

Awareness of the health care worker's vaccination 2024: A Systemic Review

Ahmed Muteb Muriaa Al-Obaidi¹, Muteb Ali Ibrahim Koriri², Hussain Ahmed Mohammed Kariri³, Hakem Motlak Alenzy⁴, Sami Mohammed Saed Alghamdi⁵, Maram Abdulrahim Misfer Alghamdi⁶, Suliman Mohammed Saed Alghamdi⁷, Fares Saed Salah Alzahrani⁸, Zakiali Mohammad Alamer⁹, Azizah Ahmad Banafi¹⁰, Khaled Saeed Mohammed Al-Thalabi¹¹

¹Epidemiology Monitoring Technician, Health surveillance Center at Prince Mohammed bin Abdulaziz, Saudi Arabia.

²Nurse technician, AhadAlmasareha General Hospital, Saudi Arabia.

³Nurse technician, Samtah General Hospital, Saudi Arabia.

⁴Public Health in Ministry of Health in Medina, Saudi Arabia.

⁵Nursing Technician, Erada complex for mental health- AlBaha, Saudi Arabia.

⁶Specialist Nurse, Erada complex for mental health-AlBaha, Saudi Arabia.

⁷Assistant nurse, Erada complex for mental health Albaha, Saudi Arabia.

⁸Nursing Technician, Security forces specialized comprehensive Clinics Albaha, Saudi Arabia.

⁹Nurse, hazem-mubarraz Health center, Saudi Arabia.

¹⁰Public Health Specialist, Health promotion department, Saudi Arabia.

¹¹public health, King Abdulaziz Airport in Jeddah, Saudi Arabia.

Received: 15.09.2024

Revised: 17.10.2024

Accepted: 24.11.2024

ABSTRACT

Background

Healthcare workers (HCW) awareness toward vaccines influences patient and community vaccine decision making. In an era of rising vaccine hesitancy and understanding HCW vaccine awareness is critical. The of health care worker's Vaccination Experts recommended that efforts be made to improve healthcare workers' awareness, knowledge and beliefs about vaccines, and their attitudes towards them, to increase vaccination coverage. While most health care workers vaccinate according to the recommended schedule, this success is challenged by individuals and groups who delay or refuse vaccines. Despite evidence demonstrating the benefits of vaccination for health care workers, individuals, populations and health systems and society in general, vaccine hesitancy still remains a key factor influencing vaccine uptake, sometimes leading to outbreaks of vaccine-preventable diseases.

Aim of the study: This systematic review aims to review awareness among HCW vaccine 2024

Methods: We searched multiple databases for peer-reviewed studies published in English that awareness vaccine acceptance and/or uptake in health care workers and conducted a systematic search in four electronic databases for studies published between February 2020 and June 2024. We included studies conducted in developed countries that used statistical methods to relate or associate the variables included in our research question. Two independent reviewers verified that the studies met the inclusion criteria, assessed the quality of the studies and extracted their relevant characteristics. The data were descriptively analyzed.

Results: he searches produced studies after removing duplicates; high numbers of studies were excluded because the interventions were not applied to health care workers. The search ended with 7 studies that met our pre-specified criteria and were included in the review. In total, 802 records of papers were identified from the search of the literature. Based on a title review, 494 records were excluded.

Conclusion: Tailored interventions are needed to bolster awareness in the vaccination, maximize vaccine uptake, and increase vaccine access to close the gaps between acceptance and uptake especially among key health care worker's residing in regions with low rates of acceptance and uptake. We that there is a low vaccine uptake rate among our study health care worker's, considering that the barriers most commonly chosen by participants are solvable with health education and campaigns oriented towards delivering facts about the vaccine and dispelling misinformation .

Keywords: Awareness , health care worker's, vaccination.

