ASSESSMENT OF INFECTION PREVENTION AND CONTROL KNOWLEDGE, PRACTICES, IMPLEMENTATION AND BARRIERS AMONG HEALTHCARE WORKERS AND SUPPORT STAFF AT PUMWANI MATERNITY HOSPITAL, NAIROBI KENYA

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Thesis submitted is for a dissertation which is in partial fulfilment for the award of the Degree of Master of Science in Tropical and Infectious Diseases of University of Nairobi.

DECLARATION

I, Dr Daisy W. Kouko declare that this is my original work and that to the best of my knowledge it has not been presented before for a degree or any other academic award at this or any other university, and all references to published works have been duly acknowledged.

Signed ____  _____

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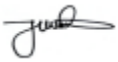
Signature  Date 08/12/2023

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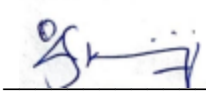
Signature  Date 08/12/2023

LIST OF ABBREVIATIONS AND ACRONYMS

CDC - Centers for Disease Control and Prevention

CI - Confidence Interval

ERC - Ethics and Research Committee

HAIs - Healthcare Acquired Infections

HCW - Healthcare Workers

IBM SPSS - International Business Machines Corporation Statistical Product and Service Solutions

ICU - Intensive Care Unit

IPC - Infection Prevention and Control

IPCAF - Infection Prevention and Control Assessment Framework

IQR – Interquartile Range

KNH - Kenyatta National Hospital

MOH - Ministry of Health

NACOSTI – National Commission for Science, Technology and Innovation

OHS - Occupational Health and Safety

OR – Odds Ratio

PMH - Pumwani Maternity Hospital

PPE - Personal Protective Equipment

PRIMA - Partners for Research and Innovation in the Mediterranean Area

UNITID - University of Nairobi institute of Tropical and infectious Diseases

UON - University of Nairobi

WHO - World Health Organisation

OPERATIONAL DEFINITIONS

Healthcare-associated infections - Infections acquired within a hospital setup that were previously not present.

Healthcare worker - Someone who offers medical care or services to the ailing

Hospital housekeeping - Sustaining a sanitary and sterile environment in the hospital.

Knowledge - Understanding of something

Morbidity - Condition of suffering from a disease or medical condition

Mortality - The state of being subject to death

Nosocomial Disease - Disease originating from a hospital.

Personal protective equipment - Clothing including masks, goggles and aprons meant to shield one from harmful substances.

Support staff – These include employees within healthcare environment who do not have high contact with patients in the wards.

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ABSTRACT

Background: Healthcare-associated infections (HAIs) represent significant threats to the safety of patients and lead to cases of increased morbidity, mortality and treatment costs in both public and private hospitals. While HAIs remain a public health concern globally, Sub-Saharan countries are the most affected, with Centers for Disease Control and Prevention (CDC) estimating the prevalence to be higher than 40%. Infection prevention control (IPC) knowledge and practices can play a central role in reducing the rate of HAIs.

Objective: To assess IPC knowledge and practices among healthcare workers and support staff, establish the level of implementation of IPC guidelines and identify barriers to IPC implementation at Pumwani Maternity Hospital, Nairobi Kenya.

Methodology: A cross-sectional survey design was adopted for the study using the employee population in Pumwani Maternity Hospital. A random sampling formula was utilized to compute the sample size of 171 healthcare workers including medical officers, nursing officers, clinical officers and hospital housekeeping support staff. Self-administered questionnaires were used to collect the data. Data were analysed using descriptive and inferential statistical techniques.

Results: The majority of the respondents, 102 (64.6%), were female. The median age was 33 (IQR: 29 – 37.5) years; 82 (51.9%) of the respondents were nursing officers, 32(20.3%) were housekeeping staff, while 23 (14.6%) were medical doctors. The median years of experience was 7 (IQR: 3 – 12) years. The overall knowledge of IPC guidelines was good (73%) with knowledge on different components assessed being waste segregation (92%), protective gloves (91%), housekeeping (85%), reusable equipment (84%), hand hygiene (80%), personal protection (75%) and injection and blood samples (68%). Respondents aged between 30 and 49 years OR =5.83, (95%CI: 1.43 – 23.88), p = 0.014, working experience of between 5 -10 years OR = 6.0, (95%CI: 1.84 – 19.57), p=0.003 and >10 years OR =4.34, (95%CI: 1.37 – 13.79), p =0.013 were more likely to have good knowledge on IPC guidelines. Compliance with IPC guidelines and practices was 36%. Clinical officers OR = 11.11, (95%CI: 2.72 – 45.46), p =0.001, support staff OR = 3.78, (95%CI: 1.61 – 8.86), p = 0.002 and good knowledge on IPC OR = 3.79, (95%CI: 1.55 – 9.23), p = 0.002 were associated with increased likelihood of compliance. The common limits to compliance with IPC practices were staff shortage and high hospital patient flow.

Conclusion and recommendation: The findings showed a good level of knowledge, although compliance with national IPC guidelines was low. Thus, there is a need for the hospital administration to provide copies of IPPC policy guidelines in all wards/units and ensure effective implementation through constant supervision as well as recruit more IPC team members.

1. INTRODUCTION

Infection prevention knowledge and practices play a central role in the control, prevention, and reduction rate of healthcare-associated infections (HAIs). HAIs are infections that develop in healthcare settings during clinical, diagnostic, and therapeutic procedures that were not present when the patient was admitted (Assefa, Diress, and Adane 2020). HAIs threaten patient safety, and increase morbidity, mortality, and healthcare cost. HAIs prolong hospital stays, predispose patients to long-term disability, increase resistance to antimicrobials, burden patients and families with high treatment and care costs, and cause unnecessary deaths. HAIs are a significant economic burden on healthcare systems (Geberemariyam, Donka, and Wordofa 2018).

HAIs are a significant public health concern in both developed and developing countries. A 2011 systematic review estimated that the prevalence of HAIs was 7.6% in developed countries and 10.1% in developing countries; World Health Organization (WHO) 2011. A 2016 fact sheet also reiterated that for every 100 hospitalized patients in high-income countries, at least 7 will acquire at least one HAI in comparison to 10 in low-income countries (WHO, 2016). Centers for Disease Control and Prevention (CDC), notes that about 2 million patients acquire HAIs in United States hospitals annually. It estimates the prevalence of the HAIs in United States and Europe at 6% in acute care hospitals, with prevalence being higher in intensive care units (ICU) patients, at 19.5%. CDC estimates the prevalence in Latin America, Asia and Sub-Saharan Africa to be higher than 40% (CDC, 2018). The high prevalence rates are associated with poor infection prevention knowledge at the facility and the failure of healthcare workers to consistently practice infection prevention measures (Rothe & Schlaich, 2013).

Despite the high level of HAIs prevalence in Sub-Saharan Africa, studies have reported mixed findings on the level of prevention knowledge and practices. A study by (Assefa, Diress, and Adane. 2020) in Ethiopia showed that most health workers had adequate infection prevention knowledge and half of those surveyed practiced them regularly, with similar results reported by (Geberemariyam, Donka, and Wordofa. 2018). However, in both studies, the level of knowledge and practice was determined by work experience and infection prevention training. In Uganda, a study at St. Daniel's Comboni hospital on compliance with standard precautions found that most health workers had fair knowledge about infection prevention, but adherence to recommended

practices was poor. The hospital also lacked standard guidelines for infection prevention (Orishaba, 2016). A Nigerian study on knowledge and practice of infection control revealed that hand washing was regarded as the most effective method for the prevention of HAIs, and that a greater number of the participants were cognizant of ways of reducing exposure to HAIs; however, there was a lack of periodic refresher training (Iliyasu et al. 2016).

Research conducted by Gichuhi et al. 2005 investigated IPC practices in Level 4 Hospitals in Kenya. The aim was to identify the level of adherence to IPC policies, determine the level of adoption of these policies at the hospital, and establish barriers to compliance. The research revealed that healthcare workers had good knowledge of these areas and that the level of awareness of policies was very high (98.7%). It was established that the hospital frequently experienced water scarcity, there were challenges in updating the policies and guidelines, and workers needed to receive continuing professional education on infection prevention practices and control (Gichuhi et al. 2015). A large-scale assessment of compliance with IPCs that recruited 14,328 patients in 935 healthcare facilities focused on five main domains: level of hand hygiene, injection and sampling of blood, use of protective gloves, waste segregation and disinfection of reusable equipment. Findings showed that strict compliance varied across domains. Hand hygiene had the highest level of use. Unlike earlier studies analysed such as Assefa et al. (2020) and Geberemariyam et al. (2018), this study reported a weak association between compliance and the level of knowledge of IPC, in addition to training in IPC practices (Bedoya et al. 2017). The hospital-specific and country-level variations call for more investigations to generate empirical evidence for improving IPCs implementation and compliance, and subsequently reducing the healthcare burden attributed to HAIs.

2. LITERATURE REVIEW

Kenya has developed a policy for healthcare services on infection prevention to prevent, identify, monitor and control the spread of infections in healthcare facilities. The Ministry of Public health and Sanitation, working with the Ministry of Medical Services in 2010, presented a report which stated that IPC guidelines resulted in reduced hospital stays, long-term disabilities, financial burden and reduced resistance of microorganisms to antimicrobials. The successful implementation of IPC guidelines depends on effective management, supervision and organization at the national, provincial, district and institutional levels. This chapter discusses literature covering areas, namely the study's empirical review and conceptual framework.

In 2019, World Health Organization (WHO) identified core components in achieving implementation of IPC guidelines. These include having IPC programmes and guidelines at different levels in a region, having recurrent IPC education and training, having healthcare-associated infections surveillance and addressing staffing and workload issues within facilities.

2.1. Knowledge of Infection Prevention and Control among Healthcare Workers and support staff

Across the globe, knowledge of IPCs differs greatly across hospitals and jurisdictions. Alhumaid et al. 2021 retrieved 3414 publications and selected 30 for analysis using Partners for Research and Innovation in the Mediterranean Area (PRIMA). Out of the selected 30, 26 examined level of knowledge. The level of knowledge was marked "aware", "knowledgeable", "high", "adequate", "good" and "fair". Five studies were rated as "aware" (77.9-94.7%), two studies as "adequate" (70.8%-84.7%), three studies had high knowledge (80.2%-84%), and two were knowledgeable (53.7%-76%). In four other studies, the level of knowledge was categorized as excellent ((≥90%,) in one study, two studies as good (74.4%–99%) and one as fair (60%). However, the commonest level of knowledge was characterised as low (25%-34%) and poor (50%) in the remaining studies. (Alhumaid et al. 2021).

