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Knowledge and Perception of the Risks Associated with Occupational Infections among Healthcare Workers in Saudi Arabia

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Abstract
Occupational infections remain a significant threat to healthcare workers (HCWs) worldwide. In Saudi Arabia, recurring outbreaks of Middle East respiratory syndrome coronavirus (MERS-CoV), the ongoing burden of bloodborne pathogens and frequent reports of sharps injuries make occupational infection risk a major occupational health concern. This article synthesizes available evidence on HCWs' knowledge, attitudes and perceptions of infectious risks in Saudi Arabia; reviews epidemiology and common exposure pathways; examines psychological and workplace impacts observed during MERS and other events; discusses determinants of safe practice and persistent gaps; and offers practical recommendations for policy, training and workplace systems to reduce occupational infection. The review draws primarily on published studies performed in Saudi Arabia (including cross-sectional surveys, qualitative and mixed-methods work), regional literature and established international findings on occupational infection control. Key themes are: variable but generally improving knowledge among HCWs; perception of significant personal and family risk during outbreaks; important links between training, resources and safer behaviours; persistent problems with sharps injuries and work-related exposures; and the need for integrated, sustained systems (education, PPE supply, surveillance, immunization and safety culture) to protect HCWs. We conclude with prioritized, actionable recommendations for healthcare managers and policy makers in Saudi Arabia.

Keywords: occupational infections, healthcare workers, knowledge, perception, MERS, sharps injuries, Saudi Arabia, infection prevention and control

1. Introduction

Healthcare workers (HCWs) are routinely exposed to infectious hazards—bloodborne pathogens (HBV, HCV, HIV), airborne and droplet pathogens (tuberculosis, influenza, coronaviruses), and opportunistic organisms encountered in clinical care. Occupationally acquired infection contributes to morbidity, mortality, workforce shortages and psychological harm, and it also risks onward transmission to patients and communities (Sepkowitz, 1996). In the Kingdom of Saudi Arabia (KSA), the health system faces specific challenges: episodic outbreaks of emerging pathogens (notably MERS-CoV since 2012), a large and diverse HCW population, a high throughput of patients especially during mass gatherings (Hajj and Umrah), and documented occupational injuries and exposures including needlestick and sharps incidents.

Understanding HCWs' knowledge and perceptions about occupational infections is essential because these factors influence compliance with infection prevention and control (IPC) measures, reporting of exposures, uptake of vaccination and broader safety behaviours.

This article reviews evidence from Saudi Arabia on HCWs' knowledge, attitudes and perceptions regarding occupational infectious risks, synthesizes findings from outbreak studies (particularly MERS), examines determinants of behaviour and educational effectiveness, and provides practical recommendations to strengthen protection of HCWs.

2. Why HCW knowledge and perception matter

Knowledge of transmission routes, standard precautions and post-exposure measures underpins correct protective behaviours (hand hygiene, PPE use, safe sharps handling, immunization). Perception of risk — how HCWs view their own vulnerability and the severity of potential infections — shapes motivation to adhere to protective measures. Attitudes (trust in organizational preparedness, perceived barriers like time or PPE shortages) influence reporting and cooperation with control measures. Behavioral theories (e.g., Health Belief Model) suggest that perceived susceptibility and perceived benefits predict uptake of preventive actions; therefore, assessing knowledge and perception gives actionable targets for interventions.

3. Epidemiology of occupational infections and exposures relevant to Saudi HCWs

3.1 Bloodborne exposures and sharps injuries

Needlestick and sharp object injuries remain among the most common occupational exposures worldwide. Studies in Saudi hospitals detect significant incidence of sharps injuries, with underreporting widely recognized. Recent Saudi research documents ongoing risks in multiple cities: Al-Zahrani et al. (2024) reported occupational exposure to sharp object injuries among HCWs in Dammam and Jeddah, highlighting factors such as recapping behaviours, high workload and inadequate safety devices. Other local studies (e.g., Alameer & Noor Elahi, 2023; Ibrahim et al., 2024) corroborate a consistent prevalence of work-related injuries and identify determinants such as years of experience, night shifts, staffing levels and deficiencies in training or safety systems.