INTRODUCTION

Vaccination imposes a significant burden worldwide from the healthcare and socio-economic standpoints. Vaccine hesitancy has increased globally, including among HCWs. Vaccine hesitancy is a complex phenomenon. (1) It has been defined as a behavior in delaying or refusing a particular vaccine or vaccination generally despite availability, or as a state of indecisiveness regarding vaccination. (2) Vaccine hesitancy has been observed throughout the world in the past decade (3)

The validation of survey tools is an essential component in measuring vaccine confidence among HCWs. (4) Validation promotes reliable, accurate, and effective tools for measuring the complex constructs of vaccine behaviors among this important population. (2)

This is also due to suboptimal vaccination coverage among the target health care worker's, even though immunization is recommended since many years and still remains the fundamental tool for its prevention. Healthcare workers (HCWs) are at increased risk of exposure to pathogens compared with the general population, with potential threat for their health and for patients' safety. (5) Nevertheless, despite recommendation for immunization of this work-category in most of Western Countries, inadequate vaccine uptake is reported during the last decade in the Arab and European area. (6) According to recent systematic reviews on this topic, the main determinants of vaccine acceptance among HCWs have been largely investigated and include desire for self-protection and to protect family rather than absolute disease risk or desire to protect patients, among the main drivers. On the other hand, concerns regarding safety of the vaccines resulted in decreased vaccine uptake. (7) Despite the significant impact of the media, health professionals have been identified as the most important source of information on vaccination for the general public. Health professionals are key players in recommending vaccination and encouraging the final decision to be vaccinated (8). Therefore, the awareness of the health care worker's vaccinated to recommend immunization is crucial. (9) That strategies to optimize and awareness vaccination coverage in children and adults should be identified and targeted towards healthcare workers (HCWs). (10) WHO emphasized the importance of HCWs' perceptions about vaccines, their attitudes towards them and the need to awareness their knowledge of vaccines and increase access to high-quality information about vaccination. (11) Successful control of the outbreak requires optimal acceptance and uptake of the vaccination, particularly among those designated as high-risk groups (12)

Moreover, vaccine hesitancy among HCWs was also associated with several issues such as low risk perception, denial of the social benefit of vaccination, low social pressure, negative attitude toward vaccines, not having been previously vaccinated against. (13) Lack of adequate - specific knowledge, lack of access to vaccination facilities, and socio-demographic variables. (14) The topic of vaccination among HCWs is challenging, full of ethical issues. Systematic reviews of randomized controlled trials (RCTs) investigating the effectiveness of interventions for improving vaccine uptake among HCWs found that combined strategies were more effective than isolate approaches. (15)

METHODOLOGY

Aim of the study

This systematic review aims to review awareness among HCW vaccine 2024.

Study design

This is a systematic review. The review is based on current best practices utilizing the Joanna Briggs Institute (JBI) systematic review framework. The population, concept, context (PCC) framework was used to guide the development of our research question. The population being HCWs; vaccine awareness. This framework as well as the literature review culminated in the research questions, review protocol exists, and the systematic review has not been registered.

Search strategy

We searched multiple databases for peer-reviewed studies published in English that awareness vaccine acceptance and/or uptake in health care workers and conducted a systematic search in four electronic databases for studies published between February 2019 and June 2024. We included studies conducted in developed countries that used statistical methods to relate or associate the variables included in our research question. Two independent reviewers verified that the studies met the inclusion criteria, assessed the quality of the studies and extracted their relevant characteristics. The data were descriptively analyzed

Data sources

After running the searches in all databases, For the full search strategy, any articles that assessed vaccine awareness among HCW were included, then the research team narrowed to tool development and validation during the screening process. Data were independently entered; also in PubMed Updated searches of the electronic databases were performed.

Selection criteria

A- Inclusion criteria

We included articles that focused on awareness of the health care worker's vaccination. Specifically, we included peer-reviewed articles describing the tool development and validation process. The term HCWs referred to any group working with healthcare. The articles were included if the entire target population for the validation process was focused on healthcare workers or healthcare professionals. We included healthcare HCWs. We excluded systematic review or an intervention study.

Exclusion criteria

Articles were excluded if they were not about awareness of the health care worker's vaccination, were not about HCPs, were solely about vaccination coverage, efficacy, or vaccine delivery, or were non-peer reviewed research papers. All countries were included. All foreign language articles were included if the abstract was available in English. The year of publication was not an exclusion criterion.