Individual studies across jurisdictions also report varying levels of knowledge on IPC. In North-Western Nigeria, Iliyasu, et al. 2016 explored IPC knowledge and practices in a referral centre,

including the healthcare workers. This was a cross-sectional study that used a questionnaire to collect data from 152 nurses and 48 doctors. A majority of the participants (87.9%) affirmed to hand washing as the most efficient HCAI prevention strategy. Nurses rated highly in IPC knowledge and practices compared to doctors (91%). Apart from handwashing, avoiding injuries from sharp objects (86%), using barrier precaution (90%), and hand hygiene were thought to effectively prevent HCAI (Iliyasu et al. 2016). While the study reports high levels of IPC knowledge and practices in the hospital, the variations between doctors and nurses present an opportunity for further investigation.

In Namibia, researchers evaluated knowledge and attitudes of IPC using health science students at the University of Namibia. Data was collected from 162 students (31 medical, 17 radiography, and 114 nursing students). Findings revealed no significant differences between the genders, with variations across the professional categories. Doctors had the highest IPC knowledge scores (73%), in comparison to 66% in nursing and 61% among radiology students (Ojulong, Mitonga, and Iipinge 2014). Similarly, high levels were described by Desta et al. 2018 study of IPC knowledge among healthcare workers at Debre Markos Referral Hospital. Out of 150 participants, 84.7% were knowledgeable; however, a lower percentage, 57.3%, demonstrated good practice. Age and education had a significant effect on IPC knowledge. Older professionals and those holding higher education status were positive indicators (Desta et al. 2018). An investigation of IPC knowledge and compliance among 75 health professionals drawn from regional referral hospitals in Northern Uganda reported the level of IPC knowledge at 69%, with compliance at 68%. However, while compliance was significantly linked to training and institutional support, the research concluded that there wasn't a significant connection between the level of knowledge among health workers and the level of institutional compliance (Amanya et al. 2021).

In Ethiopia, in a cross-sectional survey of 271 respondents drawn from Wolaitta Sodo teaching and referral hospital, 93.4% had a good attitude towards IPC, 99.3% had good knowledge towards IPC, and 39.5% of healthcare workers had poor practice. Using bivariate and multivariate logistic regression, findings showed that sex, working in different departments, and requisite training were fundamentally associated with attitude, knowledge, and practice (Hussein et al. 2017). In a separate study at the University of Gondar Comprehensive Specialized Hospital in North-West Ethiopia, the methodology used the cross-sectional study of 236 respondents revealed that 90% had good

knowledge and 57.2% had a positive attitude. In contrast, only 36% practised good study. Pearson's Chi-square tests indicated that education level and work experience were fundamentally associated with safe IPC attitude, knowledge and practice (Bayleyegn et al. 2021). Another cross-sectional study by Orishaba (2016) at St. Daniel's Comboni General Hospital, located in South-West Ethiopia sampled 49 healthcare workers, out of which 36 completed the questionnaire. Results revealed average levels of IPC knowledge and very low levels of practice. The facility lacked IPC guidelines (Orishaba, 2016). These three studies from Ethiopia indicate varying levels of IPC attitudes, knowledge and practice in various hospitals, indicating the need for hospital-level studies as the source of actionable research.

Researchers outside Africa have also reported these variations. In Brazil, a cross-sectional survey incorporating 308 nurses, technicians, doctors, and physiotherapists drawn from a public teaching hospital used questionnaires to collect data and descriptive statistics, association tests and student tests to analyse data. The results showed no significant differences in the level of knowledge across occupational categories (Silva et al. 2017). The more extensive study that covered high-income countries: United States, England, France, Italy, Poland, China and Saudi Arabia; lower-middle-income and developing countries: India, Nepal, Vietnam and Nigeria; and low-income countries: Ethiopia, Democratic Republic of Congo, and Guinea by Alhumaid, et al. (2021), cross-country analyses indicated variations in the knowledge of IPC from one country to another. Multiple connections were identified between healthcare workers knowledge and variables such as work experience, working overseas, training, the readiness for IPC guidelines, involvement of IPC committees, and information from scientific journals. IPC training, higher education level, and longer work experience had significant association with IPC knowledge (Alhumaid et al. 2021).

In Kenya, (Moyo, Gertrude Munthali. 2013) investigated the influence of knowledge and practice of IPCs and compliance among nurses working at Mbagathi District Hospital using a cross-sectional survey. A purposive sample of 90 nurses (83.3% females, 16.7% males), a majority trained at diploma level (64.4%), participated in data collection using self-administered questionnaires and observation checklists. Only 17.8% of the respondents had ample knowledge of basic IPC precautions. Comparatively, gloves were the most used personal protective equipment, followed by gowns, while only a third of respondents routinely practised hand hygiene, and only 5.6% used mouth and eye protection. Findings also showed a significant association

between acquisition of formal training and knowledge of IPC guidelines (Moyo, Gertrude Munthali. 2013).

2.2.Implementation of National Infection Prevention and Control Practices in Hospitals

In a literature synthesis of 61 peer-reviewed studies published between 1998 and 2018, in Sub-Saharan Africa, findings showed that a majority of studies focused on administrative precautions (36.5%), and the most frequently used implementation strategy was education (59.9%), quality management (64%), planning (33.5%) and restructuring (32.5%) in evaluating the implementation. Most institutions did not have clear science-specific implementation IPC protocols ((Barrera-Cancedda et al. 2019).

Opollo et al. 2021 utilised the World Health Organization's (WHO) 'Infection Prevention and Control Assessment Framework' (IPCAF) tool to determine compliance of IPC at Lira University Hospital in Uganda. The cross-sectional study established the compliance score as 225/800, which is a 28.5% compliance, a very low level. Analysis of hospital documents showed the absence of IPC committee, IPC team, staff training and no budgetary allocation. The hospital also lacked a surveillance system or a monitoring/auditing IPC unit (Opollo et al. 2021).

In Europe, Backman, et al. (2012) assessed the overall work environment including IPC practices in the surgical unit in order to analyse the implementation of the policies and procedures at a Netherlands hospital. It was a qualitative analysis, grounded on a socioecological approach on health systems. The researchers showed the existence of an active surveillance strategy and ongoing activities promoting IPC in surgical units (Backman et al. 2012).

In Asia, a study showed that IPC implementation was a neglected area in Pakistan. In the evaluation, which covered five public sector hospitals in Islamabad, the WHO IPCAF tool was utilised to determine the strengths and weaknesses regarding IPC. Analysis indicated a score less than 200, implying that implementation was deficient. The 5 hospitals did not even meet 50% of IPC standards (Savul et al. 2020). In China, a systematic review of 56 peer-reviewed journals established that 27 were survey studies, 17 were observational studies and 12 were interventional studies. Comparing the implementation standards as established by the National Health Commission of the People's Republic of China, the European Centre for Disease Prevention and

Control (ECDC) and the World Health Organization (WHO), hospitals were ranked 7 under 10 ECDC standards, 7 out of 8 WHO standards, meaning that there was a high level of implementation in mainland China, with gaps that could be addressed through continued improvement (Wang et al. 2019).

A study conducted in Ulin Hospital Banjarmasin, Indonesia, observed a reduction in the number of germs on treatment room floors after one week of implementation of housekeeping. (Sholihah and Hanafi 2017). Similarly, research findings from a study conducted in Cleveland Veterans Affairs Medical Center, Ohio, concluded that after an educational intervention, rates of environmental contamination after housekeeping cleaning were greatly reduced (Eckstein et al. 2007)

In Kenya, Gichuhi, Kamau, Nyangema, and Otieno-Ayayo (2015) investigated adherence to IPC guidelines and practices at a Level 4 hospital in Kenya. Out of three objectives from the study, one of them was to evaluate implementation of IPC measures using a cross-sectional survey. Questionnaires, focus group discussion and document reviews were used for data collection. The hospital had written IPC policy guidelines; however, there were implementation challenges. (Alice Gichuhi et al. 2015)

2.3. Barriers to Compliance with National Infection Prevention and Control Guidelines and Practices in Hospitals.

Tartari et al. 2021 assessed national IPC programs worldwide borrowing from WHO IPC core components. This assessment was carried out between June 2017 to November 2018. The multi-country study covered 103 countries (85.4% of WHO country members), of which 22.7% were low-income countries, 19.3% were middle lower-income countries, 23.9% were upper middle-income countries, and 34.1% were high-income countries. Findings showed that while 62.5% of countries assessed had a national IPC program, only 26.1% had allocated a budget for IPC implementation. Again, while 67% of the countries had established IPC guidelines, only 36.4% had an implementation strategy, and only 21.6% evaluated compliance with IPC guidelines. In general, there were significant differences concerning economic development and IPC

implementation, with 83.3% of countries that had implemented the program being high-income countries (Tartari et al. 2021). These findings confirm assessments showing poor adoption of national IPC programs and implementation of IPC guidelines in low-income countries.

In a review of IPC programs in several African countries, specifically Kenya, Namibia, Sierra Leone, Egypt, South Africa, Zimbabwe and Liberia, Sastry et al. (2017) established that concerning the current status and resources for IPC, there are variations between countries at the state level. The robustness of HAIs surveillance also varies; however, in most low- and middle-income countries, such as South Africa and Kenya, antimicrobial stewardship programs have been instituted to audit resistance. In terms of current disparities in IPC implementation, the review noted that even though IPC guidelines occur, enforcement is still challenging due to a lack of resources and a lack of proper and consistent IPC communication methods. To improve IPC document utilization, the review cited the need to increase the accessibility of IPC via technological innovations such as mobile applications, and translations into local languages (Sastry et al. 2017).

A qualitative approach was used to determine the barriers to IPC among Amhara region teaching hospitals in Ethiopia. Ten in-depth interviews and 23 focus group discussions were used to collect information from participants. The findings revealed the main barriers as inadequate facilities, material supply shortage, poorly maintained facilities and equipment, healthcare behaviour, lack of IPC knowledge among health workers, low professional experience, and high patient flow (Yallew, Kumie, and Yehuala 2019). In Ghana, a facility-based cross-sectional study recruited 100 participants to establish the level of knowledge and compliance, at the Lower Manya Krobo District. Statistical analyses isolated the barriers as low IPC knowledge among health workers. Demands for patient care, causing work overload among healthcare workers, were also cited as barriers to implementing IPC at the hospital. Finally, there needed to be better enforcement of the national policy on occupational health and safety (OHS) and IPC implementation at the hospital level (Akagbo, Nortey, and Ackumey 2017).

