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Original Article

Knowledge, Practices, and Adherence to Infection Prevention and Control among Health Care Providers in the Labour Ward at Busia County Referral Hospital

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Provider's Infection prevention and control (IPC) skills are essential for healthcare (HCPs), particularly in labour wards, where they significantly affect maternal and neonatal outcomes. Hospital-acquired infections (HAIs) are major contributors to maternal and neonatal sepsis, resulting in high morbidity and mortality rates, especially in low- and middle-income countries. This study aimed to assess knowledge, practices, and adherence to IPC among HCPs in the labour ward at Busia County Referral Hospital, focusing on hand hygiene, use of personal protective equipment (PPE), and maintaining a clean environment. A cross-sectional study design was used to collect quantitative data from HCPs directly involved in patient care. The sample size consisted of 11 HCPs, with 10 participants, including 30% nurses, 30% clinical officers, and 40% nursing students. Most participants (40%) were aged 20-25 years, and 60% were male. Data were gathered through self-administered questionnaires and an observational checklist. Analysis was performed using Microsoft Excel, with results presented in tables, graphs, and pie charts. The findings revealed that 90% of HCPs had received formal IPC training. While 60% demonstrated good IPC knowledge, the mean score was 78% for knowledge, 69% for practices, and 50% for adherence. Although HCPs exhibited strong knowledge and practices, their adherence to IPC protocols was only borderline satisfactory. The study suggests that regular IPC training is needed to improve adherence, along with hospital management providing sufficient resources, conducting supervision, and implementing feedback mechanisms for HCPs.

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INTRODUCTION

Infection prevention and control (IPC) is a vital component of healthcare, especially in the prevention of hospital-acquired infections (HAIs). IPC follows a scientific approach aimed at preventing harm to both patients and healthcare workers through the application of measures that stop the spread of infections within healthcare settings. HAIs are defined as localized or systemic infections that result from the introduction of infectious agents during healthcare delivery and were not present or incubating at the time of the patient's admission to the facility. For an infection to occur, six conditions, known as the chain of infection, must be met: the presence of a microorganism, a reservoir, a portal of exit, a mode of transmission, a portal of entry, and a susceptible host. Infection prevention and control measures seek to break this chain and prevent infection (Leone, n.d.).

To ensure effective IPC, the World Health Organization (WHO) has outlined five standard precautions: hand hygiene, use of protective attire, proper processing of used equipment, safe handling and disposal of sharps, and maintaining a clean environment. Pregnant women, especially during delivery, are highly susceptible to infections, making adherence to these precautions critical. Puerperal and neonatal sepsis are among the most common infections in labour wards, significantly contributing to maternal and neonatal morbidity and mortality. According to the Kenya Demographic and Health Survey (KDH, 2022), 15% of maternal

deaths are due to puerperal sepsis, while neonatal sepsis causes 22 deaths per 1,000 live births. These alarming statistics underscore the importance of adhering to IPC protocols to safeguard the health of mothers and their newborns.

Despite established IPC protocols, the effectiveness of infection prevention relies on the knowledge, practices, and adherence of healthcare providers (HCPs). Even when HCPs are well-trained, the availability of resources, such as personal protective equipment (PPE), hand sanitisers, running water, and soap, may limit their ability to implement IPC measures effectively. Continuous training, monitoring, and assessment are essential in identifying gaps and risks that need to be addressed to maintain high IPC standards, especially in high-risk areas like labour wards. This study sought to evaluate the knowledge, practices, and adherence of HCPs to IPC in the labour ward at Busia County Referral Hospital (BCRH) while identifying any existing gaps in IPC protocols and offering recommendations for improvement.

The Clinical Attachment and Research Experience (CARES) program is a six-week course offered to fifth-year medical students at Maseno University. It aims to provide students with hands-on experience in various county hospitals across Kenya. The program has three core objectives: to engage students in the hospital's administrative and managerial activities, to involve them in community health programs, and to enhance their clinical skills through rotations in different hospital departments.

As part of the administrative and managerial component, students meet with the hospital administration and the Sub-County Health Management Team (SCHMT) to learn about their roles and challenges. They may also participate in decision-making processes at the sub-county level. The community health activities include health talks at maternal and child health (MCH) clinics and collaborative efforts with non-governmental organizations (NGOs). During clinical rotations, students work in various departments to sharpen their clinical skills in preparation for their future medical careers. By the end of the program, students are expected to have identified a gap in the hospital's operations, conducted a study, and provided recommendations for improvement, which are then submitted to both the hospital and the school faculty. This study, conducted at BCRH, focuses on the gaps in IPC in the labour ward and aims to provide practical solutions to improve healthcare delivery in this critical area.

