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Compliance with standard precautions in infection prevention control and associated factors among health care workers in Dodoma referral hospital, Dodoma, Tanzania.

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Compliance with standard precautions in infection prevention control and associated factors among health care workers in Dodoma referral hospital, Dodoma, Tanzania.

Directed by Dr. Joon-Sup Yeom

A Master's Thesis

Submitted to the Department of Global Health Policy and Financing

and the Graduate School of Public Health, Yonsei University

in partial fulfillment of the requirements for the degree of

Master of Public Health

Mathew Elia Mushi

December 2022

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This certifies that the Master's thesis

of Mathew Elia Mushi is approved.

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DECLARATION

I, Mathew Elia Mushi, hereby declare that the research “Compliance with standard precautions in infection prevention control and associated factors among health care workers in Dodoma referral hospital, Dodoma, Tanzania” is submitted as a thesis for the competition of my Master's Degree of Health Policy and Financing at Yonsei University, Seoul and it is full results of my investigation, all idea, references and content have been acknowledged. I also certify the results of this study have not been submitted in any degree and neither currently submitted by a candidate of any degree.

Signature Date

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First and foremost, I want to thank and praise the God, the Almighty, for His blessings during my time studying in Korea and for helping me complete my studies and research.

My parent's love, prayers, care, and sacrifices during my education have made me incredibly grateful. I am grateful for the love, compassion, prayers, and ongoing support of my wife Mariam Mgalula, my son Melvin Mushi, and my daughter Meghan Mushi throughout the time when I was far from them. I also want to thank my sisters and brothers for their help and impactful prayers.

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Last but not least, I would want to express my gratitude to KOICA for providing a scholarship for me to pursue my studies in Korea, as well as to all my classmates, the Dodoma RR Hospital, and everyone else who helped me in any way to accomplish my research and studies.

Mathew E. Mushi

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DEDICATION

This thesis is dedicated to my wife and our two children, Melvin and Meghan, for being a continual source of support and encouragement for me throughout this period when I was away from them studying. This work is also dedicated to my parents, who have always loved me unconditionally and whose good examples have taught me to work hard for the things that I aspire to achieve.

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ABBREVIATIONS

CDC	Centers for disease control
HAIs	Hospital-acquired infections
COVID-19	Corona Virus Disease 2019
HIV	Human Immunodeficiency Virus
IPC	Infection Prevention and Control
HCWs	Health Care workers
PPE	Personal Protective Equipment
WHO	World Health Organization

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ABSTRACT

Background: Compliance with Infection prevention and control (IPC) standard precautions reduces the risk of transmission of infections between patients, healthcare workers (HCWs), and others in the healthcare environment. Infections associated with the provision of healthcare affect patients, consumers, and the health workforce can cause considerable harm and may increase the risk of morbidity, and mortality, and increase the cost burden to the health system.

Purpose: This study assessed the level of Compliance with standard precautions in IPC and associated factors among HCWs in Dodoma referral hospital, Dodoma, Tanzania 2022.

Methodology: An institutional-based cross-sectional study was conducted on September 2022 at Dodoma RR Hospital and 156 HCWs participated. Google form Questionnaires were used to collect data and questionnaire links were administered using WhatsApp. Data from the online questionnaires were collected on a spreadsheet, cleaned, and analyzed using Jamovi software version 2.3.16. To determine the contributing factors, adjusted odds ratios with a 95% confidence interval were estimated by multivariate logistic regression analysis. A P-value less than 0.05 was considered statistically significant.

Results: Approximately 32.7% of HCWs had high compliance with IPC standard precautions. The highest compliance was hand hygiene after touching body fluid 94.2% followed by redisposing needles in safety boxes immediately after use 90.4%, the lowest compliance rate was 5.1% regarding the disposal of the sharp box when 3/4 full. Being a nurse AOR (95% CI) 3.1(1.15-8.77) P value 0.025), completed two doses of coronavirus disease-2019 (COVID-19) vaccine AOR (95% CI) 3.5 (1.27-9.84) P value 0.015), IPC training upon hire AOR (95% CI) 3.0(1.27-7.07) P value 0.012), adequate PPE AOR (95% CI) 2.5(1.05-6.32) P value 0.037), enough sharp safety boxes AOR (95% CI) 2.7(0.98-7.59) P value 0.05) were revealed to be factors of the HCWs compliance with IPC standards precautions.

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Conclusion: This study revealed that the level of compliance with IPC standard precautions at Dodoma RR hospital is very low 32.7%. Being a nurse, completing two doses of the COVID-19 vaccine, training upon hire, adequate personal protective equipment (PPE) supply, and enough sharp safety boxes were among of factors associated with compliance with IPC standard precautions. Therefore, the provision of enough safety sharp boxes, PPE, and training on standard precaution upon hire will improve compliance with standard precaution practice.

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CHAPTER 1

1.0 INTRODUCTION

1.1 Background

Outbreaks of infectious diseases, such as those caused by Ebola, Middle East respiratory syndrome, and the Coronavirus disease 2019 (COVID-19), have shown how epidemic-prone pathogens can spread rapidly (Organization, 2022). Out of every 100 patients in emergency-care hospitals, seven patients in high-income countries and 15 patients in low- and middle-income countries will acquire at least one healthcare-associated infection during their hospital stay (Organization, 2022). The World Health Organization (WHO) conducted a prevalence study in 55 hospitals across 14 countries and found that 8.7% of inpatients contracted infections during hospitalization (Luo et al., 2010). Tanzania is the most affected country in Africa with a prevalence of 14.8% while the average prevalence in Africa varies between 2.5% to 14.8% (Kinyenje et al., 2020). The most common hospital-acquired infection (HAIs) in African countries includes health-care-associated urinary tract infection, surgical site infection (SSI), hospital-acquired pneumonia, and health-care-associated bloodstream infection (Nejad et al., 2011). HAIs are still a major cause of death and morbidity among inpatients and outpatients. Although they occur worldwide, low-income countries are more affected (Ducel et al., 2002). A major economic burden falls on healthcare systems in low-income countries due to HAIs (WHO, 2016). Hospital infection develops within the hospital environment, posing a serious threat to the health and safety of patients and medical workers worldwide and increasing the cost of medical care, and lowering the quality of care (Luo et al., 2010).

In 1996, the Centres for Disease Control and Prevention (CDC) developed standard precautions to help protect both HCWs and patients from infection with blood-borne pathogens in the healthcare settings These precautions apply when there is a risk of potential

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exposure to (1) blood; (2) all body fluids, secretions, and excretions, except sweat, regardless of whether or not they contain visible blood; (3) non-intact skin, and (4) mucous membranes (Garner, 1983).

HAIs can be reduced significantly by adhering to infection prevention control (IPC) standard precautions (De Bono et al., 2014). IPC Standard Precautions are the minimum infection prevention precautions that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where health care is delivered including hand hygiene, use of personal protective equipment (PPE), safe injection precautions, sterile instruments and devices, clean and disinfected environmental surfaces, and proper health care waste management (Garner, 1983).

To continue fighting against HAIs, constant action is necessary at all levels, especially from policymakers to hospital directors to prevent most avoidable infections among patients and healthcare workers (WHO, 2016).

Compliance with IPC standards in Tanzania is not satisfactory, especially in this era of COVID-19 and other emerging and reemerging diseases (Bahegwa et al., 2022; Powell-Jackson et al., 2020). Compliance with hand hygiene and disinfection is a major problem in Tanzania and it is encouraged by low knowledge and a lack of supplies (Powell-Jackson et al., 2020).

It is difficult to find reliable evidence regarding the level of compliance of HCWs with standard precautions due to this the study aimed to assess the level of compliance with IPC standard precautions among HCWs in Dodoma regional referral hospital, Tanzania and explore the association between compliance and IPC standard precautions. The findings are important to reveal strategies and interventions needed to strengthen workplace policy in healthcare settings and sustain the capacity of a healthcare system to fight HAIs as well as maintain essential health services.

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1.2 Problem **statement**

Tanzania's standard-based management recognition tool (SBM-R) ensures that hospitals comply with IPC standard precautions by using performance standards to conduct rapid and repeated assessments of their health facilities. It is used to ensure compliance with IPC standards in hospitals. A comprehensive assessment of clinical and support systems, identification of gaps in compliance with these standards, corrective interventions, and recognition mechanisms are used to reward achievements (Kinyenje et al., 2020). Among all activities, the baseline compliance with IPC standards in all facilities was 32% in 2010, which increased to 53% in 2014, and dropped to 34% in 2017; no reliably documented reasons were provided for this status (Hokororo et al., 2021).

Compliance with IPC in Tanzania hospitals currently in this era of COVID-19 is very low compared to the WHO standard (Bahegwa et al., 2022; Powell-Jackson et al., 2020).