Houghton et al. (2020) reviewed barriers to adherence to IPC guidelines. In total, the researchers selected 20 studies for analysis. Out of these, ten covered Asian countries, four covered African countries, four were from North and Central America, and two were from Australia. The barriers identified in the analysis included poor access to IPC guidelines since the documents were long,

ambiguous, and needed to reflect national and international policies. Other barriers included a need for clearer communication about IPC guidelines (Houghton et al. 2020).

Reasons for successful or unsuccessful IPC guidelines implementation are often multiple and interconnected. In a review of the key elements underpinning successful implementation, it was established that governance approaches, modes of communication and formats of guidelines are core prerequisites for improving collaboration and transparency among actors in the implementation process. The review outlined the critical determinants as: shaping guidelines and recommendations, adjusting government approaches to align with the context, whether regional or national, accurate use of surveillance systems and indicators, and strengthening communication systems as well as adopting new technologies for ease of monitoring IPC practices (Birgand et al. 2015). Other predictors of noncompliance have been established as high workload and time constraints. Professional category-specific factors and patient-to-nurse ratio and were also higlighted. Scarcity of equipment, such as soap, alcohol hand rub, and paper towels; and the absence of IPC protocols (Alhumaid et al. 2021). The effects of these barriers are significantly stronger in resource-limited settings (Manchanda, Suman, and Singh 2018).

Kenya created a national IPC program in 2013, and there are myriad implementation challenges. A case review of the country's IPC program by Sastry et al. 2017 revealed that Kenya depends largely on external donor support to implement IPC programs. While the Ministry of Health recognized a knowledge gap and conducted trainings with the support of CDC Kenya, analysis suggests that the governance structure changes, such as the devolution of health services to the counties, has severely compromised the implementation of IPC guidelines. Few hospitals have adequate laboratory sufficiency for diagnostics and functional health information systems. The review cited a World Bank report in 2013, titled 'The National Patient Safety Survey', which reported a wide-ranging inadequate IPC knowledge and practices among healthcare personnel in Kenya, attributed to lack of adequate financial resources.

Other studies have also investigated barriers to implementation in Kenya since the adoption of the national policy. In a study evaluating factors influencing compliance with IPC standards in hospitals in Migori County, 163 health workers participated, and findings showed that a majority were highly exposed to occupational health hazards. There were cases of health workers reporting injuries from sharp objects. Further, a majority also had inadequate IPC knowledge,

had undergone poor training, and that there were weak IPC guidelines in hospitals in the County (Helmut et al.).

An assessment of compliance, from data collected from 1680 healthcare workers, 14,328 patients and 935 healthcare facilities in Kenya, found the mean compliance to be 0.318, with compliance ranging from 0.023 for hand hygiene to 0.871 for injection and sampling safety. There was a weak association between the characteristics of the hospital (public or private) and the level of hospital specialization in the implementation of IPC (Bedoya et al. 2017). However, not all studies reported inadequacies in all areas. Gichuhi et al. (2015) showed that many respondents stated that there were sufficient resources for IPC implementation, with 89.5% of nurses and 71.4% of laboratory staff being affirmative. Furthermore, 68.6% of support staff and 60.9% of casuals also had adequate materials such as gloves and face masks. On the contrary, the researchers found that 86.9% of respondents needed access to clean and consistent water supply (Alice Gichuhi et al 2015).

2.4.Conceptual Framework

Independent Variable:

Knowledge of Infection Prevention and Control (IPC) - Understanding healthcare workers' awareness and comprehension of IPC principles

- ✓ Level of education and training
- ✓ Work experience
- ✓ Attitudes and beliefs
- ✓ Motivation

Implementation of National Infection Prevention and Control Practices - Examining the practical application of IPC measures in the healthcare setting

- ✓ Budgetary constraints
- ✓ Organizational culture
- ✓ Communication
- ✓ Resources

Barriers To Compliance with National Infection Prevention and Control Guidelines – Identifying factors hindering successful IPC implementation and exploring challenges faced by healthcare workers in adhering to IPC guidelines.

- ✓ Attitude and beliefs
- ✓ Accountability
- ✓ Resources
- ✓ Level of education and training

Dependent Variable:

Effective Infection Prevention and Control

- ✓ Reduced Morbidity & Mortality
- ✓ Reduced Hospital Stay

The conceptual framework above illustrates the relationship between the independent variable and the dependent variable of the study.

2.5.Justification of the Study

Healthcare-associated infections pose a significant challenge and threat to patient and staff safety and are associated with increased morbidity, mortality, and treatment costs in both public and private hospitals (Geberemariyam, Donka, and Wordofa 2018). While HAIs remain a public health concern globally, Sub-Saharan countries are the most affected, with CDC estimating the prevalence to be higher than 40% (CDC, 2018). Infection prevention knowledge and associated practices play a central role in the control, prevention, and reduction in the rate of HAIs. The high prevalence of HAIs in Sub-Saharan Africa has been associated with poor infection prevention knowledge and the failure of healthcare workers to consistently practice infection prevention measures (Rothe & Schlaich, 2013).

Various studies have been done in Kenya on the knowledge of IPC guidelines and associated practices. In general, there are mixed results. (Alice Gichuhi et al. 2015) found very high levels of knowledge and awareness of infection prevention and control practices (98.7%) but also cited water shortages, lack of continuous updating of IPC guidelines, and absence of continued professional education and training on these guidelines and policies. (Bedoya et al. 2017) also reported high levels of compliance with these practices, but with variabilities across the domains: level of hand hygiene, use of protective gloves, disinfection of reusable equipment, injection and sampling of blood, and waste segregation. They also found a weak interrelation between compliance with the level of health worker knowledge and training, meaning that there were other factors influencing compliance with practices other than knowledge. With HAIs still a problem despite a high level of knowledge, Bedoya (2017) recommended that future studies include behavioural indicators such as health worker attitudes.

Studies show that even though health workers indicate sufficient knowledge and awareness of IPC, the level of HAIs remains high. This means that beyond establishing the level of health worker knowledge, it is also essential to evaluate the level of compliance with or level of implementation of standard guidelines adopted by the facility, while also looking into barriers to knowledge acquisition and standards of guidelines implementation.

The primary responsibility of ensuring that hospital staff are knowledgeable about and adhere to recommended practices lies with the hospital. A study that quantifies the level of knowledge and

awareness and compliance with recommended practices, offers crucial insights that a hospital can use to improve infection prevention and control. When infection prevention control guidelines are well implemented, there is a reduction in hospital stays, long term disabilities and financial burden on institutions and patients. Safe practices also promote the health of healthcare workers and prevent occupational diseases.

Policymakers are responsible for developing national IPC guidelines. The findings reveal to policymakers the level of health worker comprehension of what constitutes infection prevention and control, show how well the hospital is complying with national standards, and identify barriers that need to be tackled in favour of improving IPC.

Infection prevention and control standards are constantly evolving to deal with the evolution of HAIs in different hospitals globally. An assessment of the knowledge, practice and barriers, informs academicians of the current state of developments in the discipline and bridges gaps in the existing literature. Researchers can utilize the empirical findings presented in the study to inform future research.

This study therefore, assesses the knowledge, practices, implementation and barriers associated with IPC in a public health hospital. Public hospitals in Kenya have challenges in addressing Infection prevention & control standards as compared to private facilities because of budgetary constraints, a high number of patients, and inadequate staff. Pumwani maternity hospital, which is the biggest maternity hospital in East Africa, receives many patients daily. This study seeks to extend and investigate the study of IPC in public and maternity hospitals by involving health workers and support staff, of which Pumwani Maternity hospital represents the highest numbers.

2.6.Research Questions

1) What is the level of knowledge of infection prevention and control among healthcare workers and support staff at Pumwani Maternity Hospital?
2) What is the level of implementation of national infection prevention and control practices at Pumwani Maternity Hospital?
3) What are the barriers to compliance with national infection prevention and control guidelines and practices at Pumwani Maternity Hospital?

2.7.Research Objectives

2.7.1. General Objective

To assess the knowledge, practices, implementation and barriers associated with infection prevention and control at Pumwani Maternity Hospital, Nairobi Kenya

2.7.2. Specific Objectives

1) To assess the level of knowledge of infection prevention and control among healthcare workers and support staff at Pumwani Maternity Hospital.
2) To determine the level of implementation of national infection prevention and control practices at Pumwani Maternity Hospital.
3) To identify the barriers to compliance with national infection prevention and control guidelines and practices at Pumwani Maternity Hospital.

3. METHODOLOGY

3.1.Study Design

A cross-sectional survey design was used in the study.

3.2.Study Area Description

The study area was Pumwani Maternity Hospital (PMH), Nairobi Kenya. PMH is the biggest obstetric and reproductive referral hospital in Kenya and Sub-Saharan Africa. The hospital has a bed capacity of 354 in total, 144 baby cots, 3 theatres and a High Dependency Unit and also runs a College of Nursing and Midwifery (Pumwani Maternity Hospital, 2021).

3.3.Study Population

The study population was healthcare workers and support staff at the Pumwani Maternity Hospital, specifically medical officers, clinical officers, nursing officers, pharmacists and technologists, nutritionists, occupational therapists and physiotherapists and hospital housekeeping staff, as they are the most engaged with infection prevention control of HAIs. The Human Resource Records at Pumwani Maternity Hospital indicates that as of July 2021, there were 367 staff at the facility (Pumwani Maternity Hospital, 2021). Out of the 367 staff, 239 could be defined as healthcare workers and 60 as hospital housekeeping staff. This study focussed on medical officers, clinical officers, pharmacists and technologists, nursing officers, nutritionists, occupational therapists and physiotherapists and housekeeping support staff who collectively constitute 299 of the staff at PMH. The distribution of employees according to a professional category is presented in Table 3.1.