Busia County is located in western Kenya and borders Uganda to the west. The county has seven sub-counties: Bunyala, Butula, Matayos, Namable, Samia, Teso North, and Teso South. According to the 2019 census, Busia County has a population of 893,681, with 426,252 males and 467,401 females, along with 28 individuals identifying as intersex. The population is predominantly rural, with 779,928 people residing in rural areas and 113,753 in urban areas. The county is mainly inhabited by the Luhya, Teso, and small groups of the Luo communities. The economy is driven by farming, trade, and tourism (Busia County, Wikipedia).

Busia County has 193 healthcare facilities, with 98 of them managed by the Ministry of Health, 13 faith-based, 9 owned by NGOs, and 73 private facilities (Labflow Kenya, 2022). BCRH, a level 4 hospital, is the primary referral hospital in the county. It was established in 1972 and gazetted in 1979. With a bed capacity of 210 and an average daily admission of 40-50 patients, BCRH serves a catchment population of 67,765. The hospital has

two main departments: outpatient and inpatient. Inpatient services include maternity, neonatal, male and female surgical, male and female medical, gynaecology, and pediatric wards. Patients typically stay in the hospital for an average of four days (Studocu, n.d.).

The goal of infection prevention and control is to minimize the risk of spreading infections among patients and healthcare workers. In the labour ward, IPC practices are essential for ensuring positive maternal and neonatal outcomes. However, several gaps in IPC practices were observed during this study. These included the reuse of examination beds without proper cleaning between patients, insufficient PPE, and inadequate access to running water and soap. This study aims to assess the knowledge and practices of HCPs regarding IPC and observe their adherence to IPC protocols in the labour ward at BCRH.

Labour wards are high-risk environments for infection, and poor hygiene practices can put both mothers and newborns at risk of sepsis. However, there is limited information on the knowledge, practices, and adherence of HCPs to IPC protocols in the labour ward at BCRH. This research seeks to assess the knowledge and practices of HCPs regarding IPC and observe their adherence to IPC protocols. The findings will help identify potential gaps in IPC measures and provide feedback to hospital administration and healthcare workers to improve patient outcomes. The study aimed to evaluate the crucial role of IPC in the labour ward and to assess the knowledge, practices, and adherence of HCPs to these essential protocols. The specific objectives addressed by the authors include;

Specific Objectives

- To assess the knowledge level of healthcare providers in the labour ward regarding IPC protocols.

- To evaluate the current practices of healthcare providers in infection prevention in the labour ward.
- To determine the adherence level of healthcare providers to IPC protocols in the labour ward.

METHOD AND MATERIALS

Study Area

The study was conducted at Busia County Referral Hospital (BCRH) in the labour ward. BCRH is located in Busia municipality, 200 meters off the Kisumu-Busia to Uganda highway. It has a bed capacity of 210, with an average of 40-50 daily admissions (Busia County Referral Hospital, n.d.). The maternity unit of the hospital is divided into several sections: the antenatal ward, postpartum ward, post-caesarean section ward, labour room, newborn unit, kangaroo room, and isolation rooms. The labour room itself has a capacity of four beds, with an average daily admission of 12-15 mothers and approximately 8 deliveries each day. The choice of BCRH as the study area was based on the hospital's importance as a referral centre, its high patient flow in the labour ward, and the observed gaps in infection prevention and control (IPC) practices in this high-risk area, making it an ideal site for assessing healthcare provider knowledge, practices, and adherence to IPC protocols.

Study Design

A cross-sectional study design was employed to collect quantitative data. The cross-sectional design was chosen because it allows data to be collected at a specific point in time, making it suitable for assessing the knowledge, practices, and adherence levels of healthcare providers (HCPs) to IPC protocols in the labour ward. This design also facilitates the identification of gaps and areas for improvement without the need for extended follow-up periods, which was crucial given the study's limited timeframe.

Study Population

The study population consisted of healthcare providers (HCPs) working in the labour ward at BCRH. These HCPs included medical officers, nurses, clinical officers, and nursing students who had direct contact with patients in the labour ward. At the time of the study, there were 12 HCPs attached to the labour ward. The study focused on these professionals as they were directly responsible for implementing and adhering to IPC measures in the labour ward, and their knowledge and practices significantly impacted the infection risk to mothers and newborns.

Inclusion Criteria

HCPs working in the labour ward who consented to participate in the study were included. This also encompassed student nurses, who, despite their in-training status, played a role in patient care and IPC implementation in the labour ward. The inclusion of these student nurses allowed for a broader understanding of IPC knowledge and practices across different professional levels.

