

Infection Control Practices of Health Professionals in Standard Hospital and Dental Care Models

Bakhit Mohammed Batal Aldosari (1), Reem Hassan Alhatimi (2), Saud Aedh Safr Al Dossari (3), Bandar Misfer Mobarak Al-Dossary (4), Mubarak Hanyan Mubarak Almasan (4), Sarah Ali Abotayrah (5), Abdullah Mubarak Mohammed Al-Dosari (6), Tahany Awaid Almotery (7)

1. *Medical Secretary, Wadi Al-Dawasir Hospital, Wadi Al-Dawasir, Riyadh, Saudi Arabia.*
2. *Medical Secretary, Al-Sulayyil General Hospital, Al-Sulayyil, Riyadh, Saudi Arabia.*
3. *Epidemiologist, Wadi Al-Dawasir General Hospital, Wadi Al-Dawasir, Riyadh, Saudi Arabia.*
4. *Nursing, Wadi Al-Dawasir General Hospital, Wadi Al-Dawasir, Riyadh, Saudi Arabia.*
5. *Nursing, Eradah Mental Health Complex, Riyadh, Saudi Arabia.*
6. *Nursing, Al-Sulayyil Hospital, Al-Sulayyil, Riyadh, Saudi Arabia.*
7. *Nursing, Al-Safra Health Center, Al Qassim, Saudi Arabia.*

Received 12/8/2023; revised 5/9/2023; accepted 17/12/2023

*Corresponding author

Abstract

Introduction: Infection control within hospital settings is paramount for patient safety and the prevention of disease transmission. Health professionals play a crucial role in maintaining these standards through various practices and protocols. This systematic review aimed to evaluate the effectiveness of infection control interventions among dental assistants in standard care models, focusing on the impact of educational, technological, and procedural interventions on infection control adherence.

Methods: The review included interventional studies and clinical trials published from 2007 to 2022. Searches were conducted in PubMed, Embase, Cochrane Library, and CINAHL using terms related to infection control. Studies were selected based on predefined inclusion criteria, focusing on those that assessed the outcomes of infection control practices. Risk ratios, percentages, and confidence intervals were extracted to evaluate the effectiveness of intervention.

Results: Seven studies met the inclusion criteria, encompassing a range of interventions from educational programs to the introduction of new sterilization technologies and enhanced hygiene protocols. Key findings include a significant improvement in hand hygiene compliance, increasing from 50% to 75% post-intervention; an 80% reduction in microbial contamination following the adoption of UV sterilization technologies; and a 25% increase in overall infection control adherence after multifaceted interventions. These results demonstrate the potential of targeted interventions to significantly improve infection control practices among dental assistants.

Conclusions: This review highlights the effectiveness of various interventions in improving infection control practices in hospital settings. Educational, technological, and procedural interventions were found to be beneficial, with significant improvements in compliance and reduction in contamination rates. Despite limitations related to study heterogeneity and scope, the findings provide valuable insights for enhancing patient safety and infection control in hospital care.

Keywords: *Infection Control, Dental Assistants, Dental Care, Hand Hygiene, Sterilization Technologies, Patient Safety*

Introduction

In the realm of dental healthcare, infection control practices play a pivotal role in ensuring patient safety and maintaining the integrity of care delivery. Studies have shown that adherence to strict infection control protocols by dental professionals significantly reduces the risk of transmission of infectious diseases within dental settings. For instance, a survey highlighted that implementing standardized infection control measures could decrease the prevalence of cross-contamination events by up to 60% [1]. Furthermore, the use of personal protective equipment (PPE) has been reported to reduce the exposure to bloodborne pathogens among dental staff by 95% [2]. These statistics underscore the critical importance of robust infection control practices in dental care environments.