By reducing the risk of microorganism transmission from both recognized and unknown sources, standard precautions aim to protect both health workers and patients. Standard precautions can prevent the spread of infectious diseases to patients, health workers, and the environment when applied consistently. Implementing these measures can improve the facility's healthcare services in terms of quality and safety. This study aims to assess the level of compliance with IPC standard precautions and to describe factors affecting compliance with IPC standards precautions among HCWs at Dodoma referral regional hospital, Dodoma, Tanzania.

1.3 Study purpose

To assess the level of compliance with IPC standard precautions and to describe factors affecting compliance with IPC standard precautions among HCWS at Dodoma referral regional hospital, Dodoma, Tanzania.

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1.4 Specific Objectives

1. To determine the level of compliance with IPC standards precautions among HCWS at Dodoma referral regional hospital, Dodoma, Tanzania, 2022.

2. To identify factors associated with compliance to IPC standard precautions among HCWs in Dodoma referral regional hospital, Dodoma, Tanzania, 2022.

3. To identify the hospital determinants that affect compliance with IPC standards precautions at Dodoma referral regional hospital, Dodoma, Tanzania, 2022.

1.5 Research Questions

1. **What is the level of compliance to IPC standards precautions among HCWs at Dodoma referral hospital?**

2. **What are the factors associated with compliance with IPC standards precautions among HCWs in Dodoma referral regional hospital, Dodoma, Tanzania?**

3. What are the hospital determinants affecting compliance with IPC standards precautions at the Dodoma referral regional hospital, Dodoma, Tanzania?

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1.6 Significance of the study

DR Congo and Uganda, neighboring countries to Tanzania, witnessed Ebola virus disease and Marburg outbreaks in recent years. A lack of compliance with IPC standard precautions increased HAIs, AMRs, and increased healthcare costs, resulting in increased mortality, morbidity, and reduced life expectancy. Especially in this era of COVID-19 infection, prevention and control standard precautions should be strengthened and adhered to prevent outbreaks and the spread of infectious diseases. It is critical to assess compliance with IPC standards practice in hospital settings and to reinforce IPC standard precautions.

This study will contribute to our understanding of the reasons for poor adherence among HCWs to IPC measures and will add to the existing literature and will be used in developing the most appropriate interventions. By doing so, Tanzanian policymakers and stakeholders will be able to increase compliance with IPC standard precautions.

1.7 Hypothesis

Compliance with IPC standard precautions among HCWs at Dodoma regional referral hospital, Dodoma, Tanzania, is not affected by hospital factors, social demographic factors, or IPC experience-related factors.

1.8 Conceptual framework

The ecological framework was used to formulate a conceptual framework in this study. In this framework, the dependent variable is compliance with IPC standard precautions (hand hygiene, proper health waste management, injection safety, and proper use of PPE.

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Compliance with IPC precautions in this study depends on HCWs and hospital/institution determinants. HCW factors include social demographic factors like the type of profession, age, working experience, and highest qualification, these factors interact with hospital/institution determinants such as adequate supplies and supportive management to influence compliance with IPC standard precautions.

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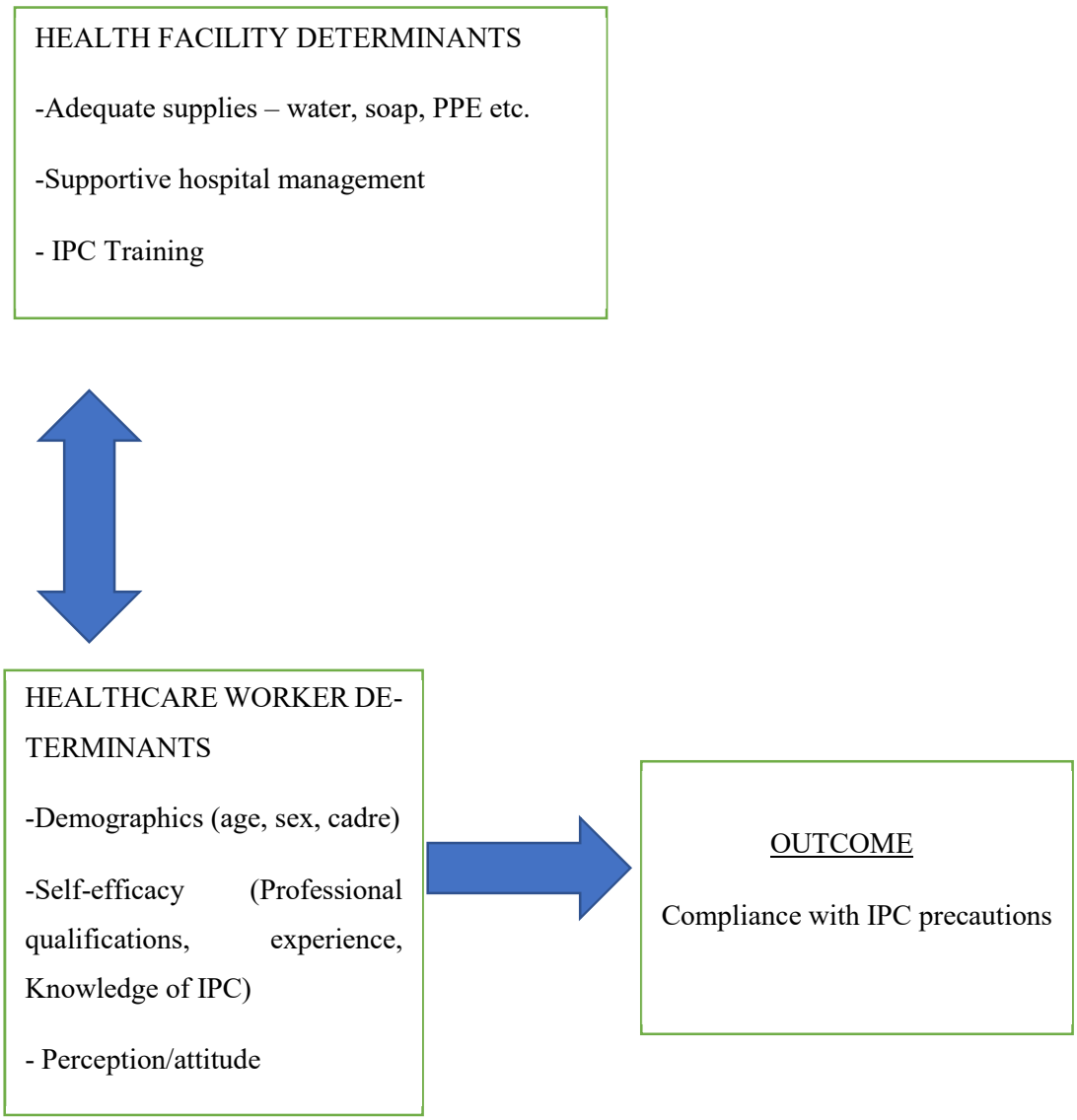

Figure 1. Conceptual Frame

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1.9 Operational Definition of Critical Terms

Infection prevention and control (IPC) is a practical, evidence-based approach to preventing patients and health workers from being harmed by avoidable infections (WHO, 2022).

Standard Precautions are the minimum infection prevention practices that apply to all patient care, regardless of the suspected or confirmed infection status of the patient, in any setting where health care is delivered (Garner, 1983).

Personal protective equipment (PPE) refers to wearable equipment designed to protect healthcare providers from exposure to or contact with the infectious agent

Hospital-acquired infections-are nosocomial-acquired infections that are typically not present or might be incubating at the time of admission. These infections are usually acquired after hospitalization and manifest 48 hours after admission to the hospital (Garner, 1983).

A healthcare worker delivers care and services to the sick and ailing either directly as doctors and nurses or indirectly as aides, helpers, laboratory technicians, or even medical waste handlers.

Compliance is the practice of obeying rules or requests made by people in authority.

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CHAPTER 2

2.0 LITERATURE REVIEW

2.1 Background of standard infection prevention and control

IPC is a practical, evidence-based approach to preventing patients and health workers from being harmed by avoidable infections (13) while Standard Precautions are the minimum infection prevention precautions that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where health care is delivered (8).

As early as 1985, the Centres for Disease Control (CDC) introduced universal precautions mostly in response to the human immunodeficiency virus (HIV). Universal precautions are a standard set of guidelines to prevent the transmission of bloodborne pathogens from exposure to blood and other potentially infectious materials. It does not apply to sputum, feces, sweat, vomit, tears, urine, or nasal secretions unless they are visibly contaminated with blood. This is because the risk of transmitting Hepatitis B or HIV is low. In 1987, the CDC introduced another set of guidelines, Body Substance Isolation, which emphasized avoiding direct physical contact with “all moist and potentially infectious body substances,” even if blood is not visible. A limitation of this guideline was that it emphasized handwashing after removing gloves only if the hands were visibly soiled. In 1996, the CDC combined the major features of Universal Precaution and Body Substance Isolation into what is now referred to as Standard Precautions. These guidelines also introduced three transmission-based precautions: airborne, droplet, and contact (Garner, 1983).

