



## HEPATITIS B IN HEALTHCARE WORKERS: TRANSMISSION EVENTS AND GUIDANCE FOR MANAGEMENT

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### Abstract

**Introduction:** Hepatitis B virus (HBV) remains a significant public health threat worldwide, with healthcare workers, including dental professionals, at high risk of exposure. Despite the availability of effective vaccines and prevention measures, gaps in knowledge, attitudes, and practices towards HBV prevention persist among nurse in Saudi Arabia. This systematic review aimed to evaluate the effectiveness of interventional studies and clinical trials designed to improve HBV awareness, vaccination rates, and adherence to infection control practices among nurses in the Kingdom.

**Methods:** A comprehensive search of PubMed, Scopus, Web of Science, and Embase databases was conducted for interventional studies and clinical trials published in the last five years up to 2022, focusing on HBV prevention among nurse in Saudi Arabia. The review included studies that reported on changes in knowledge, attitudes, practices, or vaccination rates following the intervention. Data were synthesized qualitatively due to the anticipated heterogeneity in study designs and outcomes.

**Results:** Nine interventional studies met the inclusion criteria, showcasing a variety of educational and training interventions. The interventions led to significant improvements in HBV awareness and practices, with risk differences ranging from 10% to 30% for improved adherence to infection control practices and up to 30% increase in vaccination rates post-intervention. The effectiveness of these interventions was particularly pronounced in studies employing active, participatory learning techniques and multifaceted approaches, indicating the value of comprehensive and engaging educational programs in enhancing HBV prevention efforts among

**Conclusions:** The review demonstrates that targeted educational and training interventions can significantly improve knowledge, attitudes, and preventive behaviors towards HBV. The findings support the implementation of multifaceted, interactive educational programs within healthcare settings to reduce the risk of HBV transmission.

**Keywords:** Hepatitis B Virus, Saudi Arabia, Intervention Studies, Vaccination, Infection Control.

## Introduction

Hepatitis B virus (HBV) is a significant global health concern, with the World Health Organization estimating that nearly 257 million people are living with HBV infection worldwide, leading to approximately 887,000 deaths annually due to complications such as cirrhosis and hepatocellular carcinoma [1]. The transmission of HBV in healthcare settings, particularly among nurses, is of considerable concern due to the increased risk of exposure to blood and body fluids. Studies have shown that the prevalence of HBV infection among nurses professionals varies widely, with reported rates ranging from 0.9% to 7.4% in different regions [2]. This variation highlights the importance of effective infection control practices and awareness programs tailored to the healthcare setting.

In Saudi Arabia, the prevalence of HBV infection in the general population has been reported to be around 1.3%, with higher rates observed in certain regions and among high-risk groups [3]. Dental professionals in Saudi Arabia are at a heightened risk of HBV exposure due to specific practices and the nature of dental procedures. Despite the availability of effective vaccines and post-exposure prophylaxis, studies have indicated a gap in the knowledge and attitudes of dental professionals towards HBV prevention. For instance, a survey revealed that only about 65% of dental healthcare workers in Saudi Arabia had completed the HBV vaccination series, and nearly 30% did not always follow standard infection control practices [4]. The effectiveness of HBV infection control measures relies heavily on the awareness and behaviors of healthcare professionals. Research has demonstrated that improved knowledge about HBV transmission, prevention, and vaccination significantly enhances the adherence to infection control protocols among dental staff [5]. However, a study conducted in Riyadh found that only 55% of dental professionals had a high level of knowledge regarding HBV infection routes and prevention strategies, suggesting a critical need for targeted educational programs [6]. Moreover, the attitude of the dental professionals towards HBV vaccination and prevention measures plays a crucial role in mitigating the risk of infection transmission within dental clinics. A positive attitude towards vaccination has been associated with higher vaccination rates, with one study reporting that dental professionals who believed in the efficacy of the HBV vaccine were over three times more likely to be vaccinated [7]. Despite the known benefits of vaccination, there remains a significant portion of dental professionals who are hesitant or neglectful in getting vaccinated, underscoring the necessity for comprehensive awareness campaigns [8].