Table 3.1: Study Population

Professional Categories	Number of Staff	Total
Senior Medical Administration		7
Senior Deputy Director Medical Services	1	
Deputy Director Medical Services	1	
Senior Assistant Director Medical Services	2	
Senior Medical Specialist	1	
Assistant Director Medical Services	2	
Medical Officers		37
Senior Medical Officers	37	
Clinical Officers		11
Senior Clinical Officers	1	
Assistant Chief Clinical Officer	3	
Chief Registered Clinical Officer	1	
Registered Clinical Officers	6	
Pharmacists and Technologists		22
Senior Pharmacists	2	
Pharmaceutical Technologists	6	
Laboratory Technologist	6	
Chief Radiographer	3	
Chief Orthopaedic Technologist	1	
Assistant Chief Orthopaedic Technologist	1	
Chief Medical Engineer Technologist	1	
Medical Engineer Technologist	2	
Nursing Officers		152
Senior Nursing Officers	5	
Chief Senior Registered Nurse	1	
Senior Registered Nurses	13	
Senior Enrolled Community Nurses	29	
Nursing Officers	93	
Chief Nursing Officer	8	
Assistant Chief Nursing Officer	1	
Principal Nursing Officers	2	
Nutritionists		5
Principal Nutrition and Dietetics Technologist	1	
Nutrition and Dietetics Technologist	1	
Senior Nutrition and Dietetics Officer	1	
Nutrition and Dietetics Officers	2	
Occupational Therapists and Physiotherapists		5

Chief Assistant Occupational Therapist	1	
Assistant Occupational Therapist	1	
Senior Physiotherapist	1	
Assistant Chief Physiotherapist	1	
Physiotherapists	1	
Housekeeping staff		60
TOTAL		**299**

According to Bedoya et al (2017) IPC knowledge and practice areas encompass five core domains: level of hand hygiene; waste segregation; injections and blood sampling; protective glove use; and disinfection of reusable equipment. Therefore, in this study, the target population were medical officers, clinical officers, pharmacists and technologists, nursing officers, nutritionists, occupational therapists and physiotherapists, and hospital housekeeping staff.

3.4.Sample Size Determination

The study used 'Yamane formula' to establish the sample size of healthcare workers to use in the study.

$$n = \frac{N}{[1+Ne^2]}$$

Where n is the sample size,
N is the population sample and
e is the margin of error.

$$n = \frac{299}{[1+299(0.05)^2]}$$

$$=171.1$$

The sample size for the study was 171 healthcare workers, including senior medical administration, medical officers, clinical officers, pharmacists and technologists, nursing officers, nutritionists, occupational therapists and physiotherapists and hospital housekeeping staff.

Sample ratio = Sample Size/Target Population = 171/299 = 0.57 (57%)

To adequately represent and distribute the sample size among the population clusters, simple stratified sampling was employed as shown below.

Equation 2: $n_h = (Nh / N) * n$

Where:

nh is the sample size for stratum h,

Nh is the population size for stratum h,

N is the total population size,

n is the total sample size.

For example; Senior medical administration

$$nh = 7/299 \times 171 = 4$$

Table 3.2: Sample Size Distribution

Professional Categories	**Target Population**	**Sample Size Distribution**
Senior Medical Administration	7	4
Medical Officers	37	21
Clinical Officers	11	6
Pharmacists and Technologists	22	13
Nursing Officers	152	87
Nutritionists	5	3
Occupational Therapists and Physiotherapists	5	3
Housekeeping staff	60	34
TOTAL	**299**	171

The final sample size was however below the optimal sample size due to lack of response and consent to participate from some selected participants. Out of a sample size of 171 there were 163 responses. 5

respondents did not give consent to participate in the study. A final sample size of 158 healthcare workers and hospital housekeeping support staff consented to participate in the study. This represented 92% of the intended sample size.

3.5.Sampling Procedure

Random sampling procedure was used in this study. In this study, the respondents were randomly selected from the sampling frame. A list containing the names, designations, station and contacts of all healthcare workers identified in the sampled population was obtained from Human Resource Records at Pumwani Maternity Hospital. The respondents were notified physically at place of work and given access to the online questionnaire via a WhatsApp message

3.6.Recruitment and Consenting Procedures

3.6.1. Inclusion Criteria

a. Healthcare workers, including senior medical administration, medical officers, clinical officers, pharmacists and technologists, nursing officers, nutritionists, occupational therapists and physiotherapists working at Pumwani Maternity
b. Support staff only included housekeeping staff working at Pumwani Maternity Hospital
c. Consent to participate in the study.
d. At least 70% filled out questionnaires.

3.6.1. Exclusion Criteria

a. Less than 70% filled out questionnaires

3.7. Variables

The variables in this study are:

a. Demographic characteristics
    - ✓ Age
    - ✓ Gender
    - ✓ Professional Education and Category
    - ✓ Work Experience
b. HCW IPC Knowledge and Practice
c. Implementation of IPC Guidelines at the Facility
d. Barriers to IPC

3.8. Data Collection Procedure

Data were collected using self-administered questionnaires. The questionnaires were generated using Google forms and distributed through the online platform WhatsApp. There were four main sections in the questionnaire. Section A collected information on demographic information; Section B collected information on IPC knowledge and practices; Section C collected information on IPC implementation at the hospital; and Section D collected information on compliance with IPC guidelines. A Likert scale was used in Sections B, C and D to assess the participant's knowledge and perception on infection prevention and control in the facility. National guidelines on IPC were used to determine the participants level of knowledge. Depending on the nature of the question, if correct practice is affirmative, good knowledge was represented as strongly agree and agree. Whereas if correct practice is not affirmative, good knowledge was represented as strongly disagree and disagree.

3.9. Ethical Consideration

This protocol was submitted to the Kenyatta National Hospital -University of Nairobi Ethics and Research Committee for review. The study was carried out with the approval from KNH-UoN ERC and thus, the consent form and the questionnaire were shared only when the study was approved. Further study approval was requested from the National Commission for Science, Technology and Innovation (NACOSTI) and Pumwani Maternity Hospital research committee before proceeding to collect data.

Once the study had been approved, the respondents were randomly selected from a sampling frame. A list containing the names, designations, station and contacts of all healthcare workers identified in the sampled population was obtained from Human Resource Records at Pumwani Maternity Hospital. The principal investigator notified the respondents physically at their workplace and provided access to a link to the informed consent form on their mobile phones. The online informed consent preceded the online questionnaire. After reading the consent form, the participant confirmed their decision to participate or declined to consent. Those who consented selected YES on "I AGREE TO PARTICIPATE IN THIS STUDY" and then moved on to the questionnaire. Those who declined to consent selected NO on "I DO NOT AGREE TO PARTICIPATE IN THIS STUDY and thus were excluded from the study.

The online questionnaires included consent information where the participants were adequately briefed on the study objectives. Any matters that arose during the study were discussed comprehensively.

Participation was voluntary, and one could opt out at any time without giving any explanation. The researcher protected the privacy and confidentiality of the respondents at all times. No personally identifiable information was collected from respondents. The data collected were stored in a protected drive, and only the researcher had access.

3.10. Data Management

Data were collected in a Microsoft Excel file, cleaned for inconsistencies and incompleteness, and prepared for data analysis. After cleaning and pre-processing the raw data, the file was imported into IBM SPSS (Version 23) for statistical analysis. The researcher performed both descriptive and inferential statistical analysis.

Descriptive statistical measures, frequencies, percentages, mean and standard deviation, were used to summarize the responses on demographic characteristics, IPC knowledge and attitudes, IPC implementation, and IPC barriers. The overall calculation of knowledge was obtained by using the percentage of affirmative responses. Mean and standard deviation were calculated to enable measurement of how the disperse the data was from the mean. The findings were presented in tables, pie charts and graphs.

Inferential statistical analysis included logistic regressions, which were used to test the hypotheses, on the relationship between HCW demographic characteristics (age, gender, professional category, work experience) on IPC knowledge and practices; the relationship between IPC knowledge among HCW and IPC implementation; the relationship between IPC knowledge among HCW and barriers to implementation of IPC guidelines; and the relationship between IPC implementation barriers and the level of IPC guidelines at the facility.

3.11. Study Results Dissemination Plan

The results of this study will be disseminated to the Kenyatta National Hospital - University of Nairobi Ethics and Research committee, Pumwani Maternity Hospital and the study participants at the Pumwani Maternity Hospital. The study has been presented at the department of Medical Microbiology and Immunology. A journal paper drawn from the thesis will be submitted to peer-reviewed journals around the world for publication.

3.12. Study closure plan

The researcher shall commence closure procedures once the study has been completed. Research outcomes shall be safely stored. The final database which includes data analysis and publication, will be duly labelled and set for archiving. Research outcomes will be reported to KNH-UoN ERC at the end of the research project. This will include publications and results dissemination plan. Should the research qualify for permanent closure, the researcher shall submit the study closure report to the KNH-UoN ERC for verification and approval.

4. RESULTS

This study sought to assess knowledge, implementation and barriers associated with infection prevention and control at Pumwani Maternity hospital. Out of a sample size of 171 there were 163 responses. 5 respondents did not give consent to participate in the study. A total of 158 healthcare workers, including medical officers, nursing officers, clinical officers, and hospital housekeeping support staff consented to participate in the study. This represented 92% of respondents compared to the calculated sample size.

4.6. Demographic characteristics of study participants

A majority of the respondents, 102(64.6%) were female. The median age was 33 (IQR: 29 – 37.5) years; 82(51.9%) of the respondents were nursing officers, 32(20.3%) were housekeeping staff, while 23(14.6%) were medical doctors. The median years of experience were 7(IQR: 3 – 12) years, as shown in Table 4.1.

Table 4.1: Demographic characteristics of study participants

	Frequency	Percent
Gender		
Male	56	35.4
Female	102	64.6
Age (Median (IQR) years	33(IQR: 29 - 37.5)	
Age		
<30 years	30	19
30 - 49 years	105	66.5
>=50 years	23	14.6
Level of education		
Primary	4	2.5
Secondary	19	12
Diploma	75	47.5
Degree	58	36.7
Postgraduate	2	1.3
Cadre		
Clinical officers	9	5.7
Housekeeping staff	32	20.3
Medical doctor	23	14.6
Nursing officer	82	51.9
Nutritionist	3	1.9
Occupational therapist/ Physiotherapist	3	1.9
Pharmacist/ Pharmacy technologist	6	3.8
Years of experience (Median (IQR) years	7(IQR: 3 - 12)	

<5 years	48	30.4
5 - 10 years	66	41.8
>10 years	44	27.8

4.7. The level of knowledge and practice of infection prevention and control among healthcare workers and support staff at Pumwani Maternity Hospital

4.7.1. Hand hygiene

Majority of the respondents agreed that they washed their hands after being exposed to body fluids (M = 4.5, SD =0.5). The findings also revealed that many of the respondents wash their hands after touching the patient. They also wash hands after coming into contact with an object that has touched the patient or is in the patient's vicinity (M =4.3, SD = 1.2). The findings further showed that many of the respondents neither agreed nor disagreed with the statement that they wash their hands prior to giving an injection or taking a blood sample (M =3.2, SD =1.7). The overall knowledge on hand hygiene among respondents was 80% as shown in Table 4.2.

