Challenges of Compliance with Infection Prevention and Control (IPC) Standard Procedures among Healthcare Workers: A Hospital-Based Cross-Sectional Study

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Abstract

Introduction: This hospital-based cross-sectional study aimed to assess the compliance of 251 healthcare workers (HCWs) with Infective Prevention and Control (IPC) standard procedures. The study addresses the critical issue of IPC compliance among HCWs, as it plays a pivotal role in reducing the risk of infectious disease transmission within healthcare settings.

Methodology: Analytical cross-sectional study was conducted at St. Francis Referral Hospital, involving 251 healthcare workers from different departments including Internal medicine, Surgery, and Emergency. The Compliance with Standard Precautions Scale (CSPS) tool developed by WHO was used. Descriptive and regression analysis was done. A P-value of less than 0.05 indicated statistical significance.

Results: Overall average compliance with IPCSPs was 54% whereby only 24.7% (62/251) of healthcare workers had a good compliance. The majority of HCWs (85.3%) reported highest compliance on proper disposal of used sharp items into sharp boxes and low compliance rate (11.6%) was on the disposal of the sharp box, sharp box is only disposed when it is full. Statistically significant were found between IPCSPs and number of years of working experience, level of education, profession, IPC training and IPC meeting attendance.

Conclusion: This cross-sectional study has shed light on the critical challenges faced by healthcare workers in complying with IPCSPs. Findings revealed a concerning compliance with IPCSPs which is below the WHO standard and national level standard as well. We therefore recommend enhancement of IPC training program, IPC awareness campaign, and more implementational research for IPCSPs compliance.

1. Introduction

Back in the 1970s there was a significant spread of hepatitis among healthcare workers (HCWs) due to exposure to bloodborne pathogens. In response, Infection Prevention and Control Standard Precautions (IPCSPs) were established, initially known as universal precautions. These precautions are essential for preventing the transmission of infectious agents and apply to all patients and healthcare workers in all healthcare settings [1,2]. IPC is crucial for global health systems, impacting the safety of both patients and health providers. It plays a vital role in containing Antimicrobial Resistance (AMR), preventing Healthcare-Associated Infections (HAIs), and managing outbreaks of highly contagious diseases. The

United States Centers for Disease Control and Prevention (CDC) proposed IPCSPs in 1996, expanding on universal precautions to include all potential sources of infection [3-5]. HAIs pose a significant public health issue worldwide, contributing to morbidity, mortality, increased hospital admissions, healthcare costs, and the rise of AMR whereby Low and Middle-Income Countries (LMICs) bear the highest burden. While the economic burden of HAIs is well-documented in developed countries, limited data is available for LMICs. In Africa, HCWs' attitudes and behaviors have been identified as contributors to HAI transmission. The emergence of diseases like Ebola and COVID-19 emphasizes the need to strengthen IPC for resilient health systems [6,7]. Sub-Saharan

African countries struggle with high Healthcare Associated Infection (HAI) rates due to inadequate IPCSP compliance. Factors like insufficient training, lack of protective equipment and workload hinder compliance [8]. In Tanzania, efforts have been made to improve IPC for healthcare workers in healthcare settings since 2004, with revised national IPC documents introduced in July 2018, aligning with World Health Organization (WHO) recommendations [9]. These updated guidelines are designed to enhance HCWs' compliance with IPCSPs, ultimately breaking the cycle of infection transmission and safeguarding HCWs, patients, and the community from HAIs and associated consequences, including AMR, prolonged hospital stays, increased costs and tragically, deaths [8]. Despite these efforts, adherence to IPCSPs remains a significant challenge in many countries, particularly in the developing world [1,10]. This lack of adherence exposes patients to heightened risks of contracting HAIs, whether through direct contact with contaminated hands of HCWs, exposure to contaminated equipment, or during healthcare procedures [11]. Consequently, this study aimed to comprehensively assess the challenge of compliance with IPCSPs among healthcare workers at St. Francis Referral Hospital, with the ultimate goal of informing targeted interventions to strengthen infection prevention and control measures.

2. Methodology
2.1. Study Design
This was analytical cross-sectional study, which included 251 healthcare workers from different departments and different levels of expertise, conducted between July and September 2023.

2.2. Study Area
This study was conducted at St. Francis Referral Hospital at Ifakara town in Kilombero district, Morogoro region. The hospital has 371 beds and it is divided into department of Surgery, Internal medicine, Gynaecology and Obstetrics, Paediatrics, Ophthalmology, Chronic diseases, Orthopedics, Community Health and Intensive care. Additionally, there were Outpatients' Department and wards for Tuberculosis, Dental Medicine, Physiotherapy, Occupational therapy, Psychiatry, Rehabilitation, Radiology and a laboratory for the production of infusions.

