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ASEPSIS BETWEEN THE DENTAL OFFICE AND LABORATORY: A TUNISIAN CROSS-SECTIONAL STUDY

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Abstract

Introduction: For a long time, the prevention of cross-contamination in dentistry has mainly been concentrated in the operating room. Activity related to laboratory work, a potential source of pathogen transmission, is therefore often overlooked. In addition, the practice of prosthodontics often gives the impression that aseptic measures cannot be rigorously applied. Several factors account for this situation. Designing a prosthesis involves handling a certain number of potentially contaminated and heat-sensitive objects (prostheses, impressions, wax tubes, occlusion bites, etc.). The items transferred between the dental office and the dental laboratory as well as the prosthetic instruments constitute the main chain of cross contamination in prosthodontics. Thus, an evaluation of the dentists and prosthetists' compliance with regard to their asepsis through a cross-sectional study was necessary. **Methods**: two anonymous questionnaires were distributed. The first was among the dentists and the second to dental prosthetists in the public and private sectors. **Results**: From the 302 questionnaires distributed, only 220 were filled-in. 78% of the dentists and 37% of the prosthetists know the disinfection protocol of reusable instrumentation. 80.3% of the dentists and 74.1% of the prosthetists disinfect their prosthetic work but with varying percentages according to the group of items (impressions, prosthesis, etc.). 71.5% of the practitioners and 18.5% of the technicians disinfect their laboratory instruments systematically. However, 45% of the dentists and 54% of the prosthetists think they are not exposed to infections. **Discussion**: The results showed an insufficient level of knowledge and compliance to ensure asepsis of the prosthetic work both in the public and private sectors, contributing to a relatively high level of exposure to infections compared to a Canadian study. **Conclusion**: Given the insufficient compliance and in order to remedy these deficiencies, a simple decontamination protocol is suggested. Improving awareness and providing continuous training are then required.

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Introduction

For a long time, the prevention of cross contamination in dentistry has been mainly concentrated in the operating room. The design of a complete removable prosthesis involves the handling of a number of potentially contaminated and heat-sensitive objects (prostheses, impressions, wax strands, articulated occlusion devices, etc.) (Williams et al., 2011). It involves several stakeholders, is spread over time in several stages, is often carried out in different locations and involves contaminated articles transferred between the dental office and the dental laboratory acting as intermediaries in the cross-contamination and transmission of an infectious agent, by direct contact (Runkle, 2016).

The biological load on the article, its potential for contamination, the nature of the care offered (bloody or not) and the immune condition of the individual are determining factors for the manifestation of the infection (Binate et al., 2014).

There are now growing questions about the effectiveness of aseptic measures applied to laboratory instrumentation and items transferred between the dental office and the dental laboratory, and the behavior of the professionals involved in relation to recommendations to interrupt this chain of cross-contamination has been studied in some

countries and cities around the world (Miller & Palenik, 2016; Sedky, 2014).

Through the results of an epidemiological, descriptive, cross-sectional survey of the KAP type (knowledge, attitudes and practice) carried out in the interest of the prevention of cross-contamination in a complete removable prosthesis and the place of the dental laboratory in the chain of infection, and to establish whether professionals in the dental field must be sensitized to the relevance of the application of an aseptic protocol of transferred articles and laboratory instruments uniform and standardized, we conducted this study through which we will try to: to evaluate the decontamination measures in dentistry, to assess the knowledge and mastery of dental professionals of the rules of asepsis of dental prosthesis material, to note if the aseptic means provided are sufficient, and underline the failures in the chain of asepsis of the dental articles to remedy them.

Method

The method used is described in detail, for unusual methods a reference must be included. Contains the design or research design used, research objectives, data collection techniques and instruments that describe data analysis techniques.

This is an epidemiological, descriptive, cross-sectional, KAP-type survey (knowledge, attitudes and practice) conducted on a sample of 220 dental professionals, namely 193 dentists and 27 prosthetists, spread over five governorates (Tunis, Ariana, Sousse, Monastir, Sfax) in both the private and public sectors, namely: The Monastir Hospital-University Dental Medicine Clinic and the dental medicine department at Farhat Hached Hospital in Sousse, Sahloul University Hospital, Tunis Military Principal Instruction Hospital (HMPIT) and Center Militaire d'Instruction in Tunis, Dental Medicine and Surgery of Greater Tunis.