Table 4.2: Knowledge on hand hygiene

	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean (SD)
I wash my hands before touching the patient	6(3.8)	12(7.6)	24(15.2)	55(34.8)	55(34.8)	3.8 (1.3)
I wash my hands after touching the patient	4(2.5)	0	7(4.4)	44(27.8)	97(61.4)	4.3(1.2)
I wash my hands before performing a clean or aseptic procedure	3(1.9)	3(1.9)	4(2.5)	56(35.4)	82(51.9)	4.1(1.3)
I wash my hands after exposure to body fluids	3(1.9)	0	1(0.63)	30(19.0)	118(74.7)	4.5(0.5)
I wash my hands after contact with an object that has touched the patient or is in the patient immediate environment	3(1.9)	5(3.2)	8(5.1)	43(27.2)	94(59.5)	4.3 (1.2)
I wash my hands before giving an injection or taking a blood sample	5(3.2)	13(8.2)	28(17.7)	53(33.5)	36(22.8)	3.2(1.7)
I wash my hands after giving an injection or taking a blood sample	2(1.3)	5(3.2)	13(8.2)	47(29.7)	70(44.3)	3.7(1.7)
Overall knowledge on hand hygiene						**80%**

4.7.2. Protective gloves

The results revealed that 91% of the respondents had knowledge of the use of protective gloves. The results showed that gloves should not be reused on more than one patient (M =4.6, SD = 1.0), gloves should always be discarded before exiting the area where the patient was seen (M =4.6, SD =0.8) and most of the respondents agreed that it is necessary to wash hands even when one is using gloves when examining a patient (M = 4.4, SD =0.8) as shown in Table 4.3.

Table 4.3:Knowledge on use of protective gloves

	Strongly disagree n (%)	**Disagree n (%)**	**Neutral n (%)**	**Agree n (%)**	**Strongly agree n (%)**	**Mean (SD)**
Gloves should not be reused on more than one patient	8(5.1)	2(1.3)	3(1.9)	21(13.3)	124(78.5)	4.6(1.0)
It is necessary to wash hands even when one was using gloves when examining a patient	3(1.9)	3(1.9)	8(5.1)	58(36.7)	86(54.4)	4.4(0.8)
Gloves should always be removed before leaving the area where the patient was seen	4(2.5)	1(0.6)	1(0.6)	42(26.6)	110(69.6)	4.6(0.8)
Overall knowledge on protective gloves						**91%**

4.7.3. Injections and blood samples

Majority of the respondents agreed that syringes should not be reused on more than one patient (M = 4.35, SD = 1.12). However, most of the respondents disagreed with the statement that needles should be recapped after use before disposal (M =2.29, SD = 1.5). The overall assessment showed that 68% of the respondents had knowledge on injection and blood samples as shown in Table 4.4.

Table 4.4:Knowledge on injections and blood samples

	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean (SD)
Needles should be recapped after use before disposal	79(50)	22(13.9)	9(5.7)	28(17.7)	20(12.7)	2.29(1.5)
Needles and syringes should be discarded together in the same container after use	28(17.7)	13(8.2)	12(7.6)	59(37.3)	46(29.1)	3.52(1.4)
Syringes should not be reused on more than one patient	12(7.6)	3(1.9)	1(0.6)	43(27.2)	99(62.7)	4.35(1.12)
Overall knowledge on injections and blood samples						**68%**

4.7.4. Reusable equipment

In investigating reusable equipment, most of the respondents agreed that a thermometer should be disinfected after contact with one patient (M = 4.65, SD =0.74). The results also revealed that 84% of the respondents had knowledge on reusable equipment as shown in Table 4.5.

Table 4.5:Knowledge on reusable equipment

	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean (SD)
A thermometer should be disinfected after contact with one patient	3(1.9)	1(0.6)	4(2.5)	32(20.3)	118(74.7)	4.65(0.74)
A fetoscope/stethoscope should be disinfected after contact with one patient	3(1.9)	3(1.9)	6(3.8)	51(32.3)	95(60.1)	4.47(0.82)
Lab coats should be washed after a week of use	27(17.1)	14(8.9)	30(19)	39(24.7)	48(30.4)	3.42(1.44)
Overall knowledge on reusable equipment						**84%**

4.7.5. Waste segregation

Respondents were also assessed on waste segregation. The findings showed that, most of the respondents (92%) had knowledge on waste segregation as shown in Table 4.6.

Table 4.6:Knowledge on waste segregation

	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean (SD)
I know the recommended types of containers that should be used for segregating syringes	3(1.9)	3(1.9)	7(4.4)	40(25.3)	105(66.5)	4.53(0.83)
I know the recommended types of containers that should be used for segregating needles	4	4	7	33	110	4.53(0.89)
I know the types of waste that should go in each colour-coded container	3(1.9)	4(2.5)	3(1.9)	37(23.4)	111(70.3)	4.58(0.89)
Red container is used for highly infectious waste or hazardous health-care waste and black for non-infectious waste	3(1.9)	1(0.6)	6(3.8)	20(12.7)	128(81)	4.7(0.7)
Overall knowledge on waste segregation						**92%**

4.7.6. Personal protection

The findings revealed that most of the respondents neither agreed nor disagreed with the statement that they have adequate personal protective equipment (PPE) while at work (M = 3.27, SD =1.3) while majority agreed that have been vaccinated against pathogens such as Hepatitis B, Coronavirus (M =4.27, SD =1.02). Overall analysis showed that 75% of the respondents had knowledge on personal protection as shown in Table 4.7.

Table 4.7:Knowledge on personal protection

	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean (SD)
I have adequate personal protective equipment (PPE) while at work	18(1.4)	30(19)	24(15.2)	63(39.9)	23(14.6)	3.27(1.3)
I have been vaccinated against pathogens such as Hepatitis B, Coronavirus	3(1.9)	12(7.6)	12(7.6)	43(27.2)	88(55.7)	4.27(1.02)
Overall knowledge on personal protection						**75%**

4.7.7. Housekeeping

The findings revealed that most of the respondents agreed that mops must be completely dry before reuse (M = 4.35, SD =0.95), linen soaked in blood and body fluid should be packed in leak proof containers/ bags (M =4.3, SD =0.86) and the floor should be cleaned at least 3 times in 24 hours with detergent (M =4.27, SD =1.3). Eighty five percent of the respondents had knowledge on housekeeping as shown in Table 4.8.

Table 4.8:Knowledge on housekeeping

	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean (SD)
The floor should be cleaned at least 3 times in 24 hours with detergent	1(0.6)	6(3.8)	17(10.8)	54(34.2)	80(50.6)	4.27(1.3)
Linen soaked in blood and body fluid should be packed in leak proof containers/ bags	6(3.8)	3(1.9)	7(4.4)	55(34.8)	87(55.1)	4.3(0.86)
Mops must be completely dry before reuse	5(3.2)	5(3.2)	19(12.0)	61(38.6)	68(43.0)	4.35(0.95)
Transport waste in dedicated trolleys	2(1.3)		6(3.8)	51(32.3)	99(62.7)	4.15(0.97)
Curtains and room partitions should be cleaned and changed weekly	7(4.4)	12(7.6)	14(8.9)	50(31.6)	75(47.5)	4.10(1.12)
Overall knowledge on housekeeping						**85%**

4.7.8. Overall knowledge and practice of infection prevention and control among healthcare workers and support staff

The findings revealed that 73% of the respondents had good knowledge on the infection prevention and control as shown in Figure 4.1.

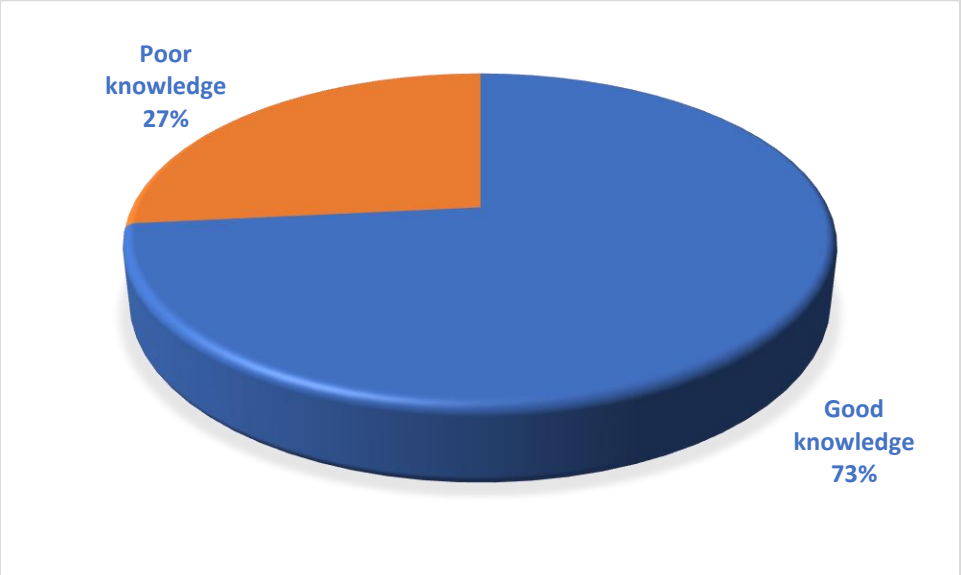

Figure 4.1:Level of knowledge on IPC

4.7.9. Factors associated with knowledge of infection prevention and control among healthcare workers

The findings revealed that age and years of experience were greatly associated with comprehension of IPC. Respondents who were aged between 30 and 49 years were 5.8 times more likely to have good knowledge of IPC compared to those aged less than 30 years, OR =5.83, 95%CI: 1.43 – 23.88, p = 0.014. Those who had years of experience of between 5 – 10 years were six times more likely to have good knowledge of IPC compared to those with less than five years of experience. Similarly, those who had >10 years of experience were four times more likely to have good knowledge of IPC in comparison to those with <5 years of experience, (OR = 6.0, 95%CI: 1.84 – 19.57, p=0.003) and >10 years (OR =4.34, 95%CI: 1.37 – 13.79, p =0.013) as showed in Table 4.9.