2.3. Study Population
This study was conducted among healthcare workers present at St. Francis Referral Hospital during the study period.

2.3.1. Inclusion Criteria
All healthcare workers were included, regardless of their cadre (clinicians, nurses, laboratory personnel, pharmacists, medical attendants, physiotherapist, radiographers and mortuary attendants).

2.3.2. Exclusion Criteria
Medical students and volunteers were not involved in the study.

2.4. Sampling Procedure
Simple random sampling was used where each healthcare worker had equal chance to participate in this study as far as he or she met the inclusion criteria.

2.5. Sample Size Estimation
Open Epi computation statistical software was adopted in calculation of sample size, thus came up with the sample size of 248 healthcare workers with confidence level 95%, Margin of error 5% and population proportion 50%.

2.6. Data Collection
A questionnaire to assess adherence to Standard Precautions Scale with 20 items to be responded by a four-point Likert scale (never, seldom, sometimes and always) was designed based on the SPs guidelines that were published by WHO [5,7]. This questionnaire was used to assess the extent to which HCWs comply with SPs. A score of 1 was given to an "always" response in positively worded statements and the "never" option in negatively worded statements, while 0 for the other responses, giving a total possible score range of 0 to 20. Scores above 16 meant better adherence with SPs. Compliance Rats (CR) was considered as the average compliance with the 20 items in percentage. Healthcare workers were expected to comply with National Guidelines for Recognition of Implementation Status of Quality Improvement Initiatives in Health Facilities and National IPC guidelines and standards fully; hence, a compliance rate of 80% was the desired level of compliances and was used as dichotomous variable, compliance score of 80% and above was categorized as high compliance and compliance score of below 80% as low compliance [12]. This was examining the adherence to PPE, disposal of sharps and waste products, decontamination and prevention of cross-infection between patients. Other parts of questionnaire were social demographic characteristics, working experiences and challenges of compliance with IPC standards precautions. Finally, Data collection was done by filling out the questionnaire.

2.7. Variables
2.7.1. Dependent Variable
Compliance to IPCSPs such as; hand washing, waste management, decontamination and use of PPEs. Compliance of 80% and above was considered as desired level of IPC compliance. This is according to Tanzania standard-based management and recognition for quality of services in Tanzania guidelines, hence compliance was considered as dichotomous variable whereby compliance score of 80% and above was categorized as high compliance and compliance score of below 80% as low compliance.

2.7.2. Independent Variables
Challenges of compliance with IPCSPs: social demographic factors, Healthcare workers factors, Health facility factors and Health system factors.

2.8. Data Management and Analysis

Data were collected by research assistance, entered and checked daily by principal investigator for completeness and entered in Excel, then exported to SPSS for analysis. Descriptive statistics was done on the calculation of median, interquartile range and frequency for Continuous variables. Categorical variables were summarized in form of proportions, frequency tables and p-values computed for categorical variables using Chi-square test and Fisher's exact test. Also, frequency distribution was compared using the Chi-square test where those with p-value < 0.2 entered to bivariate modified Poisson regression model because the outcome for this study was common that means it was greater than 15%. Variables that showed significant association with the compliance to IPC standard precautions in bivariate modified Poisson regression analysis were added into the multivariate modified Poisson regression model using forward selection for further analysis. The factors included in the model were, profession, level of facility, working years' experience, IPC training in previous 1 year, needle stick injury experience, blood/body fluid splash, hepatitis B vaccination status and IPC supportive supervision. Bivariate and multivariate binary modified Poisson regression was used to identify challenges associated significantly with high compliance to IPC standards precautions at p-value < 0.05 with their respective prevalence ratios and 95% confidence interval.

3. Results

3.1. Demographic Characteristics of the Study Respondents

A total of 251 participants were recruited in this study. The mean age of participants was 31.64 ± 8.96 years where the predominantly age group was 21-30 (64.9%). Majority of the respondent were: male (54.6%), nurses (45.4%) and Diploma (45.82%).

Variable	Frequency	Percentage
Age		
21 – 30	163	64.9%
31 – 40	57	22.7%
41 – 50	14	5.6%
51 >	17	6.8%
Sex		
Male	137	54.6%
Female	114	45.4%
Profession		
Clinician	89	35.5%
Nurses	114	45.4%
Health laboratory Officer	10	4.0%
Pharmaceutical personnel	35	13.9%
Radiologist	1	0.4%
Level of Education		
Certificate	53	21.12%
Diploma	115	45.82%
Bachelor degree	74	29.48%
Master's degree	7	2.78%
PhD	2	0.80%

Table 1: The Demographic Characteristics of the Study Participants

3.2. Infection Prevention and Control (IPC) Experience of the Study Respondent.

Table 2 below shows the working experience of the respondents where by majority had been working in healthcare services delivery in less than 6 years (72.1%). In addition, majority of healthcare workers (68.5%) had experienced blood / body fluid exposure while 54.6% had not been vaccinated against hepatitis B. On IPC experiences, 54.2%, 26.3% and 22.8% had not received IPC training, received a rarely motivation in their working unit and attend a weekly IPC meeting at their working unit for the past one year of working respectively. 21.1% did not receive any IPC supportive supervision for the past one year.