The investigation took place over a period of six months from May to October. The criteria for inclusion in the population require that you hold a national diploma of doctor of dentistry or technician of dental prosthesis and practice in Tunisiain the private or public sector

(University Hospital), be resident or 6th year student in dentistry.

Students in dental medicine or dental prosthesis who have not yet graduated (including students who are on internship), as well as any person holding one of the two above-mentioned diplomas who is unemployed, hospital-university facilities without a dental prosthesis laboratory, questionnaires returned empty and those received outside the results collection period (during the trial period of the questionnaire or after October), are excluded.

Two questionnaires were designed for the purposes of this study (dentist and prosthetist) and distributed in the above-mentioned establishments, comprising forty-two varied questions making it possible to obtain information on the knowledge of the personnel surveyed, their behaviors (attitudes and practices) and the working conditions (material and materials made available). They were administered by two methods: Self-administration where the respondent self-completes the questionnaire in paper format and via the Internet (electronic format) established on Google Forms and distributed via the electronic mail and the social network Facebook. The exploitation of the data has been carried out in two stages: Descriptive (one-dimensional) analysis by estimating the percentage of qualitative variables and the explanatory analysis that is done using Pearson's chi-squared (chi-squared) test to investigate the dependency or non-dependency relationship between two qualitative variables.

Result

The various data from the questionnaires received were entered and analyzed using the SPSS version22.0 software. For the analysis of the results we will distinguish between the group of dentists and the group of prosthesists. Their allocations by sector, the nature of the exercise and its age are shown in the figures below. Most dentists and prosthetists work in the govermental sector, in groups and for less than five years of experience. (fig 1, 2 et 3)

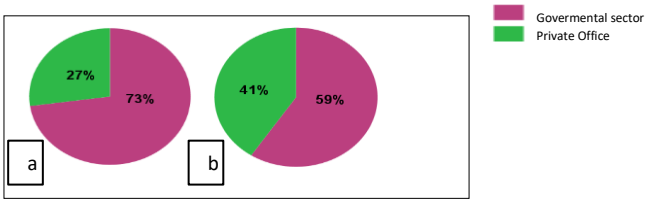

Figure 1. Distribution of Dentists (a) and prosthesists (b) by Sector

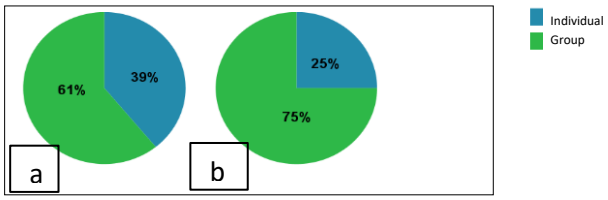

Figure 2. Distribution of dentists (a) and prosthetists (b) by type of practice.

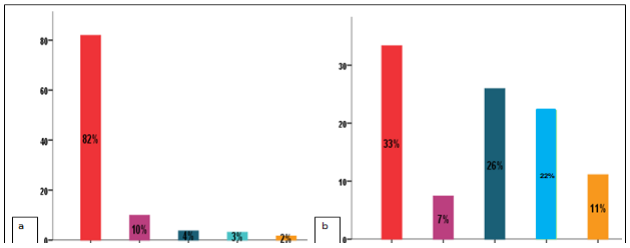

Figure 3. Distribution of dentists (a) and prosthetists (b) by years of excercise

(a) Less than (5-10y) (10-15Y) (15Y-20Y) more than 20y 5years(b) Less than (5-10y) (10-15Y) (15Y-20Y) more than 20y 5years

