

Evaluation of the Behavior of dental Students of the State University of Paraíba Regarding Biosafety in Dental Radiology

Avaliação da Conduta dos Alunos do Curso de Odontologia da Universidade Estadual da Paraíba a Respeito da Biossegurança em Radiologia Odontológica

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Abstract

During radiographic taking at the dental clinic, the operator contacts the patient's oral cavity and with the X-ray cone and exposure button, which may be cross-infection, without adequate biosafety measures. The objective of the present study was to evaluate the behavior of dental students of the State University of Paraíba regarding biosafety in Dental Radiology. This is a cross-sectional, observational, descriptive study, carried out through the application of a questionnaire with questions related to biosafety in Dental Radiology, in which participated students from the 5th to 10th period of the Dentistry course of this institution. The students who were studying or had studied the curricular component Dental Radiology were included in the study. Eighty-eight questionnaires were answered. Data were analyzed using descriptive statistics. With regard to infection control concern, 99% of the students were concerned about biosafety. As for the most used chemical solution for disinfection, 70% alcohol was the most used (63%). Regarding the disinfection practice of the equipment, 78% did not respond to the question. Concerning the protection of intraoral films, 97% answered that they use mechanical barriers. As for the procedure done after the use of the positioners, the majority (58%) of the students answered that they use disinfectant solutions. It was concluded that most of the students were worried about biosafety in the Radiology Clinic and that they had adequate disinfection behavior before, during and after procedures.

Keywords: Dentistry. Practice Patterns, Dentists'. Containment of Biohazards.

Resumo

Durante as tomadas radiográficas na clínica odontológica, o operador entra em contato com a cavidade oral do paciente e, em seguida, com o cone de raios-X e botão de exposição, o que pode haver infecção cruzada, sem as medidas de biossegurança adequadas. O objetivo do presente trabalho foi avaliar a conduta dos alunos do curso de Odontologia da Universidade Estadual da Paraíba a respeito da biossegurança em Radiologia Odontológica. Trata-se de um estudo transversal, observacional, de caráter descritivo, realizado por meio da aplicação de questionário com perguntas relacionadas à biossegurança em Radiologia Odontológica, no qual participaram alunos do 5º ao 10º período do curso de Odontologia da referida instituição. Os alunos que estavam cursando ou haviam cursado o componente curricular Radiologia Odontológica foram incluídos no estudo. Foram respondidos 88 questionários. Os dados foram analisados por meio de estatística descritiva. No que diz respeito à preocupação com o controle de infecção, 99% dos alunos mostraram-se preocupados com biossegurança. Quanto à solução química mais utilizada para desinfecção, o álcool a 70% se mostrou o mais utilizado (63%). Em relação a prática de desinfecção do equipo, 78% não responderam à questão. Quanto à proteção dos filmes intrabucais, 97% responderam que fazem uso de barreiras mecânicas. Quanto ao procedimento feito após o uso dos posicionadores, a maioria (58%) dos alunos respondeu que utiliza soluções desinfetantes. Concluiu-se que a maioria dos alunos se mostraram preocupados com a biossegurança na clínica de Radiologia e que possuíam condutas adequadas de desinfecção antes, durante e após os procedimentos.

Palavras-chave: Odontologia. Padrões de Prática Odontológica. Contenção de Riscos Biológicos.

1 Introduction

In odontological radiology, procedures are less invasive and instruments of cutting or drilling are not employed in their techniques, either intra or extraoral^{1,2}. However, the contact with saliva, blood and secretions often occurs during the clinical practice, this being considered a skill that has the potential to promote cross-infection³.

In the dental environment, the oral cavity represents the largest concentration of micro-organisms, being susceptible to infections of bacterial, fungal and/or viral origin⁴. In this

context, blood and saliva are considered the main carriers of these pathogen agents³. Once there is contact with oral fluids of patients, there is a possibility of occurrence of biological cross infections and the development of several diseases, such as herpes, hepatitis B, hepatitis C, pneumonia and tuberculosis^{2,3}.

