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Factors Influencing Adherence to Infection Prevention and Control Measures Among Healthcare Workers during the COVID-19 Pandemic

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Abstract

During the COVID-19 pandemic, Infection Prevention and Control (IPC) played a critical role in minimizing viral transmission within healthcare settings. This study investigated factors that either hindered or promoted IPC adherence among healthcare workers (HCWs) during the COVID-19 crisis in Kampala City, Uganda. Fourteen key informants from 12 health facilities in Nakawa Division participated, including three government-run and nine private not-for-profit facilities. Participants were either designated IPC focal persons or HCWs with in-depth knowledge of IPC practices at their facilities. Data were transcribed, coded using a bespoke codebook in Atlas.ti version 9, and analyzed thematically. Participants reported that fear of contracting COVID-19 was a major motivator for IPC adherence. They further noted that the sustainability of IPC practices was reinforced by HCWs' perception of themselves as role models for the community in demonstrating health-promoting behaviors, particularly concerning COVID-19. Barriers to compliance included limited access to IPC training, with priority given only to HCWs in high-risk areas such as triage and Intensive Care Units, despite all staff being exposed to potential COVID-19 cases. High workloads also occasionally led to skipping essential IPC procedures. Findings indicate that reducing COVID-19 transmission among HCWs requires a holistic IPC approach that includes continuous capacity building and adequate provision of supplies, alongside active engagement from HCWs, facility management, and government bodies to ensure comprehensive IPC implementation during future outbreaks.

Keywords: COVID-19, Infection prevention, HCWs, Intensive care units

Introduction

The COVID-19 pandemic highlighted the pressing need to strengthen Infection Prevention and Control (IPC) practices in healthcare facilities worldwide, including in Uganda [1–4]. At the pandemic's peak, the country faced hundreds of new infections daily, challenging health facilities to manage increasing patient loads while safeguarding healthcare workers (HCWs) [5, 6]. IPC has historically been a critical issue in healthcare, with infections being leading causes of patient mortality before the antibiotic era [7]. Despite advances in IPC, healthcare-associated infections continue to present serious challenges, leading to significant morbidity and mortality; roughly 7 out of 100 patients in developed nations and 15 out of 100 patients in developing countries acquire infections in acute care settings [7, 8]. HCWs are also at risk, especially during epidemics [9]. Beyond the loss of life, inadequate IPC implementation imposes substantial financial burdens on healthcare systems, costing billions of dollars globally [10, 11].

IPC efforts should not be limited to outbreak periods [12]. Moreover, IPC programs are not universally standardized; each country tailors priorities based on its local context [8, 13, 14]. In many low- and middle-income countries, robust IPC implementation is often only initiated during declared outbreaks [15]. In Africa, many countries still lack fully operational IPC programs, leaving health systems vulnerable to emergencies [14, 16]. This reactive approach often results in high-cost interventions and temporary solutions that fail to sustain

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IPC practices post-outbreak [17], increasing the risk of transmission to patients, colleagues, caregivers, and communities beyond the hospital [18, 19].

In Uganda, the Ministry of Health has issued IPC guidelines and training materials to support standard implementation in health facilities [20]. Specific COVID-19 IPC guidelines were also developed to address the challenges posed by the pandemic, particularly in a setting where HCW-to-population ratios are low [21]. Despite persistent shortages of Personal Protective Equipment (PPE) and hand hygiene materials across facilities, HCWs continued providing care to COVID-19 patients under unsafe conditions, raising concerns about their safety. Understanding the factors that motivated HCWs to follow IPC protocols in these difficult circumstances was essential. Therefore, this study aimed to identify the barriers and facilitators influencing IPC adherence among HCWs delivering care in Kampala City health facilities during the COVID-19 pandemic.