By assessing their knowledge, only 5% of dentists know the first emergency actions to take when faced with a blood exposure accident (BAE). 78% of dentists and only 37% of prosthetists know the disinfection protocol for reusable instruments, including laboratory instruments. In terms of protection, 18.9% of dentists and one in two of prosthesists are not vaccinated against hepatitis C. 98% of dentists wear gloves and 60% wear masks before each patient. 41% of practitioners wear goggles only in the presence of a patient at risk, and 48% have never worn a cap. 1.6% of dentists change their gloves only when the gloves are visibly soiled or damaged.The same parameters tested in prosthesists. (fig 4)

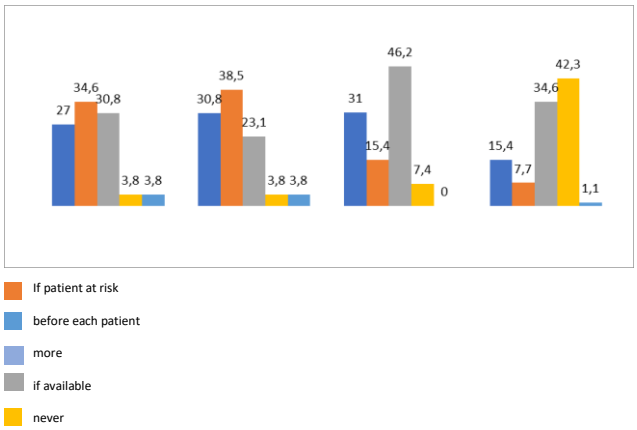

Figure 4. Frequency of wearing protective clothing among prosthesists.

The majority of respondents wear a gown over their civilian clothes at the rate of 79.8% of dentists and 85.2% of prosthesists.

Hygienic hand washing is done by only 15.5% of dentists and 3.7% of prosthetists. . As regards the equipment needed for hand hygiene, the handwashing protocol sheet appears in only 28.5% of the dental rooms and in 33.3% of the prosthesis laboratories. 41% of dentists and 24% of prosthetists wash their hands between two patients (before and after wearing gloves) and 3% of practitioners and 20% of technicians only wash their hands when gloves are not available in their laboratory. (Figure 5)

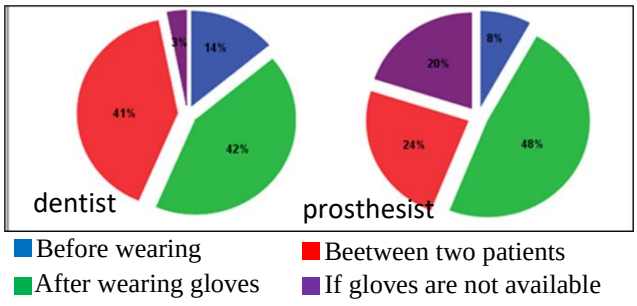

Figure 5. Frequency of hand washing among dentists and dental technicians

In the dental room, cleaning the unit and spittoon after each patient is done only 43.5%of the time. While environmental treatment is never done in 26.3%. In the laboratory, environmental treatment occurs in 85% of cases with varying frequencies. (Fig 6)

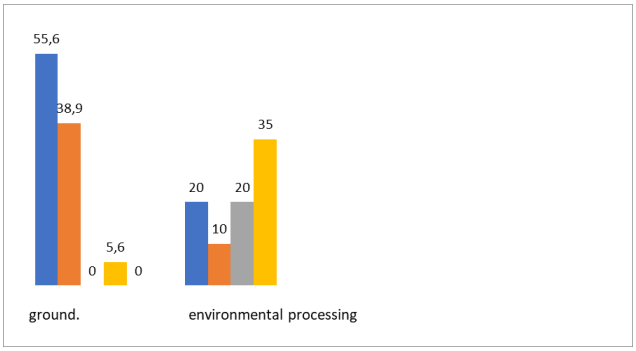

Figure 5. Frequency of biocleaning of the dental laboratory

The transfer of prosthesis work from the dental room (dental office) to the laboratory is done in 37% of cases in a box for single use or reusable and disinfected regularly, in 39% of cases without any support. For there verse circuit, 56% of prosthetic use no support. (Table 1)

Table 1. Type of enclosure used during the transfer of prosthetic work

	From the treatment room to laboratory (%)	From the laboratory to the care room (%)
In a single-use or reusable box reusable and disinfected regularly	37.3	3.7
In a reusable box without disinfection	21.2	29.6
Without support	38.9	55.6
Other: plastic bag	2.6	11.1
Total	100	100

80.3% of dentists and 74.1% of prosthetists disinfect their prosthesis work, of which 45.6% and 18.5%systematically, respectively. 94.3% of dentists disinfect their prosthetic instruments, of which 71.5% systematically. In the laboratory, the situation differs because, of 66.7% of prosthetists, only18.5% systematically disinfect their instruments and 33.3% abstain.

