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# Assessing the preparedness of dental professionals for bioterrorism events: protocol of a scoping review on knowledge gaps and strategies

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**ABSTRACT**

**Introduction:** Forensic dentistry and bioterrorism are distinct concepts, yet they are connected through the role forensic dentistry plays in identifying victims and analysing biological threats. This review examines the intersection and significance of these factors, considering the available training, protocols, and preventive measures. Hence, this scoping review aims to assess the current literature on the role of dental professionals in bioterrorism response, identify existing knowledge gaps, and propose strategies for enhancing preparedness.
**Methods:** A scoping review will be performed according to Joanna Briggs Institute methodology. Scientific databases as well as grey literature will be used and the following keywords will be applied: bioterrorism, dental health services, dentists, dental care, emergency response.
**Results:** This scoping review is expected to identify and map the extent of existing evidence regarding the preparedness of dental professionals to respond to bioterrorism events. Anticipated findings include significant gaps in knowledge, limited integration of bioterrorism-related content in dental education, and uneven preparedness across countries and professional backgrounds. The review will likely highlight that while most dentists express willingness to assist in emergency responses, they often lack the specific competencies and formal training required. Additionally, it is expected to identify effective educational strategies and models—such as simulation-based training, online learning, and interdisciplinary collaboration—that may enhance preparedness. The synthesized evidence will inform recommendations for curriculum development, continuing professional education, and policy-making aimed at strengthening bioterrorism readiness within dental healthcare systems.
**Conclusions:** This scoping review will enhance our understanding concerning dental practice and bioterrorism in a forensic context. According to the available data, it will help implement guidelines for dental preparedness. This protocol was registered with the Open Science Framework.

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**RESUMO**

**Introdução**: A medicina dentária forense e o bioterrorismo são conceitos distintos, mas estão ligados pelo papel que a medicina dentária forense desempenha na identificação de vítimas e na análise de ameaças biológicas. Esta revisão explora a sua interseção e significado, considerando a formação disponível, os protocolos e as medidas preventivas.
**Métodos**: Será realizada uma revisão exploratória de acordo com a metodologia do Joanna Briggs Institute. Serão utilizadas bases de dados científicas, bem como literatura cinzenta, e serão aplicadas as seguintes palavras-chave: bioterrorismo, serviços de saúde dentária, dentistas, cuidados dentários, resposta a emergências.
**Resultados**: Prevê-se que esta revisão de escopo identifique e mapeie a evidência disponível sobre o nível de preparação dos profissionais de medicina dentária para responder a eventos de bioterrorismo. Espera-se encontrar lacunas significativas de conhecimento, uma limitada integração de conteúdos sobre bioterrorismo na formação académica e diferenças de preparação entre países, níveis de experiência e contextos institucionais. É provável que os resultados revelem que, embora a maioria dos dentistas manifeste disponibilidade para colaborar em situações de emergência, existe uma insuficiente capacitação técnica e ausência de formação estruturada nesta área. Adicionalmente, prevê-se que a revisão identifique estratégias educativas eficazes — como o treino baseado em simulação, o ensino online e a colaboração interdisciplinar — que possam contribuir para reforçar a preparação e a resposta dos profissionais. A síntese da evidência permitirá propor recomendações para a atualização dos currículos académicos, para a formação contínua e para a implementação de políticas públicas que fortaleçam a prontidão da medicina dentária perante ameaças bioterroristas e outros cenários de emergência em saúde públic.
**Conclusões**: Esta revisão de escopo irá melhorar a nossa compreensão sobre a prática da medicina dentária e o bioterrorismo num contexto forense. De acordo com os dados disponíveis, ajudará a implementar diretrizes para a preparação odontológica. Este protocolo foi registado no Open Science Framework.

## Introduction

Bioterrorism, the deliberate release of biological agents to cause harm, poses a significant threat to public health and national security. Historically, biological agents have been used as weapons due to their potential to spread disease, cause mass casualties, and disrupt societal stability. The increasing concern over bioterrorism has led to extensive research on preparedness and response strategies across various healthcare sectors, including dentistry.[1-3] While medical professionals have been actively integrated into bioterrorism response frameworks, the role of dentists remains underexplored. Given their extensive training in infection control, diagnostics, and public health surveillance, dentists could play a crucial role in early detection and management of bioterrorism-related incidents.[4-6]

Dental professionals possess unique skills that can contribute to bioterrorism preparedness and response. Their expertise in orofacial infections, diagnostic imaging, and forensic odontology makes them valuable assets in identifying biological agents and aiding in mass casualty management.[7] Although research indicates a strong willingness among dentists to respond during bioterrorism events, their potential effectiveness is significantly hampered by deficiencies in knowledge and a lack of formal training.[8] For instance, a study conducted among dental students in India found that while over 90% were willing to provide care, their actual knowledge of bioterrorism was significantly low, emphasizing the need for targeted education.[9]