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All levels of the health system must be involved in IPC, including policymakers, facility managers, health workers, and patients. A quality healthcare system cannot function without an effective IPC (WHO, 2016).

2.2 Level of compliance with IPC Standard Precautions

A study done in Europe to monitor anti-microbial drug resistance showed a low level of compliance with IPC measures commonly reported in European countries apart from the availability of all guidelines (Tacconelli et al., 2019). In Australia, a study done on final-year undergraduate nurses showed that the level of compliance was low (59%) compared to international standards (Mitchell et al., 2014). A study conducted in India also showed an inadequate level of compliance with IPC standard precautions (Kermode et al., 2005).

In Africa, an institution-based cross-sectional study done at Gondar university specialized hospital in Ethiopia showed the overall compliance of HCWs with standard precautions was very low(12%). This was the same as another institutional-based cross-sectional study conducted at Hawassa Comprehensive Specialized Hospital, which was 56.5% (Bekele et al., 2020; Haile et al., 2017). Another study done in Ridge regional hospital Accra Ghana concluded that the level of IPC compliance standards precautions was low compared to WHO recommended Standards (Hayeh & Esena, 2013).

A cross-sectional study done in the Songwe region of Tanzania to assess factors affecting compliance with IPC standard precautions among HCWs showed that Songwe Region HCWs compliance with standards precautions was at 66% and only 22.5% of HCWs had high compliance with IPC standard precautions greater than 80%. The study concluded that the level of compliance was very low (Bahegwa et al., 2022). Across Tanzania, a cross-sectional study conducted to examine compliance with IPC precautions among a large sample of health workers in 18 regions of

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Tanzania showed a low level of compliance mainly in the hand hygiene and disinfection (Powell-Jackson et al., 2020) in Dar es Salaam, Tanzania. This was a quantitative cross-sectional and observational study done to assess adherence to universal precautions among nurses caring for critically ill patients in intensive units (ICUs). It also showed an inadequate level of compliance with IPC standard precautions (Wibonela et al., 2020). An evaluation of IPC was conducted in Tanzania's primary healthcare facilities. IPC principles were adhered to on average by 31% before interventions, but there was only 57% of adherence after interventions (Kinyenje et al., 2020).

2.3 Factors associated with compliance with IPC standards precautions

Global studies conducted in China to determine factors impacting compliance with standard precautions showed that knowledge and general self-efficacy are highly associated with high compliance with IPC standard precautions (Luo et al., 2010) and a descriptive, cross-sectional study conducted at two university nursing schools in South Korea showed that attitudes and knowledge of IPC standard precautions are important for increasing the adherence to best standard precautions, and also promoting safe environments (supportive work environment, infrastructure, and resource) and increasing periods gaining clinical experience and increasing the level of compliance (Kim & Hwang, 2020; Kim & Park, 2021; Oh & Choi, 2019).

African studies conducted in Ethiopia discovered that significant association in compliance among HCWs who had received training on IPC standard precautions 3.99 times more compared with HCWs that did not receive training on standard precautions, female sex, perception of infection risk, training, and knowledge of standard precautions were significantly associated with compliance with standard precautions (Bekele et al., 2020; Haile et al., 2017).

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A study completed in the Songwe region of Tanzania showed that being a nurse, IPC training, years of working experience, and lack of needle injury were associated with high compliance with IPC standard precautions (Bahegwa et al., 2022). Another study done on IPC in outpatient facilities noted that the age and sex of HCWs influenced compliance levels. The age of HCWs was negatively associated with the correct use of gloves with compliance noted to be lower among those who were above 30 years old. Female HCWs were likely to adhere to hand hygiene compared to their male HCWs (Powell-Jackson et al., 2020).

2.4 Hospital determinants affecting compliance with IPC standards precautions

Hospital determinants have a significant effect on compliance with IPC precautions, the finding from a study done in the United States showed that most HCWs consistently do not follow IPC standard precautions mostly due to a lack of good hospital environment, leadership support, and monitoring and evaluation (McCoy et al., 2001). While a study done in India concluded that the availability of PPEs was one of the barriers to compliance with the IPC standard precautions (Punia et al., 2014).

A study done in Ethiopia showed that the hospital factor plays a big role in IPC compliance. The study showed that HCWs who had more frequent management support towards a safe environment at the institution were 2.23 times more likely to be always compliant than those who had less frequent management support. Moreover, HCWs who had readily accessed PPE were 2.87 times more likely to be compliant than those who had not readily accessible PPE. Another study showed that the availability of supplies of infection prevention increases the utilization of those supplies and increases the level of compliance (Desta

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et al., 2018). A study conducted in Hawassa hospital in Ethiopia concluded that there was a correlation between compliance with standard safety precautions and access to the safety box, availability of running tape water, participation in the training program, health facility training upon hire, and supportive supervision for IPC (Bekele et al., 2020).

In a Tanzanian study done in the Songwe region HCWs in Songwe, it was reported that accessibility and availability of PPE are major barriers to high compliance with IPC standards practice among health workers (Bahegwa et al., 2022). Another study showed that HCWs' compliance with IPC, particularly regarding hand hygiene and disinfection, was inadequate within outpatient settings due to a lack of supplies (Powell-Jackson et al., 2020).

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CHAPTER 3

3.0 METHODOLOGY

3.1 Study design

This study was an institutional cross-sectional study to assess the level and factors associated with compliance with IPC standard precautions among HCWs at Dodoma referral regional hospital, Dodoma, Tanzania. The study was conducted in September 2022.

3.2 Study area

This study was conducted at Dodoma referral regional hospital which is located in the central part of Tanzania and Tanzania's capital city, Dodoma. It is located in the center of the country, the town is 453 kilometers west of the former capital at Dar es salaam and 441 kilometers south of Arusha, the headquarters of the East African Community, and the population of Dodoma city is around 410,956.

Dodoma referral hospital was established in 1930. Currently, more than 400 outpatients are receiving medical services daily and the bed capacity is 420 beds with 500 HCWs (Doctors -80, Nurses -317, pharmaceutical personnel -18 laboratory personnel-34 others-42).

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Figure 2. Map of Dodoma showing the study area

3.3 Study population

The study population was Dodoma referral hospital HCWs.

3.4 Inclusion and exclusion criteria

3.4.1 Inclusion criteria

HCWs who offered regular clinical services during this study period and have direct contact with patients were included.

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3.4.2 Exclusion criteria

HCWs not permanently employed at Dodoma referral regional hospital (interns, students, volunteers).

3.5 Sampling procedures and data collection

3.5.1 Sampling procedures

In this study, convenience sampling was applied using Dodoma regional referral hospital HCWs.

3.5.2 Data Collection Method

A Google form was used for the online survey, which was administered through WhatsApp, which is widely used in Tanzania. The Google form Questionnaire link was sent to the HCWs individually and the hospital WhatsApp group. At the beginning of the questionnaire the study's overall goals, methods, the importance of participation, withdrawal from the study, and confidentiality were explained. The remaining information was sent in daily messages.

The questionnaire was developed from different guidelines and literature (11, 18, 23). The questionnaire is composed of three parts: 1. social demographic data, 2. scale to assess the level of compliance to IPC standard precautions, and 3. hospital determinants of infection control standard precautions compliance.

As a part of the scale, 20 compliance items with standard precautions which were scored using three Likert scale points (1-always 2-sometimes 3-never) were included. Always score 1, sometimes 0, and never 0, except for negatively worded questions, those which never scored 1, and others scored 0. As per Tanzania IPC guidelines (Bahegwa et al., 2022), the compliance rate was calculated as the average compliance with the 20 items in the percentage, with more than 16 being considered high compliance and less than 16 was considered low compliance.

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3.6 Data Analysis

Data from the online questionnaires were collected on a spreadsheet, cleaned, and analyzed using Jamovi software version 2.3.16.

The study variables' means, standard deviations, and frequencies were presented using descriptive statistics. To find variables significantly associated with the dependent variable, bivariate, and multivariate logistic regression analyses were performed. The odds ratio with a 95% confidence interval was used to determine how significantly the dependent and independent variables were associated. For this study, multivariable logistic regression analysis was run on all variables with a P value of less than or equal to 0.2. Significantly associated variables in the multivariable logistic regression model were those with a P value of less than or equal to 0.05.

3.7 Variables

Dependent variables compliance to IPC standard precautions (hand hygiene, healthcare waste management, decontamination, and use of PPE).

According to Tanzania standard-based management and recognition for the quality of services in Tanzania guidelines, compliance of 80% and above will be considered a good level of compliance with IPC standard precautions.

Independent variables– factors associated with compliance with IPC standard precautions: social demographic factors, health care worker factors, institutional, and health system factors.