For disinfection of prosthetic jobs, most dentists rinsewith running water. For those who have used adisinfectant solution, sodium hypochlorite appears to be the preferred solution for the immersion of their articles, especially for prostheses. However, 40% of them do not disinfect plaster models.

With regard to disinfection of prosthesis work in the laboratory, the most observed lines with variable frequencies are rinsing with running water (from 26% to 67%) and abstention (from 9% to 48%). Sodium hypochlorite in both forms (immersion or spraying) is most commonly used with frequencies around 10% except for disinfection of occlusion models, where 25%of prosthetists use the spray form

Dentists' adherence to sterilization of prosthetic instruments is better for those who are not heat-sensitive. In contrast, only 17.4%of prosthetists disinfect their temperature-sensitive instruments.

The Chi-square test shows a dependence on the nature of the exercise and the sector in favor of the state sector. This attitude could be explained by two factors: * the lack of available means for disinfection: 57%of dentists believe that the disinfection products available to them in their institutions are insufficient to ensure proper asepsis. * the nature of group work means that the responsibility for asepsis is divided and not assumed by a single person.

Discussion

Fingerprint disinfection, In the rare cases where fingerprint disinfection is carried out, the results obtained are even more alarming, where simple rinsing with running water is the most widely used treatment for disinfecting fingerprints with alginate: 76% of dentists and 67% of prosthetists.

This helps to remove saliva and reduce the microbial load on the surface of the fingerprints. Likewise, the application of an antiseptic mouth wash before taking the fingerprints considerably reduces the amount of germs present; this has the consequence of reducing the risk of transmission of infection and cross-contamination, but must not replace disinfection by the appropriate solution under any circumstances.

Marya and her collaborators have shown that an undisinfected footprint can contaminate the entire prosthetic laboratory and clinical area. (Binate et al.,

2014) According to our results, the use of 2% glutaraldehyde as disinfection solution (spraying or immersion) is very limited or even rare in the treatment room and in the laboratory. This reluctance to use Glutaraldehyde as a disinfectant can be explained by the perceived idea of dimensional variations and the damage to the surface condition that may be experienced by fingerprints once in contact with this product. That neither 1% sodium hypochlorite nor 2% glutaraldehyde causes deformation or deterioration of the surface of plaster models from alginate prints disinfected with one of these two disinfectants (Gali & Souza, 2014; Guiraldo et al., 2012).

Disinfection of plaster models: Disinfection of plaster models is done by 17% of dentists and 22% of prosthetists. This reluctance can be explained by the fear of damaging the surface condition and consequently losing reproductive fidelity.

According to the Organization for Safety and Asepsis Procedures (OSAP), castings should only be treated if they have been cast from hydrocolloid or polyether impressions from a patient at high risk of contamination and whose impression is heavily contaminated with blood. Without this, it is only preferable to disinfect the cavities before casting (Ukuoghene et al., 2017).

The aim is always to achieve effective disinfection without harming the physicochemical properties and the surface state of the castings. This disinfection may be achieved by incorporating 1% sodium hypochlorite or 2% glutaraldehyde into the liquid powder mixture (Vazquez-Rodríguez et al., 2018). Immersion in 1% sodium hypochlorite solution for one hour may also be effective (Kumar et al., 2012). Microwave sterilization has been proposed as an alternative, but some authors have found it ineffective (Emami et al., 2014).

Disinfection of polymerized prostheses: 37% of dentists and 16% of prosthetic disinfect new prostheses before they are put in the mouth. These figures increase considerably for the treatment of old prostheses which have remained in the mouth, namely49% and 36% respectively for the two groups. The results also show that doctors disinfect prostheses more than prosthesists do. This can be explained by their contact with the patients and taking responsibility for disinfection.