Materials and Methods

Study design, setting, and participant recruitment

This research adopted a qualitative approach, using key informant interviews (KIIs) to understand healthcare workers' views on factors that either promoted or hindered adherence to Infection Prevention and Control (IPC) protocols [22, 23]. The study was carried out in 12 health facilities within Nakawa Division, Kampala City, Uganda, which included three government-run facilities and nine private not-for-profit (PNFP) centers. The facilities comprised one hospital, one Health Centre IV, three Health Centre IIIs, and seven Health Centre IIs. Detailed information about the selection process and the services offered at each facility level has been reported elsewhere [24]. At each facility, participants were either the designated IPC focal person or a staff member well-versed in the IPC practices implemented there. In the referral hospital, two additional interviews were conducted with the heads of the emergency department and intensive care unit to reflect the higher likelihood of COVID-19 patient encounters in these units. In total, 14 key informants were interviewed, a sample considered adequate to achieve thematic saturation, consistent with qualitative research standards [25].

Data collection

Two Public Health Officers with prior experience in qualitative research conducted the interviews between 29 March and 5 May 2022. The interview guide, containing 14 main questions with probing follow-ups, was reviewed by the research team to ensure clarity, cultural appropriateness, and content validity. The guide explored three major areas: challenges to IPC adherence, motivating factors for compliance, and adaptive strategies employed when PPE or hand hygiene resources were limited [26]. Probes examined HCWs' perception of COVID-19 severity, concerns about transmitting the virus to colleagues or household members, and the influence of vaccination coverage among staff. Interviews were held in English at the participants' workplaces, lasting 25 to 45 minutes, and were audio-recorded with notes taken to capture contextual details.

Data management and analysis

Debriefing sessions were held daily between the interviewers to discuss emerging insights and identify areas for further exploration. Transcripts were prepared by an independent transcriber and then cross-checked by the interviewers for accuracy. The verified transcripts were imported into Atlas.ti version 9, and a codebook developed specifically for this study was applied. The initial five transcripts were coded collaboratively by the interviewers to establish consistency and ensure the coding captured participants' perspectives accurately [27], while the remaining transcripts were coded by one interviewer. Codes were then organized into categories, which were further grouped into sub-themes under the overarching study themes. Thematic analysis was employed to interpret and synthesize the findings [28].

Ethical considerations

The study protocol was approved by the Makerere University School of Public Health Higher Degrees Research and Ethics Committee. All participants provided written informed consent after being fully briefed on the study's objectives.

Results and Discussion

Participant characteristics

Among the 14 key informants, three were from the hospital and the remaining 11 represented other health centers, with one participant per facility. Twelve participants were female, three were under the age of 30,

and five served as IPC focal persons in addition to their regular roles, as summarized in **Table 1**.

Table 1. Demographic characteristics of participants (N = 14).

Variables	Number (n)	Percentage (%)
Sex		
Female	12	85.7
Male	2	14.3
Age (years)		
<30	3	21.4
30+	11	78.6
Designation		
IPC focal person	5	35.7
Laboratory technician	3	21.4
Nurse in charge	4	28.6
Doctor	2	14.3

Facilitators of IPC compliance

Fear of contracting COVID-19

Participants reported that fear of infection was a major motivator for healthcare workers (HCWs) to follow IPC protocols during the COVID-19 pandemic. Early exposure to news reports and social media showing the severe consequences of the virus in other countries made HCWs more aware of its potential danger, reinforcing their adherence to protective measures.

"They witnessed patients dying and suffering, which motivated them because they were genuinely afraid," Participant 5, Lab technician.

"When you watched international news showing severe COVID-19 deaths, it pushed us, the basawo [HCWs], to consistently wear masks and follow other precautions," Participant 1, Lab technician.

These observations emphasized that, in the absence of other treatments, IPC measures were the primary defense against infection. Participants noted that fear consistently influenced compliance throughout multiple waves of the pandemic in Kampala City. While some HCWs initially thought other diseases posed a greater threat than COVID-19, monitoring rising case numbers and deaths prompted them to adjust their practices accordingly. Compliance increased during periods of high transmission and decreased when cases declined.

"They were relaxed initially, but after eighteen staff members tested positive at once, they became very serious. It was a wake-up call that anyone could be next," Participant 7, IPC focal person.

Social pressure and moral responsibility

Another key facilitator was the influence of social norms and a sense of moral duty. HCWs felt responsible for modeling proper health behaviors, recognizing that the community looked to them for guidance on what precautions to take. This sense of responsibility encouraged consistent adherence to IPC measures.

