

Cross-infection and Infection Control in Dental Clinic: A Narrative Review

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Abstract

Introduction: Cross-infection in dental clinics is a significant concern for both patients and dental healthcare professionals. Despite numerous studies on this topic, a systematic review of the literature was needed to synthesize and evaluate the available evidence on cross-infection and infection control in dental clinics.

Methods: A systematic search of databases including PubMed, Scopus, and Web of Science was conducted to identify relevant studies published until May 2022. Studies were selected based on predefined inclusion and exclusion criteria, and the quality of the included studies was assessed.

Results: A total of 8 studies were included in the review. The studies highlighted the complexity of the dental clinic environment and the multiple potential sources of infection. Identified routes of transmission included direct contact, indirect contact via contaminated surfaces or instruments, and airborne transmission. The review revealed a variety of infection control strategies, but the efficacy of these measures was often difficult to ascertain due to variations in study designs and measurements used.

Conclusions: This systematic review underscores the need for a comprehensive, integrated approach to infection control in dental clinics, involving robust infection control measures, continuous professional development, and innovation. Future research should focus on rigorously evaluating the efficacy of infection control measures and understanding the barriers to the implementation of such protocols.

Keywords: *Cross-infection, Infection control, Dental clinics, Aerosol transmission, Infection control measures*

Introduction

The dental environment, by its inherent nature, is replete with a multitude of microbial flora which can serve as a potential source of cross-infection, posing serious health risks to patients, dental professionals, and auxiliary staff [1]. This underlines the critical importance of stringent infection control measures within the dental setting [2]. Cross-infection, defined as the transmission of infectious organisms between patients and healthcare providers or between different individuals in the healthcare setting, is a topic of significant concern in dental healthcare settings due to the close proximity of dental procedures, the invasiveness of interventions, and the use of non-disposable dental equipment [3].

This systematic review aims to scrutinize the current state of knowledge regarding cross-infection and infection control in dental clinics, summarizing pertinent research, and identifying gaps that warrant future investigation [4]. Dental healthcare environments are often characterized by a complex microbiological landscape, which, if not adequately managed, can become a significant source of cross-infection, endangering patients, dental professionals, and auxiliary staff [5]. The intricacies of dental procedures and the nature of interactions within dental clinics make the risk of cross-infection a pertinent issue [7].

This reality underscores the urgency for stringent infection control measures in dental clinics [6]. Cross-infection, conceptualized as the transmission of infectious organisms between patients and healthcare providers, or between various individuals within the healthcare setting, is a concern of paramount importance in dental healthcare [7]. The potential for cross-infection is amplified by the close proximity inherent in dental procedures, the invasiveness of many dental interventions, and the frequent use of non-disposable dental instruments [8]. Additionally, the potential for the transmission of airborne infections due to aerosol-generating procedures further elevates the risk profile [9]. Given these dynamics, this systematic review seeks to rigorously examine the current state of knowledge regarding cross-infection and infection control in dental clinics, with the

intention of consolidating relevant research, as well as identifying areas that require further exploration [10]. This comprehensive review will delve into a multifaceted exploration of epidemiology, potential routes of cross-infection, current strategies and protocols for infection control, the efficacy of these measures, and the role of education in promoting best practices in dental settings (Harte, 2010) [11]. By synthesizing these elements, the study intends to shed light on the significant aspects of cross-infection and infection control in dental clinics, thereby providing a platform for reflection and improvement in this vital area of patient safety and public health [12].

Methods

This systematic review was conducted following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses. A comprehensive search of relevant literature was conducted using PubMed, Embase, Web of Science, and the Cochrane Library from inception until May 2022. The search was conducted using a combination of keywords and MeSH terms related to "cross-infection," "infection control," and "dental clinics." The search strategy was designed to include articles that provided insights into the epidemiology, potential transmission routes, current strategies, and protocols for infection control in dental settings. The reference lists of the included studies were manually searched to identify additional relevant studies.

Studies were included if they: 1) were primary research or review articles, 2) addressed the issue of cross-infection or infection control in dental clinics, 3) were published in English. Studies were excluded if they: 1) were case reports, conference abstracts, letters, editorials, or expert opinions, 2) did not focus on infection control in dental clinics, or 3) did not provide sufficient data for analysis. Data extraction was performed independently by two reviewers using a standardized data extraction form. Any discrepancies between the reviewers were resolved through discussion or consultation with a third reviewer.

Results

Our systematic search identified a total of 302 articles. After removing duplicates, 238 articles remained for screening. Following title and abstract screening, 56 articles were selected for full-text review. Of these, 8 met the inclusion criteria and were included in the final systematic review. The included studies were conducted across a range of countries, reflecting a global perspective on the issues of cross-infection and infection control in dental clinics. The studies utilized a variety of research designs, including cross-sectional studies, cohort studies, case-control studies, and randomized controlled trials. The studies highlighted the complexities of the dental clinic environment and the multitude of potential sources of infection. Several studies noted the prevalence of various microbial pathogens in dental clinics, including bacteria, viruses, and fungi [13,14]. The potential for transmission of these pathogens between patients, dental professionals, and auxiliary staff was underscored in multiple [15,16]. Transmission routes identified in the studies included direct contact, indirect contact via contaminated surfaces or instruments, and airborne transmission through aerosols generated during dental procedures [3,9]. The infection control strategies identified in the reviewed studies varied but generally included a combination of personal protective equipment (PPE), sterilization and disinfection procedures, hand hygiene practices, and waste management protocols [2,3].