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3.8 Ethical clearance

The ethics review committee approved the study topic and methodology from Dodoma RR hospital. Permission to conduct the study was obtained from the Dodoma Regional Referral Hospital. There were no risks associated with the research for participants. Having explained the purpose of the study, the benefits to the subject, and the confidentiality of the data, electronic consent was secured from all respondents.

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CHAPTER 4

4.0 RESULTS

4.1 Overview

The study findings have been presented in line with the objectives in the following order: socio-demographic characteristics, IPC experiences of the participants, level of compliance among HCWs at Dodoma regional referral hospital, and hospital factors affecting IPC compliance and association between hospital determinants and level of IPC compliance among HCWs.

4.2 Participants' socio-demographic characteristics and infection prevention and control experiences of the study participants

A total of 156 HCWs participated in this study. The majority were within the 31–40 years age group with a mean age of 32.9 and a standard deviation of 6.01. The majority of participants were males 59.6% compared to females 40.4%. Furthermore, the majority of participants were doctors 46.2% followed by nurses 45.5%. Additionally, majority of participants (52.6%) had a graduate degree as their highest qualification and most (82.1%) had training on IPC standard precautions. Approximately (50.6%) had less than six years of working experience. A majority of the participants (60.3%) had no history of a needle or stick injury when providing health services but 55.1% had a history of body fluid exposure while providing services. The Hepatitis B virus vaccine was administered to 64.1% of the participants, and the COVID-19 vaccine was administered to 62.9% of the participants (Table 1).

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Table 1: Participants' socio-demographic characteristics and infection prevention and control experiences among participants

Variable	Frequency(N=156)	Per cent (%)
Age		
21-30	57	36.5
31-40	88	56.4
41-50	7	4.5
>50	4	2.6
Sex		
Female	63	40.4
Male	93	59.6
Health professional		
Doctors	72	46.2
Laboratory personnel	13	8.3
Nurse	71	45.5
Highest qualification		
Certificate	13	8.3
Degree	82	52.6
Diploma	38	24.4

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Masters	23	14.7
Training on IPC?		
Yes	128	82.1
No	28	17.9
Work experience in years		
1 to 5	79	50.6
6 to 10	54	34.6
>10	23	14.7
Experience with sharp/needle stick injury		
Yes	62	39.7
No	94	60.3
Experience of blood or other body fluid exposure		
Yes	86	55.1
No	70	44.9
Hepatitis b vaccine dosage completed		
Yes	100	64.1
No	56	35.9
Received two doses of the COVID-19 vaccine?		
Yes	108	62.9
No	48	30.8

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4.3 Compliance with infection prevention and control standards precaution

The highest rate of compliance was for hand hygiene after touching body fluid (94.2%) followed by redisposing needles in safety boxes immediately after use (90.4%). In the study, the lowest compliance rate was 5.1%, which was for disposing of the safety box when full. Many HCWs did not dispose of their safety boxes until they were filled. Only 32.7% of HCWs showed high compliance with IPC standard precautions, and 67.3% of participants had low compliance (Table 2).

Table 2. Level of compliance with IPC standard precautions among healthcare workers at Dodoma RR Hospital in September 2022

IPC Standard precaution	Percentage of compliance	
	N=156	%
Use of PPE		
I use gloves when performing procedures	136	87.2
I use gowns when performing procedures likely to produce splashes	73	46.8
I use a face mask/face shield to perform procedures likely to generate splashes	71	45.5
I change gloves between treating each patient	127	81.4

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I avoid wearing my gown out of the workplace	121	77.6
Disposal of sharps objects and healthcare waste management		
Recapping needles	83	53.2
Redisposing of needles in safety boxes immediately after use	141	90.4
Disposing of needles in safety boxes and syringes in the dustbin	40	25.6
The sharp box is only disposed of when full	8	5.1
I use only sterilized reusable equipment with patients	131	84.4
I segregate non-infectious medical wastes in a yellow color-coded dust bin	91	58.6
I decontaminate the surface and machines (e.g., machine thermometer after use	104	66.7
I clean devices contaminated by blood/body fluids using disinfectant	133	85.3
I segregate non-infectious wastes in a black-coded dust bin	120	76.9
Hand hygiene		
I perform hand hygiene before touching a patient	103	66
I perform hand hygiene after touching a patient	124	79.5
I perform hand hygiene after touching body fluids	147	94.2
I perform hand hygiene soon after removing my gloves	116	74.4

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I perform hand hygiene after touching the patient's surroundings	105	67.3
I perform hand hygiene before clean/aseptic procedures	118	75.6

High compliance above 80%= 32.7%

Low compliance below 80%= 67.3%

4.4 Social demographic and experience factors associated with compliance with infection prevention control standard precautions

As presented in Table 3, the study depicted is a relationship between high compliance with IPC standard precautions and health professionals, which is statistically significant (p-0.009). Laboratory personnel had a significantly higher proportion (53%) of high compliance with IPC standard precautions compared to doctors and nurses.

Furthermore, the study found a statistically significant difference (0.022) between participants who attended standard precautions seminars or training. Compared to those who did not attend training, participants who attended training had a higher proportion (36.7%) of high compliance with IPC standard precautions.

Participants who received two doses of the COVID-19 vaccine had a high proportion (38%) of high compliance with IPC standard precautions compared to those who had not received the COVID-19 vaccine and the relationship was statistically significant (P-0.035).

Furthermore, findings revealed no statistical difference between the groups based on age, sex, vaccination against Hepatitis B, exposure to bodily fluids, or injury from sharp/needle sticks.

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Table 3. Relationship between infection prevention and control standard precautions compliance and individual factors

Variable	Low compliance	High compliance	x2	P- value
Age (years)				
21-30	38(66.7%)	19(33.3%)	3.29	0.349
31-40	57(64.8%)	31(35.2%)		
41-50	6(85.7%)	1(14.3%)		
Above 50	4(100%)	0(0%)		
Sex				
Male	62(66.7%)	31(33.3%)	0.043	0.836
Female	43(68.8%)	20(31.7%)		
Health professional				
Doctors	57(79.2%)	15(20.8%)	9.39	0.009
Health laboratory personnel	6(46.2%)	7(53.8%)		
Nurses	42(59.2%)	29(40.8%)		
IPC training				
No	24(85.7%)	4(14.3%)	5.25	0.022
Yes	81(63.3%)	47(36.7%)		

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Work experience in years.				
0-5	55(69.6%)	24(30.4%)	1.59	0.452
06—10	33(61.1%)	21(38.9%)		
>10	17(73.9%)	6(26.1%)		
History of sharp/needle stick injury				
Yes	42(67.7%)	20(32.3%)	0.008	0.925
No	63(67%)	31(33%)		
Exposure to blood or other body fluids				
Yes	60(69.8%)	26(30.2%)	0.527	0.468
No	45(64.3%)	25(35.7%)		
Completed three doses of the Hepatitis B vaccine				
Yes				
No	38(67.9%)	18(32.1%)	0.012	0.913
	67(67%)	33(33%)		
COVID -19 vaccine received				
Yes	67(62%)	41(38%)	4.43	0.035
No	38(79.2%)	10(20.8%)		

4.5 Institutional determinants of compliance with IPC standard precautions

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The study revealed that 62.2% of the participants said that hospitals do not conduct IPC standard precautions training upon hire. However, 77.6% of the participants agreed that the hospital provides enough hand hygiene supplies. Only 39.7% of the participants agreed that the hospital provides enough PPE but 56.4% agreed that the hospital provides enough safety boxes. Lastly, 35.3% stated that the hospital provides enough disinfectants and waste segregation supplies (Table 4).

Table 4. Institutional determinants of compliance with IPC standard precautions

Variable	Frequency(N=156)	Per cent (%)
Management conducts training on IPC upon hire.		
No	97	62.2 %
Yes	59	37.8 %
Does management provides adequate hand hygiene supplies?		
No	35	22.4 %
Yes	121	77.6 %
Does management provides adequate PPE?		
No	94	60.3 %
Yes	62	39.7 %
Does management provides enough sharp safety boxes?		
No	68	43.6 %
Yes	88	56.4 %

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Hospital provides adequate disinfectants and wastes segregation supplies?		
Yes	55	35.3 %
No	101	64.7 %

4.6 Association between the institutional determinants and high compliance with IPC standard precautions

High compliance with IPC standard precautions was significantly correlated with IPC training upon employment (p-value 0.001), with 50.8% of those who agreed to train upon employment reporting high compliance. Furthermore, respondents who agreed that management provides enough hand hygiene supplies, PPE, and safety boxes had high compliance with IPC standard precautions compared to those who disagreed and this was statistically significant (p-value-0.026, proportion 37.2%, P value <0.001 proportion 50% and p-value <0.001 proportion 43.3%, respectively).