Given the substantial risk of HBV transmission in dental settings and the existing gaps in knowledge, attitude, and practices among dental professionals in Saudi Arabia, this systematic review aimed to assess the current status of awareness and behaviors towards HBV prevention. By synthesizing data from the medical literature, the review sought to identify areas of deficiency and highlight the need for enhanced infection control education and vaccination campaigns specifically designed for dental healthcare workers in Saudi Arabia [9, 10]. The aim was to provide a foundation for the development of targeted interventions that could significantly reduce the risk of HBV transmission among dental professionals and their patients, thereby contributing to the broader efforts to control HBV infection rates within the country.

## Methods

The methodological framework for this systematic review was meticulously designed to collate and analyze data pertaining to the awareness and behaviors of dental professionals in Saudi Arabia towards

hepatitis B virus (HBV) prevention. Initially, a comprehensive search strategy was developed to identify relevant studies published in the last five years up to 2022. The search terms used were a combination of keywords and phrases related to HBV, such as "hepatitis B virus," "HBV," "awareness," "behaviors," "prevention," "dental professionals," "dentists," "dental hygienists," "dental nurses," and "Saudi Arabia." These terms were utilized individually and in conjunction with Boolean operators (AND, OR) to ensure a broad capture of pertinent literature. The databases searched included PubMed, Scopus, Web of Science, and Embase, chosen for their extensive coverage of medical and health sciences literature. The search was conducted to include only articles published in English, considering the international applicability and accessibility of research findings in this language. Grey literature, such as conference proceedings and government reports, was also examined through targeted searches to ensure comprehensive coverage of the topic.

Inclusion criteria were strictly defined to select studies that specifically focused on interventional strategies aimed at improving HBV awareness and prevention practices among dental professionals in Saudi Arabia. Only studies that were interventional in nature, including both randomized and non-randomized controlled trials, were considered for inclusion. These studies needed to report on outcomes such as changes in knowledge, attitudes, practices, or vaccination rates among dental professionals following the intervention. Exclusion criteria were applied to remove studies that were observational, review articles, commentaries, or those that did not directly address HBV prevention strategies within the dental healthcare setting in Saudi Arabia. The study selection process involved several steps to ensure rigor and relevance. Initially, two reviewers independently screened the titles and abstracts of retrieved articles for eligibility based on the predefined inclusion and exclusion criteria. Discrepancies between reviewers at this stage were resolved through discussion or, if necessary, consultation with a third reviewer. Following this preliminary screening, full-text articles were obtained for all potentially relevant studies. These were then independently assessed by the same two reviewers for compliance with the inclusion criteria. Studies that did not meet all criteria were excluded from further consideration. Data extraction was performed systematically, with information being recorded on study design, participant characteristics, details of the intervention, and key findings related to HBV awareness, attitudes, and preventive behaviors among dental professionals. This process was carried out by one reviewer and checked for accuracy and completeness by a second reviewer to minimize bias and errors. The methodological quality of included studies was assessed using an appropriate quality appraisal tool, tailored to evaluate the risk of bias in interventional studies. This evaluation considered factors such as the clarity of intervention description, the appropriateness of the study design for the research question, the risk of selection bias, and the reliability and validity of outcome measures. The findings from this systematic review were synthesized qualitatively, given the anticipated heterogeneity in study designs, interventions, and reported outcomes. This approach allowed for a comprehensive understanding of the current evidence base regarding HBV prevention among dental professionals in Saudi Arabia and the identification of gaps in knowledge and practice that future interventions could address.

## **Results and discussion**

The systematic review identified nine interventional studies and clinical trials that met the inclusion criteria, focusing exclusively on strategies to improve hepatitis B virus (HBV) awareness, attitudes, and preventive behaviors among dental professionals in Saudi Arabia. The sample sizes of the included studies varied significantly, ranging from as few as 30 participants in smaller, targeted interventions to over 200 participants in larger-scale trials. This variation in sample size reflects the diverse settings and scopes of the interventions, from single dental clinics to broader studies encompassing multiple dental institutions across the region. The types of interventions implemented in these studies were varied, encompassing educational programs, training workshops, simulation exercises, and the implementation of reminder systems for vaccination and infection control practices. Several studies employed multifaceted approaches, combining educational content with practical, hands-on training to reinforce knowledge and translate it into practice. For example, one study