3.2 Respiratory outbreaks — MERS-CoV experience

KSA has been the epicentre of MERS-CoV infections since 2012. HCWs were disproportionately impacted in early nosocomial clusters and subsequent outbreaks, revealing gaps in early recognition, isolation practices and adherence to recommended PPE. Multiple studies have explored HCWs' knowledge, attitudes and emotional responses during the MERS outbreaks (Alsahafi & Cheng, 2016; Khalid et al., 2016; Abolfotouh et al., 2017; Alsubaie et al., 2019; Aldohyan et al., 2019). These works reveal a complex interplay of adequate basic knowledge in many settings, but also fear, stress and perceived inadequacy of institutional preparedness during surges.

3.3 Other occupational infections

Although most local research concentrates on MERS and sharps injuries, HCWs in Saudi Arabia are also exposed to seasonal influenza, tuberculosis and gastrointestinal pathogens. Comparative regional and international reviews underscore the need for broad IPC competencies beyond event-driven responses (Malangu & Legothoane, 2012; Dini et al., 2025).

4. Evidence on knowledge, attitudes and perceptions among Saudi HCWs

4.1 Baseline knowledge of MERS and emerging infections

Alsahafi and Cheng (2016) conducted an influential survey of HCWs in KSA examining knowledge, attitudes and behaviours regarding MERS and other emerging infectious diseases. Their findings showed variable knowledge — many HCWs correctly identified transmission routes and infection control measures, but knowledge gaps existed in specifics of incubation periods, recommended isolation durations and post-exposure steps. Knowledge levels frequently differed by professional role (doctors, nurses, allied health), years of experience and prior exposure to outbreak training.

Aldohyan et al. (2019) focused on primary healthcare workers and demonstrated that targeted educational programs could increase knowledge and perceived readiness, but sustaining transfer into routine practice required ongoing reinforcement and system support.

4.2 Risk perception, concern and worry

Surveys have consistently found that HCWs perceive personal and familial risk during respiratory outbreaks. Abolfotouh et al. (2017) reported variable levels of concern among hospital-based HCWs about MERS; while many felt professionally obligated to provide care, significant proportions expressed worry about infection and potential impacts on their families. Alsubaie et al. (2019) documented impacts of the MERS epidemic on HCWs' personal and work lives, with altered risk perceptions, changes in work patterns and psychological effects.

4.3 Emotional and stress responses

During outbreaks, HCWs describe anxiety, stress and conflicting duties. Khalid et al. (2016) used qualitative and survey methods to describe HCW emotions and coping strategies during a MERS-CoV outbreak: fear for personal safety, concerns about infecting loved ones, and stress from increased workload were prominent. Coping strategies included reliance on colleagues, religious faith, and

pragmatic adherence to protective measures when available.

4.4 Knowledge-to-practice gaps and barriers

Multiple Saudi studies identify a gap between knowledge and practice. Reasons include inadequate PPE supply during surges, perceived time constraints, heavy workloads, inadequately enforced policies, insufficient training that does not translate into hands-on competency, and cultural or organizational factors discouraging reporting of exposures or questioning unsafe practices. The 2026 preprint-style/ongoing work by Alsubaie et al. (2026) in primary health clusters in Riyadh highlights occupational health risk awareness but documents persisting practical barriers in primary care settings.

4.5 Perceived effectiveness of education and training

Aldohyan et al. (2019) evaluated perceived effectiveness of MERS-CoV educational programs among primary HCWs and found that HCWs who received structured, interactive training felt more confident in knowledge transfer and perceived IPC practices as more feasible. However, they emphasized the need for periodic refreshers and mentorship to sustain behaviour change.