According to the study, 50.8% of those who agreed that the hospital provides enough disinfectant supplies and waste segregation supplies had high compliance, which was statistically significant (p-<0.001) compared to those who disagreed (Table 5).

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Table 5: Association between the institutional determinants and high

Variables	Compliance		Total	X 2	P-value
	Low compliance N=156 %	High compliance N=156 %			
Training on IPC upon hire?					
No	76(78.4)	21(21.6)	97	14.2	<0.001
Yes	29(49.2)	30(50.8)	59		
Adequate hand hygiene supplies?					
No	29(82.9)	6(17.1)	35	4.96	0.026
Yes	76(62.8)	45(37.2)	121		
Enough sharp safety boxes?					
No	56(82.4)	12(17.6)	68	12.4	<0.001
Yes	49(55.7)	39(44.3)	88		
Adequate PPE supplies?					
No	74(78.7)	20(21.3)	94	14	<0.001

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Yes	31(50)	31(50)	62		
Adequate disinfectants and waste segregation supplies?					
Yes	27(49.1)	28(50.9)	55	12.8	<0.001
No	78(77.2)	23(22.8)	101		

4.7 Analysis of factors associated with compliance with infection control standard precautions using bivariate and multivariate regression

From Table 6, the 41–50 years age group was 0.3 less likely to comply with IPC standards precautions compared to the 21–30 years age group, but this was not statistically significant. Furthermore, males were 1.26 times more likely to comply with IPC standard precautions compared to females but the difference was not significant.

Nurses were 3.1 times more likely to comply with IPC standard precautions compared to their doctor colleagues and this was statistically significant (p-value 0.02). Also, laboratory personnel was 3.5 times more likely to comply with IPC standard precautions compared to doctors but this was not statistically significant.

HCWs who attended IPC standard precautions training were 3.4 times more likely to comply with IPC standard precautions compared to those who had not attended the training; however, this difference was not statistically significant.

HCWs who received two doses of the COVID-19 vaccine were 3.5 times more likely to comply with IPC standards precautions compared to those who had not received the COVID-19 vaccine and this was statistically significant (p-value 0.015).

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Furthermore, respondents who agreed that they received IPC standards precautions training upon hire were three times more likely to comply with IPC standards precautions compared to those who did not receive training upon hire and the association was statistically significant (p-value 0.012).

Respondents who agreed that the hospital provides enough hand hygiene supplies were 1.2 times more likely to comply with IPC standard precautions compared to participants who disagreed that the hospital provides enough hand hygiene supplies; however, this was not statistically significant.

Respondents who agreed that the hospital provides enough PPE were 2.5 times more likely to comply with IPC standard precautions compared to those who responded that the hospital does not provide enough PPE and this was statistically significant (p-value 0.03). Furthermore, respondents who agreed that the hospital provides enough sharp safety boxes were 2.6 times more likely to comply with IPC standard precautions and this was statistically significant (p-value 0.05).

Those who agreed that the hospital provides enough disinfectants and waste segregation supplies were 2.7 times more likely to comply with IPC standards precaution, though this was not statistically significant. Lastly, the study revealed no association between work experience, exposure to blood or other body fluid, or Hepatitis B vaccine status and compliance with IPC standard precautions.

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Table 6: Bivariable and Multivariable analysis results for factors associated with compliance with IPC standard precautions in Dodoma RR hospital, Tanzania, September 2022

		Bivariable	Multivariable	
Variables	P value	COR (95% CI)	P value	AOR (95% CI)
Age (years)				
21-30	Ref		Ref	
31-40	0.815	1.08 (0.5-2.1)	0.916	0.95(0.3-2.3)
41-50	0.325	0.33(0.03-2)	0.37	0.3(0.02-4.0)
Above 50	0.97	-	0.98	-
Sex				
Female	Ref	Ref	Ref	
Male	0.83	1.0(0.54-2.1)	0.591	1.29(0.5-3.3)
Health professional				
Doctor	Ref		Ref	
Health laboratory personnel	0.018	4.43(1.2-15)	0.118	3.5(0.7-17.7)
Nurse	0.011	2.62(1.2-5.4)	0.025	3.1(1.1-8.7)
Training on IPC?				
No	Ref	Ref		
Yes	0.029	3.48(1.1-10)	0.06	3.4(0.9-12.6)

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Completed COVID-19 vaccine doses?				
No	Ref			
Yes	0.038	2.325(1.0-5)	0.015	3.5(1.2-9.8)
IPC training upon hire?				
No	Ref			
Yes	<0.001	3.74(1.8-7.5)	0.012	3(1.27-7.07)
Adequate hand hygiene?				
No	Ref	Ref		
Yes	0.031	2.86(1.1-7.1)	0.71	1.2(0.3-4.5)
Adequate PPE supply?				
No				
Yes	<0.001	3.7(1.83-7.4)	0.037	2.5(1.05-6.3)
Enough sharp safety boxes?				
No	Ref	Ref		
Yes	<0.001	3.71(1.7-7.8)	0.05	2.7(0.98-7.5)
Adequate disinfectants and waste segregation supplies?				
No	Ref	Ref		
Yes	<0.001	3.517(1.7-7)	0.07	2.2(0.93-5.4)

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CHAPTER 5

5.0 DISCUSSION

5.1 overview

This chapter includes a discussion of the main findings of this study. This chapter discusses the level of compliance to IPC standard precautions among HCWs at Dodoma RR hospital, socio-demographic characteristics and IPC experience of participants, and how these characteristics and experiences are associated with the compliance levels of IPC standard precautions compliance levels and hospital factors influencing compliance with IPC standard precautions.

5.2 Level of compliance with IPC standard precautions among HCWs at Dodoma RR Hospital

Infections prevention control is a major challenge in most healthcare settings in low-income countries. This study aimed to determine the level of compliance with standard precautions and associated factors among HCWs in Dodoma RR hospital. This study revealed a low level of compliance with IPC standard precautions among HCWs in Dodoma RR hospital. Moreover, the majority of HCWs do not use face masks, which is similar to discoveries in a study in Ethiopia (Kassa et al., 2022). Most HCWs are still recapping needles, however, this is in contrast with the study done in Ethiopian hospitals (Bekele et al., 2020; Haile et al., 2017) and Sogwe, Tanzania (Bahegwa et al., 2022) where most HCWs dispose of needles in safety boxes when they are full and not ¾ full. The study showed that nurses, training upon hire, COVID-19 vaccine, enough supply of safety boxes, and adequate supply of PPE are factors associated with high compliance with IPC standard precautions. Hand hygiene compliance was higher for HCWs who always perform hand hygiene before touching a patient (66%), those who perform hand hygiene after touching a patient (79.5%), HCWs perform hand hygiene after touching body fluid (94.2%), those who perform hand hygiene soon after removing gloves (74.4%), HCWs that perform hand hygiene after touching pa-

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tient surroundings (67.3%), and those who perform hand hygiene before clean/aseptic procedures (75.6%) compared to the Ethiopia study where HCWs who always comply with hand washing before touching a patient is at 18.2%, those who wash their hands before clean or aseptic procedures makeup 39.6%, HCWs who wash their hands after body fluid exposure amount to 92.2%, those who wash hands after touching a patient are at 27.8%, HCWs who wash their hands immediately after they remove their gloves are at 80.6%, those who was their hands between patient contact are 19.4%, and those who wash their hands after touching patient surroundings are 22.4% (Haile et al., 2017).

Only 32.7% of HCWs had high compliance with IPC standard precautions and 67.3% of participants had low compliance. This low level of compliance may expose 7 HCWs out of 10 to the risk of acquiring HAIs and also put the health of patients at risk.

This low-level compliance is similar to other studies conducted in Tanzania. In a study conducted in the Songwe region, only 22% of HCWs had high compliance (Bahegwa et al., 2022). A retrospective analysis of data from eight randomly selected regions across Tanzania's median adherence to IPC principles was 31% (Kinyenje et al., 2020). Another study conducted in the outpatient setting in 18 regions revealed low levels of compliance with IPC standard precautions (Powell-Jackson et al., 2020). A similar study done in Bahir Dar town hospitals in Ethiopia showed that the level of compliance among HCWs was 41%, implying that four out of every 10 HCWs followed IPC standard precautions (Mulat Endalew et al., 2022).

5.3 Factors associating compliance with IPC standard precautions

5.3.1 Health professional

This study revealed that nurses were 3.1 times more likely to comply with IPC standard precautions compared to their doctor colleagues. This is similar to a study conducted in the

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southern part of Tanzania, which showed that clinicians were 0.61 times less likely to comply with IPC standard precautions at a high level compared to nurses (Bahegwa et al., 2022). The same study was done in Bangladesh where nurses were found to be significantly more compliant with IPC standard precautions (Salwa et al., 2022).