Several initiatives have been proposed to enhance bioterrorism preparedness among dental professionals. The American Dental Association (ADA) and the U.S. Public Health Service have recommended the integration of disaster response training into dental education.[4] Moreover, simulation-based training, standardized patients, and online learning modules have been suggested as effective methods to improve dentists' competency in recognizing and responding to bioterrorism threats.[1] Advances in nanopore sequencing and forensic DNA analysis also present new opportunities for dentists to contribute to bioterrorism surveillance and identification.[10]

This scoping review aims to assess the current literature on the role of dental professionals in bioterrorism response, identify existing knowledge gaps, and propose strategies for enhancing preparedness. By synthesizing

evidence from various studies, this review will provide insights into how dentistry can be integrated into bioterrorism response frameworks, ultimately contributing to a more comprehensive and coordinated public health approach.[11]

## Methodology

A research protocol will be drawn up according to Joanna Briggs Institute (JBI) model[12-14], which leads to the formulation of the following question: What is the level of preparedness of dentists in responding to bioterrorism, considering the available training, protocols, and preventive measures? Thus, the acronym PCC will be Population (P): Dentists; Concept (C): Preparedness in responding to bioterrorism; Context (C): Training, protocols, and preventive measures in dental practice.

The methodology applied will be based on a search of scientific articles without any time or language limits.

The databases to be used in this study are Pubmed, ScienceDirect, MEDLINE with Full Text (via EBSCO), and Web of Science, where the Mesh term (bioterrorism AND (dental health services OR dentists OR dental care)) AND (emergency response) will be applied.

The articles will be selected through Rayyan after being retrieved from the aforementioned databases.

For the final review, the items identified in the reports prepared for the guidance of systematic reviews and the extension of meta-analyses (PRISMA-ScR) will be used. This protocol was registered in the OSF (https://osf.io/vjzxm/).

### *Inclusion and exclusion Criteria*

Inclusion criteria: articles that address the proposed theme; studies published with no restrictions; studies in English, Portuguese or French, and with no time limit.

Exclusion criteria: articles that do not address the proposed theme; narrative, systematic or scoping reviews; non-dentist population; no dental practice context.

### *Search strategy*

The search strategy was planned by two reviewers and will be peer-reviewed by an expert third reviewer considering the Peer Review of Electronic Search Strategies (PRESS) checklist.[15]

In this scoping review, the search will be conducted across the following databases: PubMed, MEDLINE with Full Text (via EBSCO), Web of Science, and ScienceDirect. The JBI-recommended research strategy will be implemented.

A preliminary search was conducted across the PubMed, MEDLINE with Full Text (via EBSCO), Web of Science, and ScienceDirect databases to identify keywords and index terms used in publications on the theme. This allowed the development of the search strategy for each database (Table 1). This survey was conducted on 17 January 2025.

**Table 1.** Bibliographic research strategy.

| Database | Articulations of keywords | Number of articles |
|---|---|---|
| PubMed | (bioterrorism AND (dental health services OR dentists OR dental care)) AND (emergency response) | 13 |
| Science Direct | (bioterrorism AND (dental health services OR dentists OR dental care)) AND (emergency response) | 38 |
| MEDLINE with Full Text (via EBSCO) | (bioterrorism AND (dental health services OR dentists OR dental care)) AND (emergency response) | 5 |
| Web of Science | ((((ALL=(bioterrorism)) AND ALL=(dental health services)) OR ALL=(dentists)) OR ALL=(dental care)) AND ALL=(emergency response) | 880 |

The reference lists of all included articles will be reviewed for the possibility of the inclusion of additional articles. After the search, the identified articles will be deposited in the ENDNOTE program. The electronic search results will be exported to Rayyan®[16], and duplicates will be eliminated. The developer of the software is Rayyan Systems Inc. from Cambridge, MA, USA. Software AI-driven was not used to select the articles. Rayyan software will be used as a support tool, only to gather all the articles found in the different databases described above and identify duplicates.

### *Study selection*

Two reviewers, independently, will collect the data from the articles to decide their inclusion in this scoping review. Doubts and disagreements will be discussed using a third reviewer according to the peer review of the Electronic Search Strategies (PRESS) checklist.[15]

The preliminary test will be carried out by two independent reviewers, who will first analyse the title/abstract of articles and then the full text. Based on this analysis, 5% of the total articles will be used to achieve at least 75% consensus among reviewers. In the next step of the research, 2% of the full-text articles will be used to obtain the same level of agreement.

Studies that address the key goal of this review will be identified, selected, and evaluated for eligibility using the inclusion and exclusion criteria and research limiters.

