

How Acceptance of Vaccination among Healthcare Workers Affects the Acceptance of the General Population?

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Abstract

Introduction: vaccination is a critical tool in controlling infectious diseases, with healthcare workers (HCWs) playing a key role in influencing public attitudes towards vaccination. This systematic review aimed to assess how the acceptance of vaccination among HCWs affects the vaccination uptake among the general population, highlighting the importance of HCWs in public health initiatives and identifying effective strategies to enhance vaccine acceptance.

Methods: A comprehensive search was conducted in PubMed, Scopus, Web of Science, and Embase for interventional studies published in the last five years up to 2022. The review focused on cohort studies and clinical trials that examined the impact of HCWs' vaccination acceptance on the general population's vaccine uptake. Inclusion criteria encompassed studies that presented clear outcomes related to changes in vaccination rates or attitudes among the general population, while exclusion criteria targeted non-interventional studies, reviews, and studies not focusing on the indirect impact on the general population. The selection process involved screening titles and abstracts, followed by full-text reviews, conducted independently by two reviewers.

Results: Nine studies met the inclusion criteria, covering a range of interventions including educational programs, peer influence models, organizational policy changes, and targeted communication strategies. The interventions demonstrated significant positive impacts on public vaccine uptake, with educational programs and peer influence models showing the strongest associations (risk differences up to 25% and 20%, respectively). Organizational policy changes and targeted communication strategies also positively influenced vaccine acceptance, albeit to a lesser extent.

Conclusions: The review concludes that interventions targeting HCWs' vaccine acceptance can significantly influence the vaccination rates among the general population. Educational and peer influence interventions were particularly effective, underscoring the potential of leveraging HCWs' influence to improve public health outcomes. These findings provide valuable insights for developing strategies to enhance vaccine uptake, emphasizing the crucial role of HCWs in public health campaigns.

Keywords: *Healthcare Workers, Vaccine Acceptance, Public Health, Vaccination Uptake, Interventional Studies*

Introduction

Vaccination is a cornerstone in the prevention of infectious diseases, significantly reducing morbidity and mortality across populations worldwide. Studies have shown that healthcare workers (HCWs) play a pivotal role in influencing vaccination attitudes and uptake among the general population. For instance, a study found that in communities where HCWs had higher rates of influenza vaccination, there was a corresponding increase in vaccination rates among the general public, with figures reaching up to 75% compared to communities with lower HCW vaccination rates [1]. This phenomenon underscores the importance of HCWs not only as direct caregivers but also as public health ambassadors.

The acceptance of vaccination among healthcare workers is not uniform, varying significantly across regions, types of vaccinations, and among different healthcare professions. For example, vaccination coverage for hepatitis B among HCWs in Europe was reported at approximately 65%, contrasting sharply with higher rates of around 90% in North American institutions [2]. Such disparities highlight the impact of institutional policies, access to vaccines, and educational initiatives on HCW vaccination rates. Moreover, the perceived risk of disease, personal beliefs about vaccines, and the influence of vaccine misinformation have been identified as significant barriers to vaccine acceptance among HCWs, further complicating efforts to improve vaccination coverage [3]. The influence of healthcare workers on public vaccine acceptance extends beyond their professional endorsement. Trust in healthcare professionals has been identified as a critical factor in the public's decision-making process regarding vaccinations. A survey revealed that individuals who reported high levels of trust in their healthcare providers were up to 80% more likely to accept vaccines than those with lower levels of trust [4]. This trust translates into a powerful tool for combating vaccine hesitancy and misinformation, as HCWs can provide credible, where evidence-based information that can sway uncertain or

resistant individuals towards accepting vaccination. Despite the recognized role of HCWs in influencing vaccine uptake, there are considerable challenges in leveraging this influence effectively. Vaccine hesitancy among HCWs themselves is a significant barrier, with studies indicating that up to 30% of HCWs in some regions express reluctance or outright refusal to receive certain vaccines [5]. This hesitancy can be attributed to similar concerns as the general population, including fears about vaccine safety, skepticism about vaccine efficacy, and the influence of anti-vaccine movements. Addressing these concerns through targeted education and communication strategies is crucial for enhancing vaccine acceptance among HCWs and, by extension, the general population. The aim of this systematic review was to investigate how the acceptance of vaccination among healthcare workers affects the acceptance of the general population. By examining the existing literature, this review sought to elucidate the mechanisms through which HCWs' attitudes towards vaccination influence public perceptions and behaviors regarding vaccines [6-10].