Exclusion Criteria

HCPs who declined to participate in the study or those attached to other sections of the maternity unit, such as the antenatal or postpartum wards, were excluded. This exclusion was necessary to maintain the focus on the labour ward, which has unique infection risks compared to other maternity sections.

Sample Technique and Sample Size

A purposive sampling technique was used to select participants. Given the small number of HCPs (12) working in the labour ward at the time of the study, the sample size included all 12 HCPs. This approach was justified by the limited population of eligible participants, making it practical to include everyone in the study to ensure comprehensive data collection. The use of purposive sampling was also appropriate, as the study specifically targeted

individuals with direct involvement in patient care in the labour ward.

Data Collection Tools

Two main tools were used for data collection: a self-administered closed-ended questionnaire and an observational checklist. The questionnaire was designed to assess the knowledge and practices of HCPs related to IPC. It was inspired by a similar study (Mutaru et al., 2022) and contained three sections:

- **Section A:** Demographic information of respondents, including professional rank, age, gender, and formal IPC training.
- **Section B:** Ten multiple-choice questions aimed at assessing knowledge on IPC practices such as hand hygiene, use of PPE, and maintaining a clean environment. Each correct response earned one point, and scores were categorized as good (75% or above), moderate (50%-74%), or poor (below 50%) based on studies from Saudi Arabia (Saati, & Alkalash, 2022) and Tanzania (Silago et al., 2022).
- **Section C:** Ten questions aimed at assessing IPC practices, using a yes/no format to elicit responses on hand hygiene, PPE use, and maintaining a clean environment.

An observational checklist was also used to evaluate adherence to IPC protocols during routine activities in the labour ward. This checklist was based on the CDC's Quick Observation Tools (QUOTs) for infection prevention (CDC, 2021). The checklist measured adherence to IPC protocols through direct observation of practices such as handwashing, PPE use, and equipment disinfection. Each item on the checklist elicited a yes/no response, where 'yes' indicated adherence and 'no' indicated non-adherence.

Data Collection Procedure

The data collection procedure began with an explanation of the study objectives and procedures

to the nurse in charge of the labour ward and all participating HCPs. The questionnaires were then placed at the reception desk of the labour ward, where HCPs could pick them up and complete them anonymously. Participants were given 24 hours to fill out the questionnaire and return it to the same reception desk. This method was chosen to maintain confidentiality and reduce the likelihood of response bias, as participants could complete the questionnaire without feeling monitored. Observational data was collected using the checklist during routine working hours in the labour ward. The researcher observed IPC practices as they occurred naturally, without interference, to ensure that the data reflected actual practices rather than altered behaviours that might occur under direct scrutiny.

Data Analysis and Presentation

Data analysis was performed using descriptive statistics, including means, frequencies, and standard deviations, which were calculated using Microsoft Excel. This method was chosen for its simplicity and ability to present a clear, concise overview of the findings. Data were then presented in tables, pie charts, and graphs, allowing for easy interpretation and comparison of HCPs' knowledge, practices, and adherence to IPC protocols.

Limitations

Several limitations affected the study. First, the small sample size of 12 HCPs limited the ability to generalize the findings to all healthcare providers in BCRH or other similar hospitals. Additionally, the limited time frame of the study did not allow for an in-depth assessment of IPC adherence over an extended period. The relatively narrow scope of questions in the questionnaire also meant that some areas of IPC knowledge and practices may not have been fully explored. Despite these limitations, the study provides valuable insights into IPC practices in the labour ward at BCRH.

Ethics Considerations

Ethical approval to conduct the study was sought and obtained from the Medical Superintendent of BCRH. Informed consent was obtained from all participants through a consent form attached to the questionnaire. Participants were required to tick the consent box to confirm their willingness to participate in the study. This process ensured that participation was voluntary and that respondents understood the study's purpose and their role in it. Maintaining anonymity in the questionnaire distribution and data collection process helped protect participants' privacy and encouraged honest responses.

FINDINGS AND RESULTS

Demographics

The study included 10 participants, achieving a response rate of 83%. The average age was 27.3 years with a standard deviation of ± 5.2 . The majority (60%) of participants were professionally trained healthcare providers, including nurses and clinical officers, while nearly all (90%) had received prior infection prevention and control (IPC) training. More than half of the participants (60%) were male. These demographic findings are detailed in Table 1.