Despite the transmission of infectious diseases being commonly associated with perforating materials, drops of blood or saliva, can also be transmitted by contact with contaminated surfaces and materials⁴. In radiological

procedures, the radiographic film is the largest vector of transmission of micro-organisms^{1,5,6} that can be disseminated in the work environment⁶. In addition, the operator enters into contact with the oral cavity of the patient, and then with the cone of X-rays and exposure button. Thus, saliva and/or blood can be easily transferred to the equipment surfaces⁷. To avoid contamination, professionals should adopt biosecurity measures⁸.

The necessity of the use of biosecurity measures by means of aseptic techniques is an attempt to eliminate and/or reduce the risk of cross-infection during the socket and the radiographic processing³. Therefore, it is important the protection with mechanical barriers before each radiographic procedure to avoid the contact of contaminated gloves of the operator with the X-ray equipment and other areas of contact in the work environment^{1,2}. In addition, the disinfection of surfaces through chemical substances is also considered a practical method and fast to combat cross-infection.

Despite many advances in infection control in recent years, there are many problems in universities, clinics and medical offices. One of the shortcomings in this area is the lack of evaluation of the infection control in universities⁹. Therefore, the assessment of knowledge of professionals and students about certain conduct is fundamental for the identification of possible errors. In addition, it is necessary to have the constant updating of knowledge and application of a permanent education about the biosecurity measures¹⁰. In this sense, the questionnaire is considered a simple and effective method that is widely used in the evaluation of such lines¹¹. However, studies that use this method for evaluation of behaviors related to biosafety in Radiology, both professionals and students, are scarce^{8,12-14}.

Thus, the objective of this study was to evaluate the students' behavior Dentistry Course at State University of Paraíba (UEPB), Campus I, on biosafety in Dental Radiology. In addition, it was sought to find the main mistakes in biosafety committed by students, thus intensifying the guidelines about the best course of action to be taken in various situations during the use of the facilities intended for the realization of the technique, processing and radiographic analysis.

2 Material and Methods

It is a descriptive study with a quantitative approach, performed in the Department of Dentistry UEPB, Campus I. The research project was submitted to and approved by the Committee for Ethics in Research of UEPB, Campina Grande-PB, Brazil (Protocol number 0732.0.133.000-11).

This study was conducted with 88 Dentistry course students from the 3rd to 5th year. All those who agreed to participate in the research and had attended or were attending a discipline dental radiology were included. Data collection was carried out through the application of a questionnaire with questions about the maintenance of the infection control in

Radiology. The questionnaires were applied in the classrooms of the Department of Dentistry and dental radiology sector of this institution.

The data collected were organized in *Excel® software for Windows* and analyzed using the *Statistical Package for Social Science* (version 17.0, SPSS Inc., Chicago, IL, USA). Then, they were analyzed and presented by means of descriptive statistical techniques.

3 Results and Discussion

The research relied on a sample of 88 Dentistry course students of UEPF, being 41 males and 47 females, where 31 students were coursing the 3rd year, 28 were coursing the 4th year and 29 were coursing the 5th year. These answered a questionnaire about the infection control maintenance in radiology. In Table 1, the data distribution is displayed regarding the conduct of Dentistry students in relation to biosecurity in radiology clinic.

Table 1 - Issues related to the knowledge of the Dentistry course scholars on biosafety in dental radiology

