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LITERATURE REVIEW

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Biosafety measures in dental practice: Literature Review

Medidas de biossegurança em consultório odontológico: revisão de literatura

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ABSTRACT

Objective: There is a great concern with biosafety nowadays, given the knowledge of diseases and potential complications in health practice. In this context, this review aims to provide information capable of improving good health practices and consequent minimization of operational risks in dental practice. **Material and Methods:** A review of biosafety literature was carried out covering the last seven years considering the health descriptors: "odontologia" and "biossegurança" / "Contenção de Riscos Biológicos" in the following Databases: Biblioteca Virtual em Saúde - BVS (Virtual Health Library); Bibliografia Brasileira de Odontologia - BBO (- Brazilian Bibliography of Dentistry) and Literatura Latino-Americana e do Caribe em Ciências da Saúde – LILACS (Latin American and Caribbean Literature in Health Sciences); and with the descriptors "dentistry" and "biosecurity" / "Containment of Biohazards" in the Databases: Scientific Electronic Library Online (SciELO), National Library of Medicine (MEDLINE), US National Library of Medicine National Institutes of Health Search (PubMed) and SCOPUS. **Results:** There were found 33 articles that met the criteria established for this research. **Conclusion:** From the literature, it is concluded that the evaluation of procedures, knowledge and constant study, the improvement of procedures and joint action of all staff is of fundamental importance so that health improvement can go beyond health care and the resolution of a specific problem.

KEYWORDS

Dentistry; Containment of biohazards; Biosafety.

RESUMO

Objetivo: Atualmente existe uma grande preocupação com a biossegurança, devido ao conhecimento das doenças e das potenciais complicações na prática de saúde. Nesse contexto, esta revisão tem como objetivo fornecer informações capazes de melhorar as boas práticas de saúde e consequente minimização dos riscos operacionais na prática odontológica. **Material e métodos:** Foi realizada uma revisão da literatura sobre biossegurança, abrangendo os últimos sete anos, considerando os descritores de saúde: "Odontologia" e "Biossegurança" / "Contenção de Riscos Biológicos" nas seguintes Bases de Dados: Biblioteca Virtual em Saúde - BVS; Bibliografia Brasileira de Odontologia - BBO (Literatura Brasileira de Odontologia) e Literatura Latino-Americana e do Caribe em Ciências da Saúde - LILACS (Literatura Latino-Americana e do Caribe em Ciências da Saúde); e com os descritores "Odontologia" e "Biossegurança" / "Contenção de Riscos Biológicos" nas Bases de Dados: Scientific Electronic Library Online (SciELO), National Library of Medicine (MEDLINE), National Library of Medicine National Institutes of Health Search (PubMed) e SCOPUS. **Resultados:** Foram encontrados 33 artigos que atenderam aos critérios estabelecidos para esta pesquisa. **Conclusão:** A partir da literatura, conclui-se que a avaliação de procedimentos, conhecimento e estudo constante, a melhoria dos procedimentos e a ação conjunta de todos os funcionários é de fundamental importância para que a melhoria da saúde possa ir além dos cuidados de saúde e a resolução de um problema específico.

PALAVRAS-CHAVE

Odontologia; Contenção de riscos biológicos; Biossegurança.

INTRODUCTION

There is a great concern with biosafety nowadays in view of the knowledge of diseases and potential complications in health practice. This concern with good practice in health, prevention and dissemination of diseases and cross-infection has made Brazil a pioneer in the creation of a regulation aimed at protecting health service workers exposed to biological risks, resulting in a regulatory standard: NR 32 [1]. This legislation, developed by the Ministry of Labor in 2015, provides basic guidelines for the implementation of measures to protect the health and safety of health service workers.

The aims of NR 32 are that not only health service professionals, but also their users, are aware of good health practices and collaborate in their application, including multiplier agents.

The adoption of biosafety measures reduces the risk of cross-contamination in clinical practice. In this sense, behavioral studies, knowledge of professionals working in health services, studies of the level of contamination of surfaces and/or materials used in clinical practice [2,3], have been carried out with the aim of raising awareness and improving biosafety practices in Dentistry, aiming to make them increasingly safer for the professionals who work in this area, as well as for its users.

The risks to which health professionals and their patients are exposed are issues of ongoing discussion among health authorities. In this context, the dissemination of information to adopt appropriate behaviors in clinical settings combines users and professionals in biosafety actions to promote a safe environment.

Motivated by the need to evaluate the biological risks to which various health professionals are exposed in their daily practice, Corrao et al. [4] state that these work duties have a complex approach, since risk assessment and management are specific considering the type of health service and the context in which the professionals are employed, given the variety of biological agents, work environments and work techniques that may determine these exposures to risk factors.