Table 1: Demographics of Participants

S/No	Variable	Item	Frequency	Percentage
1.	Professional rank	Clinical officer	3	30%
		Nurse	3	30%
		Nursing student	4	40%
2.	Age in years	20-25	4	40%
		26- 30	3	30%
		Above 30	3	30%
3.	Gender	Female	4	40%
		male	6	60%
4.	Formal training on IPC	Yes	9	90%
		No	1	10%

Knowledge on IPC

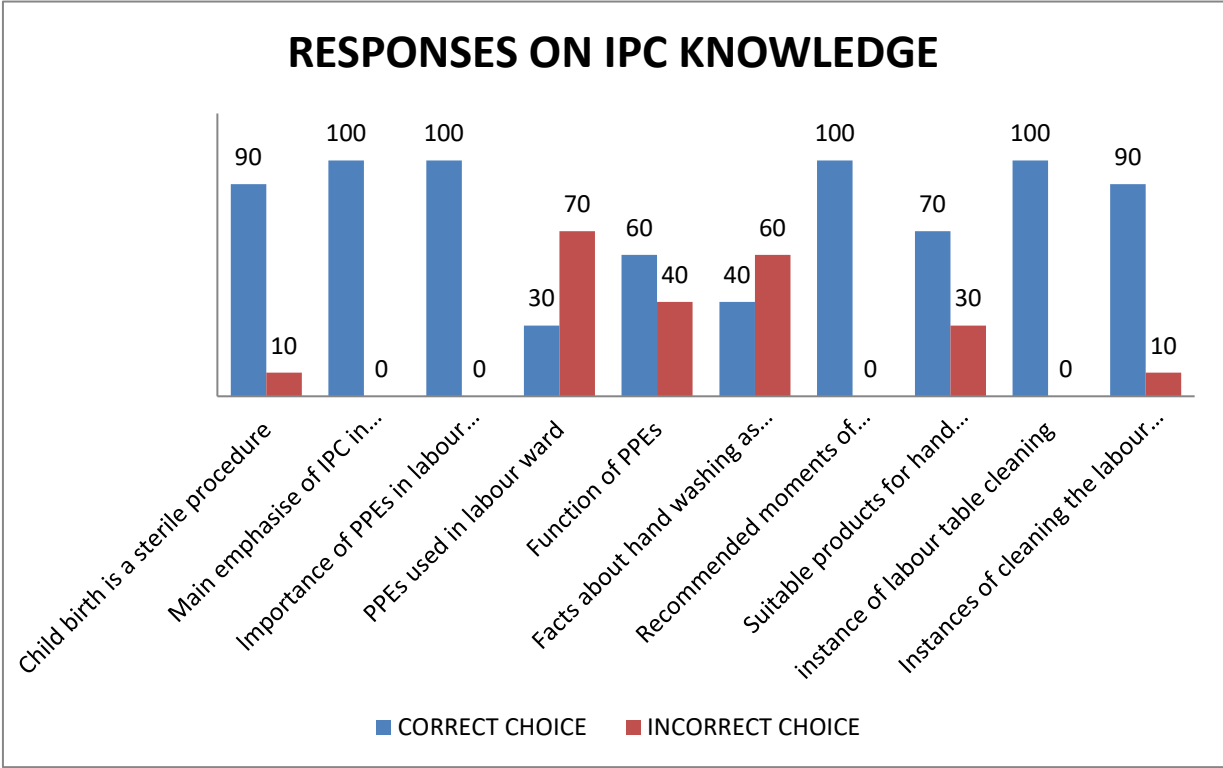
The results revealed that 60% (n=6) of the respondents scored 80% or higher on knowledge of infection prevention and control (IPC), while 40% (n=4) scored 70%. The mean score was 78%, indicating good knowledge among healthcare providers (HCPs) at Busia County Referral Hospital (BCRH). Nearly 90% of the respondents recognized childbirth as a sterile procedure, and all participants understood that the primary goal of IPC is to reduce hospital-acquired infections (HAIs). While only 30% could accurately identify the necessary personal protective equipment (PPE) in the labour

ward according to WHO standards, 60% demonstrated knowledge of the function of each PPE. However, just 40% were aware of the specific guidelines for hand hygiene, though all respondents knew when handwashing was required, such as before and after patient contact and before childbirth. Additionally, all participants agreed that the labour table must be cleaned after each delivery and during every shift, with 90% recognizing proper cleaning procedures for the labour room. These findings suggest that, while the overall knowledge of IPC was good, specific areas, particularly regarding PPE and hand hygiene practices, need further attention and improvement.

