Middle East Research Journal of Dentistry
ISSN: 2789-8687 (Print) & ISSN: 2958-2075 (Online)
Frequency: Bi-Monthly
DOI: https://doi.org/10.36348/merjd.2026.v06i01.001

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Approaches Used by Dentists and Prosthetic Technicians for Disinfecting Dental Impressions

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Abstract: ***Objective***: to evaluate the communication and analyze dentists' and dental technicians' attitudes, knowledge and training regarding the disinfection of dental impressions. ***Materials and Methods***: In order to evaluate behavior and opinions about the disinfection of dental impressions, a questionnaire was completed by 65 dentists and 10 dental prosthesis laboratories from Cairo-Egypt. ***Results***: All responders (100%) utilized alginate as their impression material, and it is the most common impression material used in prosthodontics. Although 80% of dental prosthesis labs do not receive any notice regarding this, 60.3% of dentists assert that they always disinfect impression materials provided to the lab. Alcohols are typically used as a spray for chemical disinfection, and efficacy is the primary determinant factor for the choice of the disinfecting material. The majority of dentists who responded to the poll (65.6%) said they don't let the lab know if the impression material has been disinfected. 80% of dental prosthesis labs acknowledge that they have doubts about the disinfection that dentists perform. ***Conclusions***: More efforts are needed regarding the infection control procedures and communication between labs and clinics. The findings fall short of expectations and even go against worldwide literature about the level of trust and communication between the dental technicians and dentists.

Keywords: Disinfection, Dental Impression Materials, Cross Infection, Infection Control and Disinfectants.

Research Paper

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How to cite this paper:
Mohamed Mahmoud Abdelgawad Abdelfattah (2026). Approaches Used by Dentists and Prosthetic Technicians for Disinfecting Dental Impressions. *Middle East Res J. Dent, 6*(1): 1-6.

Article History:
| Submit: 28.11.2025 |
| Accepted: 31.12.2025 |
| Published: 02.01.2026 |

INTRODUCTION

Dental impressions are a common procedure in dentistry, especially in areas related to oral rehabilitation. The biomaterials used must allow for the production of precise impressions of oral tissues, which reproduce in detail the anatomical topography of the desired area, presenting good dimensional stability [1, 2]. The contact of these materials with the oral environment necessarily implies their contamination by microbial agents, which can contribute to increasing the risk of cross-infection, if the correct disinfection procedures for these biomaterials are not carried out [3]. Dental technicians and dentists are particularly exposed to cross- infection from potentially contaminated dental impressions. Disinfection involves the destruction of pathogenic organisms or their reduction to safe numbers. Some factors such as the type of disinfectant, the disinfection method, the exposure time and the impression material itself used can influence the effectiveness/ success of the disinfection [4]. According to Haralur *et al*, it is the dentist's responsibility to prevent and control cross-infection in the clinical environment, including the correct disinfection of dental impressions before sending them to the dental technician. However, it was found that many impressions were sent to dental laboratories without adequate disinfection, some of which are clearly contaminated with traces of blood, saliva and food remnants [5]. Chemical disinfectants can be applied by immersion or spraying. Disinfection by immersion in chemical disinfectants has the advantage of covering all surfaces of the impression material at once. As for spraying, it does not appear to be able to effectively disinfect all surfaces. However, unlike the dipping process, spraying can significantly reduce the amount of distortion of printing materials [6, 7]. The main objective of this study was to collect data on the attitudes, knowledge and education of dentists and dental technicians regarding the disinfection of impression biomaterials used in dentistry. The level of cooperation, the disinfection measures used and the quality of communication between stakeholders were also studied.

METHODS

Ethical Approval: This study protocol was approved by The Ethical Committee of the Faculty of Dentistry- Cairo university on: 27/5/2025, approval number: 48.5.25.

In order to evaluate the behavior and attitudes of the dentists and dental prosthesis technicians in Cairo that made up the study's sample, an anonymous questionnaire was given to them (Table 1). The questionnaire's questions, the majority of which are closed-ended, were modified from the study conducted by Almortadi in 2010 [8].