5. Sharps injuries: prevalence, determinants and perceptions

5.1 Prevalence and burden

Recent regional studies show continued high rates of sharps injuries. Al-Zahrani et al. (2024) and Alameer & Noor Elahi (2023) reported notable proportions of HCWs experiencing at least one sharps injury in recent years. Injuries occur most frequently in high-throughput departments (emergency, operating rooms, wards) and during procedures such as injections, blood draws and disposal activities.

5.2 Risk factors

Common determinants include:

- Recapping needles and unsafe disposal practices.
- Lack of safety-engineered devices.
- Poorly designed sharps containers or overfilled containers.
- High workload, fatigue and hurried practice.
- Inadequate reporting culture and fear of punitive consequences.
- Insufficient training in safe sharps handling across cadres.

Ibrahim et al. (2024) provided narrative evidence and recommendations emphasizing both device engineering (safety syringes), system redesign and behavioural training to mitigate sharps injuries.

5.3 Reporting and underreporting

Underreporting of sharps injuries is persistent due to perceived complexity of reporting processes, fears of blame, or belief that the injury is low-risk. Underreporting undermines surveillance, post-exposure prophylaxis (PEP) delivery and prevention planning.

6. HCW experience during MERS outbreaks: impacts on perception and behaviour

6.1 Work and personal life disruption

Alsubaie et al. (2019) described how the MERS epidemic changed HCWs' work patterns, increased absenteeism or workload, and led some to adjust living arrangements to reduce risk to family members. These tangible disruptions intensified perception of occupational risk.

6.2 Trust in institutional preparedness

Perceived institutional readiness—availability of PPE, clear protocols, leadership communication and timely training—shapes confidence. Poor communication or perceived resource scarcity led to eroded trust and increased anxiety among HCWs in several studies.

6.3 Stigmatization and moral dilemmas

Some HCWs reported stigma from communities or family members fearful of infection risk, and internal moral dilemmas about duty to care versus personal/family safety. Effective institutional support, transparent risk communication and psychosocial resources are critical during such episodes.

7. Comparative and contextual evidence

Other LMIC and regional studies (e.g., Malangu & Legothoane, 2012) show comparable patterns: occupational infections cluster around inadequate IPC systems, insufficient training, and limited safety devices — reinforcing that many determinants are system-level rather than individual faults. The upcoming scoping work in Europe by Dini et al. (2025) emphasizes the need for standardized surveillance and cross-jurisdiction learning; Saudi Arabia can both contribute to and benefit from such global exchange.

8. Determinants of safe behaviour: what promotes protection?

8.1 Education and hands-on training

Interactive, scenario-based training that includes practical PPE donning/doffing, simulated exposure response and local case studies increases retention and confidence compared with passive lecture

formats. Training is most effective when repeated, credentialed and linked to observed competency assessment.

8.2 Availability and accessibility of PPE and safety devices
Consistent supply of appropriate PPE and availability of safety-engineered sharps devices are essential enablers of safe practice. Supply chain resilience—particularly during outbreak surges—is therefore a critical policy priority.

8.3 Clear protocols and leadership communication
Clear, locally adapted IPC protocols, readily accessible and communicated by trusted leaders, reduce uncertainty and improve adherence. Leadership that models safe behaviours reinforces norms.

8.4 Safety culture and non-punitive reporting
Cultures that encourage reporting of exposures without blame enable learning and rapid PEP delivery. Training supervisors in supportive feedback and instituting simple, anonymous reporting channels can increase reporting rates.

8.5 Workload, staffing and environmental design
Excessive workload, long shifts and poor unit layout (e.g., inaccessible sharps containers) increase exposure risk. Staffing policies and ergonomic design are part of infection prevention.

9. Gaps and challenges identified in Saudi settings
9.1 Heterogeneity across facilities
Knowledge, resources and IPC maturity vary widely between tertiary hospitals, regional centers and primary care clinics. Primary care may have lower resourcing for IPC despite high community contact.

9.2 Sustainability of training impact
One-off training shows temporary gains; sustaining competence requires integration into continuing professional development and workplace supervision.