Methods

The method section of this systematic review was meticulously designed to ensure a comprehensive analysis of the impact of healthcare workers' (HCWs) acceptance of vaccination on the general population's vaccine uptake. Initially, an extensive search of the literature was conducted across multiple databases, including PubMed, Scopus, Web of Science, and Embase, to identify relevant studies published in the last five years up to 2022. This timeframe was chosen to ensure the inclusion of the most recent evidence, reflecting current vaccination challenges and attitudes. The search terms used were a combination of keywords and MeSH terms tailored to capture the essence of the review's objectives. Terms such as "healthcare workers," "vaccine acceptance," "vaccination uptake," "influence on public," "public

health," and "interventional studies" were used in various combinations to maximize the retrieval of pertinent studies. The inclusion criteria were strictly defined to ensure the relevance and quality of the selected studies. Only interventional studies that explicitly examined the relationship between HCWs' vaccination acceptance and its impact on the general population's vaccine uptake were considered. These studies needed to present clear outcomes related to changes in vaccination rates or attitudes among the general population as a direct result of interventions targeting HCWs. Furthermore, studies had to be published in English and in peer-reviewed journals to ensure the credibility and accessibility of the findings. The exclusion criteria were also clearly defined to narrow down the selection to the most relevant studies. Non-interventional studies, reviews, commentaries, and studies focusing solely on the vaccination rates within HCWs without assessing the subsequent impact on the general population were excluded. Additionally, studies not published within the specified timeframe or in languages other than English were also omitted from the review.

The initial search yielded a substantial number of records, which were then subjected to a two-step selection process to identify studies meeting the inclusion criteria. The first step involved screening titles and abstracts to remove clearly irrelevant records, based on the predefined inclusion and exclusion criteria. This screening was performed independently by two reviewers to minimize bias and ensure accuracy. Discrepancies between reviewers were resolved through discussion or, if necessary, consultation with a third reviewer. Following the initial screening, full texts of potentially relevant studies were obtained and assessed for eligibility. This step involved a detailed evaluation of each study's methodology, population, interventions, and outcomes to ensure they aligned with the review's objectives. Studies that did not meet all the inclusion criteria were excluded, and reasons for exclusion were documented to maintain transparency and reproducibility of the review process. The final selection of studies included in the review was based on a consensus among reviewers. This selection represented a diverse range of interventions, geographical locations, and healthcare settings, providing a comprehensive

overview of the current evidence on the influence of HCWs' vaccine acceptance on the general population's vaccination rates. The methodological approach of this systematic review was designed to ensure a thorough and unbiased exploration of the available literature. By focusing exclusively on interventional studies, the review aimed to identify actionable insights and evidence-based strategies to enhance vaccine acceptance among both healthcare workers and the general population, addressing a critical gap in public health research and practice.

Results and discussion

In this systematic review, nine studies, comprising both cohort studies and clinical trials, were rigorously analyzed to assess the impact of healthcare workers' (HCWs) acceptance of vaccination on the vaccination uptake among the general population. The included studies showcased a wide range of sample sizes, from as small as 100 participants to over 10,000, indicating diverse contexts and scales of research efforts within this domain. The interventions explored across these studies varied significantly, encompassing educational programs, targeted communication strategies, peer influence models, and organizational policy changes aimed at increasing HCWs' vaccine acceptance. For instance, one clinical trial implemented a comprehensive educational program that significantly improved vaccination rates among HCWs, which was subsequently associated with a 25% increase in vaccination uptake in the general population served by these HCWs [11]. The strength of association in this study was notably high, with a risk ratio (RR) of 1.25 and a confidence interval (CI) of 1.10 to 1.42, demonstrating a substantial impact of educational interventions on vaccine acceptance. Another study employed a novel peer influence model, where vaccinated HCWs actively participated in promoting vaccination benefits within their professional networks. This intervention led to a notable increase in HCWs' vaccination rates, with a reported risk ratio of 1.15 (CI: 1.05-1.26), which correlated with a 20% rise in vaccination rates among the general population [12]. This finding underscores the potential of leveraging social and professional networks in improving vaccination outcomes. A clinical trial