Table 2: Score per Participant

Number of participants	Score per participant
2	90%
4	80%
4	70%

Figure 1: Knowledge of IPC



Infection Prevention Practices

The participants scored an average of 69% on correct infection prevention and control (IPC) practices. Despite this score, 90% acknowledged that they implemented adequate IPC practices in the labour ward. The majority (80%) confirmed that they washed their hands with running water and soap, and nearly all (80%) reported following all steps of handwashing within the recommended time according to WHO guidelines. However, more than half (60%) of the healthcare providers (HCPs) did not consider handwashing as a substitute for wearing gloves. Gloves and gowns were universally

used (100%) during childbirth, while masks and footwear were used by 90% of participants. Notably, 90% of respondents admitted to reusing certain personal protective equipment (PPE), including footwear (80%), masks (30%), gowns (30%), and capes (20%) between patients. Furthermore, 90% reported having a regular cleaning schedule for the labour room surfaces and a clear protocol for maintaining cleanliness. These findings imply that while the participants generally recognized the importance of IPC practices, the reuse of PPE and potential gaps in hand hygiene could compromise infection control efforts.

Table 3: Score per Participant on IPC Practices

Number of participants	Score per participant
1	100%
2	80%
5	70%
1	50%
1	30%

Figure 2: Practices on IPC

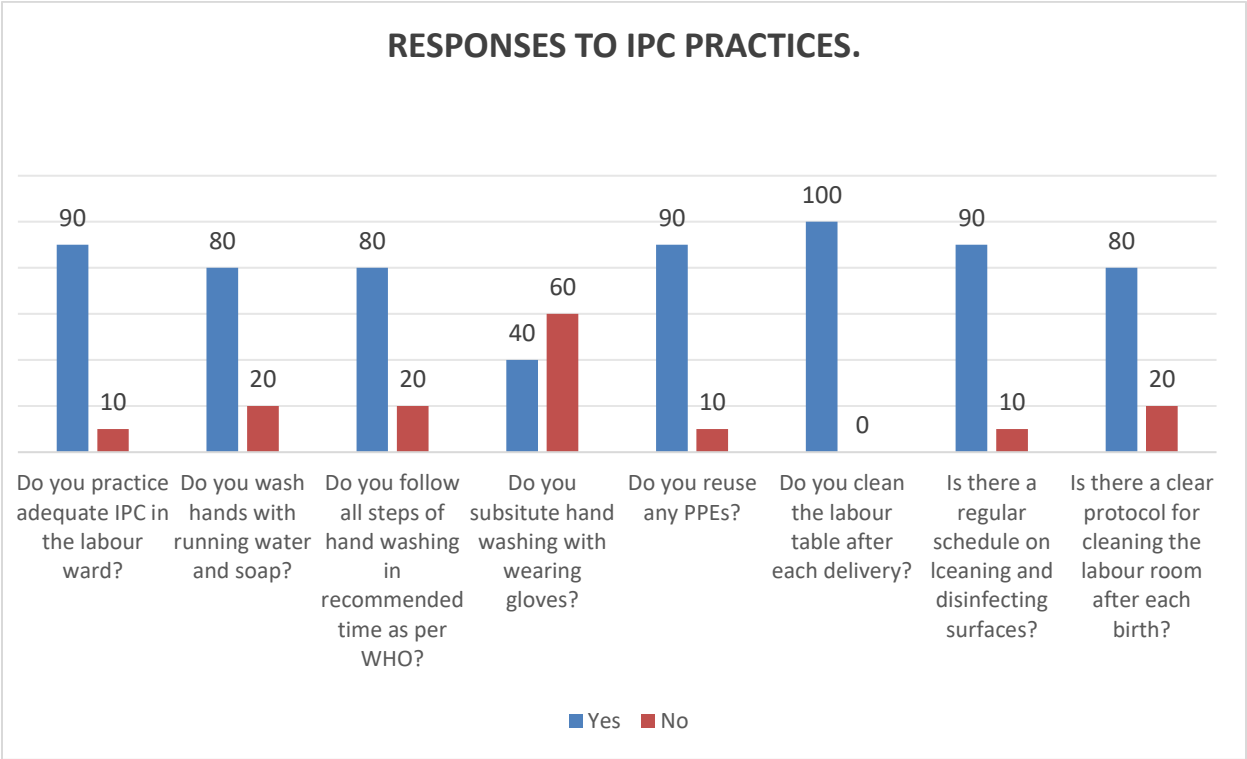


Figure 3: PPEs Worn During Child Birth

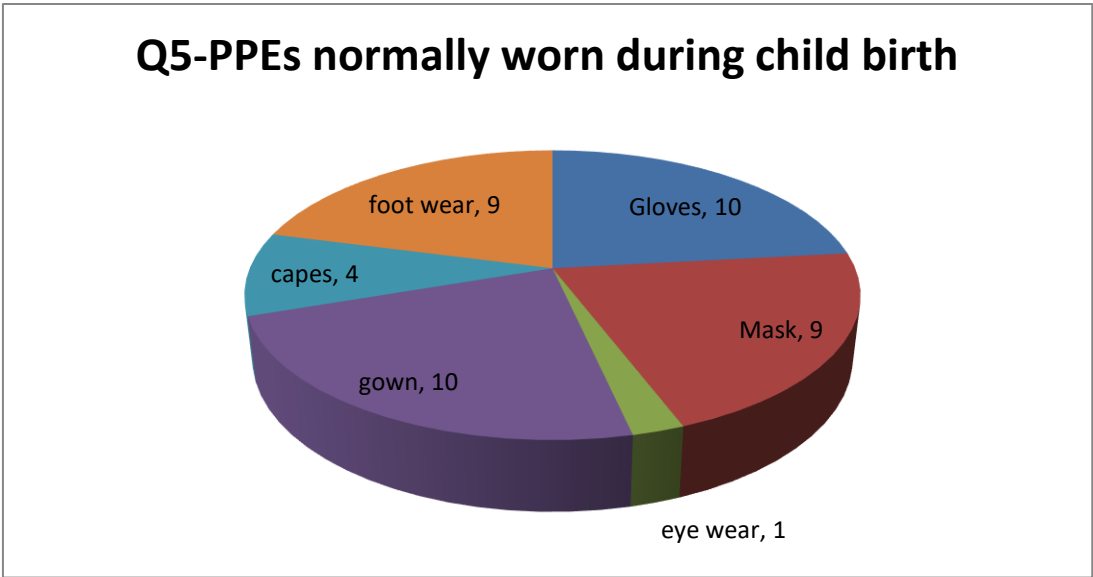
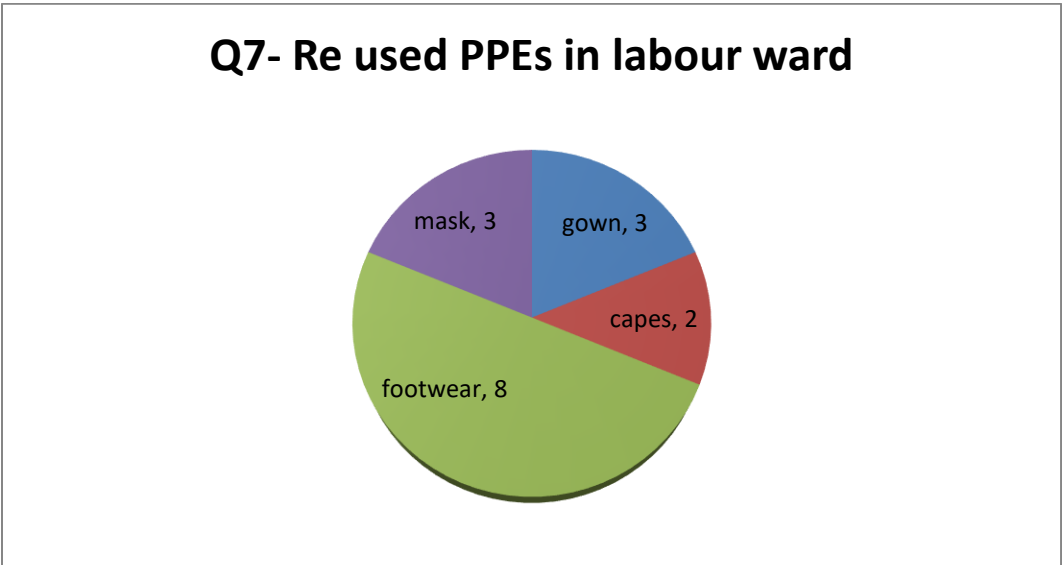