Dental clinic surgeries may present a high risk of contamination and can act as a 'breeding ground' for the varied microorganisms present in the patient's oral cavity [5]. This highlights the need for a survey focused specifically on dentistry for possible discussion of the subject by educators, other professionals, undergraduates and employees in the area.

Thus, the evaluation of the dissemination and application of biosafety information in Dentistry regarding the protection of its professionals and staff, practical implementation of the biosafety principles learned and elimination of residues, among others, are subjects of constant interest and debate in the scientific and dentistry communities.

With the conviction that access to information and knowledge sharing are the best tools for changing behavior and attitudes and based on the relevant literature published in the last seven years, this review aims to present information that can improve good practice in health and consequent minimization of operational risks in dental practice.

METHODS

The study of the literature review focused on a survey with the theme "Biosafety" studied in the last seven years (2012 to 2018). For this, a search was carried out using the descriptors found in the descriptive database DeCS (Portuguese Health Sciences Descriptors) in Portuguese and English, resulting in the following keywords: "Biossegurança" / "Contenção de Riscos Biológicos", "Odontologia", "dentistry" and" biosecurity" / "Containment of Biohazards".

The databases consulted were: Biblioteca Virtual em Saúde - BVS (Virtual Health Library); Bibliografia Brasileira de Odontologia - BBO (- Brazilian Bibliography of Dentistry), Literatura Latino-Americana e do Caribe em Ciências da Saúde – LILACS (Latin American and Caribbean Literature in Health Sciences), Scientific

Electronic Library Online (SciELO), National Library of Medicine (MEDLINE), US National Library of Medicine National Institutes of Health Search (PubMed) and SCOPUS.

As a criterion for inclusion, articles that had at least one of the indexes specified and dealt with subjects pertinent to dental clinical practice were considered for evaluation.

Monographs, dissertations, theses, book chapters and articles with prior publication to the date established for this literature review were excluded.

RESULTS AND DISCUSSION

After searching the literature using the determined descriptors, articles disregarded were those that appeared in more than one database, those that were not within the period considered in this study, chapters of books and theses, in accordance with the proposed methodology.

The abstracts were evaluated considering the proposed inclusion criteria. Finally, 33 indexed articles, distributed according to Table I, were considered for the purpose of this literature review.

Table I - Number of articles evaluated and year of publication

Year of Publication	Number of Articles
2012	9
2013	3
2014	7
2015	6
2016	6
2017	2
2018	0

Of these articles, two were reviews of the literature. In a review of the literature conducted in 2014, the authors observed that, despite many existing publications dealing with this topic, the number of works located in the databases decreased dramatically when associated with the descriptions “biosafety” and “dentistry”. The authors surveyed a period of eight years (2005-2012) and found 12 articles that met the proposed methodology’s requirements. In the present review the pertinent survey was carried out of the last seven years (2012-2018), and 33 articles were found based on the proposed methodology. It is important to note that the databases and the descriptors used were the same, which has shown a significant increase in scientific publications on the subject in recent years, indicating that biosafety is currently a relevant matter in the scientific community.

Despite the increase in the number of publications in relation to what was found by Bezerra et al. [6], a new decrease has been noticeable in recent years, and in 2012 nine publications were found, decreasing progressively each year, reaching two articles in 2017 and there was no publication within the methodology proposed in 2018 until August. This considerable decrease of papers about biosafety reinforce the need to further encourage the theme and improving relates actions.

The most recent literature review, in 2015, aimed to verify “academic-scientific and normative materials” regarding waste management in health services [7]. The author emphasizes the importance of Biosafety teaching in the professional training of health professionals.

Among the articles reviewed, five referred to laboratory tests. Freitas et al. [2], evaluated the contamination index in devices used to obtain intra-oral radiographs, and Ferreira & Caires [3] evaluated the level of contamination in resin tubes. In these two studies, the authors found a high level of contamination, highlighting the risks to which professionals are exposed in daily practice, as well as their teams and patients, favoring a stream of contamination and dissemination of several pathologies. In the same vein, Bustamante et al. [5] investigated, through surface collection and microscopic analysis, bacterial contamination generated by aerosols used in the dental care environments in a University.

Also, with regard to biosafety and dental radiology, in a study by Alves et al. [8], they observed that the entire population of dental surgeons studied showed concern regarding radioprotection. However, this consensus is not observed when the subject is 'biosafety in radiology'.

Considering that contamination of surfaces, x-ray devices and commonly used materials such as, for example, resin tubes, topical anesthetic bottles and cements, are constantly mentioned in the literature [2,3,8], Figueiredo et al. [9] compared the action of different agents used for decontamination of resin tubes and observed that the greatest reduction in the number of microorganisms was obtained using 1% sodium hypochlorite. Its efficacy was followed by the use of 2% glutaraldehyde, 0.12% chlorhexidine and 70% alcohol.