The author visited the dental clinics in Cairo that were included in the Egyption Health Regulatory Authority's database in order to distribute the questionnaires in person using paper format. Based on data gathered from the dentists questioned, we contacted the fifty dental prosthesis laboratories that we knew were operational. In these labs, a survey of hundred ten dental prosthesis technicians were conducted. A dental prosthesis technician will represent the sample. Since these technicians' operations are properly protocoled, the surveys they get will be sorted by laboratory.

Following the delivery of the required instructions for filling out the questionnaire, an 8–15day window was set aside for its collection. The software programs IBM SPSS Statistics, v.21® (Software Statistical Package for the Social Science) (Chicago, IL, USA) and Excel® (Microsoft Corporation, Seattle, WA, USA) were used to process and analyze the results using descriptive statistical techniques.

RESULTS

Of the 3100 clinics referenced by the authorities, it was only possible to apply the questionnaire to 2153, given the refusal shown by 840 clinical directors/persons in charge (rejection rate: 38.9%). 1313 questionnaires were given to dentists, 1120 were collected with a valid response (response rate:85.3%). Regarding the 50 dental prosthesis laboratories contacted (110 dental prosthesis technicians) the response rate was 100%. Since the different laboratory procedures are duly protocolled (which was proven by the equality of the responses to the questionnaire), it was decided to carry out an analysis by a “Dental Prosthesis Laboratory”. Only the answers of the sample were carried out by a “Dental Prosthesis Technician”. The sample of dentists surveyed included 583 females (52%) and 537 males (48%), with an average age of 33.4 years. Of this population, 56.3% had a bachelor's degree and the remaining sample had a master's degree. The totality (100%) of the sample stated that they use alginate as an impression material on a daily basis, with silicones being the second most used material. Prosthodontics is the area of dentistry in which the majority (95.3%) of those questioned perform impressions. In the population of dental prosthesis technicians studied, females (63.3%) are more prevalent than males (36.4%). Regarding their age distribution, it is worth noting that the average age is 36 years, with the age group between 31 and 40 years being the most frequent. 70% of dental prosthesis technicians have a bachelor's degree. All dental prosthesis laboratories accept alginate impressions, with silicones being the second most accepted material. Prosthodontics is the area of dentistry from which most impressions are received. As for the disinfection method applied, spraying by a spray was the most used by both dentists and dental prosthesis laboratories (Table 2). Most dental laboratories use disinfectants from the alcohol group for these procedures. It was also found that the majority (60.3%) of dentists claim to always carry out disinfection procedures before sending impressions to the laboratory, in contrast to only 4.8% who admit to never carrying out disinfection. In assessing the issue «Does the prosthodontist inform about the disinfection status of the prints? », the results obtained show that 65.6% of dentists do not provide any information in this area. Correlating these data with the values obtained in the qualifications, we obtain a statistically significant relationship ($p< 0.05$), that is, dentists with a bachelor's degree usually provide more information to the prosthesis technician, compared to dentists with a master's degree (Table 3).When a dental impression comes from a patient identified as being at risk, 62.5% of the dentists surveyed stated that they notify the dental technician about this, which coincides with 60.0% of the laboratories that claim to be informed on these occasions. Also, in this type of clinical situation, the majority of dentists, 53.1%, admit to taking extraordinary disinfection measures. In this case, all dental prosthesis laboratories prefer to disinfect the impression material received again. Of the laboratories surveyed, the majority (60.0%) stated that they do not receive impressions visibly contaminated with blood. A large proportion (80.0%) of dental prosthesis laboratories reported that they did not receive any type of notification about the disinfection status of the impressions received. Regarding the confidence that dental prosthesis laboratories have in the disinfection process carried out by dentists, the majority (80.0%) admitted that they did not have confidence. Regarding the question asking dentists to rank in an orderly manner (1-6) the factors that influence the choice of a disinfectant, there were only 836 valid responses and effectiveness was the most important factor (table 4).