Figure 4: Re-used PPEs

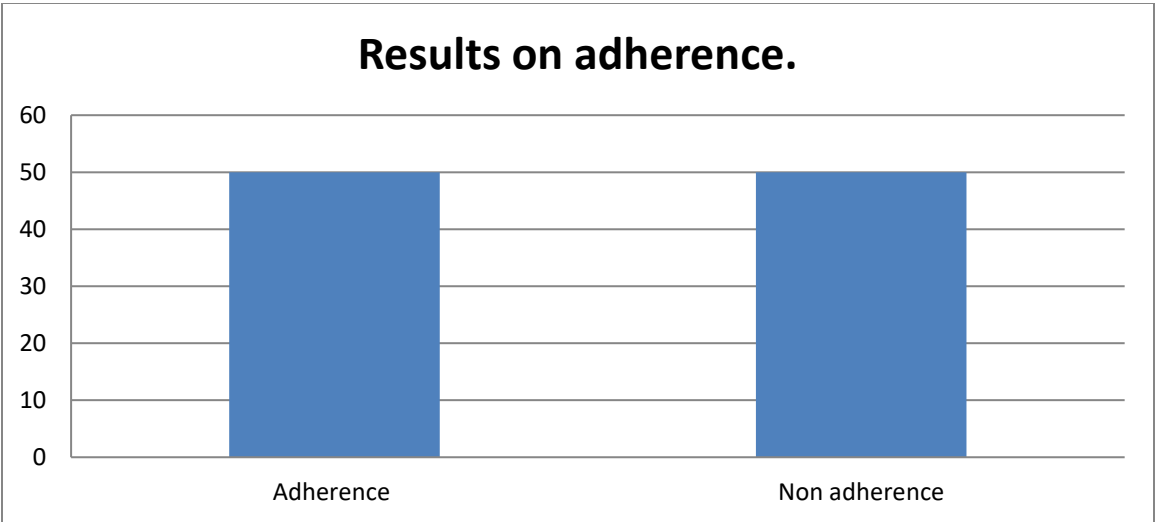


Adherence to IPC

The study assessed adherence to infection prevention and control (IPC) among healthcare providers (HCPs) in the labour ward, revealing a score of 50%, indicating fair adherence levels. While sterility was maintained during childbirth and running water was available for handwashing, soap was absent, which compromises effective hygiene practices. Alcohol rubs were consistently available and frequently utilized for hand hygiene, and handwashing was conducted at recommended intervals. However, the availability of personal

protective equipment (PPE) was limited; only gloves were consistently accessible, while gowns, eye shields, masks, and capes were unavailable. Consequently, HCPs were not wearing the full range of recommended PPEs. Although the labour ward was cleaned during each shift and after spills, the lack of a regular cleaning schedule and clear protocol for disinfecting the labour room and surfaces raises concerns. These findings imply that while some IPC measures were implemented, significant gaps in adherence could increase the risk of hospital-acquired infections.

Figure 5: Results on Adherence Level



DISCUSSION

The ongoing battle against maternal and neonatal mortality remains a critical healthcare concern, especially in developing countries. With increased encouragement for women in low- and middle-income countries to utilize hospital maternity services, the prevalence of healthcare-associated infections (HAIs) remains alarmingly high (de Barra et al., 2021). HAIs contribute to at least 9% of maternal mortality and 16% of neonatal deaths globally (BMC Health Services Research, n.d.). This study's findings underscore the necessity of implementing effective infection prevention and control (IPC) protocols to mitigate these statistics, especially since yearly, 3 million newborns are affected by sepsis, leading to approximately 500,000 deaths (Peters et al., 2020). Moreover, maternal sepsis accounts for 11% of maternal deaths, primarily originating in labour wards. Enhanced practices, such as proper hand hygiene and the correct use of personal protective equipment (PPE), are essential in curbing these alarming figures.

This study specifically focused on healthcare providers (HCPs) who directly interact with patients in the labour room, highlighting their pivotal role in infection transmission and the overall health outcomes for mothers and infants. Despite 90% of HCPs reporting prior training in IPC, adherence scores were disappointingly low at only 50%, indicating a gap between knowledge and practice.

Knowledge on IPC

In this study, HCPs displayed commendable knowledge regarding IPC, evidenced by an average score of 78%, with 60% achieving scores above 80%. This finding aligns with previous research by Mutaru et al. (2022), which reported a similar high knowledge score of 72.6% among healthcare professionals. However, this contrasts with a study conducted in Tanzania, where more than 75% of participants demonstrated good knowledge alongside 88.3% receiving IPC training (Silago et

al., 2022). In some regions, such as South East Ethiopia, Geberemariam et al. (2018) found that 46.3% of respondents had inadequate IPC knowledge, while a study in Korea revealed only 36.6% of HCPs exhibited sufficient knowledge (Nofal et al., 2017). Such discrepancies may stem from variations in training effectiveness, healthcare system infrastructure, and local health policies. As evidenced by previous research, effective training has been shown to enhance HCPs' IPC knowledge (de Barra et al., 2021; Umscheid et al., 2011). Additionally, while all respondents recognized the critical importance of IPC, only 30% could identify the PPEs recommended by WHO for the labour ward (Leone, n.d.). This gap suggests that while knowledge exists, practical application remains insufficient.