Issues	n (%)
Do you worry about Biosecurity?	
Yes	87 (99.0)
No	1 (1.0)
What is the chemical solution used for disinfection?	
Alcohol 70%	55 (63.0)
Soap and water	7 (8.0)
Glutaraldehyde 2%	5 (6.0)
Sodium hypochlorite 1%	3 (3.0)
Sodium hypochlorite 0.5%	1 (1.0)
Sodium hypochlorite 5.0%	1 (1.0)
Did not answer the question	16 (18.0)
Which part of the X-ray equipment do you disinfect?	
X-ray tube	5 (6.0)
Arm of the Chair	5 (6.0)
Head	4 (5.0)
Lead Apron	3 (3.0)
Thyroid Shield	1 (1.0)
Trigger.	1 (1.0)
Did not answer the question	69 (78.0)
Which biological protection do you use in the intrabuccal films?	
Mechanical Barrier	62 (70.0)
Alcohol 70%	16 (18.0)
Flowing Water	6 (7.0)
Drying with paper towel	1 (1.0)
None of the options	3 (3.0)
What procedure is done after the use of the positioner?	
Disinfectant solution	50 (58.0)
Autoclaving	27 (30.0)
Soap and water	5 (6.0)
Store in a clean place	2 (2.0)
Any method available	1 (1.0)
Not Answered	3 (3.0)

Source: Data from the survey.

Regarding concern with the infection control, 99% were concerned with biosafety. Regarding the chemical solution used for disinfection in clinical radiology, alcohol at 70% was the most used one (63%). While some believed that soap and water (8%) were sufficient for a good disinfection.

In relation to the practice of disinfection of equipment, 78% did not respond to the question. Among those who responded, the majority stated that disinfected the X-ray tube (6%) and the arm of the dental chair (6%). However, when questioned about the protection of intrabuccal films, 70% responded that they make use of mechanical barriers.

Concerning the procedure done after the use of positioners, the majority of the students answered that they use disinfecting solutions (58%) to disinfect them and 30% responded that sterilize the positioners in autoclave.

Cross infection can be defined as the transmission of infectious agents between patients and professional teams, within a clinical environment. This transmission can occur from one person to another or through contaminated objects³. The dental office is an environment quite conducive to infection with infectious agents, capable of causing diseases from the simplest to the most complex^{4,8,15}. Thus, it can be assumed that the surgeon dentist is the main responsible for the control of cross-infection in the work environment¹.

The occupational risks in the dental office are classified into five groups: ergonomic physical, chemical, and biological risks of accidents. Of these, the biological risks are considered to be those that involve the contamination by fungi, viruses, parasites, bacteria and protozoa⁸. Therefore, the adoption of infection control measures is an effective way to reduce the occupational risk and transmission of pathogens, mainly through saliva, blood, air or water¹⁶. Therefore, biosecurity measures should be essential part in the practical conduct of a dental office¹⁰ and the dental professional must be eminent connoisseur of methods of biosecurity and mandatorily must apply them⁸.

Regarding the application of biosafety in the dental office, in a study conducted with 135 Turk dental surgeons, 95.6% of these stated that the universal precautions of biosecurity measures should be applied to all patients, because they accept that they should all be regarded as carriers of infection¹². In addition, in the same study, 74.1% of the dental surgeons were concerned with the risk of cross-infection¹². In a study conducted by Diniz et al.¹³, the majority of the students (90%) were concerned with the biosecurity, similar to that observed in the present study.

Although the accomplishment of x-ray exams in dentistry is usually considered a semi-critical procedure, many infectious diseases can be transmitted by saliva¹⁴. In a cross-sectional study of Shaghaghian et al.¹⁷, with 191 Dentistry students of Shiraz, Iran, who answered a questionnaire with demographic information and experiences of acute lesions and mucocutaneous contamination, saliva was the most common body fluid (99%) in which the students came

into contact. Therefore, it is important the protection with mechanical barriers before each radiographic procedure to avoid the contact of contaminated gloves with saliva or blood of the operator with the X-ray equipment and other areas of contact in the work environment².

Through microbiological analyzes, several studies demonstrate the radiological environment as a vector of cross-contamination, proving the presence of several species of microorganisms in the devices used, following the example of the study by Santos et al.¹⁵, where 7 species of fungi were identified 1, with higher frequency of *Candida albicans* (75%), commonly known as the causative agent of infections in immunocompromised patients. Furthermore, the authors found that the components of the intrabuccal X-ray apparatus, the head (76.4%) and the button of the panel (41.1%) were more heavily colonized by fungi, followed by the cylinder (35.2%) and the trigger (17.6%)¹⁵. In addition, Freitas et al.⁴, seeking to assess the microbiological contamination of the X-ray apparatus of a Dentistry Course of São Luís, observed that 70% of surfaces were contaminated and the organisms that exhibited a greater percentage of growth were the fungi (65%).