Variable	Frequency	Percentage
Working experience (years)		
1 – 5	181	72.1%
6 – 10	29	11.6%
> 10	41	I6.3
Experience of needle stick Injury		
Yes	117	46.6%
No	134	53.4%
Experience of blood / body fluid exposure		
Yes	172	68.5%
No	79	31.5%
Hepatitis B vaccination		
Yes	114	45.4%
No	137	54.6%
IPC trainings attended		
None	136	54.2%
1 – 3	95	37.8%
> 3	20	8.0%
Motivation		
Weekly	62	24.7%
Monthly	50	19.9%
Quarterly	14	5.6%
Annually	4	1.6%
Rarely	66	26.3%
No motivation	55	21.9%
IPC meetings attended		
Weekly	56	22.3%
Monthly	51	20.3%
Quarterly	10	4.0%
Annually	10	4.0%
Rarely	54	21.5%
Supportive supervision given		
Weekly	42	16.7%
Monthly	49	19.5%
Quarterly	41	16.3%
Annually	17	6.8%
Rarely	49	19.5%
No supervision	53	21.1%

Table 2: The Working Experience of the Respondents

3.3. Compliance with Infection Prevention and Control Standard Precaution (IPCSPs)

The overall average compliance of the healthcare workers to IPCSPs at SFRH was 54% where by only 24.70% healthcare workers had good compliance to IPCSPs. The majority of Healthcare workers experienced the highest compliance with proper disposal of used sharp items into sharp boxes (85.3%) while only 11.6% reported that the sharp box is only disposed when it is full. Healthcare workers reported suboptimal compliance to the following IPCSPs: 70.9% covered wound or lesion with waterproof dressing before

patient contacts, 70.1% wear gloves to decontaminate used equipment with visible soil, 70.1% cleaned up spillage of blood or other body fluid immediately with disinfectants. For hand hygiene practice, only 64.5% of healthcare workers wash hands between patient contact while 52.2% did not use alcohol hand rub as an alternative when hands are visible soiled, and 18.7% used only water for hand washing.

Table 3 shows compliance with IPC standard precaution of HCWs (N = 251) at SFRH with Standard Precaution (SP) based on the WHO Compliance with Standard Precaution Scale (CSPS)

SP No	Item	Compliance rate	Percentage
1	I wash my hands between patient contacts	162	64.5%
2	I only use water for hand washing	47	18.7%
3	I use alcohol hand rubs as an alternative if my hands are not visibly soiled	131	52.2%
4	I recap used needles after giving an injection	113	45.0%
5	I put used sharp articles into sharp boxes	214	85.3%
6	The sharps box is only disposed when it is full	29	11.6%
7	I remove PPE in designated area	163	64.9%
8	I take a shower in case of extensive splashing even after I have put on PPE	90	35.9%
9	I cover my wound or lesion with waterproof dressing before patient contacts	178	70.9%
10	I wear gloves when I am exposed to body fluids, blood products and any excretion of patients	209	83.3%
11	I change gloves between each patient contact	159	63.3%
12	I clean my hand immediately after removal of glove	157	62.5%
13	I wear a surgical mask alone or in combination with goggles, face shield, and apron whenever there is a possibility of a splash or splatter	110	43.8%
14	My mouth and nose are covered when I wear a mask	174	69,3%
15	I re use surgical mask or disposable PPE	122	48.6%
16	I wear a gown or apron when exposed to blood, body fluid or any patient excretions	123	49.0%
17	Waste contaminated with blood, body fluid, secretion and excretion are placed in red plastic bags irrespective of patient's infective status	159	63.3%
18	Decontaminate surface and equipment after use	172	68.5%
19	I wear gloves to decontaminate used equipment with visible soil	176	70.1%
20	I clean up spillage of blood or other body fluid immediately with disinfectants	176	70.1%