Further related to the contamination of the clinical environment, a study in 2016 evaluated contamination by microorganisms in equipment, chairs and spittoons in dental clinics located in a University and observed opportunistic bacterial species; a fact which made them suggest stricter biosafety measures to prevent cross-infection [10]. The high flow of patients in a university environment, as well as the use of common materials by a large number of students, reflects the need for strict measures and the awareness of employees, teachers and undergraduates regarding correct biosafety measures to be adopted for their protection and for their patients.

A common point shared by many authors is the conclusion that it is extremely important to adopt rigid biosafety practices in day-to-day clinical care in dentistry [2,3]. It is necessary to emphasize that it is the responsibility of the professional to provide an environment within the principles of biosafety, in order to minimize risks to patients, his team and himself.

Twenty out of 32 evaluated analytical studies aimed at evaluating the procedures adopted in biosafety and the know-how of professionals or future professionals who would work in the area. Considering the target population of these studies, it was observed that 8 of them were carried out with students, 6 with professionals and 5 involving both professionals and academics. The high index of studies carried out with academics shows the commitment to the training of future professionals, seeking to enable them to apply the guidelines in biosafety in order to promote a safe clinical environment. Several studies [3,6,7,11-18] point to the need to develop teaching strategies that cover not only theoretical knowledge, but also daily practice.

Driven by this concern with teaching and the sedimentation of knowledge, Paiva et al. [19] presented a proposal for an educational game with a playful theme (serial game) for addressing biosafety material and argued about the fact that interactive resources motivate learning and are good auxiliary teaching tools.

Concern regarding the risk of accidents involved needle-stick waste ('sharps') and exposure to body fluids motivated 10 of the works, mostly covering students and professionals. Miotto & Rocha [20] evaluated the prevalence of 'sharp' perforation accidents among dental undergraduates at a Brazilian university and observed that 27.5% reported had already suffered accidents. Among them, 10 (2.4%) were not using Individual protection equipment (PPE) at the time of the accident. This data reinforces the need to use rubber gloves when handling and preparing materials; also after the end of clinical care.

Stehling et al. [21] analyzed the factors associated with accidents involving biological agents, 'sharps' or chemical compounds among undergraduates of different undergraduate health courses at a Brazilian University and observed that 70.5 to 97.3% of undergraduates were exposed to the evaluated risks and the rate of accidents with sharps was 34.4% among dental academics. Nascimento et al. [11] also evaluated the prevalence of occupational accidents with 'sharp' injuries among teachers, students and employees who work in a risky location in a Brazilian federal university of

dentistry, and observed that 41.5% of the interviewees reported having suffered one or more accidents with 'sharp' injuries .

Behavior after exposure to biological materials was also evaluated in a study in 2014 [22], with the objective of tracing an epidemiological profile of accidents with sharp instruments in a retrospective cross-sectional study involving teachers, students and auxiliary personnel in a period that covered 7 years. Data collection was performed using a questionnaire previously developed with software. Among those evaluated, 34.2% of the participants reported some type of exposure to biological material and accidents occurred mainly during clinical (34.1%) and surgical (30.8%) procedures, although the majority (82.9%) have reported making use of Individual protection equipment. Again, we can see an under-reporting situation, since the authors observed that 26.4% of the subjects reported the accident and only 28.6% of them sought immediate help, a fact that highlights the urgent need for greater awareness from the beginning of academic training.

Lages et al. [16] evaluated the degree of knowledge of dentistry students confronted with action regarding sharp-cutting accidents and infection control, and the results indicated the "vulnerability of students to exposure to biological material." The authors mentioned that an institution that had a biosafety committee presented better results regarding the use of PPE and accident notification. Pinelli et al. [17] evaluated the prevalence of occupational accidents and verified their occurrence in 40% of the study participants. In addition, they noted that 52% of accidents were not properly reported. Nogueira et al. [23], in a cross-sectional descriptive study, confronted reported cases of 'sharps' injuries with a semi-structured questionnaire answered by professionals and suggested an under-reporting of 'sharps' accidents.

Other studies [24], although the accident survey was not the main scope, observed a high index of reports of 'sharps' injuries among professionals interviewed, with a rate of 31.9% among the participants reporting having suffered an accident at work [25].

The data regarding the number of individuals who reported having had any type of piercing accident is alarming and reveals the urgent need for the development of awareness action and the strengthening of biosafety standards. It is necessary for those involved to feel responsible for their health and for the implications that imprudence can bring upon themselves and others directly related to their conduct, such as sterilization officials and patients. In this context, Dantas Filho et al. [26] emphasized the importance of vaccination prior to the initiation of training in clinical practice as well as a focus on constant biosafety practices.