With the objective to evaluate the index of intra and extrabuccal digital radiographs equipment contamination of odontological radiology clinic of a public institution of education, Malta et al.¹⁸ found a growth of fungi and *Staphylococcus* in all the samples locations, before and after the procedures for infection control. Among the various types of organisms that can be found in the oral cavity, the species *Staphylococcus aureus* are considered as one of the most versatile and dangerous human pathogens. These microorganisms are considered opportunist and can cause from simple infections to severe infections, such as endocarditis³. Analyzing statistically the contamination by different genera of micro-organisms by means of the test of kruskall Wallis on X-ray apparatus, Freitas et al.⁴ observed a statistically significant predominance of microorganisms of the genus *Staphylococcus*.

During the intraoral radiographic procedure, the radiographic films may be contaminated with oral microorganisms contained in saliva or blood of patients. Once contaminated and then handled without due care, they can contaminate the operator's hands and the places that he or she touches, such as: radiological equipment and materials used in the radiographic procedure³. The majority of clinics use chemical solutions for disinfection of both surfaces of the radiographic equipment⁷ and the films. In a study conducted by Fernandes et al.² a biosafety protocol was suggested to the conventional intraoral exposure, where one must protect with a mechanical barrier all surfaces that may be touched by gloves contaminated with saliva during the exposure. The authors recommend that if the barrier is not available, the dental film should be disinfected with alcohol 70%².

Evaluating the effectiveness of chemical solutions alcohol

70%, glutaraldehyde, 2%, sodium hypochlorite 1% used in the decontamination of contaminated periapical radiographic films in the oral cavity of 7 volunteer patients, Baldissera et al.⁵ observed that all solutions tested in different times through immersion and friction, were effective in decontamination of periapical radiographic films, whereas in the control group, large bacterial growth was observed.

In our study, the majority of respondents (63%) replied that uses the alcohol 70% as a disinfectant solution in the clinic of Radiology. While, in a study conducted by Diniz et al.¹³ of the students who responded which substance they used for disinfection, the majority answered that they used alcohol 70% (14%). Whereas in relation to parts of the radiologic clinic that were disinfected, in our study, those who responded, 6% would disinfect the tube and 6% would disinfect the arm of the chair. Whereas in the study conducted by Diniz et al.¹³ 57% and 50% of the students answered that disinfect the chair and the X-ray tube, respectively. The results found in our study are due, mainly, to the implementation of the Biosecurity content in dental radiology discipline. The conducts passed to the students are those suggested in the manual of biosecurity measures proposed by the University of São Paulo¹⁹.

In the dental office, the largest source of contamination is the manipulation of the intraoral radiographic films⁸, once they come into contact with mucous and saliva of patients⁵. Therefore, it is recommended the protection of film with a mechanical barrier, such as the plastic polyvinyl chloride (PVC) or plastic film to prevent cross-contamination during the radiographic processing. In the present study, 70% of the students responded that they make use of a mechanical barrier. In contrast, in the study of Jardim Júnior et al.¹⁴ 76% of the dental surgeons did not use a mechanical barrier. Regarding the conduct taken after the use of the positioners, the majority of the students in our study answered that used disinfectant solution (58%), similar to the results found in other studies described in the literature^{8,13}.

4 Conclusion

It was concluded that the majority of students were concerned with biosafety in radiology clinic and that they had appropriate behaviors of disinfection before, during and after the radiological procedures. Despite the students' apparent concern, it is essential for the implementation of protocols and intensification of guidelines that seek to reduce the risk of cross-infection which the students and patients are exposed to.

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