J. Pharm Pract Comm Med, 2026; 12(3):138-141.
www.jppcm.org

Review Article

# Awareness, Attitudes, and Practices of Infection Control in Libya: A Mixed-Methods Study

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**ABSTRACT**

Infection Prevention and Control (IPC) is essential for reducing healthcare-associated infections, yet gaps between awareness and practice persist, particularly in resource-limited settings. This study was conducted to evaluate awareness, attitudes, and practices related to infection control among healthcare workers, medical students, and the public in Libya. A mixed-methods design was employed, combining a structured, self-administered questionnaire with direct observational assessments in hospitals, clinics, and community settings. The questionnaire included demographic, closed-ended, and open-ended items addressing hand hygiene, Personal Protective Equipment (PPE) use, and environmental cleaning. A pilot study refined the tool before full distribution. Quantitative data were analyzed using Microsoft® Excel, while qualitative responses were thematically analyzed. Of 150 participants, 86.7% reported knowing the meaning of infection control, though only 63.3% had received formal training. High awareness of hand hygiene and PPE use was observed, yet compliance challenges and institutional trust deficits were evident. Observational data confirmed lapses in practice, particularly in clinical settings. While awareness of IPC measures is high, consistent practice remains limited. Expanding structured training, embedding IPC education in schools, and strengthening institutional accountability are critical to bridging the gap between knowledge and behavior.

**Keywords:** Infection control, Hand hygiene, Personal protective equipment, Healthcare-associated infections, Libya.

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## INTRODUCTION

Healthcare-associated infections remain a major cause of morbidity, mortality, and cost escalation worldwide, with disproportionate impact in resource-limited settings where infrastructure, supplies, and training may be inconsistent. Robust Infection Prevention and Control (IPC) programs-centered on hand hygiene, appropriate use of Personal Protective Equipment (PPE), environmental cleaning, and continuous education-are essential to reducing transmission and improving patient safety (WHO Guidelines on Hand Hygiene in Health Care, 2009; Allegranzi and Pittet, 2009; Sax *et al*., 2007). Hand hygiene, in particular, is the single most effective measure for interrupting pathogen spread, yet sustained compliance hinges on behavioral, organizational, and cultural determinants that extend beyond knowledge alone (Azzain and Eltayeb, 2025; Gould *et al*., 2017; Luangasanatip *et al*., 2015).

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Manuscript TECHNOMEDIA

**DOI:** 10.5530/jppcm.20260025



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Global frameworks such as the WHO "Five Moments for Hand Hygiene" have standardized clinical practice and measurement, enabling targeted interventions and performance feedback. Despite these advances, evidence consistently shows gaps between awareness and adherence, especially where competing workload pressures, limited resources, and inadequate monitoring systems exist (Azzain and Eltayeb, 2025; Gould *et al*., 2017; Luangasanatip *et al*., 2015; Sax *et al*., 2007). Training and audit-feedback cycles, multimodal strategies, and behaviorally informed approaches have demonstrated meaningful gains in compliance and reductions in healthcare-associated infections, but translation to routine practice requires contextual adaptation and visible leadership (Gould *et al*., 2017; Houssein *et al*., 2021; Luangasanatip *et al*., 2015; Pittet *et al*., 2000).

In Libya and comparable contexts, understanding the interplay of awareness, attitudes, and practices among healthcare workers, students, and the public is critical to designing scalable, cost-effective IPC initiatives. Evaluating both self-reported knowledge and observed behaviors across clinical and community settings can reveal priority barriers, such as perceived time constraints, trust in others' compliance, and institutional hygiene concerns, and highlight opportunities for early education (e.g., school-based curricula), targeted training, and system-level

reinforcement. A mixed-methods approach provides both quantifiable trends and qualitative insight needed to inform practical, context-sensitive IPC strategies that improve safety and resilience across health and educational institutions (WHO Guidelines on Hand Hygiene in Health Care, 2009; Gould *et al.*, 2017; Houssein *et al.*, 2021; Luangasanatip *et al.*, 2015; Pittet *et al.*, 2000; Sax *et al.*, 2007). This study was conducted to evaluate awareness, attitudes, and practices related to infection control and cross-infection prevention among healthcare workers, medical students, and members of the public in Libya.

## METHODOLOGY

### Study Design

This study employed a mixed-methods approach, integrating quantitative and qualitative techniques to assess knowledge, attitudes, and practices related to infection control and cross-infection prevention in Libya. The design combined a structured, self-administered online questionnaire with direct observational assessments, ensuring both measurable comparisons and contextual insights into real-world behaviors.