Nurses often participate in activities that require IPC standard precautions, and nurses spend more time with patients than other cadres. IPC standards are included in nurses' curricula, whereas, in doctors' curricula, IPC is not included. As a result, nurses are more likely to comply with IPC standard precautions than doctors.

5.3.1 COVID 19 vaccine

This study showed that HCWs who received two doses of the COVID-19 vaccine were 3.5 times more likely to comply with IPC standards precautions compared to those who had not received the COVID-19 vaccine. Similarly, a study in Bangladesh found that HCWs with a history of contact with COVID-19 patients or their belongings demonstrated significantly greater compliance with standard precautions than those without (Salwa et al., 2022). Therefore, these HCWs are more likely to adhere to IPC standard precautions than others to reduce the possibility of them being infected with diseases and not preventing the transmission of infections to patients or visitors. This finding creates scope for further research.

5.3.3 IPC training upon hire

The study revealed that respondents who agreed that they received IPC standards precautions training upon hire were three times more likely to comply with IPC standards precautions compared to those who did not receive training upon hire this study resembles the study done at Hawassa university hospital, Ethiopia. The study found a significant association between compliance among HCWs who had received training on standard safety precautions. When compared with HCWs that did not receive training upon their hire, these

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HCWs were 3.2 times more likely to adhere to IPC standard precautions (Bekele et al., 2020). The fact that training could improve the knowledge and skills of HCWs who have just graduated from college or university upon hiring may be the rationale for this conclusion. They would be able to apply fundamental guidelines, recommendations, and standards of conduct consistently throughout their career since they would accurately understand them. The trust in HCWs' adherence to IPC standard precautions may also be increased by current knowledge, skills, and routine activities in this area.

5.3.4 Enough safety boxes supply

This research revealed that HCWs with enough safety boxes were 2.7 times more likely to comply with IPC standard precautions as discovered in another study which showed enough and accessible safety boxes increase the level of compliance (Bekele et al., 2020). For health personnel to deliver safe and effective services, all required infection prevention tools and supplies must be available. Additionally, the availability of sufficient safety boxes at all places of care is necessary for safe injection practices, making their provision a motivator of high compliance.

5.3.5 Adequate PPE supply

This study showed that HCWs with adequate PPE were 2.5 times more likely to comply with IPC standard precautions compared to those with inadequate PPE. This is similar to other studies (Beyamo et al., 2019; Haile et al., 2017). This result may be explained by the fact that to promote compliance, PPE must be accessible and available at the point of use. However, unless a healthcare professional has a positive attitude toward following standard precautions, they can view the lack of particular equipment as a reason to disregard advised practices. Additionally, frequent shortages and difficulty obtaining PPE may lower the motivation of previously motivated employees and contribute to low compliance.

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5.4 Limitations of the Study

1. Given that there was no direct observation in this study, there is a possibility of response bias because study participants were likely to overreport their practices.
2. The small sample size of the large-scale research will provide statistically significant data at the national level to help IPC policymakers.
3. It was difficult to use Google Forms/online survey, especially for those who were unfamiliar with it, which may have resulted in poor participation.

5.5 Suggestions for further research

- Barriers to HCWs adhering to IPC measures.
- The role of policymakers, stakeholders, and government officials in IPC in hospitals.
- The impact of the shortage of HCWs on IPC.
- The effect of the COVID-19 vaccine on IPC.

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CHAPTER 6

6.0 CONCLUSION AND SUGGESTION

6.1 Conclusion

In total, 156 HCWs from the Dodoma RR hospital participated in this study, and the results revealed that only 32.2% of HCWs had high compliance with IPC standard precautions, which is a very low level of compliance. This study found that nurses and HCWs with IPC standard precautions upon hire and HCWs who received the COVID-19 vaccine, adequate safety boxes, and adequate PPE were associated with high compliance with IPC standard precautions among HCWs in Dodoma RR hospital.

6.2 SUGGESTIONS

6.2.1 Ministry of Health (MOH)

In particular, considering the current outbreak of deadly infectious diseases like the Ebola virus disease, the MOH should keep supporting IPC activities such as training, supportive supervision, and funding for research. Moreover, the MOH should collaborate with the Ministry of Education to ensure that IPC training is included in all health education curricula. The MOH should also mobilize resources to ensure that all IPC supplies and PPE are always available in all healthcare facilities.

6.2.2 Health institution

To increase compliance with IPC standard precautions practice, health institutions should increase the availability and accessibility of supplies in all departments such as hand hygiene supplies, PPE, safety boxes, and waste segregation supplies. Hospitals must ensure that IPC training is provided to all new staff, and institutions must expand on-the-job training and internal supportive supervision to keep HCWs informed about IPC.

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6.2.3 Healthcare workers

The use of PPE and safe injection techniques, such as recapping needles and discarding safety boxes when they are 3/4 full, should be carefully observed by HCWs because compliance was very low. HCWs should also approach every patient under the presumption that they could be a source of infectious agent acquisition or transmission. Additionally, since they are to prioritize the health of patients and visitors as well as their health, healthcare personnel should ensure that they are vaccinated against infectious diseases including COVID- 19 and Hepatitis B Viruses.

6.2.4 Researchers

To counteract low adherence to the IPC standard precautions and find evidence-based advice for policymakers, researchers should continue to examine the factors influencing healthcare professionals' adherence to it.

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REFERENCES

Bahegwa, R. P., Hussein, A. K., Kishimba, R., Hokororo, J., German, C., Ngowi, R., Eliakimu, E., & Ngasala, B. (2022). Factors affecting compliance with infection prevention and control standard precautions among healthcare workers in Songwe region, Tanzania. Infection Prevention in Practice, 100236.

Bekele, T., Ashenaf, T., Ermias, A., & Arega Sadore, A. (2020). Compliance with standard safety precautions and associated factors among health care workers in Hawassa University comprehensive, specialized hospital, Southern Ethiopia. Plos ONE, 15(10), e0239744.

Beyamo, A., Dodicho, T., & Facha, W. (2019). Compliance with standard precaution practices and associated factors among health care workers in Dawuro Zone, South West Ethiopia, cross sectional study. BMC Health Services Research, 19(1), 1-6.

De Bono, S., Heling, G., & Borg, M. (2014). Organizational culture and its implications for infection prevention and control in healthcare institutions. Journal of Hospital Infection, 86(1), 1-6.

Desta, M., Ayenew, T., Sitotaw, N., Tegegne, N., Dires, M., & Getie, M. (2018). Knowledge, practice and associated factors of infection prevention among healthcare workers in Debre Markos referral hospital, Northwest Ethiopia. BMC Health Services Research, 18(1), 1-10.

Ducel, G., Fabry, J., & Nicolle, L. (2002). Prevention of hospital acquired infections: a practical guide. Prevention of hospital acquired infections: a practical guide.(Ed. 2).

Garner, J. S. (1983). Guideline for isolation precautions in hospitals. US Department of Health and Human Services, Public Health Service, Centers ….

Haile, T. G., Engeda, E. H., & Abdo, A. A. (2017). Compliance with standard precautions and associated factors among healthcare workers in Gondar University Comprehensive Specialized Hospital, Northwest Ethiopia. Journal of Environmental and Public Health.

Hayeh, P. A., & Esena, R. K. (2013). Infection prevention and control practices among health workers at Ridge regional hospital in Accra Ghana. International Journal of Health Science Research, 3(8), 47-55.

Hokororo, J., Eliakimu, E., Ngowi, R., German, C., Bahegwa, R., & Msigwa, Y. (2021). Report of trend for compliance of infection prevention and control standards in Tanzania from 2020 to 2017 in Tanzania Mainland. Microbiology and Infectious Disease, 5(3), 1-10.

Kassa, A., Tadesse, S. E., Walelign, F., & Kebede, N. (2022). Compliance with standard precaution of infection prevention practice and associated factors among health care workers in Ethiopia: Mixed method study. Health Science Reports, 5(5). https://doi.org/10.1002/hsr2.830

연세대학교
YONSEI UNIVERSITY

Kermode, M., Jolley, D., Langkham, B., Thomas, M. S., Holmes, W., & Gifford, S. M. (2005). Compliance with Universal/Standard Precautions among health care workers in rural north India. American journal of infection control, 33(1), 27-33.

Kim, H., & Hwang, Y. H. (2020). Factors contributing to clinical nurse compliance with infection prevention and control practices: A cross-sectional study. Nursing & Health Sciences, 22(1), 126-133.

Kim, H., & Park, H. (2021). Compliance with infection prevention and control practice among prospective graduates of nursing school in South Korea. International Journal of Environmental Research and Public Health, 18(5), 2373.

Kinyenje, E., Hokororo, J., Eliakimu, E., Yahya, T., Mbwele, B., Mohamed, M., & Kwesigabo, G. (2020). Status of infection prevention and control in Tanzanian primary health care facilities: learning from star rating assessment. Infection Prevention in Practice, 2(3), 100071.

