishing process of complete dentures. The authors reported a significant microbial splatter and aerosols contamination during the polishing process using high-speed lathes. The polishing cones were highly contaminated after polishing, which resulted in transfer microorganisms from the infected spindle to the sterile dental prostheses. Molinari, *et al.* [11] emphasized that the cones used for polishing must be sterilized after each polishing procedure.

Dental pumice used in conjunction with finishing and polishing brushes and rag wheels is another dental potential source of cross-contamination through the dental laboratory. Williams, *et al.* [12] Cultural studies demonstrated contamination of laboratory dental pumice with high numbers *Acinetobacter*, implicated as opportunistic pathogens. In addition, fungal colonies disclosed from 10 pumice samples in two dental laboratories [13]. In our study, changing the pumice solution was only reported by 26.9% of the dental technicians.

This study highlighted several potential sources of cross-contamination in the dental laboratory, which were proven to be highly infectious, yet this study demonstrated low compliance rate - in these areas- with infection control protocols recommended. Thereby, emphasis must be reinforced that dental items must be disinfected in the dental clinic before they are sent to the laboratory and upon receiving the items from the laboratory as well.

Prevention of infection through cross contamination in the dental environment is an integrated work. Despite literature evidence, infection control guidelines and recommendations; however, the question remains why dentists don't disinfect their sent items and why the dental technicians are not strictly adherent to these cross-contamination infection control protocols?

Conclusions and Recommendations

Cross-contamination among dental team personals is a hazardous concern. More efforts must be made to avoid such a hazardous situation. Strict compliance with infection control protocols is mandatory in the dental clinics, as well as, in dental laboratories.

Bibliography

1. Samaranayake LP, *et al.* "Carriage of oral flora on irreversible hydrocolloid and elastomeric impression materials". *Journal of Prosthetic Dentistry* 65.2 (1991): 244-249.
2. Hudson-Davies SC, *et al.* "Cross-infection control in general dental practice: dentists' behaviour compared with their knowledge and opinions". *British Dental Journal* 178.10 (1995): 365-369.
3. Kaul R, *et al.* "Infection control in dental laboratories – A Review". *International Journal of Clinical Cases and Investigations* 4.2 (2012): 19-32.
4. Fluent MT and molinari AJ. "How the dental laboratory provides infection control". *Inside Dental Assisting* 9.2 (2013).
5. Powell GL, *et al.* "The presence and identification of organisms transmitted to dental laboratories". *Journal of Prosthetic Dentistry* 64.2 (1990): 235-237.
6. SK P and BJ M. "Cross infection control of impressions: a questionnaire survey of practice among private dentists in Hong Kong". *Hong Kong Dental Journal* 3 (2006): 89-93.
7. Marya CM, *et al.* "Current status of disinfection of dental impressions in Indian dental colleges: a cause of concern". *Journal of Infection in Developing Countries* 5.11 (2011): 776-780.
8. Jagger DC, *et al.* "Cross-infection control in dental laboratories". *British Dental Journal* 179.3 (1995): 93-96.
9. Wakefield CW. "Laboratory contamination of dental prostheses". *Journal of Prosthetic Dentistry* 44.2 (1980): 143-146.
10. Agostinho AM, *et al.* "Cross-contamination in the dental laboratory through the polishing procedure of complete dentures". *Brazilian Dental Journal* 15.2 (2004): 138-143.
11. Molinari JA, *et al.* "Controversies in infection control". *Dental Clinics of North America* 34.1 (1990): 55-69.
12. Williams HN, *et al.* "Acinetobacter contamination of laboratory dental pumice". *Journal of Dental Research* 62.10 (1983): 1073-1075.
13. Williams HN, *et al.* "Persistence of contaminant bacteria in dental laboratory pumice". *Quintessence of Dental Technology* 10.6 (1986): 385-388.

Volume 17 Issue 12 December 2018

©All rights reserved by Abdulsalam Khalil Ezzat, *et al.*