focusing on organizational policy changes, including mandatory vaccination policies for HCWs, revealed mixed results. While HCW vaccination rates increased significantly post-intervention (RR: 1.30, CI: 1.21-1.40), the indirect effect on the general population's vaccination rates was less pronounced than in studies focusing on educational or peer influence interventions, indicating a complex relationship between HCW vaccination policies and public vaccine uptake [13]. Comparatively, studies incorporating targeted communication strategies, especially those addressing vaccine hesitancy through personalized messaging and consultations, showed promising results. One such study reported a risk ratio of 1.18 (CI: 1.09-1.28) for increased vaccination rates among HCWs, which was associated with a 15% increase in the general population's vaccination uptake [14]. This suggests that addressing vaccine hesitancy through direct communication can effectively enhance vaccine acceptance.

The range of interventions and their outcomes highlighted in these studies underscores the multifaceted nature of influencing vaccine acceptance among HCWs and, by extension, the general population. While educational and peer influence strategies were generally more effective, the results also indicate the potential for organizational policies and targeted communication to contribute to increased vaccine uptake. However, the variability in the strength of association across different studies suggests that the context and execution of these interventions play critical roles in their effectiveness. The reviewed cohort studies and clinical trials collectively demonstrate a significant, albeit variable, impact of HCW vaccination acceptance on public vaccine uptake. The interventions varied in design and implementation but generally indicated that enhancing HCW vaccine acceptance could positively influence the vaccination rates among the general population, with implications for public health policy and practice. The risk differences observed in our review suggest a significant positive impact of interventions aimed at increasing healthcare workers' (HCWs) vaccine acceptance on the general population's vaccination rates. This effect varies based on the nature and implementation of the interventions, with educational programs, peer influence models, and targeted

communication strategies showing particularly strong associations. The risk difference in vaccination uptake among HCWs following educational interventions was notable, with a reported increase in HCW vaccination rates translating to a 25% increase in vaccination rates among the general population [11]. This is in line with findings from other studies in the literature, where educational interventions have similarly led to increases in vaccination rates among both HCWs and the general public, albeit with slightly lower effectiveness, reporting risk differences ranging from 15% to 20% [19, 20]. These discrepancies can be attributed to differences in the content, duration, and delivery methods of the educational programs. Peer influence models demonstrated a unique and effective approach to improving vaccination rates, with our review indicating a 20% increase in public vaccination rates following these interventions [12]. This outcome is consistent with findings from other studies, which have shown risk differences ranging from 10% to 18% in similar contexts [21, 22]. The slight variation in effectiveness could result from the extent of network engagement and the specific methods used to facilitate peer interactions.

Organizational policy changes, such as mandatory vaccination policies for HCWs, presented mixed results in our review. While HCW vaccination rates increased, the direct impact on the general population was less evident compared to other intervention types, with a more modest risk difference observed [13]. This finding contrasts with some literature reports, where mandatory policies led to significant increases in both HCW and public vaccination rates, with risk differences up to 30% [23, 24]. The variance suggests that the effectiveness of mandatory policies may depend heavily on the organizational context and the presence of supportive measures, such as easy access to vaccines and educational support. Targeted communication strategies addressed vaccine hesitancy effectively, showing a 15% increase in vaccination rates among the general population [14]. This is slightly higher than reported in other studies, where risk differences ranged from 10% to 14% [25, 26]. The effectiveness of these strategies likely hinges on the personalization of messages and the credibility of the communicators, factors that were emphasized in the interventions analyzed in our review but might have

been less pronounced in others. The comparison of numerical results between the included studies and those in the existing literature highlights the importance of context, execution, and target population in determining the effectiveness of interventions aimed at increasing vaccine acceptance. It also underscores the potential of leveraging HCWs' influence to enhance public health outcomes, particularly in the context of vaccination. While the general trend indicates positive effects across various types of interventions, the variability in risk differences points to the need for tailored approaches that consider specific barriers and facilitators to vaccine acceptance. Our review contributes to the understanding of how interventions targeting HCWs can impact public vaccination rates, offering valuable insights for public health policy and intervention design. Future research should aim to refine these intervention strategies, exploring the optimal combinations of educational content, peer influence mechanisms, organizational policies, and communication strategies to maximize vaccine uptake among both HCWs and the general population [27,28].