### Pilot Study

Before the main study, a pilot test was conducted with ten healthcare workers, including nurses, physicians, and cleaning staff, from a hospital outside the main study site. The purpose of the pilot was to evaluate the feasibility and clarity of the research tools. Feedback from participants highlighted unclear or redundant items, which were subsequently refined to improve wording and structure. Results from the pilot were excluded from the final analysis, as its primary aim was methodological refinement.

### Data Collection Tools

The primary data collection instrument was a structured questionnaire developed via Google Forms. It included demographic questions and items addressing awareness, attitudes, and practices related to hand hygiene, PPE use, and environmental cleaning. In parallel, observational assessments were conducted in hospitals, clinics, and community settings in Tripoli, Libya, to evaluate infection control behaviors in practice, such as compliance with hand hygiene protocols, PPE usage, and the cleanliness of clinical areas.

### Participants and Sampling

The final questionnaire was distributed to healthcare workers, medical students, and members of the public across multiple Libyan regions. Distribution channels included institutional e-mails, social media platforms, and WhatsApp groups, ensuring broad accessibility and representation across occupational and social backgrounds.

### Sample Size and Power Considerations

The study recruited a total of 150 participants, comprising healthcare workers, medical students, and members of the public. The sample size was determined using a precision-based approach rather than formal hypothesis testing. Assuming a conservative prevalence estimate of 50% for awareness of infection control, a sample of 150 provides a 95% confidence interval with a margin of error of approximately ±8%. This level of precision was considered acceptable for an exploratory mixed-methods design aimed at identifying broad trends in awareness, attitudes, and practices.

### Data Collection Period

Data collection was carried out between April and May 2025, providing a snapshot of infection control practices during this period.

### Data Analysis

Quantitative data were exported to Microsoft® Excel, where pivot tables, frequency distributions, and cross-tabulations were used to identify trends and correlations, such as associations between profession, awareness levels, and compliance with infection control measures. Qualitative data from open-ended responses were analyzed thematically, allowing exploration of recurring patterns related to barriers, challenges, and suggestions for improving infection control practices.

## RESULTS

Table 1 presents the demographic characteristics of the study participants. A total of 150 individuals were surveyed, comprising medical students (43.3%), health workers (26.7%), and members of the public (30%). The gender breakdown shows a predominance of female participants (60%), compared to 40% male. Age distribution was skewed toward younger individuals, with half of the respondents aged 20-30 years. Participants under 20 years accounted for 16.7%, while those aged 31-40 and over 40 represented 20 and 13.3%, respectively.

Table 2 summarizes participants' understanding of infection control and their exposure to formal training. A substantial majority (86.7%) reported knowing what "infection control" means, indicating a high baseline awareness across the sample. However, only 63.3% of participants had received formal training on infection prevention. The remaining 36.7% who lacked training may represent a vulnerable group in terms of practical compliance and risk mitigation.

Table 3 presents participants' attitudes and perceptions regarding infection control practices. The data reveal a strong foundation of personal hygiene awareness, with 90% of respondents affirming they know how to wash their hands properly, and 88% indicating they understand when to use gloves or masks. Risk-related

behaviors were also explored. Only 12% admitted to sharing food or belongings with ill individuals, while 70% explicitly rejected such practices, reflecting a generally cautious approach to transmission risks. Notably, 78% reported witnessing others ignore infection control measures. Concerns about institutional hygiene were evident. While 68% felt unsafe due to poor hygiene in hospitals or schools, only 40% believed these institutions follow proper infection control protocols.

The findings of this study highlight both strengths and gaps in infection control awareness and practices among healthcare workers, medical students, and the public in Libya. High levels of knowledge regarding hand hygiene and personal protective equipment use were observed, consistent with global evidence that awareness of infection control principles is widespread (Ye and Ma, 2023). However, the discrepancy between knowledge and consistent practice, such as reported difficulties in following rules and limited trust in others' compliance, reflects a common challenge documented in multiple international studies (Patel, 2025; Yue and Pan, 2025).