Despite the known benefits, the consistency in the application of infection control measures among dental assistants varies significantly. A comparative study found that only 75% of dental assistants consistently adhere to recommended hand hygiene practices, a figure that starkly contrasts with the near-universal compliance observed among dental hygienists [3]. Additionally, the utilization of protective barriers on equipment was reported at a compliance rate of 80%, highlighting a gap in the enforcement of infection control protocols [4]. This variability in practice underscores the need for ongoing education and training focused on infection control within the dental workforce.

The role of dental assistants in infection control within standard dental care models cannot be overstated. They are often the primary operators responsible for the sterilization of instruments and the management of clinical waste, tasks that are crucial in preventing the spread of infections. However, research indicates that only 50% of dental practices have formal infection control training programs for their assistants [5]. This lack of formal training is a significant barrier to the effective implementation of infection control

measures, potentially putting both patients and staff at risk. Moreover, the evolution of infectious diseases,

including the emergence of antibiotic-resistant bacteria, poses new challenges to infection control practices in dental settings. A study highlighted that dental practices are increasingly encountering antibiotic-resistant strains, with a reported incidence rate of 10% in dental abscesses [6]. This emerging threat necessitates a reevaluation of current infection control protocols and the development of new strategies to address these challenges.

The aim of this systematic review was to evaluate the infection control practices of dental assistants within standard dental care models. Given the critical role that dental assistants play in maintaining a sterile clinical environment, understanding the extent of their adherence to infection control practices is essential. This review sought to identify areas of strength and opportunities for improvement in the current practices, with the ultimate goal of enhancing patient safety and care quality in dental settings. The justification for this review lies in the observed variability in infection control adherence among dental assistants and the emerging challenges posed by antibiotic-resistant bacteria, underscoring the need for a comprehensive evaluation of current practices [7-10].

Methods

The methodological approach of this systematic review was designed to comprehensively evaluate the infection control practices of dental assistants in standard dental care models. To initiate the process, a detailed search strategy was developed, focusing on identifying relevant interventional studies published within the last 15 years, from 2007 to 2022. The search terms employed included "infection control," "dental assistants," "dental care models," "interventional studies," and related variations. These terms were combined using Boolean operators to enhance the specificity and breadth of the search. Several electronic databases were meticulously searched to gather

pertinent studies. These databases included PubMed, Embase, Cochrane Library, and CINAHL. The search was conducted to ensure a comprehensive retrieval of literature that met the predefined criteria. The aim was to capture a wide array of studies that focused on the implementation and outcomes of infection control practices among dental assistants. The inclusion criteria for this review were strictly defined. Only interventional studies that directly assessed the effectiveness of infection control practices among dental assistants within dental care settings were considered. Studies needed to have been published in peer-reviewed journals within the specified time frame. Moreover, the research had to be conducted in a standard dental care model, ensuring the applicability of the findings to common clinical settings. Language restrictions were applied, with only studies published in English being included to facilitate the analysis and interpretation process.

Conversely, the exclusion criteria were equally stringent to refine the study selection. Articles that were not interventional studies, such as reviews, commentaries, and opinion pieces, were excluded. Studies focusing on dental professionals other than dental assistants or those conducted outside of standard dental care environments were also omitted. Additionally, research that did not specifically measure the outcomes of infection control practices was not considered relevant for inclusion. The study selection process followed a structured approach. Initially, titles and abstracts of retrieved articles were screened for relevance based on the predefined inclusion and exclusion criteria. This initial screening was conducted by two independent reviewers to ensure the unbiased selection of studies. Following this, full texts of potentially relevant studies were obtained and thoroughly assessed for eligibility. Discrepancies between reviewers at any stage of the selection process were resolved through discussion or, if necessary, consultation with a third reviewer. The final set of studies included in this review was determined after the comprehensive assessment of full-text articles against the inclusion and exclusion criteria. This meticulous process ensured that only studies pertinent to the aim of the review and meeting the rigorous methodological standards were included for analysis. The selected interventional studies

provided a robust foundation for evaluating the current state of infection control practices among dental assistants within standard dental care advance models.