RESULT

The searches produced studies after removing duplicates; high numbers of studies were excluded because the interventions were not applied to health care workers. The search ended with 10 studies that met our pre-specified criteria and were included in the review. In total, 802 records of papers were identified from the search of the literature. Based on a title review, 494 records were excluded. A further 302 records were duplicates and also excluded. 150 were excluded based on abstract review. Full texts were obtained for the remaining 45 records, of which 10 papers met the inclusion criteria and were included in the review. The systematic review included a total of 10 interventional studies and clinical trials, each contributing valuable insights into the effectiveness of various strategies to awareness of the health care worker's vaccination requesting patterns. The sample size of the included studies varied widely, ranging from small-scale trials with as few as larger studies involving over awareness of the health care worker's vaccination.

Table 1: Article described information: Authors, year of publication, study setting location, dimensions studied, study aim, tool assessed, result, Conclusions .

Author, Date, Country	Practice Setting	Dimensions Studied	Results
Kanan et al 2024, (16)	Saudi Arabia We has be conduct a thorough search across various databases, encompassing a wide range of vaccines, and pay special attention to vaccination campaigns and refusals	The study has been use the Crowe Critical Appraisal Tool for quality assessment and perform a narrative synthesis to summarize findings thematically.	Expected to reveal the prevalence and trends of vaccine hesitancy among different populations. It may show whether vaccine hesitancy rates have been increasing or decreasing over time and how this compares to global trends. Factors Contributing to Vaccine Hesitancy Identification of specific factors contributing to vaccine hesitancy in the Saudi Arabian context. Insights into cultural, religious, and social influences on vaccine hesitancy within Saudi Arabia. Discover potential comparisons between vaccine hesitancy factors and strategies in Saudi Arabia and those in other countries, particularly within the Middle East region, and understand whether Saudi Arabia faces unique challenges or shares common issues with other nations. Conclusions The findings are has been to have direct policy implications and guide interventions to strengthen vaccination programs and improve public health outcomes. Saudi Arabia's vaccine hesitancy, examining prevalence, trends, and contributing factors across diverse populations. It evaluates the effectiveness of implemented strategies and draws regional and global comparisons, shedding light on unique challenges or shared issues within the Middle East. The findings hold implications for Saudi public health policy, suggesting tailored vaccination strategies to combat hesitancy. Additionally, by identifying research gaps, the

			review provides direction for future studies, pinpointing areas where further investigation is crucial for a comprehensive understanding of vaccine hesitancy in Saudi Arabia.
Akinsola, et al (2024). (17)	review of measures of healthcare workers' vaccine confidence, Human Vaccines & Immunotherapeutic	This systematic review aims to review instruments that have been validated to measure HCW vaccine confidence. We conducted a search in five databases in June 2023. Data was descriptively synthesized.	<p>Overall, 9970 articles were returned from the search, and 12 were finally included. The most common reason for article exclusion at full text review were: not focusing on tool development/validation, being a duplicate(1), being an abstract only(1), focusing on infection control rather than vaccination(1), aim not including HCWs(1), being a protocol (1). One additional article was added that was published after the last search but fit all inclusion criteria, also summarizes the aims, tools assessed, vaccines, dimensions of confidence measured by the tools, and results of the ten included articles. The majority of the articles (10/12) were published since 2013, and all except one study were conducted in high-income countries. One study was in Malaysia, an upper middle-income country.</p> <p>Conclusions: We conclude that the Pro-VC-Be tool as the most useful for future research and can be used as a standard for criterion validation because the Pro-VC-Be underwent a robust validation process. Additionally, our systematic review emphasizes the critical need for more culturally adapted and standardized tools for assessing vaccine hesitancy among HCWs. Addressing discrepancies in the existing research settings can significantly contribute to the understanding of HCWs vaccine hesitancy and inform targeted interventions and policies in settings.</p>

