

MAKERERE UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

**ADHERENCE TO STANDARD INFECTION PREVENTION &
CONTROL PRACTICES & FACTORS ASSOCIATED AMONG
HEALTHCARE WORKERS AT JUBA TEACHING HOSPITAL,
JUBA, SOUTH SUDAN**

BY

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SUPERVISORS' APPROVAL

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DEDICATION

I dedicate this research dissertation report to my supervisors, family and friends who accorded me support and encouragement during the development of this research dissertation report.

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ACRONYMS AND ABBREVIATION

AMR	Anti-Microbial Resistance
CDC	Center for Disease Control
GOSS	Government of South Sudan
HAI	Hospital Acquired Infections
HBV	Hepatitis B Virus
HCW	Health Care Workers
HIV	Human Immune Virus
IPC	Infection Prevention and Control
JCC	Juba City Council
JTH	Juba Teaching Hospital
KII	Key Informant Interview
MOH	Ministry of Health
PEP	Post Exposure Prophylaxis
PPE	Personal Protective Equipment
RMF	Real Medicine Foundation
TB	Tuberculosis
WHO	World Health Organization

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OPERATIONAL DEFINITIONS

Adherence: In this study, Adherence to standard infection prevention and control (IPC) practices was referred as healthcare worker who “**always**” practice at all time the standard infection prevention and control (IPC) practices as recommended by WHO and CDC. Also, healthcare worker who had (mean score of 25 and above of 25 items times 2 points) was considered “adherent”, this was used in the study and was consistent with study conducted by (Haile et al., 2017).

Healthcare workers: Are any medically trained persons such as nurses, nursing assistants, medical doctors, midwives, clinical officers whose activities involve contact with patients and their blood or body fluid in health setting. This definition excludes cleaners and other support staffs (Wasswa, 2015)

Infection prevention and control Practices: Are practical evidence based approaches that prevent healthcare workers and patients from hospital acquired infections. These IPC practices include Hand hygiene, PPE, disinfection, waste management practices, safe injection practices, sterilization, Isolation and Post exposure prophylaxis (PEP) (WHO, 2018).

Hospital-acquired infections, also called “Nosocomial infections”: Are infections acquired during hospital care which are not present or incubating at admission. Infections occurring more than 48 hours after admission are usually considered nosocomial (WHO, 2002b)

Standard Precautions: Are basic infection control measures which must be applied to all patients at all times, regardless of diagnosis or infectious status (Ministry of health, 2013).

Hand hygiene: is a general term referring to any action of hand cleansing (WHO, 2009).

Disinfection: is the process of destroying or inhibiting disease producing microorganisms outside the body without destroying the microbial spores (Ministry of health, 2013).

Sterilization: is a process that eliminates all microorganisms (bacteria, viruses, fungi and parasites) including bacterial endospores from inanimate objects by high-pressure steam (autoclave), dry heat (oven), chemical sterilant or radiation (Ministry of health, 2013).

Safe Injection practice: proper use of sterile syringes and needles, injection verification before administering, method of sharp waste disposal and HCWs needle recapping practice (Bekele et al., 2018).

Post exposure prophylaxis: is short-term antiretroviral treatment to reduce the likelihood of HIV infection after potential exposure, either occupationally or through sexual intercourse (WHO, 2014).

ABSTRACT

Background: Hospital acquired infections such as COVID-19 and Sepsis, among others, have become a serious threat to healthcare workers' productivity and patient safety in hospitals worldwide. Therefore, healthcare workers' adherence to infection prevention and control (IPC) practices is the recommended approach to prevent these infections. The study assessed the level of adherence, explored the availability of infection prevention and control (IPC) supplies and determined the factors associated with adherence to standard IPC practices among healthcare workers at Juba Teaching Hospital.

Methods: This was a facility based cross-sectional study. A total sample of 168 HCWs were selected by stratified sampling technique at Juba Teaching Hospital. The healthcare workers at the hospital were stratified by profession. The dependent variable was healthcare worker's adherence to standard infection prevention and control (IPC) practices and independent variables were; level of education, working experience, availability of IPC supplies, IPC policies/guideline, IPC committee and in-service training. Structured questionnaire, key informant and in-depth interview guides were the data collection tools used. Data was analyzed using Stata and then presented into tables, graphs and logistic regression tables.