Table 4.9:Factors associated with knowledge of infection prevention and control among healthcare workers

	Good knowledge n (%)	Poor Knowledge n (%)	OR (95%CI)	p-value
Gender				
Male	39(33.6)	17(40.5)	Ref	
Female	77(66.4)	25(59.5)	0.75(0.36 - 1.54)	0.455
Age				
<30 years	16(53.3)	14(46.7)	Ref	
30 - 49 years	80(76.2)	25(23.8)	5.83(1.43 - 23.88)	0.014
>=50 years	20(87)	3(13)	2.08(0.57 - 7.6)	0.266
Education level				
Primary	2(1.7)	2(4.8)	Ref	
Secondary	17(14.7)	2(4.8)	0.23(0.11 - 1.53)	0.511
Diploma	55(47.4)	20(47.6)	1.54(0.34 - 2.11)	0.321
Degree	40(34.5)	18(42.9)	0.79(0.31 - 1.97)	0.608
Cadre				
Medical doctors	18(15.5)	5(11.9)	Ref	
Clinical officers	10(8.6)	8(19)	0.71(0.20 - 2.49)	0.593
Nurses	65(56)	20(47.6)	2.04(0.611 - 6.84)	0.246
Support staff	23(19.8)	9(21.4)	0.79(0.31 - 1.97)	0.608
Years of experience				
<5 years	30(62.5)	18(37.5)	Ref	
5 - 10 years	46(69.7)	20(30.3)	6.0(1.84 - 19.57)	0.003
>10 years	40(90.9)	4(9.1)	4.34(1.37 - 13.79)	0.013

4.8. The level of implementation of national infection prevention and control practices at Pumwani Maternity Hospital

4.8.1. IPC program, guidelines, education and training programs implementation

In investigating presence of IPC program, majority of the respondents 127(80.4%) agreed that the hospital IPC programme is supported by an IPC team comprising of IPC professionals. 127(80.4%) of the respondents also agreed that the hospital has established guidelines for controlling infectious diseases. In education and training, 122(77.2%) of the respondents agreed that the hospital has personnel with IPC expertise that lead IPC training, as shown in Table 4.10.

Table 4.10:Implementation of IPC programs, guidelines, education and training.

	Disagree	**Neutral**	**Agree**
Presence of Infection prevention and control (IPC) program			
Hospital IPC programme is supported by an IPC team comprising of IPC professionals	6(3.8)	25(15.8)	127(80.4)
Hospital IPC programme has an active IPC committee constituted by healthcare workers among others	5(3.2)	32(20.3)	121(76.6)
Hospital IPC programme is supported by the facility's top leadership	10(6.3)	35(22.2)	113(71.5)
Infection Prevention and Control (IPC) guidelines			
Hospital has established guidelines for controlling infectious diseases	8(5.0))	23(14.6)	127(80.4)
Hospital guidelines are consistent with national/international guidelines	5(3.2)	36(22.8)	117(74.1)
Hospital guidelines were developed in consultation with healthcare workers	19(12)	38(24.1)	101(63.9)
Infection Prevention and Control (IPC) education and training			
Hospital has personnel with IPC expertise that lead IPC training	11(7.0)	25(15.8)	122(77.2)
Healthcare workers frequently receive training regarding IPC in the facility	40(25.3)	27(17.1)	91(57.6)
Hospital carries out periodic evaluations of the effectiveness of training programs	30(19.0)	34(21.)	94(59.5)

4.8.2. Surveillance and monitoring/audit implementation

The findings revealed that more than half of the respondents, 87(55.1%) agreed that the hospital has clearly defined surveillance under the IPC programme. Similarly, 89(56.3%) agreed that the hospital regularly evaluates surveillance to ensure that it is adhering to the needs and priorities of the facility. The findings also revealed that 99(62.7%) of the respondents agreed that the hospital uses multimodal strategies to implement IPC interventions, 99(62.6%) disagreed with the assertion that the hospital has appropriate staffing levels to meet the patient workload at the facility as shown in Table 4.11.

Table 4.11:Surveillance and monitoring/audit implementation

	Disagree	Neutral	Agree
Health care-associated infection (HAI) surveillance			
Hospital has clearly defined surveillance under the IPC programme	28(17.7)	43(27.2)	87(55.1)
Hospital has prioritized the HAIs targeted for surveillance	30(19)	48(30.4)	80(50.6)
Hospital regularly evaluates surveillance to ensure that it is in line with the needs and priorities of the facility	30(19)	39(24.7)	89(56.3)
Multimodal strategy for implementation of IPC			
Hospital uses multimodal strategies to implement IPC interventions.	18(11.4)	41(25.9)	99(62.7)
Monitoring/audit of IPC practices and feedback			
Hospital has a well-defined monitoring plan with clear goals, targets and activities for monitoring and auditing IPC practices and feedback	17(10.7)	53(33.55)	88(55.7)
Workload, staffing and bed occupancy			
Hospital has appropriate staffing levels to meet the patient workload at the facility	99(62.6)	20(12.7)	39(24.7)
Hospital has adequate bed capacity in line national and international standards	77(48.7)	32(20.3)	49(31)

4.8.3. Built environment, materials and equipment for IPC at the facility level

Majority of the respondents, 143(90.5%) agreed that the hospital has a dedicated decontamination area and/or sterile supply department for the decontamination and sterilization of medical devices and other items. Almost half of the respondents, 67(42.4%) disagreed with the statement that the hospital has single patient rooms or rooms for cohorting patients with similar pathogens if the number of isolation rooms is insufficient as shown in Table 4.12.

Table 4.12:Built environment, materials and equipment for IPC at the facility level

	Disagree	Neutral	Agree
Hospital has adequate water services availability at all times and of sufficient quantity to meet the facility's needs	38(24.1)	25(15.8)	95(60.1)
Hospital has functioning hand hygiene stations	31(19.6)	26(16.5)	101(63.9)
Hospital has sufficient energy/power supply available at day and night for all uses	7(4.4)	17(10.8)	134(84.8)
Hospital has single patient rooms or rooms for cohorting patients with similar pathogens if the number of isolation rooms is insufficient	67(42.4)	28(17.7)	63(39.9)
Hospital has functional waste collection containers for non-infectious (general) waste, infectious waste and, sharps waste in close proximity to all waste generation points	13(8.2)	14(8.9)	131(82.9)
Hospital has a dedicated decontamination area and/or sterile supply department for the decontamination and sterilization of medical devices and other items/equipment	10(6.3)	5(3.2)	143(90.5)

4.8.4. Overall level of implementation of national infection prevention and control practices at Pumwani Maternity Hospital

The results showed that 57(36.1%) of the respondents perceived the hospital to be compliant with the implementation of national infection prevention and control practices as shown in Figure 4.2.

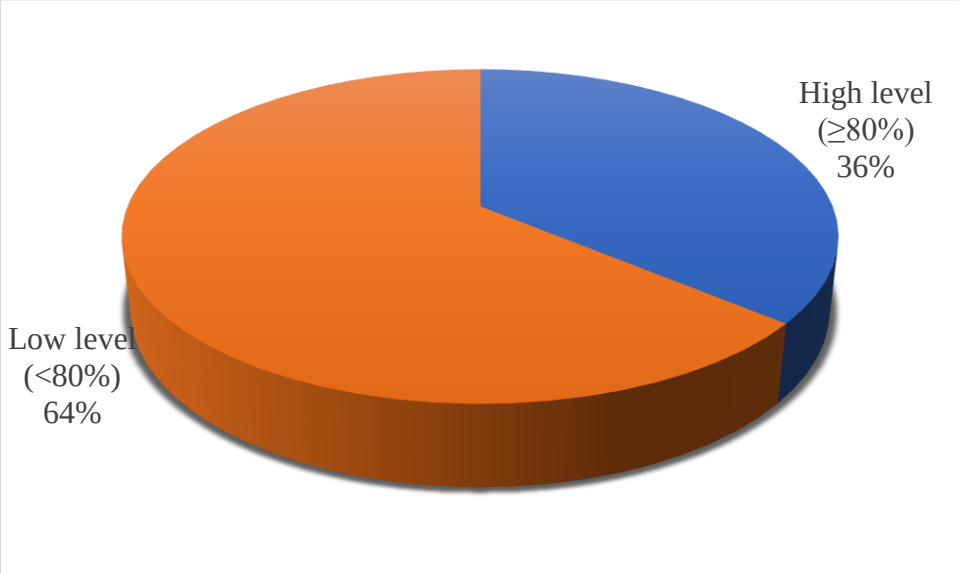

Figure 4.2:Overall level of implementation of national infection prevention and control practices

4.8.5. Factors associated with compliance with implementation of national infection prevention and control practices at Pumwani Maternity Hospital

The findings showed that cadre and knowledge on IPC were significantly associated with compliance with the implementation of national IPC practices. Clinical officers were 11 times more likely to perceive high level compliance compared to medical doctors, OR = 11.11, 95%CI: 2.72 – 45.46, p =0.001. Support staff respondents were 3.7 times more likely to perceive a high level of hospital compliance with the implementation of national IPC practices compared to medical doctors, OR = 3.78, 95%CI: 1.61 – 8.86, p = 0.002. The findings also revealed that those who had good knowledge of IPC were 3.8 times more likely to perceive high level compliance with the implementation of national IPC practices compared to those who had poor knowledge, OR = 3.79, 95%CI: 1.55 – 9.23, p = 0.002 as shown in Table 4.13.

Table 4.13: Factors associated with compliance with implementation of national infection prevention and control practices at Pumwani Maternity Hospital

	High compliance n (%)	Low compliance n (%)	OR (95%CI)	p-value
Gender				
Male	20(35.7)	36(64.3)	Ref	
Female	37(36.3)	65(63.7)	0.98(0.50 - 1.93)	0.543
Age				
<30 years	11(36.7)	19(63.3)	Ref	
30 - 49 years	35(33.3)	70(66.7)	1.58(0.52 - 4.78)	0.415
>=50 years	11(47.8)	12(52.2)	1.83(0.74 - 4.57)	0.193
Cadre				
Medical doctors	3(13)	20(87)	Ref	
Clinical officers	8(44.4)	10(55.6)	11.11(2.72 - 45.46)	0.001
Nurses	26(30.6)	59(69.4)	2.08(0.64 - 6.73)	0.22
Support staff	20(62.5)	12(37.5)	3.78(1.61 - 8.86)	0.002
Education				
Primary	1(25)	3(75)	Ref	
Secondary	8(42.1)	11(57.9)	2.11(0.55 - 2.31)	0.451
Diploma	37(49.3)	38(50.7)	0.78(0.55 - 3.11)	0.344
Degree	11(19)	49(81)	1.56(0.561 - 3.22)	0.671
Years of experience				
<5 years	21(43.8)	27(56.3)	Ref	
5 - 10 years	20(30.3)	46(69.7)	0.74(0.32 - 1.7)	0.471
>10 years	16(36.4)	28(63.6)	1.31(0.59 - 2.95)	0.507
Knowledge on IPC				
Good knowledge	50(43.1)	66(56.9)	3.79(1.55 - 9.23)	0.002
Poor Knowledge	7(16.7)	35(83.3)	Ref	

4.9. The barriers to compliance with national infection prevention and control guidelines and practices at Pumwani Maternity Hospital

The findings revealed that the common barriers to implementation of IPC practices included, there is a high patient flow at the hospital (M =4.39, SD = 0.83) and shortage of adequate staff at the hospital (M =3.95, SD =1.2) as shown in Table 4.14.