<p>Garrison,et al 2022 (18)</p>	<p>Germany, Finland, France and Portugal general info, self-assessment on expertise, attitude towards flu vaccination and motivation, confidence, compliance, and risk perception.</p>	<p>Compared the change-in-slope of the monthly laboratory ordering rate between intervention and control physicians for 12 months pre-intervention and 6 months post-intervention.</p>	<p>Some vaccines can cause autoimmune diseases' from the 'perceived risks of vaccines' dimension; this item was therefore selected to represent this dimension in the short-form version. In the same manner, the dimensions of complacency, collective responsibility, trust in authorities, openness to patients, commitment to vaccination and reluctant trust were much more frequently (48.31–69.20%) represented by one particular item in the good-to-excellent fit CFA models, so this item was retained for the short-form tool, also HCVI was statistically verified as a predictive parameter. 17% considered themselves to be poorly competent in understanding vaccines. Statistically significant differences between departments and professional profiles. 80% of population not vaccinated against flu. Conclusions:Measuring the impact of this score on the behaviors and attitudes of HCPs related to vaccination is of great public health concern: HCPs role in vaccination remains essential as a trusted source of information and advice for their patients and as role models. Improving resources available to HCPs can thus improve resources available to the general public and promote vaccination of the public against vaccine-preventable diseases. Intervention research to improve HCP vaccine confidence and psychosocial resources to promote vaccination remains a priority.</p>
<p>Saleh, et al, 2023,(19)</p>	<p>Saudi Arabia, Cross sectional study, was conducted among Saudi Arabia health care workers in primary health care centers</p>	<p>A study participant has been recruited on Makkah including PHC centers under supervision of Directorate of Health Affairs. The study has been carried out in the city of Makkah . The study has been conducted among health care workers in the PHC centers</p>	<p>The results showed that regarding you believe that the COVID-19 vaccine is safe the majority of Participant answer Yes were (82.2%), but regarding you think that COVID-19 vaccination has adverse reactions the majority of Participant answer Yes were (88.9%) while No were (37.8%), while regarding Do you encourage your family/friends/relatives to get the COVID 19 vaccine the majority of Participant answer Yes were (88.9%), also you believe the COVID-19 vaccine and booster dose can reduce the spread of COVID-19 the majority of Participant answer Yes were (91.1%). While regarding you received COVID- 19 vaccines and booster dose because it is mandatory the majority of Participant answer Yes were (84.4%) answers while No were(15.6%), but regarding you believe that only high-risk individuals such as health care workers and elderly persons with other diseases only need COVID- 19 vaccines the majority of Participant answer No were (60.0%) Conclusion : This study provides valuable information regarding COVID-19 vaccine hesitancy and the potential variables influencing it. The relatively high vaccine acceptability among HCWs could result from earlier COVID-19 vaccination experience, regarding safety, and the high risk of contracting COVID-19 from healthcare facilities. Concerns about vaccine</p>

			<p>safety, vaccine efficacy, and lack of trust were possible underlying causes of vaccine hesitancy. HCWs are positively influenced by close friends and co-workers who value COVID-19 vaccination, which may encourage the development of cross departmental interactions to increase vaccination rates. The presented observations and conclusions may serve as tools for building future policies and public health actions designed to increase the COVID-19 vaccination rate.</p>
Kadir et al (2021)(20)	<p>Malaysia, Health care workers play an important role in supporting childhood vaccination as they are the most trusted source of vaccine-related information for parents.</p>		<p>The aims to develop and validate knowledge and attitude regarding childhood vaccination (KACV) The I-CVI relevancy for KACV ranges from 0.50 to 1. The S-CVI/Ave for both the knowledge and attitude domain is 0.92. In the knowledge section (33 items), 29 items had I-CVI \geq 0.83, and in the attitude section (17 items), 15 items had I-CVI \geq 0.83. A total of 10 items were removed, and one item was added. Four items were removed because the panel thought they were not suitable to be asked. After all, Malaysia is implementing a new vaccination schedule. The final KACV questionnaire consists of 28 items for knowledge and 15 items for the attitude domain.</p> <p>Conclusion: assessing knowledge and attitudes about childhood vaccination among healthcare workers is important to achieve immunization coverage and reduce vaccine-preventable diseases in our population. Understanding factors affecting knowledge and attitude on childhood vaccination among these groups of HCW may help develop targeted interventions since they are one of the main sources of information for the public. This tool has potential applications in both the research setting and in clinical practice. Thus, further study can assess knowledge or misconception and attitude of childhood vaccination among healthcare workers in Malaysia.</p>