Practices

Self-reported practices yielded an average IPC score of 69%, indicating moderate adherence to IPC protocols. This finding is consistent with results from Ashebir et al. (2022) and Yazie et al. (2019), but contrasts with a mixed-methodology study that found only 55.6% adherence among 378 HCPs (Kassa et al., 2022). Specifically, 80% of HCPs reported washing hands with running water and soap and following all recommended handwashing steps. These findings corroborate Silago et al. (2022), who found similarly high rates of handwashing adherence. Conversely, Almoslem et al. (2021) reported only 61% compliance, and Gon et al. (2020) noted scores below 50% in low- and middle-income countries. The lack of full PPE usage among HCPs during childbirth is alarming, aligning with El-Ghitany et al. (2023), where only 5.9% wore complete PPE, while Khashaba et al. (2022) found 65.1% of HCPs did not adhere to full PPE protocols. This suggests systemic issues related to PPE availability and usage practices. Notably, 90% of HCPs acknowledged reusing some PPEs between patients, which poses a significant risk for contamination, as highlighted by Doos et al. (2022). While the current study identified good practices in

maintaining a clean environment, it contrasts sharply with findings from Cronk et al. (2021), who reported that 73% of facilities in rural Africa did not meet WHO cleanliness standards.

Adherence

Adherence to IPC protocols was evaluated through direct observation, resulting in a compliance score of 50%, reflecting a significant variance of 19% compared to self-reported practices. This aligns with Randle et al. (2010), who recorded a 65% compliance rate in a 24-hour observational study but is higher than Amsalu, & Kassaye's (2022) report of only 10.6% compliance. Non-adherence to IPC protocols contributes significantly to neonatal and puerperal sepsis and increases the risk of antimicrobial resistance. Although sterility was maintained during childbirth, recontamination by HCPs was frequently observed, as reported by de Barra et al. (2021). Contributing factors included the high workload and the tendency for a single HCP to manage the delivery without assistance.

The current study revealed that while HCPs understood the importance of hand hygiene, the lack of available soap significantly hindered compliance, as noted by Ahmadipour et al. (2022). Furthermore, despite HCPs' awareness of the essential PPE needed, their poor adherence stemmed largely from the unavailability of these materials. Research conducted in India highlighted that PPE availability is crucial for adherence (George et al., 2023), while Reid et al. (2011) emphasized that accessibility strongly influences adherence rates. The current study indicated that non-sterile gloves were always available, but other PPE items, such as gowns and masks, were not readily accessible. This scarcity mirrors findings from Malawi, where certain PPEs were available, but critical items were lacking (Madziater et al., 2020).

Maintaining a clean environment in the labour ward is vital for patient safety. The current study found good adherence to cleaning protocols during shifts and after deliveries, despite the absence of a formal

cleaning schedule. This supports the necessity for structured cleaning protocols to ensure the safety and cleanliness of the environment, as recommended by the WHO (2016). While HCPs in this study exhibited good knowledge and self-reported moderate adherence to IPC protocols, practical challenges such as the lack of essential resources and inconsistent cleaning protocols hindered effective implementation. Addressing these barriers is essential to enhance IPC practices and ultimately improve maternal and neonatal health outcomes.

CONCLUSION AND RECOMMENDATIONS

Healthcare providers at BCRH labour ward exhibited good knowledge of infection prevention and control (IPC) protocols; however, their practices reflected moderate adherence, revealing a disparity between self-reported behaviours and actual compliance. This discrepancy is largely attributed to the lack of essential resources, which increases the risk of disease transmission and cross-contamination among mothers, newborns, and healthcare providers. To mitigate these risks, it is crucial to implement continuous education on IPC for healthcare providers, ensuring they are updated with the latest guidelines and provided with adequate resources for effective practice.

To enhance IPC adherence, it is recommended that healthcare providers actively pursue ongoing education on infection prevention, consistently apply IPC protocols in their daily routines, and adhere to established standards. Additionally, hospital management should organize regular continuing medical education (CME) and IPC training sessions for staff to upgrade their knowledge, supply necessary PPEs, and ensure their accessibility. Regular supervision of HCP practices is vital for identifying gaps while reviewing and updating in-house guidelines and policies, which will enhance adherence. Lastly, establishing a feedback system for HCPs to communicate with hospital administration will facilitate better implementation of IPC policies and procedures.

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