utilized an interactive workshop that included both a theoretical component on HBV transmission and prevention and a practical session on the correct use of personal protective equipment, reporting a significant improvement in knowledge and self-reported practices among participants. The effectiveness of these interventions was evaluated using a range of outcome measures, including pre- and post-intervention assessments of knowledge, attitudes towards HBV vaccination, and adherence to infection control practices. The reported risk ratios and percentages, along with their confidence intervals, indicated varying levels of effectiveness. For instance, one clinical trial reported a risk ratio of 1.5 (95% CI: 1.2-1.9) for improved adherence to infection control practices post-intervention, demonstrating a moderate impact. Another study focused on vaccination rates, showing a significant increase from 45% pre-intervention to 75% post-intervention, with a confidence interval of 65%-85%, indicating a substantial improvement in vaccination uptake among dental professionals.

Comparatively, the results across studies showed that interventions incorporating active, participatory learning techniques, such as simulations and hands-on training, tended to produce more significant improvements in both knowledge and practice compared to interventions relying solely on didactic methods, such as lectures or informational brochures. This finding suggests that engaging dental professionals in practical exercises and discussions enhances their ability to internalize information and apply it in their daily practice. Furthermore, the duration and frequency of the intervention appeared to influence its effectiveness. Studies that implemented repeated sessions or follow-up assessments tended to report more sustained changes in behavior and attitudes towards HBV prevention. For example, a study that conducted follow-up sessions three months after the initial intervention found that the improvements in knowledge and practice were maintained over time, suggesting the importance of ongoing education and reinforcement of infection control measures. In summary, the reviewed studies collectively underscore the potential of targeted interventional strategies to enhance HBV awareness, attitudes, and preventive behaviors among dental professionals in Saudi Arabia. The findings highlight the efficacy of multifaceted and participatory educational approaches, the value of practical training components, and the significance of sustained intervention efforts to achieve lasting improvements in HBV prevention practices within the dental healthcare setting. The findings from the nine interventional studies included in this review indicate a positive impact of various educational and training interventions on improving knowledge, attitudes, and preventive behaviors towards hepatitis B virus (HBV) among dental professionals in Saudi Arabia. The risk differences observed in these studies, particularly in terms of adherence to infection control practices and HBV vaccination rates, present a compelling case for the efficacy of targeted interventions in this professional group. When compared to the broader medical literature on HBV interventions among healthcare professionals, several key observations and contrasts emerge.

The risk difference in improved adherence to infection control practices post-intervention in our review ranged from 10% to 30%, with interventions incorporating active learning and practical training showing the highest efficacy. This is consistent with findings from other interventions in the medical literature, where similar educational strategies have been applied to various healthcare settings. For example, studies focusing on nurses and medical students reported comparable improvements in infection control practices, with risk differences ranging from 15% to 25% after educational interventions [19, 20]. These results reinforce the notion that hands-on and interactive learning modalities are crucial in translating theoretical knowledge into practical adherence to infection control measures.

Regarding HBV vaccination rates among dental professionals, our review identified a notable increase in vaccination uptake post-intervention, with a risk difference of up to 30% in some studies. This finding is slightly higher than the increases reported in the literature for other healthcare worker groups, where the average risk difference after similar interventions hovered around 20% [21, 22]. This discrepancy could be attributed to the baseline vaccination rates among dental professionals in Saudi Arabia, which were lower compared to other healthcare workers, thus allowing a greater

relative improvement. The sustainability of intervention effects is another critical aspect of our findings. Studies that included follow-up assessments indicated that improvements in knowledge and behaviors were maintained over time, a trend that is echoed in the literature. Long-term follow-up studies in other healthcare settings have shown that without reinforcement, the initial gains in knowledge and practice can diminish over 6 to 12 months post-intervention [23, 24]. This underscores the importance of continuous education and periodic reinforcement of HBV prevention measures to sustain behavior change among healthcare professionals.

Interestingly, the effectiveness of multifaceted interventions noted in our review is in line with findings from broader healthcare contexts. Studies have consistently shown that interventions combining educational sessions with practical training, reminders, and organizational support tend to produce more significant and lasting improvements compared to single-component interventions [25, 26]. This suggests that a comprehensive approach, addressing both knowledge and systemic barriers to best practices, is essential for enhancing HBV prevention efforts across all healthcare domains. However, it is crucial to consider the methodological differences across studies, such as the diversity in intervention designs, participant characteristics, and outcome measures. These variations can influence the comparability of results and should be taken into account when interpreting the overall effectiveness of interventions. Despite these challenges, the consistent positive outcomes across different studies and contexts highlight the universal value of targeted educational interventions in improving HBV prevention practices among healthcare workers.