Table 3

3.4. Perceived Challenge of Compliance with Infection Prevention and Control Standard Precaution

The finding of this study showed statistically significant between the number of years of working experiences (p= 0.002) and compliance with IPCSPs where by healthcare workers with 1- 5 years working experience had a good compliance (69.35%) compared to those with more than 6 years of working experiences (10.58%). Additionally, the findings showed a statistically significant between the healthcare workers who received IPC training (p= 0.05) in previous 1 year and compliance with IPCSPs where by those who had never attend any IPC training experienced a poor compliance compared to those received the training. Furthermore, compliance with IPCSPs was found to be statistically significant with IPC meeting attendance (p= 0.02) where by those who never attend any meeting had a poor compliance compared with those attended

weekly meeting. Lastly, compliance with IPCSPs were found to be statistically significant with level of education (p= 0.038) and professional (p= 0.024) where by diploma holders experienced a good compliance (45%) compared to other cadre and majority of them were nurses (53.23%). Age and sex were found to be non-statistically significant with the compliance of IPCSPs.

4. Discussion

Findings of this study highlight the low compliance with IPCSPs among healthcare workers per WHO standards and national standard as well [9,12]. This study show that the overall average compliance with IPCSPs is 54% where by only 24.70% demonstrating a good compliance to IPCSPs of greater than 80% where by majority of them (85.3%) show high compliance to proper disposal of used sharp items into sharp boxes while 70.1% show sub optimal

compliance to a tendency of wearing gloves to decontaminate used equipment with visible soil and cleaning up spillage of blood or other body fluid immediately with disinfectants , 64.5% wash hand between patients In addition 18.7% demonstrating low compliance where by use only water for hand washing . This low compliance with IPCSPs findings is consistent with a study done in Songwe Tanzania which demonstrated the same profile as far as the IPCSPs is concerned [13]. However, in the study done in Songwe the overall average compliance with IPCSPs was 66% now the discrepancy of compliance between these two studies show a critical gap in this area this could be due to lack of IPCSPs training and motivation among healthcare workers [13].

This study highlight that nurses are more likely to comply with IPCSPs at a good level compared to other cadre, this is purely consistent with a study done in Jorden which showed that nurses' score for compliance were high in concomitant to other clinicians [14]. This could be due to presence of IPC clinical education in their curriculum at nursing school compared to other healthcare professions in which IPC is not included. That is why this seems to have a positive impact on nurses' compliance with IPCSPs at work.

Number of years of working experience and level of education are associated with compliance to IPCSPs whereas healthcare workers who had been at work for 1 up to 5 years are more prone to comply with IPCSPs in concomitant to healthcare workers who had been at work for more than five years and majority of them are diploma holders. This is not consistently with a study done in Jordan which reported that the duration of clinical experiences has an impact on compliance with IPCSPs because of the experience obtained from many years' training, mentorship and supportive supervision on IPC at work during employment [14]. Unfortunately, for this study the situation is totally different where by healthcare workers who had been at work for more than 5 years have poor compliance. This poor compliance could be due to neglectfulness and attitude among healthcare workers.

The number of IPC training session and IPC meeting attendance are also associated with IPCSPs compliance where by healthcare workers who received IPC training in previous 1 year are more prone to comply good compliance with IPCSPs compared to those who has never attend any IPC training in previous years, majority of them did not receive any IPC training (54.2%). Furthermore, those healthcare workers who have never attend any IPC meeting are likely comply a poor compliance compared with those attended weekly meeting. This is supported by multiple studies which highlight the pivotal role of IPC training and regular meeting as the drives to IPC compliance and can be explained by the fact that IPC training provide current evidence updates regarding IPC and what is in the pipeline regarding the healthcare workers and patient safety , for instance some few year back we get a lesson from the outbreak happened (Ebola and Covid 19) and therefore added a body of knowledge in the IPC ground [15-17].

5. Conclusion and Recommendation
This cross-sectional study has shed light on the critical challenges faced by healthcare workers in complying with infection prevention and control (IPC) standard precautions. Our findings revealed a concerning compliance with IPCSPs which is below the WHO standard and national level standard as well. In light of these findings, we therefore recommend that we should enhance IPC Training by Implement comprehensive and regular IPC training programs for all healthcare workers, emphasizing the importance of adherence to standard precautions and proper use of PPE. In addition, Increasing IPC awareness by foster a culture of IPC awareness and safety within healthcare facilities. Encourage reporting of exposure incidents, provide easy access to PPE, and regularly review and update IPC protocols. Furthermore, Foster Research and Development by Invest in research to develop advanced IPC technologies and practices that can further minimize the risk of exposure to blood/body fluids and other infectious agents. Lastly, encourage the collaborative learning by facilitate the exchange of best practices and lessons learned among healthcare institutions to promote continuous improvement in IPC compliance. By addressing these recommendations, healthcare facilities can enhance IPC compliance, reduce the risk of exposure to bloodborne pathogens, and ultimately create safer environments for both healthcare workers and patients.

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