"We couldn't enter the clinic without a mask; it was important to show the community that COVID-19 is serious by practicing hand hygiene and mask use," Participant 1, Lab technician.

"As healthcare workers, we have to set the right example so others can follow our lead," Participant 7, IPC focal person.

Participants explained that staff were concerned about appearing negligent regarding widely promoted health interventions. Consequently, even when national COVID-19 cases fell, HCWs maintained practices like mask-wearing and sanitizer use. In public spaces, staff sometimes felt like outliers when continuing to follow these measures while community adherence dropped. Compliance was also influenced by leadership: active engagement by facility or department heads encouraged staff to follow IPC protocols, whereas low involvement from supervisors led to reduced adherence.

"In public, like in a taxi, wearing a mask may make you feel out of place, but in the hospital we are reminded of its importance because we still encounter COVID-19 patients," Participant 11, Nurse in charge.

Provision of adequate IPC supportive equipment

Participants emphasized that the availability of IPC supportive equipment significantly enhanced adherence to IPC measures. Essential items included masks, gloves, hand sanitizers, and accessible water and soap for patient care.

"At the start, sanitizers were placed along the facility pathways. Gloves were sometimes in short supply, but eventually we stocked everything. Once available, we purchased in bulk to prevent similar shortages in the future," Participant 7, IPC focal person.

"We rarely experience stockouts. Only during routine inventory checks might we notice supplies running low," Participant 4, Doctor.

When IPC resources were available, systems were established to ensure fair and collective access. Even limited PPE and hand hygiene supplies were distributed evenly among staff. In some facilities, supervisors

assigned specific personnel to regularly refill sanitizer dispensers, ensuring consistent availability.

"When masks were delivered, I kept a checklist. If supplies were low, I distributed five masks per person; if abundant, ten. I ensured everyone received their share carefully so that shortages could be managed without causing gaps in protection," Participant 11, Nurse in charge.

Participants also highlighted that PPE costs and inconsistent supply could hinder compliance. Some HCWs were compelled to purchase their own masks to stay protected, reflecting that self-protection was a key motivator for IPC adherence. Additionally, limited access sometimes resulted from poor coordination between department heads requesting supplies and store managers responsible for procurement.

"Maintaining compliance isn't easy when you have to buy PPE frequently; the available funds are often insufficient," Participant 2, Lab technician.

Barriers to IPC compliance

Limited Knowledge on IPC

Not all healthcare workers (HCWs) had access to training specifically focused on COVID-19 IPC measures. Priority was given to staff in departments with higher exposure risks, leaving others to seek information from secondary sources, which were sometimes unreliable.

"Some staff attended courses on PPE use, but others never had the opportunity. If they were given the chance, I believe their use of PPE would improve," Participant 5, Lab technician.

Although trained HCWs were expected to mentor their colleagues, participants reported that this system was often ineffective. The primary aim of the training was to protect the individual HCW and patients, and no dedicated time was set aside for peer training. This gap highlighted the need to adhere to national IPC guidelines, which include a "training of trainers" component. While Continuous Medical Education (CME) was offered regularly to all HCWs, it typically focused on department-specific or facility-assessed topics rather than COVID-19 IPC.

"When COVID-19 emerged, we had to adjust the CME sessions quickly to include up-to-date COVID information so that staff could learn about it rapidly," Participant 7, IPC focal person.

Heavy workload

High patient demand frequently exceeded HCWs' capacity, resulting in long queues and overextended staff. Many worked long hours without breaks, and some had very short shifts. Under these conditions, some HCWs skipped recommended IPC procedures to attend to more patients within limited timeframes.

"During the peak of the pandemic, the workload was intense. We had many patients and too few staff. So, healthcare workers ended up overworking," Participant 13, IPC focal person.

"You might need to focus on saving a patient's life, and handwashing could take time. Sometimes you just wear gloves without washing hands to act quickly," Participant 1, Lab technician.

Challenges in procuring PPE

Participants indicated that buying PPE personally was burdensome. HCWs often had to purchase masks and gloves out-of-pocket, as government or facility provisions were inconsistent.

"At our facility, we often buy our own masks and gloves. Occasionally the Ministry provides small quantities, but most of the time we purchase them ourselves," Participant 2, Lab technician.