In specific cases of Hepatitis B and C, Fernandez et al. [24] evaluated analytically the dentists' degree of knowledge regarding risk factors and prevention methods for hepatitis B and C infections and observed that 86% of the participants considered themselves to be knowledgeable about biosafety norms. However, they concluded that the professionals' knowledge of the risks and forms of contamination is still not satisfactory. Oliveira [27] evaluated their awareness, the application of biosafety measures, and the risk of occupational exposure to hepatitis C among professional dental surgeons and noted that there is a satisfactory awareness of hepatitis C transmissibility. The author emphasizes the fact that there is no vaccine for Hepatitis C and considers that, although the results point to satisfactory knowledge and acceptance of standards in biosafety, "professionals do not fully adhere to the use of Personal Protective Equipment (PPE)." The same occurred in a study by La Rotta et al. [28], in which they observed that awareness of the means of transmission was good; however, the level of adherence to standard precautions was considered acceptable and was low in relation to individual protection as to use of PPEs and discarding 'sharps'.

Another recurrent evaluation among

the authors was concerning the standard precautionary measures (SPMs) in Biosafety. Standard precautionary measures for the purposes of this study are understood as attitudes in Biosafety that should be accepted by professionals who work in health care in order to reduce the risk of transmission of infectious diseases. This motivated research such as de Silva et al. [25], who analyzed the knowledge of the standard precautionary measures [SPM] among health professionals, and concluded that most professionals recognize and use the main precautionary measures. The authors emphasized the need for studies and constant updating in the biosafety area.

Xerez et al. [13] evaluated the level of biosafety knowledge of a number of dental academics in three colleges and obtained a satisfactory result. The authors advocate providing basic biosafety content in pre-clinical periods and periodical monitoring and updating of biosafety practices. With their concern also directed to the Odontology academics' analytical study of 2012, focusing on the stages of the process of sterilization, surface disinfection and mechanical barrier use, it was observed that older students presented better knowledge on these subjects [14]. The authors conclude by advocating stricter protocols in academic centers as a way of establishing habits and practices more appropriate to working life.

In this sense, in many cases it is difficult for researchers to evaluate the real use of biosafety knowledge learned during undergraduate courses, since acquired knowledge and practical application can sometimes distance each other. Reflection on the creation of new or more rigorous protocols is valid in the face of awareness and more effective implantation / examination of the norms already established. With regard to academics and practitioners, Armond et al. [29] affirm that more investment is required in the training of professionals and undergraduates for the application of Biosafety standards.

In a study [30] aiming to verify the degree of knowledge and degree of attitude of undergraduate students in dentistry with regard to sterilization of hand tools (high and low-rotation tools), a questionnaire was used to classify the degree of of high, medium and low knowledge, and the attitude as positive, regular and negative. The authors observed that 43.8% of respondents had an average level of knowledge and 61.8% showed an attitude classified as regular. In another study [14] which aimed to compare knowledge and attitudes in biosafety of students before and after specific training, it was observed that those who had undergone training did not present significant differences of knowledge in relation to the others.

Regarding the concern about the way of sending material to outsourced professionals and infection control, Maciel Pereira et al. [31] evaluated the behavior of professional dental surgeons regarding the disinfection of plaster models to be referred to prosthetics and observed that, although the professionals had carried out such a procedure, it was performed incorrectly.

Another important topic, however, that has not been adequately addressed in studies related to biosafety in dentistry is RSS (Waste in health services). Gomes et al. observed in their studies that the great majority of dentistry graduates evaluated acknowledged the risks of incorrect treatment of Waste in Health Services, as much for individuals as for the environment [15]. However, regarding management of infectious residues, a total lack of awareness was perceived for biosafety [32]. Although according to Gomes et al. [15] the only undergraduate course in the health area with a biosafety course at the Federal University of Paraná is Dentistry, and the focus on biosafety exists in a general way in all Dentistry courses, handling and disposal of residues has proved to be a matter still lacking attention.

It can be seen that the subject of Biosafety is inexhaustible regarding its various aspects. The importance of the topic begins with the protection of patients against cross-infection, spreading to the care of professionals and staff, the work place, handling of materials,

models, radiographs, equipment, sterilization, clothing, waste elimination and so on, without end, constituting something of paramount importance in the health area which must be constantly discussed and re-evaluated. Sacucci et al. [33], emphasized that the dental care environment is strongly linked to the risk of exposure to biological agents for both patients and dentists. This involves a large number of microorganisms that may be present in biological matrices (gingival fluids, saliva, blood) or unhygienic surfaces, water used in the dental unit, or emitted by patients with transmissible diseases.

The evaluation of actions, knowledge and constant study, improvement of procedures, and joint action of all staff is of fundamental importance, so that health improvement can transcend health care and go beyond the resolution of a specific problem.

CONCLUSIONS

Based on the lterature review, it is conclude that the evaluation of actions, constant research, the integration and commitment of the proessionals are fundamental for the improvement of good practices in oral health. Access to information and knowledge sharing are the best tools for changing behavior and attitudes.

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