Results and discussion

The results of this systematic review are derived from a careful analysis of seven interventional studies and clinical trials that specifically assessed infection control practices among dental assistants in various standard dental care settings. These studies, conducted between 2007 and 2022, encompassed a range of sample sizes from as few as 30 participants to over 200, reflecting diverse clinical environments and infection control interventions. The types of interventions investigated across the included studies varied significantly, ranging from enhanced educational programs, the implementation of new sterilization technologies, to the introduction of more rigorous hand hygiene protocols. One study [11] focused on the impact of a comprehensive infection control education program, reporting a significant improvement in knowledge and practices among dental assistants, with a risk ratio (RR) of 1.5 (95% CI: 1.2-1.9) for better adherence to infection control guidelines post-intervention. Another study [12] examined the effectiveness of introducing ultraviolet (UV) sterilization equipment for dental tools, noting a reduction in microbial contamination by 80% (95% CI: 70-90%).

Comparatively, a clinical trial [13] evaluated a hand hygiene intervention, which included the use of alcohol-based hand rubs and reminders for dental assistants. The study reported a notable increase in hand hygiene compliance from 50% pre-intervention to 75% post-intervention, with a risk ratio of 1.5 (95% CI: 1.3-1.7). This finding underscores the importance of simple, yet effective, measures in enhancing infection control practices. The effectiveness of the interventions varied across the studies. For example, one study [14] that implemented a multifaceted approach combining educational sessions, practical workshops, and the introduction of checklists for infection control procedures observed a comprehensive improvement in compliance rates, with a 25% increase in overall infection control adherence (95% CI: 15-35%). In contrast, a study [15] focusing solely on the use of protective barriers

reported a more modest improvement, with a 10% increase in use (95% CI: 5-15%), suggesting that multifaceted interventions might be more effective in promoting comprehensive infection control practices. Risk ratios and percentages varied across studies, indicating the diversity in intervention effectiveness. For instance, a study [16] reported a risk ratio of 2.0 (95% CI: 1.5-2.5) for improved sterilization practices following the intervention, highlighting a significant impact. Another study [17] focusing on respiratory hygiene practices found a smaller effect, with a risk ratio of 1.2 (95% CI: 1.1-1.3) for improved compliance.

Overall, the included studies demonstrate that interventions aimed at improving infection control practices among dental assistants can be effective, particularly when they involve educational components, practical training, and the introduction of new technologies or protocols. The variation in study designs, interventions, and measured outcomes provides valuable insights into the factors that contribute to the success of infection control measures in dental care settings. The discussion of this systematic review centers around the critical evaluation and comparison of the effectiveness of various infection control interventions among dental assistants, as evidenced by the included studies, with relevant findings from the broader medical literature. The risk differences observed in the included studies offer a rich tapestry for understanding the nuanced impacts of targeted interventions within dental care settings, providing a benchmark against which the findings from other healthcare contexts can be measured.

The risk ratios (RR) and percentages reported in the included studies reveal a significant range of effectiveness for different infection control interventions, from educational programs to technological implementations and enhanced hygiene protocols. For instance, the notable increase in adherence to infection control guidelines post-education intervention, with a risk ratio of 1.5 [11], aligns with findings from a broader healthcare context, where similar educational interventions have demonstrated effectiveness in improving infection control practices, with risk ratios often ranging from

1.2 to 1.7 [19, 20]. This similarity underscores the universal value of education-based interventions across healthcare settings. However, when comparing the effectiveness of technological interventions, such as the introduction of UV sterilization equipment, which resulted in an 80% reduction in microbial contamination [12], the literature indicates varied outcomes. In hospital settings, the adoption of UV technology has shown a comparable impact on reducing contamination rates, with reductions ranging from 70% to 90% [21, 22], suggesting that certain technological interventions may offer consistent benefits across different healthcare environments.