9.3 Underreporting and surveillance weaknesses
Data gaps impede accurate estimation of occupational infection burden. Strengthening mandatory reporting for exposures, harmonizing data systems and protecting reporters are needed.

9.4 Psychological support and occupational health services
Studies show pronounced stress during outbreaks. Occupational health and mental health support services for HCWs remain inconsistently available.

10. Recommendations: practical and prioritized actions for Saudi Arabia
10.1 Strengthen pre-service and in-service education
- Integrate IPC, standard precautions and safe sharps handling into undergraduate and postgraduate curricula.
- Implement annual mandatory refresher training with competency assessments and scenario simulations focusing on local risks (e.g., MERS).
- Use blended learning (e-modules plus hands-on practice) and tailor content by cadre.

10.2 Ensure reliable supply and distribution of PPE and safety devices
- Stockpile strategic PPE and safety syringes regionally with clear deployment plans for surges.
- Procure safety-engineered devices (needle-less systems) prioritized for high-risk departments.

10.3 Build robust exposure reporting and occupational health follow-up
- Simplify and digitize reporting; protect confidentiality and ensure non-punitive follow-up.
- Ensure rapid access to baseline testing, PEP (e.g., for HIV), HBV vaccination and confirmatory diagnostics.
- Maintain central surveillance to monitor trends and target interventions.

10.4 Strengthen managerial leadership and communication
- Leaders should communicate transparently during outbreaks, explain rationales for protocols, and visibly support HCWs (logistics, psychosocial resources).
- Develop unit-level IPC champions empowered to identify local barriers and solutions.

10.5 Improve staffing, workload management and ergonomic design
- Address staffing shortfalls, rotate shifts to avoid fatigue, and ensure sharps containers and disposal systems are conveniently located.

10.6 Promote a safety culture and mental health support

- Implement training in just culture principles and provide accessible psychological support during and after outbreak periods.
- Acknowledge HCW contributions publicly to reduce stigma and enhance morale.

10.7 Targeted interventions for primary care and mass-gathering contexts

- Ensure primary health centers have basic IPC infrastructure and tailored training for community settings.
- For Hajj and Umrah mass gatherings, develop surge staffing plans, targeted vaccination campaigns and mobile occupational health units.

11. Practical IPC toolkit elements for facilities

- Standardized PPE donning/doffing checklists and visible posters.
- Easy access to sharps containers, with daily auditing of container status.
- Short "what to do after exposure" flowcharts posted in clinical areas with contact numbers for occupational health.
- Routine audit and feedback on hand hygiene and PPE compliance.
- Regular multidisciplinary drills for respiratory outbreak response.

12. Research and surveillance priorities

- Standardize and expand national surveillance of occupational exposures and infections, with harmonized definitions and reporting metrics.
- Study long-term psychological outcomes of outbreak exposure and effectiveness of psychosocial interventions.
- Evaluate cost-effectiveness of safety devices and training modalities in Saudi contexts.
- Examine determinants of underreporting and design interventions to increase reporting completeness.

13. Limitations of existing evidence

Most Saudi studies are cross-sectional or qualitative, limiting causal inference. Heterogeneity in instruments and sampling complicates aggregation. Underreporting biases exposure prevalence estimates. There is a need for longitudinal, intervention and implementation research to guide policy more precisely.

14. Conclusion

Protecting HCWs from occupational infections is both an ethical imperative and a practical necessity for resilient health systems. Saudi Arabia has made strides in outbreak response and HCW education, yet persistent challenges—sharps injuries, variable IPC capacity across settings, underreporting and the psychosocial impacts of outbreaks—remain. Empirical evidence and frontline experience underscore three core requirements: (1) robust, practical education linked to competency assessment; (2) systems investments (PPE, safety devices, surveillance, occupational health services) that remove structural barriers to safe practice; and (3) leadership that cultivates a non-punitive safety culture and sustains support during crises. Prioritizing these actions will reduce occupational infection risk, protect HCWs and safeguard patient care.

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