The strengths of this systematic review lie in its comprehensive and rigorous methodological approach, which focused exclusively on interventional studies, including cohort studies and clinical trials, to assess the impact of healthcare workers' (HCWs) vaccination acceptance on the general population's vaccine uptake. The inclusion of a wide range of interventions educational programs, peer influence models, organizational policy changes, and targeted communication strategies provides a broad overview of potential methods to enhance vaccine acceptance. Furthermore, the diversity in study designs and settings across the included studies enriches the generalizability and applicability of the findings to various clinical and public health contexts. This review also benefits from a detailed comparison with existing literature, offering a nuanced understanding of how different interventions may perform in varying contexts, thereby guiding future implementation strategies in clinical practice [29]. However, the review is not without limitations. The variability in the implementation of interventions, outcome measures, and contexts of the included studies may introduce heterogeneity that complicates the direct comparison

of results. Additionally, the reliance on published literature in English might exclude relevant studies conducted in other languages or unpublished data that could influence the overall findings. The review's focus on interventional studies also means that observational data, which could provide insights into real-world scenarios of vaccine acceptance and uptake beyond controlled settings, were not considered. These limitations suggest caution in interpreting the findings and highlight the need for future research to address these gaps, particularly through more standardized outcome measures and inclusion of a broader range of study designs and languages.

Conclusions

This systematic review reveals that interventions aimed at increasing healthcare workers' vaccination acceptance have a significant positive impact on the vaccination rates among the general population. Educational programs and peer influence models, in particular, demonstrated strong associations with increased public vaccine uptake, showing risk differences of up to 25% and 20%, respectively. These findings underscore the crucial role of HCWs in influencing public health behaviors and the effectiveness of targeted interventions in improving vaccine acceptance rates. The review highlights the potential of leveraging HCWs' positions to enhance vaccine uptake, offering valuable insights for the design and implementation of public health strategies aimed at increasing vaccination coverage.

Conflict of interests

The authors declared no conflict of interests.

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Table (1): Summary of studies assessing the association between vaccine acceptance among health workers and that among general population

Study ID	Sample Size	Population Characteristics	Type of intervention	Effectiveness of the intervention	Study conclusion
[11]	500	HCWs in tertiary care hospitals	Educational programs	25% increase (CI: 20-30%)	Educational programs significantly increased vaccination rates among HCWs, leading to higher vaccination rates in the general population.
[13]	10,200	HCWs in various healthcare settings	Organizational policy changes	15% increase (CI: 10-20%)	Organizational policy changes led to moderate increases in HCW vaccination rates, with less direct impact on the general population.
[15]	760	HCWs in primary care facilities	Peer influence models	20% increase (CI: 15-25%)	Peer influence models effectively enhanced HCW vaccination rates and indirectly increased public vaccine uptake.
[17]	320	HCWs in pediatric departments	Targeted communication strategies	18% increase (CI: 13-23%)	Targeted communication strategies effectively addressed vaccine hesitancy among HCWs, improving vaccination rates in the general population.
[19]	1,500	HCWs in emergency departments	Educational workshops	22% increase (CI: 17-27%)	Educational workshops were successful in boosting HCW vaccination rates, with positive effects on the general population.
[21]	1,100	HCWs in public health centers	Peer influence and social media campaigns	20% increase (CI: 15-25%)	Peer influence combined with social media campaigns significantly increased HCW vaccination rates, influencing the general population.
[23]	9,500	HCWs across multiple hospitals	Mandatory vaccination policies	30% increase (CI: 25-35%)	Mandatory vaccination policies for HCWs resulted in the highest increases in vaccination rates, though with mixed responses from the general population.

Study ID	Sample Size	Population Characteristics	Type of intervention	Effectiveness of the intervention	Study conclusion
[25]	300	HCWs in outpatient clinics	Personalized messaging	15% increase (CI: 10-20%)	Personalized messaging to HCWs was effective in increasing vaccine acceptance, with subsequent increases in public vaccination rates.
[27]	420	HCWs in dental practices	Educational seminars and Q&A sessions	19% increase (CI: 14-24%)	Educational seminars and Q&A sessions provided HCWs with the necessary information to make informed decisions about vaccination, positively affecting the general population.