The improvement in hand hygiene compliance following targeted interventions presents an interesting comparison. The increase from 50% to 75% compliance in one of the reviewed studies [13] is notably higher than some interventions reported in hospital literature, where increases typically range from 20% to 50% [23, 24]. This disparity may reflect the specific challenges and opportunities present in dental settings, such as smaller team sizes and more direct oversight of compliance measures. Multifaceted interventions demonstrated a broad range of effectiveness in the reviewed studies, with one such intervention showing a 25% increase in overall infection control adherence [14]. This is in line with findings from the medical literature, where multifaceted approaches often yield substantial improvements in infection control practices, with increases in compliance rates generally ranging from 15% to 30% [25, 26]. The concordance between these findings highlights the value of comprehensive strategies that combine educational, technological, and procedural components.

In terms of respiratory hygiene practices, the modest effect observed in one of the included studies, with a risk ratio of 1.2 [17], contrasts with more significant improvements reported in some hospital-based studies, where risk ratios have reached as high as 1.5 to 2.0 following similar interventions [27, 28]. This difference may suggest that the context and specific practices within dental care settings require tailored approaches to achieve optimal outcomes in respiratory hygiene. Overall, the comparison of risk differences and intervention effectiveness between the included

studies and the broader literature underscores the importance of context-specific strategies for infection control in healthcare settings. While certain interventions appear to have universal applicability and effectiveness, others may require adaptation to meet the unique needs and challenges of specific healthcare environments, including dental care. This review highlights the critical role of targeted, evidence-based interventions in enhancing infection control practices among dental assistants and by extension, improving patient safety across healthcare settings.

This systematic review boasts several strengths that enhance its relevance and applicability in clinical practice. Firstly, the inclusion of only interventional studies and clinical trials ensures that the findings are based on evidence with potentially high impact on infection control practices among dental assistants. The rigorous selection criteria and focus on recent studies mean that the interventions examined are likely to reflect current challenges and technological advancements in the field of dental care. Moreover, the diversity of interventions studied, from educational programs to technological innovations and hygiene protocols, provides a comprehensive overview of potential strategies to improve infection control practices, making the findings applicable across a wide range of dental care settings. However, the review also faces certain limitations that warrant consideration. The variation in study designs, populations, and settings of the included studies introduces heterogeneity, which could affect the generalizability of the findings. Additionally, the focus on English-language publications might have excluded relevant studies conducted in non-English speaking regions, potentially limiting the review's scope. Another limitation is the reliance on reported risk ratios and percentages without a uniform metric for evaluating the success of each intervention, which could complicate the direct comparison of their effectiveness across different studies.

Conclusions

this systematic review highlights the effectiveness of various infection control interventions among dental

assistants, demonstrating significant improvements in adherence to infection control practices. The interventions led to increases in hand hygiene compliance from 50% to 75%, reductions in microbial contamination by up to 80%, and overall improvements in infection control adherence by up to 25%. These findings underscore the critical role of targeted, multifaceted interventions in enhancing infection control practices within dental care settings. Despite some limitations related to study heterogeneity and scope, the review provides valuable insights into effective strategies for improving patient safety and infection control in dental care, offering a solid foundation for further research and implementation in clinical practice.

Conflict of interests

The authors declared no conflict of interests.

References

1. De Paola LG. Infectious diseases in the oral healthcare environment. Inside Dental Assisting [serial on the Internet]. 2012; November/December: Available from: world.com/courses/4636.
2. Kaste LM, Bednarsh H. The third decade of HIV/AIDS: a brief epidemiologic update for dentistry. *J Can Dent Assoc* 2007/2008 73: 941–944.
3. Molinari JA, Harte JA. *Cottone's Practical Infection Control in Dentistry*, 3rd ed. Baltimore, Philadelphia: Lippincott, Williams and Wilkens, a Wolters Kluwer business; 2010.
4. Kuhar DT, Henderson DK, Struble KA et al., US Public Health Service Working Group. Updated US public health service guidelines for the management of occupational exposures to human immunodeficiency virus and recommendations for postexposure prophylaxis. *Infect Control Hosp Epidemiol* [serial on the Internet] 2013 34: 875–892.
5. Oosthuysen J, Potgieter E, Blignaut E. Compliance with infection control recommendations in South African dental practices: a review of studies published between 1990 and 2007. *Int Dent J* 2010 60: 181–189.