Table 1: Questions asked to the dentists and the dental technician

Dentists	Technicians
What impression materials do you use on a daily basis?	What printing materials do you receive on a daily basis?
In which branch of dentistry do you make impressions?	From which area(s) of dentistry do you receive impressions?
If the printout is from a high- risk patient (e.g. HIV), do you take extraordinary disinfection measures?	After receiving the impressions, do you perform any type of disinfection? What type(s) of chemical disinfectant(s) do you use for the impression's disinfection?
When you send an impression for the prosthetic technician to disinfect it? If so, how does he do it?	If the impression comes from a high-risk patient, do you receive any information about this?
Did you inform the prosthesis technician about the disinfection status of the impression(s)?	Is it common to find prints contaminated with blood?
What factors influence the choice of disinfectant?	When you receive the print at the laboratory, are you notified if it has been disinfected?
	Do you trust that the impression you receive is disinfected by the dentist?

Table 2: Distribution of the disinfectant according to its application technique

	Dentists n=1120	Prosthesis laboratory n=50
Washing with water	472 (42.2%)	20(40.0%)
Spray disinfection	578 (51.6%)	30 (60.0%)
immersion in solution	385 (34.4%)	20 (40.0%)

Table 3: Relationship between qualifications and information transmitted to the dental prosthesis laboratory

Informs the prosthesis lab of the disinfection status of the impression?					
			yes	no	total
Educational qualification	Bachelor's degree	Count	297	333	630
		% within informs the prosthesis lab of the disinfection status of the impression?	47.2	52.8	56.3
	Master's degree	Count	88	402	490
		% within informs the prosthesis lab of the disinfection status of the impression?	18	82	43.8
total		Count	385	735	1120
		Expected count	385.0	735.0	1120.0
		% within informs the prosthesis lab of the disinfection status of the impression?	100.0	100.0	100.0
Test of the Thu-Pearson square (-2) p = 0.018					

Table 4: Distribution of factors that influence the choice of a disinfectant

	Rating scale (1- highest consideration; 6-lowest consideration) N=1120					
	1	2	3	4	5	6
Color	1	10	5	6	9	1089
Odor	8	12	7	4	1053	36
Effectiveness	1100	14	6	0	0	0
Easy handling	1000	54	40	16	5	5
Cost	850	198	52	15	3	2
Ready to use	100	225	205	240	300	50

DISCUSSION

The main limitation of this study is related to the sample used. Although we consider it an advantage that the sample is from a city with a higher education institution that teaches the Dentistry course, we found, during the study, that the number of dental prosthesis laboratories/technicians in the city is small, which conditioned us to carry out inferential statistics that related several questions asked to dentists and dental prosthesis technicians. However, we consider that the topic under study is important from the point of view of clinical relevance, especially in a city that has a high number of dentists compared to the resident population.

The sample that was possible to obtain in the city included 40% of the total number of dental clinics. The rejection rate for responses to our questionnaire was high (almost 40%), which could indicate a lack of interest, lack of time or possible gaps in knowledge of the disinfection protocol applied. From the sample that was possible to analyze, the average age of dentists (33.4 years [±7.8]), so it can be assumed that it is a young population. In the sample evaluated, alginate was the impression material most used on a daily basis by dentists, representing the entire sample (100%), corroborating the literature that presents this type of material as one of the most used in the execution of dental impressions. According to Haralur *et al*., this irreversible hydrocolloid is widely used in various clinical dental impression procedures [9]. The main route of transmission of infection from a patient to a prosthetic technician is through contaminated impressions and other prosthetic materials that have come into contact with biological material [10–12]. Therefore, the disinfection procedure is mandatory in order to reduce the pathogenic potential of printing biomaterials [13–15]. The British Dental Association (BDA) has been recommending the decontamination and disinfection of dental impressions before sending them to the laboratory, and it is also good practice to inform the disinfection status of the material sent.[16] These practices verified by Almortadi and Chadwick16who, in 2010, questioned 83 dentists and concluded that the majority of them (75.3%) sent a notification about the disinfection status of the impressions. By analyzing the data obtained in this study, it should be noted that the results obtained are not similar to those found by the authors previously mentioned, as it was recorded that 65.6% of dentists do not inform dental prosthesis technicians about the disinfection status, with the minority being that they report. As in this study, Pang *et al*., [17], observed a similar trend, in which the majority (52%) of dentists did not communicate the disinfection status and only 48% did so. These results inherent to the lack of communication in the medical-technical sense of dental prosthesis may result from the dentist's lack of knowledge regarding correct disinfection or a transfer of responsibility to the dental technician [17, 18].