Table 4.14:The barriers to compliance with national infection prevention and control guidelines and practices at Pumwani Maternity Hospital

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean (SD)
There is a shortage of facilities at the hospital (wards, toilets, hand washing facilities etc)	13(8.2)	45(28.5)	29(18.4)	50(31.6)	21(13.3)	3.13(1,21)
There is shortage of material supply forcing health workers to reuse equipment and materials	14(8.9)	55(34.8)	26(16.5)	45(28.5)	18(11.4)	2.99(1.21)
There is lack of regular inspection and maintenance of equipment at the hospital	12(7.6)	42(26.6)	40(25.3)	47(29.7)	17(10.8)	3.09(1.14)
There is a high patient flow at the hospital	3(1.9)	4(2.5)	5(3.2)	62(39.2)	84(53.2)	4.39(0.83)
There is a shortage of adequate staff at the hospital	8(5.1)	18(11.4)	15(9.5)	50(31.6)	67(42.4)	3.95(1.2)
Healthcare workers lack information on hospital-associated infections and infection prevention control guidelines	22(13.9)	61(38.6)	27(17.1)	36(22.8)	12(7.6)	2.71(1.18)
There is low awareness among patients and visitors on hospital associated infection	8(5.1)	39(24.7)	45(28.5)	33(20.9)	33(20.9)	3.28(1.19)

5. DISCUSSION

5.1. The level of knowledge of infection prevention and control among healthcare workers and support staff at Pumwani Maternity Hospital

IPC knowledge among healthcare workers was evaluated in the present study. The findings from the present study established that 73% of staff had good knowledge on IPC. Major gaps in knowledge were identified on best practices for injection, blood samples and personal protection. These findings are comparable to a systematic review by Alhumaid et al. (2021) which found that overall, the HCW knowledge of IPC appears to be adequate, good and high especially involving standard precautions, hand hygiene, and care of urinary catheters. However, in their study, gaps were identified in several aspects of healthcare workers' knowledge especially about occupation vaccinations, the mechanisms of infectious disease transmission, infection risk from needle stick and sharp injuries. Our present findings were also compared to a study in Uganda which found that the overall knowledge score on IPC among undergraduate medical students was 70% (Nalunkuma et al., 2021). However, in their study knowledge on hand hygiene (60%) and sharps disposal (60%) were significantly lower compared to our findings which showed 80% on hand hygiene and 68% on sharps disposal. This difference could be attributed to a difference in the study population, where our present study consisted of a practising trained population. In contrast, their study consisted of an inexperienced trainee population composed of medical students.

Our present findings on IPC knowledge among healthcare workers were higher compared to a study conducted in Nigeria which showed that overall, 72.5% of the HCW had poor knowledge, measured as >50 % of all scores. Further, even though 82 of 122 participants in the study had IPC training, only 27.3% of had good knowledge of IPC. The majority of the participants, 81.3%, couldn't establish all the points of hand washing. Their study also established that considering the possibility of infectious agent transmission in patients is a component of standard precautions. It was found that 95% had poor understanding of using puncture-resistant containers as a routine safety practice. However, 61.7% had good understanding that needlestick and sharp injuries could be sources of occupational infections. A significant number of people (60.7%) failed to realize that hands ought to be cleansed prior to making any direct contact with patients, in between patient contacts (74.7%), and after coming into contact with human fluids (81.3%). Nonetheless, a majority (69.7%) acknowledged that hands should be cleaned after removing gloves. A significant number (66.0%) also should have been made aware that all patients

should be given basic precautions regardless of clinical state. A poor understanding that all blood-tinged bodily fluids required basic measures was demonstrated by (89.3%) (Ochie et al., 2022).

Support staff play a fundamental role in infection prevention; thus, it is necessary to evaluate their knowledge level to make informed positive decisions. A study conducted in Saudi Arabia found higher (81%) overall knowledge on IPC (Alshathri, 2021). This difference could be due to the population under consideration where in their study, the healthcare workers studied were doctors, nurses, optometrists, radiologists and ophthalmic assistants while in current study support staff were also included. Similarly, a study conducted in Ethiopia also established that a higher proportion of healthcare workers had good knowledge of IPC (84%) although 57.3% demonstrated good practice on infection prevention (Desta et al., 2018). The high knowledge could be attributed to the participants in their study, who included healthcare workers who have been in direct contact with patients for at least two months.

5.2. The level of implementation of national infection prevention and control practices at Pumwani Maternity Hospital

The IPC guidelines' implementation level varies significantly across different health facilities. In our present study, the respondents perceived the level of implementation of the IPC practices at 36%. This shows that implementation of the national IPC practices, as perceived by staff at Pumwani hospital, still needs to be improved. These findings compare with those from Barrera-Cancedda et al. (2019), who found that from the review of 61 studies, most of the guidelines had not been implemented effectively, with implementation on most critical practices being less than 50% (on administrative precautions (36.5%), planning (33.5%) and restructuring at 32.5%. The study also found that education (59.9%) and quality management (64%) were the most commonly utilized implementation strategies. Similarly, Opollo et al. (2021) in a study conducted in Uganda revealed that compliance with the 'Infection Prevention and Control Assessment Framework' (IPCAF), which forms the basis of national IPC practices was 28.5%.

More effort needs to be established to ensure higher adherence to the national guidelines on IPC. These results are in keeping with those from a study in Pakistan which showed that implementation of the IPC needed to be improved with none of the hospitals investigated attaining half, 50% of the IPC standards (Savul et al. 2020).

However, our findings were inconsistent with results from a systematic review in China which found that the implementation of IPC standards in China is high based on the National Health Commission of the People's Republic of China, European Centre for Disease Prevention and Control (ECDC) and World Health Organization (WHO), hospitals were ranked seven under 10 ECDC standards, seven out of 8 WHO standards (Wang et al. 2019). The high commitment and compliance to guidelines in China have been majorly informed by the presence of precise IPC monitoring and evaluation teams which have been integral in improving the overall performance of hospitals in relation to underlying standards.

The present findings were inconsistent a study in Kenya assessing adherence to IPC measures among level four hospitals in Kenya. The results showed that there was a high level of compliance with IPC measures. Although frequent water shortage, inadequate continuous updates on IPC and inactive IPC committee were significant challenges to the compliance (W. Gichuhi, 2015). This could be due to the retrospective nature of their study, which assessed the presence of infections as a measure of compliance.

Our present findings established that clinical officers and support staff perceived the level of implementation of national IPC guidelines as high. These findings are comparable to McCauley et al. (2021), who found that the professional cadre of the respondents is associated with compliance. This is mainly based on the commitment to the underlying guidelines. Support staff are primarily involved in the disposal of waste from medical areas and around the hospital. Thus, high compliance to these measures contributes to a higher perception of the existing national IPC guidelines. Those with good knowledge of IPC were more likely to comply with the national guidelines. These findings are consistent with other studies which found that highly knowledgeable people are more likely to comply with underlying guidelines (Gichuhi, 2015;Wong et al., 2021;Alhumaid et al., 2021).

5.3. The barriers to compliance with national infection prevention and control guidelines and practices at Pumwani Maternity Hospital

The current study's findings established that staff shortage and high patient flow at the hospital were significant barriers to adherence to national IPC guidelines and practices. These results are in keeping with research carried out in Ethiopia which showed that high patient inflow was one of the major barriers to compliance with IPC guidelines and practices (Yallew, Kumie, and Yehuala 2019). These

findings show that the existing staff are sometimes overwhelmed due to high patient flow which restricts their ability to adhere to infection prevention and control guidelines and practices. Similar findings were obtained from a systematic review study assessing barriers to IPC compliance. The results revealed that HCWs struggled to adhere to local guidelines when they were lengthy, unclear, or failed to compare with national or international standards. They further discussed how IPC strategies increased their workloads and made them more fatigued, for instance, because they had to do more cleaning and use PPE. Healthcare professionals deliberated how their views of their management team's support affected their response to IPC guidelines (Houghton et al., 2020).

In addition, commitment to IPC guidelines requires a strong, well-funded team to control common challenges such as staffing and workload. Our findings have shown that workload is a significant challenge in preventing maximum efforts to focus on underlying guidelines. These findings are comparable to a qualitative study in India which revealed that significant barriers included a high rate of nursing staff turnover, limitations in language competency, time spent training new staff, and heavy clinical workloads (Barker et al., 2017). Compliance with the national guidelines has been significantly low, which creates a major gap in commitment to improving infection control. Opollo et al. (2021), in a study in Uganda, revealed that the underlying challenges to the implementation of the guidelines and practices were lack of an IPC committee, IPC team, a lack of staff training and no budgetary allocation.

Implementing IPC principles successfully or unsuccessfully might have a variety of interrelated causes. Reviewing the essential components for effective implementation, it was determined that governance strategies, communication channels, and guidelines structure are fundamental preconditions for enhancing cooperation and openness among process participants. A review by Birgand et al. (2015) identified the following as the main determinants: developing policies and recommendations, modifying government strategies to fit the context, whether local or global, accurate use of surveillance systems and indicators, bolstering communication systems, and implementing new technologies for more straightforward IPC practice monitoring. In addition, other factors that have been identified as predictors of noncompliance include a heavy workload, time restraints, a high patient-to-nurse ratio, and professional category-specific elements, the paucity of IPC norms, and an absence of supplies like soap, alcohol hand rub, and paper towels (Alhumaid et al. 2021). In environments with low resources, these constraints have a substantially greater impact (Manchanda, Suman, and Singh, 2018).

5.4. Conclusion

This study established that majority (73%) of the respondents at Pumwani Maternity Hospital had good knowledge of IPC. Knowledge of different components that were assessed includes waste segregation (92%), protective gloves (91%), housekeeping (85%), reusable equipment (84%), hand hygiene (80%), personal protection (75%) and injection and blood samples (68%).