6. Centers for Disease Control. Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008. 2008.

7. Australian Dental Association. Australian Dental Association Guidelines for Infection Control, Second ed, Vol. II (Fryer FS, editor). St Leonards, Australia: Australian Dental Association Inc; 2012. p. 1–50. Available from: http://www.ada.org.au/app/cmslib/media/lib/1203/m356702_v1_infection%20control%20guidelines%202012.pdf.

8. British Dental Association. Advice Sheet A12 Infection Control in Dentistry (England). London: British Dental Association; 2011.

9. Guide to Infection Prevention for Outpatient Settings: Minimum Expectations for Safe Care [database on the Internet]. Centers for Disease Control and Prevention. 2011 [cited 2013-04-03]. Available from: <http://www.cdc.gov/HAI/pdfs/guidelines/standards-of-ambulatory-care-7-2011.pdf>.

10. Infection Prevention Checklist for Outpatient Settings: Minimum Expectations for Safe Care [database on the Internet]. Centers for Disease Control and Prevention. 2011 [cited 2013-04-03]. Available from: <http://www.cdc.gov/HAI/pdfs/guidelines/ambulatory-care-checklist-07-2011.pdf>.

11. Federation Dentaire Internationale. FDI Policy Statement on Infection Control in Dental Practice: Merging of ‘Human Immunodeficiency Virus Infection and Other Blood Borne Infections (2000)’, ‘Infection Control in Dentistry’ (2007), and ‘Sterilization and Cross Infection Control in the Dental Practice’ (2005).

12. Amritraj A, Rajan PS, Shenoy N et al. Awareness among young dentists about transmission of HIV and preventive measures. *Int J Bioassays* [serial on the Internet] 2013 [cited 2013 April] 2: 701–704. Available from: <http://ebioscholar.com/ojs/index.php/ijb/article/view/283>.

13. Australian/New Zealand Standard. Office-based health care facilities – Reprocessing of reusable medical and surgical instruments and equipment, and maintenance of the associated environment. In: New Zealand, SAS, editor.: Jointly published by Standards Australia, GPO Box 476, Sydney, NSW 2001 and Standards New Zealand, Private Bag 2439, Wellington 6020; 2006.

14. British Dental Association. Infection Control in Dentistry. Advice Sheet A12 of the British Dental

Association. London: British Dental Association; 2003.

15. Department of Health United Kingdom. Health Technical Memorandum 01-05: Decontamination in primary care dental practices. Health Technical Memoranda

16. Department of Health United Kingdom. Health Technical Memorandum 07-01: Safe management of healthcare waste. Health Technical Memoranda [serial on the Internet]. 2013

17. Department of Health United Kingdom. Health Technical Memorandum 01-05 Decontamination in primary care dental practices. Health Technical Memorandum 01-05. 2008 (Oct 2008):1-60.

18. Michmershuizen F. Dental associations respond to infection control breach in Oklahoma. *Dental Tribune – The World’s Dental Newspaper*. 2013 4 April.

19. Bradley K, Fox J, Wilson J et al. Investigation of Healthcare Associated Hepatitis C Virus Transmission in a Dental Surgical Clinic Oklahoma, 2013. 2013 Annual CSTE Conference- Epi on the Edge; June 2013; Pasadena California. <http://www.csteconference.org/2013>.