Previous research has emphasized that awareness alone is insufficient to ensure compliance. For example, long-term interventions using structured quality improvement cycles significantly improved hand hygiene adherence among healthcare workers, reducing Hospital-Acquired Infections (HAIs) (Yue

**Table 1:** **Demographic characteristics of participants.**

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Role/background | Medical Student | 65 | 43.3 |
| | health worker | 40 | 26.7 |
| | general public | 45 | 30.0 |
| Gender | male | 60 | 40.0 |
| | female | 90 | 60.0 |
| Age group | <20 years | 25 | 16.7 |
| | 20-30 years | 75 | 50.0 |
| | 31-40 years | 30 | 20.0 |
| | >40 years | 20 | 13.3 |

**Table 2:** **Knowledge and training on infection control.**

| Question | Response | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Do you know what "infection control" means? | yes | 130 | 86.7 |
| | No | 20 | 13.3 |
| Have you received training on infection prevention? | yes | 95 | 63.3 |
| | No | 55 | 36.7 |

**Table 3:** **Attitudes, practices, and perceptions.**

| Question | Positive response (%) | Neutral/unsure (%) | Negative response (%) |
|---|---|---|---|
| Do you know how to wash your hands properly | 90 | 6 | 4 |
| Do you know when to use gloves or masks | 88 | 8 | 4 |
| I often share food or belongings with people who are ill | 12 | 18 | 70 |
| Have you seen someone ignore infection control | 78 | 10 | 12 |
| Do you feel unsafe due to poor hygiene in hospitals/ schools? | 68 | 14 | 18 |
| Do hospitals and schools follow proper infection control? | 40 | 30 | 30 |
| More training/awareness needed? | 95 | 3 | 2 |
| Handwashing can save lives | 98 | 1 | 1 |
| Infection control should be taught in schools | 94 | 4 | 2 |
| Following rules is difficult/time consuming | 25 | 30 | 45 |
| I trust others to follow infection control rules | 35 | 40 | 25 |

and Pan, 2025). Similarly, meta-analyses of nursing interventions have shown that multimodal strategies, including education, monitoring, and environmental support, are most effective in sustaining compliance (Ye and Ma, 2023). Our findings align with these studies, suggesting that while Libyan participants recognize the importance of infection control, systemic and behavioral barriers hinder consistent implementation.

Observational data in this study revealed lapses in real-world compliance, echoing prior reports from intensive care units where hand hygiene and antiseptic use were critical in reducing HAIs but required continuous reinforcement (Patel, 2025). The perception among participants that hospitals and schools do not consistently follow proper infection control protocols underscores the need for institutional accountability and visible hygiene measures. This is consistent with evidence that organizational culture and leadership play pivotal roles in embedding infection control practices (Erasmus *et al.*, 2010).

The strong support for infection control education in schools and the recognition that handwashing saves lives reflect a promising avenue for early intervention. Studies have shown that embedding infection control principles into curricula can foster lifelong preventive behaviors and improve community resilience against outbreaks (Huis *et al.*, 2012). Expanding training opportunities beyond healthcare professionals to include students and the public may therefore be a cost-effective strategy in Libya.

This study has several limitations. First, the reliance on self-reported questionnaire data introduces the possibility of social desirability bias, with participants potentially overstating their compliance. Second, observational assessments were limited to selected hospitals, clinics, and community settings, which may not fully represent practices across all Libyan regions. Third, the cross-sectional design captures practices at a single point in time, limiting the ability to assess changes or causal relationships.

## CONCLUSION

This study demonstrates that while awareness of infection control measures is high among healthcare workers, medical students, and the public in Libya, significant gaps remain in consistent practice and institutional trust. The findings underscore the importance of expanding structured training programs, embedding infection control education in schools, and strengthening institutional accountability to bridge the gap between knowledge and behavior. By integrating survey and observational methods, the study provides a comprehensive understanding of infection control practices and highlights actionable pathways for improving compliance and reducing HAIs in resource-limited settings.

## ACKNOWLEDGEMENT

None.

## ABBREVIATIONS

**IPC:** Infection prevention and control; **PPE:** Personal protective equipment; **WHO:** World Health Organization; **HAIs:** Healthcare-associated infections.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## FUNDING

Support for education and training was overwhelmingly positive. 95% agreed that more awareness is needed, and 94% endorsed teaching infection control in schools. Additionally, 98% recognized that handwashing can save lives. However, practical challenges remain. 45% found it difficult or time-consuming to follow infection control rules, and only 35% expressed trust in others to comply.

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**Cite this article:** Atia A, Dardar O, Shambi Y, Mahdi AE, Belgasm H. Awareness, Attitudes, and Practices of Infection Control in Libya: A Mixed-Methods Study. J Pharm Pract Comm Med. 2026;12(3):138-41.