The data for each selected article will include specific details on the sample size, methodology used, study method, and main evidence relevant to the objective of this review, as shown in Table 2.

**Table 2.** Form used for data collection.

| | |
|---|---|
| **Protocol Scoping Review Title** | Assessing the Preparedness of Dental Professionals for Bioterrorism Events: Protocol of a Scoping Review on Knowledge Gaps and Strategies |
| **Review objective(s)** | Analyse and map the level of preparedness of dentists in responding to bioterrorism, identifying the training received, the existing protocols, and the preventive measures applicable in dental practice. |
| **Review Question(s)** | What is the level of preparedness of dentists in responding to bioterrorism, considering the available training, protocols, and preventive measures? |
| **Inclusion/Exclusion Criteria:** | Inclusion criteria: articles that address the proposed theme; studies published with no restrictions; studies in English, Portuguese or French, and with no time limit.<br>Exclusion criteria: articles that do not address the proposed theme; narrative, systematic or scoping reviews; non-dentist population; no dental practice context. |
| **Population** | Dentists |
| **Context** | Training, protocols, and preventive measures in dental practice. |
| **Concept** | Preparedness in responding to bioterrorism |
| **Types of Evidence Sources** | |
| **Evidence Source Details and Characteristics** | |
| **Author(s)** | |
| **Year of Publication** | |
| **Origin/Country of Origin (where the source was published or conducted)** | |
| **Aims/Purpose** | |
| **Population and Sample size** | |
| **Details/Results extracted from the Source of Evidente** | |

A PRISMA-ScR flow diagram[17] will document the selection process (Figure 1).

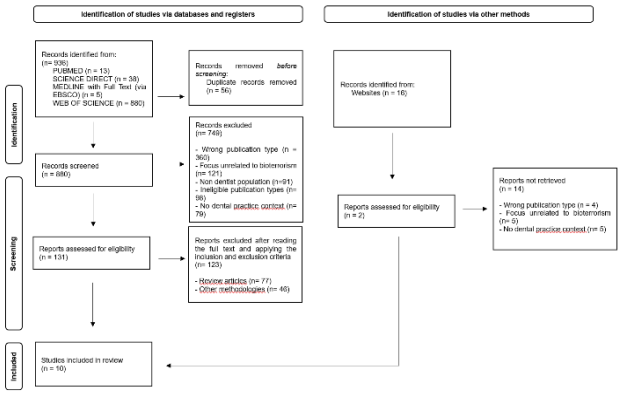


**Figure 1.** Flowchart of the article's selection process, adapted from PRISMA 2000 flow diagram (Page et. al, 2021).

## *Data analysis and presentation*

After reading the full articles included in this review, data will be extracted according to goals and research questions of the present review. The tool used for that, will be conducted by the methodology proposed by Joanna Briggs Institute[12-14], including the following relevant information: title, author(s), year of publication, country of origin, type of study, objective(s) and results, as shown in Table 2.

The collected data will be presented in narrative form using a qualitative assessment tool and corresponding coding. This will consider all aspects for bioterrorism in dental practice.

To map the available evidence and complement the information of each of the articles, a table will include the above and relevant information. The identification, characterization, and synthesis of knowledge that this review will bring, will be related to the proposed objective and review question.

# Results

This scoping review protocol outlines a comprehensive approach to examining the current level of preparedness among dental professionals for responding to bioterrorism threats. Through a systematic synthesis of the available literature, this review seeks to clarify the role of dentistry within broader public health emergency frameworks and to identify key areas requiring improvement.

A primary anticipated outcome is the identification of significant knowledge gaps regarding bioterrorism agents, their oral manifestations, and appropriate clinical and procedural responses. Highlighting these deficiencies could inform curriculum developers and public health authorities of the need to integrate essential content, such as disaster management, microbial threat recognition, and emergency triage, into dental education.

Another expected finding is disparities in preparedness across geographic location, professional experience, and educational background. Recognizing such variation may encourage the development of targeted training initiatives,

including regional workshops, online learning platforms, and continuing education programs tailored to the needs of dental professionals in under-resourced areas.

## Discussion

These anticipated findings suggest that current dental education may inadequately address topics related to bioterrorism preparedness. Integrating structured training modules and simulation-based exercises could bridge the knowledge gap identified in previous studies. Furthermore, dentists' willingness to participate in emergency responses underscores the potential of this group to be more formally included in interdisciplinary public health frameworks.

Identifying effective educational models and training strategies could provide policymakers and academic institutions with practical guidance. By adopting evidence-based approaches such as the Joanna Briggs Institute methodology and the PRISMA-ScR framework, this review will generate comprehensive evidence to support reforms in dental curricula and continuing education.

Finally, the expected synthesis of results may inform future empirical research aimed at testing specific educational interventions and assessing long-term preparedness outcomes.

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