Luo, Y., He, G.-P., Zhou, J.-W., & Luo, Y. (2010). Factors impacting compliance with standard precautions in nursing, China. International Journal of Infectious Diseases, 14(12), e1106-e1114.

McCoy, K. D., Beekmann, S. E., Ferguson, K. J., Vaughn, T. E., Torner, J. C., Woolson, R. F., & Doebbeling, B. N. (2001). Monitoring adherence to standard precautions. American Journal of Infection Control, 29(1), 24-31.

Mitchell, B. G., Say, R., Wells, A., Wilson, F., Cloete, L., & Matheson, L. (2014). Australian graduating nurses' knowledge, intentions and beliefs on infection prevention and control: a cross-sectional study. BMC Nursing, 13(1), 1-7.

Mulat Endalew, S., Abebe Melake, B., Geremew, A., Baraki, N., Mengistu, D. A., Sintie Alamirew, T., Muche Temesgen, L., Mulugeta Demmu, Y., Alemeshet Asefa, Y., Deriba, W., Alemu, F. K., Ayele, D. M., Berhanu, A., & Dirirsa, G. (2022). Healthcare workers' compliance with standard precautions and associated factors in Bahir Dar Town, Ethiopia. Environmental Health Insights, 16, 11786302221117071. https://doi.org/10.1177/11786302221117071

Nejad, S. B., Allegranzi, B., Syed, S. B., Ellis, B., & Pittet, D. (2011). Health-care-associated infection in Africa: a systematic review. Bulletin of the World Health Organization, 89(10), 757-765.

Oh, E., & Choi, J. S. (2019). Factors influencing the adherence of nurses to standard precautions in South Korea hospital settings. American Journal of Infection Control, 47(11), 1346-1351.

Organization, W. H. (2022). Global report on infection prevention and control.

Powell-Jackson, T., King, J. J., Makungu, C., Spieker, N., Woodd, S., Risha, P., & Goodman, C. (2020). Infection prevention and control compliance in Tanzanian outpatient facilities: a cross-sectional study with implications for the control of COVID-19. The Lancet Global Health, 8(6), e780-e789.

Punia, S., Nair, S., & Shetty, R. S. (2014). Health care workers and standard precautions: perceptions and determinants of compliance in the emergency and trauma triage of

연세대학교
YONSEI UNIVERSITY

a tertiary care hospital in south India. International Scholarly Research Notices, 2014.

Salwa, M., Haque, M. A., Islam, S. S., Islam, M. T., Sultana, S., Khan, M. M. H., & Moniruzzaman, S. (2022). Compliance of healthcare workers with the infection prevention and control guidance in tertiary care hospitals: quantitative findings from an explanatory sequential mixed-methods study in Bangladesh. BMJ Open, 12(6), e054837.

Tacconelli, E., Buhl, M., Humphreys, H., Malek, V., Presterl, E., Rodriguez-Baño, J., Vos, M. C., Zingg, W., & Mutters, N. T. (2019). Analysis of the challenges in implementing guidelines to prevent the spread of multidrug-resistant gram-negatives in Europe. BMJ Open, 9(5), e027683.

WHO. (2016). Health care without avoidable infections The critical role of infection prevention and control. https://apps.who.int/iris/bitstream/handle/10665/246235/WHO-HIS-SDS-2016.10-eng.pdf

WHO. (2022). Infection prevention and control. https://www.who.int/health-topics/infection-prevention-and-control#tab=tab_1

Wibonela, S. A., Mbekenga, C., Ramadhani, F. B., Mwanga, A., & Palangyo, P. (2020). Adherence to universal precautions and associated factors among nurses caring for critically ill patients in Dar es Salaam Tanzania. Saudi Journal of Nursing and Health Care, 3(03), 106-113.

Bahegwa, R. P., Hussein, A. K., Kishimba, R., Hokororo, J., German, C., Ngowi, R., Eliakimu, E., & Ngasala, B. (2022). Factors affecting compliance with infection prevention and control standard precautions among healthcare workers in Songwe region, Tanzania. Infection Prevention in Practice, 100236.

Bekele, T., Ashenaf, T., Ermias, A., & Arega Sadore, A. (2020). Compliance with standard safety precautions and associated factors among health care workers in Hawassa University comprehensive, specialized hospital, Southern Ethiopia. Plos one, 15(10), e0239744.

Beyamo, A., Dodicho, T., & Facha, W. (2019). Compliance with standard precaution practices and associated factors among health care workers in Dawuro Zone, South West Ethiopia, cross sectional study. BMC health services research, 19(1), 1-6.

De Bono, S., Heling, G., & Borg, M. (2014). Organizational culture and its implications for infection prevention and control in healthcare institutions. Journal of Hospital Infection, 86(1), 1-6.

Desta, M., Ayenew, T., Sitotaw, N., Tegegne, N., Dires, M., & Getie, M. (2018). Knowledge, practice and associated factors of infection prevention among healthcare workers in Debre Markos referral hospital, Northwest Ethiopia. BMC health services research, 18(1), 1-10.

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Ducel, G., Fabry, J., & Nicolle, L. (2002). Prevention of hospital acquired infections: a practical guide. Prevention of hospital acquired infections: a practical guide.(Ed. 2).

Garner, J. S. (1983). Guideline for isolation precautions in hospitals. US Department of Health and Human Services, Public Health Service, Centers ….

Haile, T. G., Engeda, E. H., & Abdo, A. A. (2017). Compliance with standard precautions and associated factors among healthcare workers in Gondar University Comprehensive Specialized Hospital, Northwest Ethiopia. Journal of environmental and public health, 2017.

Hayeh, P. A., & Esena, R. K. (2013). Infection prevention and control practices among health workers at Ridge regional hospital in Accra Ghana. International Journal of health science research, 3(8), 47-55.

Hokororo, J., Eliakimu, E., Ngowi, R., German, C., Bahegwa, R., & Msigwa, Y. (2021). Report of trend for compliance of infection prevention and control standards in Tanzania from 2020 to 2017 in Tanzania Mainland. Microbiol Infect Dis, 5(3), 1-10.

Kassa, A., Tadesse, S. E., Walelign, F., & Kebede, N. (2022). Compliance with standard precaution of infection prevention practice and associated factors among health care workers in Ethiopia: Mixed method study. Health Science Reports, 5(5). https://doi.org/10.1002/hsr2.830

Kermode, M., Jolley, D., Langkham, B., Thomas, M. S., Holmes, W., & Gifford, S. M. (2005). Compliance with Universal/Standard Precautions among health care workers in rural north India. American journal of infection control, 33(1), 27-33.

Kim, H., & Hwang, Y. H. (2020). Factors contributing to clinical nurse compliance with infection prevention and control practices: A cross-sectional study. Nursing & health sciences, 22(1), 126-133.

Kim, H., & Park, H. (2021). Compliance with Infection Prevention and Control Practice among Prospective Graduates of Nursing School in South Korea. International Journal of Environmental Research and Public Health, 18(5), 2373.

Kinyenje, E., Hokororo, J., Eliakimu, E., Yahya, T., Mbwele, B., Mohamed, M., & Kwesigabo, G. (2020). Status of Infection Prevention and Control in Tanzanian Primary Health Care Facilities: Learning From Star Rating Assessment. Infection Prevention in Practice, 2(3), 100071.

Luo, Y., He, G.-P., Zhou, J.-W., & Luo, Y. (2010). Factors impacting compliance with standard precautions in nursing, China. International Journal of Infectious Diseases, 14(12), e1106-e1114.

McCoy, K. D., Beekmann, S. E., Ferguson, K. J., Vaughn, T. E., Torner, J. C., Woolson, R. F., & Doebbeling, B. N. (2001). Monitoring adherence to standard precautions. American journal of infection control, 29(1), 24-31.

Mitchell, B. G., Say, R., Wells, A., Wilson, F., Cloete, L., & Matheson, L. (2014). Australian graduating nurses' knowledge, intentions and beliefs on infection prevention and control: a cross-sectional study. BMC nursing, 13(1), 1-7.

연세대학교
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Mulat Endalew, S., Abebe Melake, B., Geremew, A., Baraki, N., Mengistu, D. A., Sintie Alamirew, T., Muche Temesgen, L., Mulugeta Demmu, Y., Alemeshet Asefa, Y., Deriba, W., Alemu, F. K., Ayele, D. M., Berhanu, A., & Dirirsa, G. (2022). Healthcare Workers' Compliance With Standard Precautions and Associated Factors in Bahir Dar Town, Ethiopia. Environ Health Insights, 16, 11786302221117071. https://doi.org/10.1177/11786302221117071

Nejad, S. B., Allegranzi, B., Syed, S. B., Ellis, B., & Pittet, D. (2011). Health-care-associated infection in Africa: a systematic review. Bulletin of the World Health Organization, 89(10), 757-765.