This lack of resources, combined with other factors, influenced compliance. HCWs sometimes reused masks for several days due to cost or discomfort, relied on vaccination for protection, or found certain mask types difficult for breathing or communicating with patients.

"We reuse masks many times. For example, three masks bought on Monday might last the whole week. If you feel unsafe, you might wear the same mask from Monday to Wednesday," Participant 8, Nurse in charge.

Similarly, glove shortages sometimes led HCWs to reuse gloves between patients. While intended for self-protection, this practice risked cross-contamination.

"When there are many patients, it's hard to change gloves each time. You may be focused on a critical patient and forget, thinking you'll just skip it, but that can spread infections," Participant 2, Lab technician.

Vaccination against COVID-19

High COVID-19 vaccine coverage among healthcare workers (HCWs) appeared to influence their behavior, sometimes reducing strict adherence to other preventive measures.

"With the arrival of the vaccine, most staff got vaccinated, and they believe that being vaccinated lowers

their risk of contracting COVID," Participant 11, Nurse in charge.

Although vaccination was well understood to reduce the severity of COVID-19, many HCWs perceived it as sufficient protection on its own. While staff were aware of the general benefits of vaccines and the specific protection provided by COVID-19 immunization, this did not always translate into continued compliance with recommended IPC practices. In some facilities, ongoing awareness campaigns aimed to reinforce the importance of combining vaccination with other preventive measures.

"Many HCWs now think, 'Since I am vaccinated, I am safe; even if I get COVID, it won't be severe or fatal,' and this mindset has affected how they follow protocols," Participant 2, Lab technician.

Limited access to handwashing facilities

Several HCWs highlighted the difficulty of frequently walking to sinks for handwashing while attending to patients. When handwashing stations were not conveniently located, staff often opted to use hand sanitizer instead.

"I find sanitizing easier; going to a sink outside takes extra steps, so sanitizing is more practical," Participant 14, Nurse in charge.

"Sanitizing takes much less time, but proper handwashing is lengthy. When you have many patients, washing thoroughly becomes challenging," Participant 5, Lab technician.

Despite these obstacles, participants noted that the increased adoption of alcohol-based hand rubs represented a significant achievement for hand hygiene promotion during the pandemic.

"Staff trust that using a sanitizer with 98 percent antibacterial activity is more effective against COVID than uncertain water sources," Participant 7, Lab technician.

This study investigated the factors that facilitated or hindered compliance with Infection Prevention and Control (IPC) measures among healthcare workers (HCWs) in Kampala City. As a fundamental aspect of quality healthcare, IPC received heightened attention during the COVID-19 pandemic, particularly to protect HCWs in hospital settings. Participants identified several facilitators of IPC adherence, including fear of contracting COVID-19, social and moral obligations, and the provision of adequate IPC resources by health facility management. Compliance with IPC measures was dynamic, with HCWs demonstrating higher adherence during peaks of the pandemic, when case numbers in their vicinity were elevated. Conversely, barriers included limited IPC knowledge among staff, heavy workloads, insufficient resources for procuring PPE, perceptions related to vaccination status, and limited access to handwashing facilities. These findings indicate substantial opportunities to strengthen IPC implementation in health facilities.

Key informants noted that HCWs were motivated to follow IPC protocols early in the pandemic to avoid the guilt associated with non-compliance, particularly regarding mask usage. They also reported that HCWs felt a responsibility to set a positive example for the community, encouraging broader adherence to public health recommendations. Similar observations were reported by Yang, Wang [4], who found that HCWs' mask-wearing behaviors in China were influenced by their concern about community perceptions. This suggests that, beyond personal safety, HCWs were motivated by the desire to appear competent and responsible to patients. Prior studies emphasize that HCWs are more likely to follow IPC measures when they know they are being observed by colleagues or patients [29]. Promoting patient awareness of IPC can therefore indirectly reinforce adherence among HCWs.