Mengke et al (2022)(21)	China,in Beijing The prevention and control of influenza, it is important for healthcare workers (HCWs) to be vaccinated and recommend influenza vaccines to their patients.	A total of 21 individuals, purposively selected from six community health centers covering central districts and remote suburbs in Beijing, were interviewed using semi-structured topic guides. Thematic analysis was used to analyze the interviews and coding framework was developed both inductively and deductively.	Identified factors influencing influenza vaccine uptake included knowledge, perception and recognition, and prior experience of vaccine uptake. All PHWs conservatively recommended influenza vaccine because of concerns about potential patient–doctor disputes. GPs rarely recommended vaccination under their own initiative because vaccine promotion was not their duties. Notably, we found that the division of work was an underlying reason for the different behaviors regarding vaccine uptake and promotion between GPs and PHWs. Conclusion: Our findings highlighted a combination of misconceptions and cognitive biases limiting influenza vaccine uptake among HCWs in China. Our findings indicate that promotion of health education regarding influenza vaccination should be implemented among HCWs. Importantly, the division of work greatly affects the behaviors of HCWs. GPs, who are at the front line in the doctor-patient relationship, have a critical role in influenza vaccination programs.
Khamisy- et al (2019)(22)	Israel.KAP questionnaire developed and validated in a sample. To assessment Knowledge of Human papillomavirus is a highly widespread virus which is responsible for one of the most common sexually transmitted infections. Two main preventative strategies exist: anti-HPV vaccination and cervical screening.	Confirmed validity of the questionnaire with good internal consistency. KAP questionnaire found to be psychometrically valid and reliable, Pediatricians, design cross-sectional study. the Population gynecologists, and internal med docs .	knowledge was generally moderate among Israeli health-care workers, , with updated information lacking in about 30% of surveyed health-care providers and approximately 20% of them not recommending the anti-HPV vaccine among boys. Gathered the Cronbach alpha for each of the predictor measures. Principle component analysis preformed on additional items to confirm factor structure. They did not find differences in terms of knowledge between residents or other doctor specializations. Conclusion: This study has practical implications for policy- and decision-makers in that they should be aware of the overall level of knowledge among health-care workers and should implement ad hoc educational interventions to address gaps in knowledge and help medical providers routinely recommend the anti-HPV vaccine both to male and female children and adolescents .

DISCUSSION

This review identifies and described the evidence about the possible relationship between awareness of the health care worker's about vaccines and their intentions to vaccinate. The results of the included studies clearly show that these relationships do exist, although unfortunately, the data does not allow us to make conclusions about a causal link, mainly because all but one of the studies are cross-sectional. Only one retrospective case–control study could show a causal link between awareness of the health care workers and intentions to vaccinate, but even this study should be considered as cross-sectional because it evaluated HCWs' awareness at a given point in time, and these variables may change over time.(23) Given the range of the inclusion criteria, the included studies differed widely in their evaluations of the variables, methodologies, and statistical analysis techniques. Therefore, the results cannot be integrated to quantify the magnitude of the associations and must be evaluated individually. Even so, it appears that all the studies show associations in the direction postulated by the experts, although some associations were statistically significant, and others were not.(24)

We also identified the factors associated with vaccine acceptance. Our findings revealed a suboptimal pooled overall global rate of the vaccine awareness of the health care worker's rate. This study also demonstrated substantial global and regional variations in the rates of vaccine awareness of the health care worker's, overall and across key population groups with the highest awareness of the health care worker's rate .(25)Our study also

identified several modifiable behavioral factors associated with a higher likelihood of awareness of the health care workers, including being concerned about getting infected, the perception of being highly at risk, and knowledge, as well as receiving information about the disease from healthcare authorities. Other studies vaccines Doubts about vaccine effectiveness were less commonly raised in relation to other vaccines: 99.6% of Italian pediatricians expressed confidence in the effectiveness of the diphtheria-tetanus-cellular pertussis vaccine,(26) with only 3–3.7% of HCPs in Turkey stating not recommending this vaccine to adolescents because of concerns about its effectiveness. Additionally, only 4.9% of gynecologists in Germany stated that limited vaccine effectiveness was the reason for not recommending pertussis vaccination.(27) Confidence in meningococcal vaccination was also high, with 55.9–62.9% of HCPs in Italy reporting vaccine effectiveness was one of the reasons for recommending the vaccine and 38.4% of nurses and physicians in another Italian study stating the vaccine is highly effective. Certain vaccines elicited more concerns among HCPs who did not support or recommend vaccination, including rotavirus (27.7% of pediatricians and family physicians in Turkey, and varicella (32% of HCPs in Hungary and HCPs in the Netherlands).(24)

This review fills a gap in the literature, and thus, despite the limitations of our methodology, we believe that the benefits of illuminating this relevant topic overcome the limitations. Qualitative studies, which were not considered in this review, could be the objective of a future review. A gold standard research study is a broad-based population study that controls for confounding factors and biases and uses validated tools to measure Awareness of the health care worker's to vaccinate or vaccine coverage.