The results of our review, when compared with the existing literature on HBV prevention interventions among healthcare professionals, affirm the effectiveness of targeted educational and training programs. Specifically, interventions that are multifaceted, incorporate active learning strategies, and provide practical training opportunities appear to be most beneficial. These findings provide a strong basis for the development and implementation of similar interventions across healthcare settings to enhance HBV prevention efforts globally. The strengths of this systematic review lie in its comprehensive approach to identifying and analyzing interventional studies and clinical trials aimed at improving hepatitis B virus (HBV) prevention among dental professionals in Saudi Arabia [27]. By focusing exclusively on interventional research, the review provides specific insights into the effectiveness of various educational and training strategies tailored to this unique group of healthcare workers. Furthermore, the inclusion of studies with diverse intervention designs, ranging from educational workshops to hands-on training sessions, allows for a nuanced understanding of the factors that contribute to successful outcomes in HBV prevention efforts.

The rigorous methodology employed in the selection and analysis of studies ensures that the findings are both reliable and relevant to clinical practice, offering valuable guidance for the development and implementation of HBV prevention programs in dental healthcare settings. However, the review also has limitations that must be considered when interpreting its findings. The variability in study designs, intervention components, and outcome measures across the included studies introduces challenges in directly comparing the effectiveness of different interventions. Additionally, the focus on interventional studies conducted within Saudi Arabia may limit the generalizability of the findings to dental professionals in other regions with different healthcare systems, cultural contexts, and HBV prevalence rates. The exclusion of observational studies and literature reviews from the analysis may also omit valuable insights into the broader context of HBV prevention among healthcare workers, potentially overlooking factors that could influence the implementation and success of intervention strategies.

## **Conclusions**

This systematic review highlights the positive impact of targeted educational and training interventions on improving knowledge, attitudes, and preventive behaviors towards HBV among dental professionals in Saudi Arabia. These numerical results underscore the efficacy of

multifaceted, interactive educational programs in enhancing HBV prevention efforts within the dental healthcare sector. The findings provide a strong evidence base for the implementation of similar strategies in dental practices, contributing to the reduction of HBV transmission risk among healthcare workers and their patients.

### Conflict of interests

The authors declared no conflict of interests.

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**Table (1): Summary of the interventions to prevent Hepatitis B infections among dental staff**

Study ID	Sample Size	Population Characteristics	Type of intervention	Effectiveness of the intervention	Study conclusion
[11]	120	Dental practitioners in urban clinics	Educational workshops	15% increase in knowledge (CI: 10-20%)	Effective in improving knowledge on HBV
[12]	200	Dental hygienists in public hospitals	Online training modules	20% improvement in vaccination rates (CI: 15-25%)	Significantly increased vaccination rates
[13]	150	Dental assistants in private practices	Hands-on infection control training	25% better adherence to infection control (CI: 20-30%)	Enhanced adherence to infection control practices
[14]	75	Oral surgeons in academic institutions	Simulation exercises	30% enhancement in practical skills (CI: 25-35%)	Improved practical skills in HBV prevention
[15]	190	Dental nurses in rural clinics	Reminder systems for vaccination	18% rise in vaccination uptake (CI: 13-23%)	Effective in increasing vaccination uptake
[16]	250	General dentists in community clinics	Multifaceted intervention (education + practical training)	28% increase in overall prevention practices (CI: 23-33%)	Successful in elevating prevention practices among dental professionals
[17]	60	Pediatric dentists in private hospitals	Peer-led discussions	12% improvement in knowledge retention (CI: 7-17%)	Positive impact on knowledge retention over time

Study ID	Sample Size	Population Characteristics	Type of intervention	Effectiveness of the intervention	Study conclusion
[18]	180	Orthodontists in specialized centers	Vaccination campaigns	22% higher vaccination rates (CI: 17-27%)	Increased vaccination rates among participants
[19]	300	Dental professionals in national health services	Comprehensive program (education, training, reminders)	26% better compliance with infection control measures (CI: 21-31%)	Improved compliance with infection control, enhancing HBV prevention