A UK study reveals that 50% of prostheses leave the prosthesis laboratory with a high level of contamination and therefore recommends disinfecting them before sending and receiving them to both the clinic and the laboratory. The ADA recommends the following protocol: Rinsingunder running water, cleaning debris, and disinfecting with the appropriate solution before sending it to the office. Pavarina and her collaborators have shown that exposure of prostheses to 1% NaCl solution for 10 minutes is sufficient without specifying the recommended method.

Transfer of prosthesis work: According to our results, 62.7% of dentists and 96.3% of prosthetic do not comply with the recommendations for the transfer of prosthetic items between the treatment room and the laboratory, of which 38.9% and 55.6% respectively allow their work to proceed without support, which significantly increases the risk of cross-contamination.

According to the Occupational Safety and Health Administration (OSHA), the transfer of these items from the office to the laboratory or vice versa must meet this criterion: any potentially infected material must be placed in a container that is rigid enough to protect anyone involved in transporting and handling the contents (Boyce & Mull, 2008).

Disinfection of laboratory instruments. Many instruments used in the prosthesis laboratory (wax knife, kneading spatula, micromotor, cutters and rotary instrumentation...). may be cross-contamination vectors (Sammy & Benjamin, 2016). Air-borne microorganisms can contaminate the prosthetic or dentist's eyes, particularly as a result of the use of rotary instruments (milling cutter, brush, polishing disk, etc.). 78% of dentists and 37% of prosthetists have correct answers about the disinfection treatment of these instruments. Polishing powder is considered a major source of cross-contamination due to frequent contact with repaired older prostheses (Nejatidanesh et al., 2013).

This is because the microorganisms present in the irregularities and the pores of the prostheses can be dislodged during polishing and adhere to the disks and to the disks and even to the particles of the pumic stone. The US Army Dental Care System recommends adding a disinfectant to the polishing

powder suspension,changing it daily and regularly disinfecting the polishing lathe (Lux, 2008).

Similarly, the ADA advocated sterilization of polishingdisks, but also incorporation of a disinfectant solutionsuch as 1% sodium hypochlorite into powder (or pumicestone) and replacement in the case of a potentially contaminated prosthesis (Pavarina et al., 2003). For instruments with a low risk of contamination (articulator, face arch, plaster bowl, etc.), they can bedisinfected using the spray-wipe-spray technique. Assessment of the level of environmental contamination: Bionetching, defined as a treatment that combines cleaning, the removal of dirt and products used in objects, instruments and surfaces with the final application of a disinfectant. It combines mechanical and chemical action with a solution at the appropriate temperature, respecting the contact time of the disinfectant. The frequency of bionetching varies according to the zone concerned.

The results of our study showed that only 35-40% of establishments with hazardous frequencies provide environmental treatment and that the assessment of knowledge about the disinfecting and cleaning properties of bionetropping products is quite acceptable. properties of bionetropping products is quite acceptable.

Limitations of the study: Interpretations in this study are based on attitudes presented by the population surveyed. A certain margin of error in the results may be allowed. Furthermore, we are not in a position to verify whether their daily practices are sincerely described in their responses. The only way to properly assess the level of asepsis would be to visit all of these facilities.

In addition, several prosthesists were reluctant to participate in the survey, and some refused to complete all the sections, despite the anonymity of the questionnaire. This is due to the fact that some issues have been perceived as threatening by several dentists and dental prosthesis laboratory managers, especially those in the private sector.

Conclusions and Suggestions

The risk of cross-contamination in a prosthesis is evident mainly through the articles transferred between the treatment room and the laboratory. Our study highlighted some shortcomings in aseptic technique and occupational risk of infectious diseases.

Close communication and coordination of asepsis between the dentist and the laboratory technician is essential to maintain the physicochemical properties of the material involved and to interrupt the chain of infection effectively. A survey of the prevalence of cross-contamination in prosthodontics may be useful to improve awareness.

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