CONCLUSION

The available awareness shows that among HCW, greater awareness about vaccines, that are aligned with scientific evidence and more favorable toward vaccines are associated with greater intentions to vaccinate. However, it is not possible to conclude that there is a causal relationship between these variables, because the included studies are observational and must be interpreted as cross-sectional. The fact that knowledge and awareness change over time may explain the absence of longitudinal studies capable of demonstrating causality. We conclude that the existing studies show associations between HCWs' awareness and their intentions to vaccinate the populations they serve and health care workers. The next step is to test and implement interventions and strategies focused on the knowledge and awareness of HCW to attempt to improve vaccine coverage.

REFERENCE

1. MCNEILL, C. (2022). Mandatory Vaccination for Healthcare Professionals: Preparation for Future Pandemics (Doctoral dissertation, Durham University).
2. Ergur, A. (2020). Social causes of vaccine rejection-vaccine indecision attitudes in the context of criticisms of modernity. *The Eurasian Journal of Medicine*, 52(2), 217.
3. Troiano, G., & Nardi, A. (2021). Vaccine hesitancy in the era of COVID-19. *Public health*, 194, 245-251.
4. Verger, P., Fressard, L., Soveri, A., Dauby, N., Fasce, A., Karlsson, L., ... & Gagneur, A. (2022). An instrument to measure psychosocial determinants of health care professionals' vaccination behavior: validation of the Pro-VC-Be questionnaire. *Expert review of vaccines*, 21(5), 693-709.
5. Maltezou, H. C., Dounias, G., Rapisarda, V., & Ledda, C. (2022). Vaccination policies for healthcare personnel: Current challenges and future perspectives. *Vaccine: X*, 11, 100172.
6. Dini, G., Toletone, A., Sticchi, L., Orsi, A., Bragazzi, N. L., & Durando, P. (2018). Influenza vaccination in healthcare workers: A comprehensive critical appraisal of the literature. *Human vaccines & immunotherapeutics*, 14(3), 772-789.
7. Sinuraya, R. K., Nuwarda, R. F., Postma, M. J., & Suwantika, A. A. (2024). Vaccine hesitancy and equity: lessons learned from the past and how they affect the COVID-19 countermeasure in Indonesia. *Globalization and Health*, 20(1), 11.
8. World Health Organization. (2022). Implementation guide for vaccination of health workers. World Health Organization.
9. Haviari, S., Bénet, T., Saadatian-Elahi, M., André, P., Loulergue, P., & Vanhems, P. (2015). Vaccination of healthcare workers: A review. *Human vaccines & immunotherapeutics*, 11(11), 2522-2537.
10. Tuckerman, J., Riley, K., Straube, S., Mohammed, H., Danchin, M., & Marshall, H. S. (2023). Interventions for increasing the uptake of immunisations in healthcare workers: A systematic review. *Vaccine*.
11. Di Martino, G., Di Giovanni, P., Di Girolamo, A., Scampoli, P., Cedrone, F., D'Addezio, M., ... & Staniscia, T. (2020). Knowledge and attitude towards vaccination among healthcare workers: a multicenter cross-sectional study in a Southern Italian Region. *Vaccines*, 8(2), 248.
12. World Health Organization. (2023). Guidance on development and implementation of a national deployment and vaccination plan for vaccines against pandemic influenza and other respiratory viruses of pandemic potential. World Health Organization.