Participants highlighted that PPE, including gloves, was primarily viewed as a self-protection measure, consistent with findings from other studies [29, 30]. Nonetheless, instances were reported where a single pair of gloves was used for multiple patients. According to participants, this practice was not intended to harm patients but resulted from shortages of PPE or limited understanding of the implications of healthcare-associated infections, including COVID-19 transmission. The findings indicate that inadequate dissemination of updated guidelines and standard operating procedures contributed to poor PPE use. This issue was evident at the onset of the pandemic and persists during routine operations when updated guidelines are not effectively communicated to end-users [29, 31–33]. Consequently, poor IPC compliance increases infection risk and the likelihood of cross-transmission within facilities and into the community. Strengthening refresher training programs and ensuring access to up-to-date guidelines is therefore essential [33, 34].

Workload was another factor influencing IPC compliance. Participants reported that in high-demand settings, some HCWs, such as laboratory personnel,

relied on gloves alone, believing they provided adequate protection and thereby skipping handwashing. While this behavior may be more common among laboratory staff [35, 36], other studies indicate that heavy workloads in clinical areas can compromise glove use and overall IPC adherence, particularly during emergencies [37–39]. In such situations, HCWs may prioritize urgent patient care over strict compliance with IPC protocols. These observations highlight the importance of maintaining appropriate patient-to-HCW ratios and reinforcing IPC measures, even under high workload conditions.

Participants indicated that insufficient IPC knowledge among healthcare workers (HCWs) was largely due to inadequate training and mentorship, which are recognized contributors to poor IPC adherence [6, 19, 31]. Studies conducted in Guinea and the Democratic Republic of Congo similarly found that staff trained in IPC demonstrated better performance during outbreaks [17, 40]. Beyond gloves—which constitute standard precautions during the COVID-19 pandemic—mask usage and hand hygiene were heavily promoted both within healthcare facilities and in the community. Consistent mask-wearing or proper hand hygiene did not necessarily require formal training during the pandemic but benefited from ongoing supervision and occasional reminders. Therefore, attributing lapses in IPC solely to lack of training may not be entirely accurate, except when referring to comprehensive PPE usage in high-risk areas such as COVID-19 isolation units. Sustaining the improvements reported by participants will require coordinated efforts from health systems, healthcare facilities, and HCWs themselves, though these positive changes are challenged by various other factors [26].

Study participants emphasized the importance of expanded training, advocating for well-structured educational programs and fully operational IPC systems both during outbreaks and routine periods. Previous research has similarly highlighted training as a key determinant of IPC compliance [35], and lessons from the Ebola outbreak in West Africa reinforced this need [16]. In the current context, a robust IPC system would provide critical guidance to HCWs, who often rely on multiple sources of information to determine appropriate PPE use.

Participants also noted that HCWs' belief in the protective effects of the COVID-19 vaccine contributed positively by increasing vaccine acceptance among staff [41]. Prioritizing HCWs for vaccination was considered essential given their high-risk exposure while caring for COVID-19 patients [42]. However, participants observed that vaccination led some HCWs to reduce adherence to IPC measures, despite understanding that the vaccine primarily prevents severe illness rather than infection or transmission. This reduction in compliance is concerning, given the central role HCWs play in the community and their frequent contact with hospital visitors. Nonetheless, high vaccine acceptance reflected a positive attitude toward emerging scientific evidence and confidence in vaccination benefits.

This study has certain limitations. First, it did not capture direct experiences from HCWs actively implementing IPC measures, which would have allowed for triangulation of data. Second, using a structured framework, such as the COM-B model, to design the study and organize results might have facilitated comparisons with other research and provided clearer guidance for interventions. A key strength, however, was conducting the study during a period when health facilities were at high risk of receiving COVID-19 patients, offering timely and relevant insights. Participants were able to provide a comprehensive perspective on conditions across their respective facilities.

Conclusion

The findings indicate that, during the COVID-19 pandemic, barriers and facilitators of IPC compliance among HCWs in Kampala City largely reflected perceived risk of infection. Facilitators included the provision of IPC resources and training on proper PPE use. These results suggest that controlling the spread of COVID-19 among high-risk groups, such as HCWs, requires a comprehensive IPC approach within health facilities. Effective implementation also depends on coordinated efforts between HCWs, hospital management, and government authorities to ensure consistent compliance during COVID-19 and future infectious disease outbreaks.

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