Oh, E., & Choi, J. S. (2019). Factors influencing the adherence of nurses to standard precautions in South Korea hospital settings. American journal of infection control, 47(11), 1346-1351.

Organization, W. H. (2022). Global report on infection prevention and control.

Powell-Jackson, T., King, J. J., Makungu, C., Spieker, N., Woodd, S., Risha, P., & Goodman, C. (2020). Infection prevention and control compliance in Tanzanian outpatient facilities: a cross-sectional study with implications for the control of COVID-19. The Lancet Global Health, 8(6), e780-e789.

Punia, S., Nair, S., & Shetty, R. S. (2014). Health care workers and standard precautions: perceptions and determinants of compliance in the emergency and trauma triage of a tertiary care hospital in south India. International scholarly research notices, 2014.

Salwa, M., Haque, M. A., Islam, S. S., Islam, M. T., Sultana, S., Khan, M. M. H., & Moniruzzaman, S. (2022). Compliance of healthcare workers with the infection prevention and control guidance in tertiary care hospitals: quantitative findings from an explanatory sequential mixed-methods study in Bangladesh. BMJ open, 12(6), e054837.

Tacconelli, E., Buhl, M., Humphreys, H., Malek, V., Presterl, E., Rodriguez-Baño, J., Vos, M. C., Zingg, W., & Mutters, N. T. (2019). Analysis of the challenges in implementing guidelines to prevent the spread of multidrug-resistant gram-negatives in Europe. BMJ open, 9(5), e027683.

WHO. (2016). Health care without avoidable infections The critical role of infection prevention and control. https://apps.who.int/iris/bitstream/handle/10665/246235/WHO-HIS-SDS-2016.10-eng.pdf

WHO. (2022). Infection prevention and control. https://www.who.int/health-topics/infection-prevention-and-control#tab=tab_1

Wibonela, S. A., Mbekenga, C., Ramadhani, F. B., Mwanga, A., & Palangyo, P. (2020). Adherence to universal precautions and associated factors among nurses caring for critically ill patients in Dar es Salaam Tanzania. Saudi Journal of Nursing and Health Care, 3(03), 106-113.

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CHAPTER 7

APPENDICES

Appendix 1: Ethical Clearance

THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF HEALTH

Telegram: "Afya" DODOMA
Tel. No:: +255 026 23223267
(All letter should be written to Permanent Secretary)

Dodoma Regional Referral Hospital,
P. O. BOX 904,
DODOMA.

REF.NO.EB.229/254/01/13

05th September, 2022

Dr. Mathew Mushi
P.O. Box 904,
DODOMA.

RE: ACCEPTANCE FOR RESEARCH ON COMPLIANCE WITH STANDARD PRECAUTIONS IN INFECTION PREVENTION CONTROL AND ASSOCIATED FACTORS AMONG HCWS IN DODOMA REGIONAL REFERRAL HOSPITAL

The heading above is concerned.

I would like to inform you that your request for Research Studies on compliance with standard precautions in infection prevention control and associated factors among HCWS in Dodoma Regional Referral Hospital has been received and accepted with cost implication during the whole period of research.

Please note that you are supposed to follow all rules and Regulations which guide the Hospital.

Thank you,

Furaha John
For: MEDICAL OFFICER INCHARGE
DODOMA REGIONAL REFERRAL HOSPITAL

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Appendix 2: Informed Consent and Questionnaire

COMPLIANCE WITH STANDARD PRECAUTIONS IN INFECTION PREVENTION CONTROL AND ASSOCIATED FACTORS AMONG HEALTHCARE WORKERS

Dear respondents

I am Mathew Mushi, a graduate student currently studying Master's degree in public health majoring in global health policy and financing at Yonsei university Seoul South Korea.

This online survey is a part of the data collection process of my thesis for partial fulfillment of the award of a master's degree in public health-Global health policy and financing under the supervision of Dr. Joon-Sup Yeom of Yonsei university graduate school of public health.

This aims to assess the level of compliance with infection prevention control standard practices and to describe factors affecting compliance to infection prevention and control standards practices among healthcare workers.

This survey will be used only for academic purposes, complying with laws about survey data use and privacy protection, I will not use personally identifiable data.

I appreciate your cooperation.

Mathew Mushi

Email - drmushi2008@gmail.com

+8201027445515

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PART A: DEMOGRAPHIC DATA

1.1.1 HOW OLD ARE YOU?.....

1.1.2 SEX

☐ MALE

☐ FEMALE

1.1.4 HEALTH PROFESSIONAL

☐ NURSE

☐ DOCTOR

☐ HEALTH LABORATORY PERSONNEL

1.1.5 HIGHEST QUALIFICATION

☐ CERTIFICATE

☐ DIPLOMA

☐ DEGREE

☐ MASTERS

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1.1.6 WERE YOU TRAINED ON IPC STANDARD PRECAUTIONS?

☐ YES

☐NO

1.1.7 HOW LONG HAVE YOU WORKED AS A HEALTH CARE WORKER?

……

1.1.8 HAVE YOU EVER BEEN EXPOSED TO SHARP/NEEDLE STICK INJURY WHEN PROVIDING HEALTHCARE SERVICES?

☐YES

☐NO

1.1.9 HAVE YOU EVER BEEN EXPOSED TO BLOOD SPLASH OR ANY OTHER BODY FLUID WHEN PROVIDING MEDICAL SERVICES?

☐YES

☐NO

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1. 2.0 HAVE YOU COMPLETED THREE DOSAGES OF HEPATITIS B VACCINE?

☐YES

☐NO

1.2.1 HAVE YOU RECEIVED TWO DOSES OF COVID 19 VACCINE?

☐YES

☐NO

PART B

COMPLIANCE WITH THE STANDARD PRECAUTIONS

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1.USE OF PPE

When do you use the following PPE (Tick one response)

ACTIVITY	ALWAYS	SOMETIMES	NEVER
1. I USE GLOVES WHEN PERFORMING PROCE-DURES			
2. I USE GOWNS WHEN PERFORMING PROCE-DURES LIKELY TO PRODUCE SPLASHES			
3. I USE A FACE MASK/FACE SHIELD PERFORMING PROCE-DURES LIKELY TO GENERATE SPLASHES			
4. I CHANGE GLOVES BE-TWEEN TREATING EACH PATIENT			
5. I AVOID WEARING MY GOWN OUT OF WORK PLACE			

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2. DISPOSAL OF SHARPS OBJECTS AND HEALTHCARE WASTE MANAGEMENT

When do you do the following? (Tick one response)

ACTIVITY	ALWAYS	SOMETIMES	NEVER
1. RECAPPING NEEDLES			
2. REDISPOSING OF NEEDLES IN SAFETY BOXES IMMEDIATELY AFTER USE			
3. DISPOSING OF NEEDLES IN SAFETY BOXES AND SYRINGES IN DUSTBIN			
4. THE SHARP BOX IS ONLY DISPOSED OF WHEN FULL			
5. I USE STERILIZED ALL REUSABLE EQUIPMENT WITH PATIENTS			
6. ISEGREGATE NONINFECTIOUS MEDICAL WASTES IN YELLOW COLOUR CODED DUST BIN			
7. I DECONTAMINATE SURFACE AND MACHINES (e.g., MACHINE THERMOMETER AFTER USE			
8. I CLEAN DEVICES CONTAMINATED BY BLOOD/BODY FLUIDS USING DISINFECTANT			
9. I SEGREGATE NON-INFECTIOUS WASTES IN BLACK CODED DUST BIN			

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3.HAND HYGIENE

When do you perform hand hygiene? (Tick one answer)

STATEMENT	ALWAYS	SOME-TIMES	NEVER
1. BEFORE TOUCHING A PATIENT			
2. BEFORE CLEAN/ASEPTIC PROCEDURES			
3.AFTER TOUCHING BODY FLUIDS			
4. AFTER TOUCHING A PATIENT			
5. SOON AFTER REMOVAL OF GLOVES			
6.AFTER TOUCHING A PATIENT SURROUNDINGS			

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PART C

HOSPITAL DETERMINANTS OF INFECTION PREVENTION CONTROL COMPLIANCE

(Tick one response-Yes or no)

STATEMENT	YES	NO
1. MANAGEMENT CONDUCTS TRAINING ON IPC UPON HIRE		
2. MANAGEMENT PROVIDES ADEQUATE HAND HYGIENE SUPPLIES (SOAP, HAND SANITIZER)		
3. MANAGEMENT PROVIDES ADEQUATE PPE (GLOVES, MASK, ETC.)		
4. MANAGEMENT PROVIDES ENOUGH SHARP SAFETY BOXES		
5. THE HOSPITAL PROVIDES ADEQUATE DISINFECTANTS AND WASTE SEGREGATION SUPPLIES (BIN LINERS ETC)		