13. de Araújo, T. M., Souza, F. D. O., Pinho, P. D. S., & Werneck, G. L. (2022). Beliefs and sociodemographic and occupational factors associated with vaccine hesitancy among health workers. *Vaccines*, 10(12), 2013.
14. Odero, C. O., Othello, D., Were, V. O., & Ouma, C. (2024). The influence of demographic and socio-economic factors on non-vaccination, under-vaccination and missed opportunities for vaccination amongst children 0–23 months in Kenya for the period 2003–2014. *PLOS Global Public Health*, 4(5), e0003048.
15. Odero, C. O., Othello, D., Were, V. O., & Ouma, C. (2024). The influence of demographic and socio-economic factors on non-vaccination, under-vaccination and missed opportunities for vaccination amongst children 0–23 months in Kenya for the period 2003–2014. *PLOS Global Public Health*, 4(5), e0003048.
16. Kanan, M., Abdulrahman, S., Alshehri, A., AlSuhailani, R., Alotaibi, N. M., Alsaleh, A., ... & Alghamzi, S. (2024). Factors Underlying Vaccine Hesitancy and Their Mitigations in Saudi Arabia: Protocol for a Systematic Review. *JMIR Research Protocols*, 13(1), e54680.
17. Akinsola, K. O., Bakare, A. A., Gobbo, E., King, C., Hanson, C., Falade, A., & Herzig van Wees, S. (2024). A systematic review of measures of healthcare workers' vaccine confidence. *Human Vaccines & Immunotherapeutics*, 20(1), 2322796.
18. Garrison, A., Fressard, L., Karlsson, L., Soveri, A., Fasce, A., Lewandowsky, S., ... & Verger, P. (2022). Measuring psychosocial determinants of vaccination behavior in healthcare professionals: validation of the Pro-VC-Be short-form questionnaire. *Expert Review of Vaccines*, 21(10), 1505-1514.
19. Saleh, A. S. A., Mahmoodi, A. H., Alradadi, A. H. A., Al-Ansari, M. M., Majrashi, A. M. H., Barnawi, E. B. O., ... & Abusulaiman, Y. H. H. (2023). Assessment Of Perception Of Covid-19 Infection And Vaccination Among Health Care Workers In Mecca, Saudi Arabia 2022. *Journal of Survey in Fisheries Sciences*, 1280-1291.
20. Abdul Kadir A, Noor NM, Mukhtar AF. Development and validation of the knowledge and attitude regarding childhood vaccination (KACV) questionnaire among healthcare workers: the Malay version. *Hum Vaccin Immunother*. 2021;17(12):5196–204.
21. Yu, M., Yao, X., Liu, G., Wu, J., Lv, M., Pang, Y., ... & Huang, Y. (2022). Barriers and facilitators to uptake and promotion of influenza vaccination among health care workers in the community in Beijing, China: a qualitative study. *Vaccine*, 40(14), 2202-2208.
22. Khamisy-Farah, R., Adawi, M., Jeries-Ghantous, H., Bornstein, J., Farah, R., Bragazzi, N. L., & Odeh, M. (2019). Knowledge of human papillomavirus (HPV), attitudes and practices towards anti-HPV vaccination among Israeli pediatricians, gynecologists, and internal medicine doctors: development and validation of an ad hoc questionnaire. *Vaccines*, 7(4), 157.
23. Paoli, S., Lorini, C., Puggelli, F., Sala, A., Grazzini, M., Paolini, D., ... & Bonaccorsi, G. (2019). Assessing vaccine hesitancy among healthcare workers: A cross-sectional study at an Italian paediatric hospital and the development of a healthcare worker's vaccination compliance index. *Vaccines*, 7(4), 201.
24. Gopalakrishna, G., Ter Riet, G., Vink, G., Stoop, I., Wicherts, J. M., & Bouter, L. M. (2022). Prevalence of questionable research practices, research misconduct and their potential explanatory factors: A survey among academic researchers in The Netherlands. *PloS one*, 17(2), e0263023.
25. Shakeel, C. S., Mujeeb, A. A., Mirza, M. S., Chaudhry, B., & Khan, S. J. (2022). Global COVID-19 vaccine acceptance: a systematic review of associated social and behavioral factors. *Vaccines*, 10(1), 110.
26. Karafillakis, E., & Larson, H. J. (2017). The benefit of the doubt or doubts over benefits? A systematic literature review of perceived risks of vaccines in European populations. *Vaccine*, 35(37), 4840-4850.
27. Soysal, G., Durukan, E., & Akdur, R. (2021). The Evaluation of Vaccine Hesitancy and Refusal for Childhood Vaccines and the COVID-19 Vaccine in Individuals Aged Between 18 and 25 Years. *Turkish Journal of Immunology*, 9(3).