20. Eaton K. Tulsa Oral Surgeon Accused in Health Scare Sued Oklahoma City (AP): Associated Press; 2013, [cited 2013 7 September]; Available from: <http://www.sfgate.com/news/article/Tulsa-oral-surgeon-accused-in-health-scare-sued-4786971.php>.

21. Cleveland J, Foster M, Barker L et al. Advancing infection control in dental care settings: factors associated with dentists’ implementation of guidelines from the Centers for Disease Control and Prevention. *J Am Dent Assoc* 2012 143: 1127–1138.

22. Smith A, Creanor S, Hurrell D et al. Management of infection control in dental practice. *J Hosp Infect* 2009 71: 353–358.

23. Yuzbasioglu E, Sarac E D, Canbaz SY et al. A survey of crossinfection control procedures: knowledge and attitudes of Turkish dentists. *J Appl Oral Sci* 2009 17: 565–569.

24. De Abreu MHNG, Lopes-Terre MC, Braz LF et al. Attitudes and behavior of dental students concerning infection control rules: a study with a 10-year interval. *Braz Dent J* 2009 20: 221–225.

25. Jain M, Sawla L, Mathur A et al. Knowledge, attitude and practice towards droplet and airborne isolation precautions amongs dental health care

professionals in India. *Med Oral Patol Oral Cir Bucal* 2010 15: e957–e961.

26. Singh BP, Khan SA, Agrawal N et al. Current biomedical waste management practices and cross-infection control procedures of dentists in India. *Int Dent J* 2012 62: 111–116.

27. Cheng HC, Su CY, Yen AM et al. Factors affecting occupational exposure to needlestick and sharps injuries among dentists in Taiwan: A nationwide survey. *Public Library of Science* 2012 7: e34911. Available from <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0034911#pone-0034911-g001>.

28. Kanjirath PP, Coplen AE, Chapman JC et al. Effectiveness of gloves and infection control in dentistry: student and provider perspectives. *J Dent Educ* 2009 73: 571–580.

29. World Health Organization. *Guide to Implementation: A Guide to the Implementation of the WHO Multimodal Hand Hygiene Improvement Strategy. Save Lives Clean Your Hands*. Geneva, Switzerland: WHO Press; 2009.

Table (1): Summary of interventions to enhance dental assistants roles in infection control practices

Study ID	Sample Size	Population Characteristics	Type of intervention	Effectiveness of the intervention	Study conclusion
[11]	120	Dental assistants in urban clinics	Comprehensive infection control education program	RR 1.5 (95% CI: 1.2-1.9), 25% improvement in adherence	Education significantly improves infection control adherence.
[13]	75	Dental assistants in community health centers	Hand hygiene intervention with alcohol-based hand rubs	Increase from 50% to 75% compliance, RR 1.5 (95% CI: 1.3-1.7)	Hand hygiene compliance can be substantially increased with targeted interventions.
[15]	200	Certified dental assistants in private practices	Introduction of protective barriers	10% increase in use of protective barriers (95% CI: 5-15%)	Protective barriers are underutilized but show potential for improvement.
[17]	30	Dental assistants in hospital dental departments	Respiratory hygiene campaign	RR 1.2 (95% CI: 1.1-1.3), modest improvement in practices	Respiratory hygiene practices show modest improvements with targeted campaigns.
[19]	150	Dental assistants in pediatric dental clinics	UV sterilization equipment for dental tools	80% reduction in microbial contamination (95% CI: 70-90%)	UV sterilization significantly reduces microbial contamination.
[21]	90	Dental assistants in orthodontic clinics	Multifaceted intervention (education, technology, hygiene)	25% increase in overall infection control adherence (95% CI: 15-35%)	Multifaceted interventions yield the most significant improvements in infection control practices.
[23]	60	Dental assistants in rural clinics	Workshop on sterilization practices	RR 2.0 (95% CI: 1.5-2.5), significant improvement in sterilization	Focused workshops on sterilization practices significantly enhance procedural compliance.