The level of implementation of the national IPC practices was low at 36%, showing a significant gap in commitment to comply with the national guidelines. Compliance with IPC practices was significantly associated with cadre and knowledge among staff.

The common barriers to compliance with IPC practices were a hospital staff shortage and high patient flow. Other barriers identified included a lack of regular inspection and maintenance of equipment at the hospital, shortage of material supply forcing health workers to reuse equipment and materials and lack information on hospital-associated infections and infection prevention control guidelines.

5.5. Study Limitations

1. The compliance with national IPC guidelines was based on the respondent's perception hence the findings are more likely to be subjective.
2. The calculated sample size was not attained due to lack of consent and overall response from some selected participants.

5.6. Recommendations

1. The hospital administration should avail copies of IPC policy guidelines in all wards/units and establish effective enforcement through consistent supervision.
2. The hospital should recruit more staff to promote a conducive environment for implementation of national IPC guidelines.
3. The hospital administration should initiate regular workshops to facilitate training opportunities for every staff to advance their knowledge and compliance level with the IPC guidelines.

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7. APPENDICES

7.1. Consent Form

Title of Study: Assessment of infection prevention and control knowledge, practises, implementation and barriers among healthcare workers and support staff at Pumwani Maternity Hospital, Nairobi Kenya

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Introduction:

The researchers listed above are carrying out an online survey on doctors, nurses, clinical officers, pharmacists and technologists, nutritionists, occupational therapists, physiotherapists and housekeeping staff working at Pumwani Maternity Hospital, Nairobi. The purpose of the survey is to find out their knowledge on infection prevention and control (IPC), establish the level of implementation of infection prevention and control guidelines and identify barriers to IPC implementation at Pumwani Maternity Hospital.

Participants in this research study will be asked questions about infection prevention control knowledge, implementation guidelines and barriers to implementation of IPC. There will be

approximately 171 participants in this study randomly chosen. The above research study is voluntary and we are asking for your consent to consider participating in this study.

Purpose of the study: The purpose of the study is to assess the Infection prevention and control knowledge and practices among healthcare workers and support staff, establish the level of implementation of IPC guidelines and identify barriers to IPC implementation at Pumwani Maternity Hospital, Nairobi Kenya. Information from this study will greatly impact control of healthcare acquired infections.

Study procedure: There will be approximately 171 participants in this study randomly chosen. Participants will include doctors, nurses, clinical officers, pharmacists and technologists, nutritionists, occupational therapists, physiotherapists and hospital housekeeping staff working at Pumwani Maternity Hospital. Self-administered questionnaires will be used to conduct the survey via online platforms such as WhatsApp.

Role of the participant: Participation in the study is voluntary. One can decide to opt out of the study at any point without any consequence. Once consented, participants are urged to fill in the questionnaire as honestly as possible.

The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Questions and clarifications are welcomed. If you agree to participate in this study and consent on the online questionnaire provided, you will proceed to fill in a self-administered questionnaire. The questionnaire will take approximately seven minutes.

Benefits: While there may be no monetary benefit to participating in this study, the information you provide will help us better understand infection prevention and control guidelines being implemented at Pumwani maternity hospital and identify any gaps. This information is a contribution to science and will be helpful in aiding in the reduction of hospital acquired infections.

Risks and discomforts: The researcher will protect the privacy and confidentiality of the respondents at all times. No personally identifiable information will be collected from respondents. The data collected will be stored in a password protected drive and only the researcher will have access.

Researcher's statement

This study will cost you nothing. If you are uncomfortable answering any question you may skip it. If you have further questions or concerns about participating in this study, please call or send a text message to the study staff at the number provided at the bottom of this page.

Daisy W. Kouko.
Email address daisykouko@gmail.com. Tel: 0721869546

For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh_erc@uonbi.ac.ke.

Participant's statement:

I have read this consent form. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study. I understand that all efforts will be made to keep information regarding my personal identity confidential. By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study.

I agree to participate in this research study: Yes /No
Signature/Thumb stamp:
Date:

7.2. Infection Prevention and Control Questionnaire

Title: Assessment of Infection Prevention and Control Knowledge, Practices, Implementation, and Barriers among Healthcare Workers at Pumwani Maternity Hospital, Nairobi Kenya

Please mark where appropriate.

SECTION A: DEMOGRAPHIC INFORMATION		Answer here
1. What is your gender?	Male	
	Female	
2. What is your age?		
3. What is your profession?		
4. What is your level of education?	Diploma	
	Degree	
	Masters	
	PhD	
	Other, specify	
5. What is your work experience in years?		

SECTION B: HEALTHCARE WORKERS KNOWLEDGE OF INFECTION PREVENTION AND CONTROL GUIDELINES

7. To what extent do you agree with the following statements on infection prevention and control knowledge and practices?

Indicate by ticking (√) the cell which closely reflects your opinion. Use a Likert scale of 1- 5 where:1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5= Strongly Agree

Statements	1	2	3	4	5
(a) Hand hygiene					
I wash my hands before touching the patient					
I wash my hands after touching the patient					
I wash my hands before performing a clean or aseptic procedure					
I wash my hands after exposure to body fluids					

I wash my hands after contact with an object that has touched the patient or is in the patient's immediate environment					
I wash my hands before an injection or taking a blood sample					
I wash my hands after an injection or taking a blood sample					
(b) Protective gloves					
Gloves should not be reused on more than one patient					
It is necessary to wash hands even when one was using gloves when examining a patient					
Gloves should always be removed before leaving the area where the patient was seen					
(c) Injections and blood samples					
Needles should be recapped after use before disposal					
Needles and syringes should be discarded together in the same container after use					
Syringes should not be reused on more than one patient					
(d) Reusable equipment					
A thermometer should be disinfected after contact with one patient					
A fetoscope/stethoscope should be disinfected after contact with one patient					
Lab coats should be washed after a week of use.					
(e) Waste segregation					

I know the recommended types of containers that should be used for segregating syringes					
I know the recommended types of containers that should be used for segregating needles					
I know the types of waste that should go in each colour-coded container					
Red container is used for highly infectious waste or hazardous health-care waste and black for non-infectious waste					
(f) Personal protection					
I have adequate personal protective equipment (PPE) while at work					
I have been vaccinated against pathogens such as Hepatitis B, Tetanus Toxoid, Coronavirus					
Housekeeping					
The floor should be cleaned at least 3 times in 24 hours with detergent					
Linen soaked in blood and body fluid should be packed in leak proof containers/ bags					
Mops must be completely dry before reuse					
Transport waste in dedicated trolleys					
Curtains and room partitions should be cleaned and changed weekly					

SECTION C: IMPLEMENTATION OF INFECTION PREVENTION AND CONTROL GUIDELINES AT THE FACILITY

8. To what extent do you agree with the following statements on the level of implementation of infection prevention and control guidelines at the facility?

Indicate by ticking (√) the cell which closely reflects your opinion. Use a scale of 1- 4 where: 1

1= 0-25%; 2 = 26% - 50%; 3 =51% -75%; 4= 76% to 100%

	1	**2**	**3**	**4**
(a) Presence of IPC programme				
i. Hospital IPC programme is supported by an IPC team comprising of IPC professionals				
ii. Hospital IPC programme has an active IPC committee constituted by healthcare workers among others				
iii. Hospital IPC programme is supported by the facility's top leadership				
(b) Infection Prevention and Control (IPC) guidelines				
i. Hospital has established guidelines for controlling infectious diseases				
ii. Hospital guidelines are consistent with national/international guidelines				
iii. Hospital guidelines were developed in consultation with healthcare workers				
(c) Infection Prevention and Control (IPC) education and training				
i. Hospital has personnel with IPC expertise that lead IPC training				

ii.	Healthcare workers frequently receive training regarding IPC in the facility				
iii.	Hospital carries out periodic evaluations of the effectiveness of training programmes				
(d) Health care-associated infection (HAI) surveillance					
i.	Hospital has clearly defined surveillance under the IPC programme				

ii.	Hospital has prioritized the HAIs targeted for surveillance				
iii.	Hospital regularly evaluates surveillance to ensure that it is in line with the needs and priorities of the facility				
(e)	**Multimodal strategies for implementation of infection prevention and control (IPC) interventions**				
i.	Hospital uses multimodal strategies to implement IPC interventions. Examples of multimodal strategies are system change, education and training, monitoring and feedback, communications and reminders, safety climate and culture change)				
(f)	**Monitoring/audit of IPC practices and feedback**				
i.	Hospital has a well-defined monitoring plan with clear goals, targets and activities for monitoring and auditing IPC practices and feedback				
(g)	**Workload, staffing and bed occupancy**				
i.	Hospital has appropriate staffing levels to meet the patient workload at the facility				
ii.	Hospital has adequate bed capacity in line national and international standards				
(h)	**Built environment, materials and equipment for IPC at the facility level**				
i.	Hospital has adequate water services availability at all times and of sufficient quantity to meet the facility's needs				
ii.	Hospital has functioning hand hygiene stations (that is, alcohol-based hand rub solution or soap and water and clean single-use towels)				

iii.	Hospital has sufficient energy/power supply available at day and night for all uses				
iv.	Hospital has single patient rooms or rooms for cohorting patients with similar pathogens if the number of isolation rooms is insufficient				
v.	Hospital has functional waste collection containers for non-infectious (general) waste, infectious waste and, sharps waste in close proximity to all waste generation points				
vi.	Hospital has a dedicated decontamination area and/or sterile supply department for the decontamination and sterilization of medical devices and other items/equipment				

SECTION D: BARRIERS TO IMPLEMENTATION OF INFECTION PREVENTION AND CONTROL GUIDELINES

9. To what extent do you agree with the following statements on barriers to implementation of infection prevention and control practices?

Indicate by ticking (√) the cell which closely reflects your opinion. Use a scale of 1- 5 where:

1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5= Strongly Agree

Statements		**1**	**2**	**3**	**4**	**5**
i.	There is a shortage of facilities at the hospital (wards, toilets, hand washing facilities etc)					
ii.	There is shortage of material supply forcing health workers to reuse equipment and materials					
iii.	There is lack of regular inspection and maintenance of equipment at the hospital					

iv.	There is a high patient flow at the hospital					
v.	There is a shortage of adequate staff at the hospital					
vi.	Healthcare workers lack information on hospital-associated infections and infection prevention control guidelines					
vii.	There is low awareness among patients and visitors on hospital-associated infections					