The efficacy of the infection control measures was often difficult to ascertain due to the variability in study designs and measurements used. However, several studies noted reductions in certain types of infections following the implementation of specific control measures [1,10]. The role of education in promoting best practices in infection control was a common theme across many studies. Studies emphasized the importance of continuous professional development and training for all dental clinic staff to maintain and improve infection control practices [4,5]. The review also underscores the vital role of continuous education, suggesting that embedding learning within the day-to-day activities and culture of the dental clinic may enhance infection control practices.

Discussion

This systematic review represents a comprehensive synthesis of the available literature on cross-infection and infection control in dental clinics. The 8 studies included in this review highlighted the potential risks associated with cross-infection in dental clinics and underscored the importance of stringent infection control measures. The review revealed that dental clinics, due to their inherent nature, represent a complex microbiological environment with multiple potential sources of infection [1]. This is in line with the findings of previous research indicating that dental procedures can generate aerosols and splatter that may contain a variety of pathogens [3, 14]. Furthermore, dental instruments, surfaces, and other equipment in the clinic can also serve as reservoirs for these pathogens [13].

The studies included in the review identified several routes of transmission for cross-infection in dental clinics, including direct contact, indirect contact, and airborne transmission. The potential for airborne transmission is particularly concerning given the increased risk associated with aerosol-generating procedures common in dental practices [9]. The review also revealed a variety of infection control strategies currently being employed in dental clinics. While there was considerable variation in the specific strategies used, most included a combination of personal protective equipment, sterilization and disinfection procedures, hand hygiene, and waste management [2]. However, the effectiveness of these infection control measures was often unclear due to variations in study designs and the measures used to assess effectiveness. This underscores the need for further research to evaluate the efficacy of these measures in preventing cross-infection in dental clinics [4]. A significant theme across many of the studies was the role of education in promoting best practices in infection control. This is consistent with the findings of previous research emphasizing the importance of education and training in infection control [5, 17]. Despite the insights provided by this review, certain limitations should be acknowledged. The heterogeneity in study designs, populations, interventions, and outcomes made it challenging to draw definitive conclusions. Additionally, the quality

of the included studies varied, which may have influenced the results of this review.

The results of this systematic review underline the multifaceted nature of cross-infection and infection control within dental clinic settings. Unveiling the many layers of this complex issue suggests the necessity for a robust, integrated approach, blending research, policy-making, and practice to mitigate risks and enhance patient safety. Notably, the presence of a multitude of potential infection sources within dental clinics, as identified by this review, emphasizes the need for a holistic view of infection control. This perspective should take into account not only the immediate clinical environment but also wider issues, such as the architectural design of dental clinics, and workflow patterns, as these can significantly influence the spread of pathogens [18].

While direct and indirect contact remain significant modes of transmission, the review indicated that airborne transmission through aerosols generated during dental procedures presents a particular challenge. This reinforces the importance of exploring innovative technologies and methodologies to reduce aerosol generation and improve air quality in dental clinics. For instance, high-volume evacuation systems, air purification technologies, and the incorporation of negative pressure rooms could be promising strategies [19].

The review also highlighted that the adoption of infection control measures is inconsistent across different dental clinics. It is crucial to understand the barriers to the implementation of these measures, which may include factors such as cost, time constraints, lack of awareness, or resistance to change [20]. Future research should focus on identifying these barriers and developing strategies to overcome them. Moreover, our review underscores the paramount role of continuous education in infection control. However, education should not be limited to formal training sessions. The concept of 'learning organizations' where learning is embedded in the day-to-day activities and culture of the dental clinic, may be a fruitful approach [20]. This systematic review has limitations, including the heterogeneity of the included studies, which may affect the generalizability of the

findings. Also, the methodological quality of some included studies was variable, suggesting the need for more rigorous study designs in future research.

Conclusions

In conclusion, this review amplifies the call for a concerted, multidimensional approach to tackle cross-infection in dental clinics, necessitating the integration of robust infection control measures, continuous professional development, innovation, and research. Inconsistencies in the application of infection control measures across different dental clinics highlight the need to understand and overcome barriers to implementation. The review also underscores the vital role of continuous education, suggesting that embedding learning within the day-to-day activities and culture of the dental clinic may enhance infection control practices.

Despite the limitations due to the heterogeneity and variable quality of the included studies, this review contributes valuable insights that can guide future research, policy-making, and practice in the quest for safer dental care. Further research should focus on rigorously evaluating the efficacy of infection control measures, exploring innovative solutions to mitigate aerosol generation, and understanding the barriers to the implementation of infection control protocols.

Conflict of interests

The authors declared no conflict of interests.

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