Davenport *et al*., [19], in a study that evaluates communication between dentists and dental prosthesis technicians, suggested a communication diagram between these two entities, in which there is a parameter that aims to record the disinfection status of the material sent, in addition to facilitate information understanding, it could avoid situations in which a “double” disinfection is carried out with possible consequences in the distortion of the impression materials.

Still referring to the issue addressed above, we can state that there is a statistically significant relationship between this issue and the dentist's qualifications (bachelor's and master's degrees). In practical and clinical terms, this analogy may be related, in a suggestive way, to the hours and content of academic training, the quality and number of hours of clinical training, the existence of personal preferences, and the greater or lesser experience of the dentist himself. Although this study does not intend to explore the reasons why dentists do not disinfect impressions, the responses obtained indicate the need for educational measures and additional reinforcement regarding specific infection control practices, as well as greater communication between dentists and dental technicians [17].

This analysis shows evidence of a lack of communication in the sample we analyzed, as the majority (60.3%) of dentists report always disinfecting impression biomaterials and the majority (60.0%) of technicians report rarely being aware of the disinfection status.

Effective and coordinated communication between the prosthetics laboratory and the dental clinic aims, among other things, to ensure adequate disinfection. Analyzing the data obtained, we found that all (100%) of the dental prosthetics technicians, after receiving the impressions at their workplace, carried out the disinfection procedures, which leads us to assume that, in many cases, the disinfection procedure is repeated. This situation may reveal a lack of confidence in the disinfection performed previously or a failure of communication between the dentist and the dental prosthetics technician.

In the study done by Almortadi and Chadwick [8], they found that most dentists disinfect impressions by immersing them in the disinfectant solution and only a few sprayed the disinfectant agent on the surface. In this study, contrary to the literature, it was found that the method of spraying with a disinfectant chemical was the one chosen, representing 51.6% of the sample, and the immersion method was used by only 34.4% of the

dentists questioned. An explanation, for this result could take into account some factors clinicians' own experience and preference [20, 21].

This study focused only on a sample from Cairo, so it is not possible to extrapolate the data to the national level. In the future, this type of research should be carried out with a representative sample from all regions of Egypt. The analysis we carried out in Cairo suggests a lack of knowledge regarding disinfection protocols and insufficient communication between dentists and dental technicians. Therefore, institutions representing the professional class, in collaboration with higher education institutions in Dentistry, should develop and make these protocols available to their members. Likewise, it would be interesting to analyze whether these protocols are included in the curricular content and are adequately taught to Dentistry students. Finally, we believe that the development of short-term continuing education courses could contribute to improving the results obtained in this study.

CONCLUSION

Within the limitations of this study, we can conclude the following. Only 60.3% of dentists in Cairo, Egypt say they always perform disinfection procedures before sending impressions to the laboratory. Of the dentists questioned, 62.5% said they notify the dental technician when the patient is identified as being at risk. The vast majority of dental prosthesis laboratories report not receiving any type of notification about the disinfection status of the impressions received, admitting that they do not have confidence in the disinfection process carried out by dentists. Dentists with a bachelor's degree are those who practice this attitude of two-way communication with dental technicians more than those with a master's degree. The responses obtained indicate the need for additional educational measures regarding specific infection control practices, as well as better communication between clinics and laboratories, in order to reduce the risk of cross-infection.

Conflict of Interest: The author has no personal interest of any kind in any variant that is presented in this article.

Funding: This study was self-funded.

Data Availability Statement: I declare that this study is original and has not been published in any other journal.

Author Contribution Statement:
MMA: main researcher, responsible for collecting questionnaire, making and writing the article

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