Result: The findings showed that the overall adherence to standard IPC practices was moderate at 62.7% and none adherence was 37.4% respectively. The most available IPC supplies observed at wards were; sharp disposal containers /safety boxes 9 (90%), Hand washing facility 9(90%), and waste disposable containers 9 (90%). The least IPC supplies were; Alcohol hand rub 4(40%), Disposable gloves 3(30%), Ordinary single use syringes 2(20%), Detergent 2 (20%), protective eye wear 1 (10%), face mask 1 (10%), strong gloves 1(10%) and unavailable IPC supplies were; disinfectant (0%), color-coded bins (0%), placenta pit (0%), waste pit with sharps (0%) and waste pit for noninfectious waste (0%) respectively.

The findings showed that the factors significantly associated with adherence to standard IPC practices among healthcare workers at JTH were; being married AOR 0.43 [0.21-0.87], education beyond secondary AOR 0.29 [0.11-0.78], IPC committee AOR 2.07 [1.03-3.87] and enough IPC supplies AOR 2.35 [1.11-4.96]. In-service training COR 2.05 [1.09-3.87] and IPC policies / guideline COR 1.91 [1.01-3.65], were also found to be associated with adherence to IPC practices among healthcare workers at Juba Teaching Hospital.

Conclusion and Recommendation. Healthcare workers were more likely to adhere to standard IPC practices if they were married, educated beyond secondary, had enough IPC supplies, IPC committee in the hospital, received in-service training and IPC policies/guideline. The South Sudan, Ministry of Health should strengthen IPC committee, provide enough IPC supplies, IPC Policies/guidelines and in-service training to healthcare workers at Juba Teaching Hospital (JTH).

Key words: Adherence, Healthcare workers (HCW), IPC practices and Hospital acquired infection.

CHAPTER ONE

1.0 Introduction and background

Infection prevention and control is a scientific approach with practical solutions designed to prevent harm, caused by infections, to patients and healthcare workers grounded in principles of infectious disease, epidemiology, social science and health system strengthening rooted in patient safety and health service quality (WHO, 2018).

Hospital-acquired infections (nosocomial infections) are infections occurring in a patient in a hospital or other health care facility in whom the infection was not present or incubating at the time of admission. These include infection acquired in the hospital but appearing after discharge and also occupation infection among staff (healthcare workers) of the facility (WHO, 2002b).

Healthcare workers' none adherence to standard IPC practices has become a concern during the COVID-19 pandemic outbreak. The outbreak has increased the demand for IPC practices, such as the use of PPE across all services, with much focus on protecting patients and healthcare workers (HCWs) other than minimizing HAI (Fedele and Porter, 2020). Therefore, when adherence to standard IPC practices is not strengthened, healthcare workers' productivity and patient safety are affected.

Globally, 1.4 million people suffer from HAIs, in which on average, 1 in every 10 patients is affected by HAIs worldwide and 1 in every 10 affected patients dies as a result of HAIs. In acute care hospitals, among every 100 patients, an average of 7 in developed and 15 in developing countries will acquire at least one Hospital acquired infection (HAI). Surgical site infection such as surgical sepsis account of 30% of all septic patients in low and middle-income countries and there has been rise in cases of antimicrobial resistance at health care facilities. Neonatal sepsis occurs in 6.5 to 38 of every 100 live hospitals born in low and middle-income countries (WHO, 2018).

In sub-Saharan Africa, among hospitals born babies, infections are responsible for $\frac{3}{4}$ of cause of death in the neonatal period therefore the associated burden of hospitals acquired infection is high which when unprevented can result into prolonged hospital stay, long-term disability, increased resistance of microorganisms to antimicrobial, massive additional financial burden

for health systems, high costs for patients and their family, and unnecessary deaths (WHO, 2018).

The risk of Hospital acquired infections (HAI) is about 2-20 times higher in developing countries (Beulah Devadason et al 2011) especially in sub-Saharan Africa, where the health system is challenged by resource limitation and surveillance systems, limited supplies and education on IPC. By virtue of healthcare workers' occupation at hospitals, their involvement in parenteral medications, cleaning, feeding, handling of patients' beddings, dressing of wounds and giving medications increase their risk to hospitals acquired infection such as COVID-19, tuberculosis, Hepatitis B, HIV/AIDS and antimicrobial resistance bacteria. However, this risk can be reduced by healthcare workers' adherence to standard IPC practices. Infectious pathogens from medical equipment, medical waste and others can be transmitted to healthcare workers and patients when there is none adherence to standard IPC practices.

Therefore, healthcare workers' none adherence to IPC practices makes these infections compromise healthcare workers performance and patient outcome (Zaidi, 2005). Many studies have shown none adherence to standard IPC practices among healthcare workers in health facility settings. For example, a study conducted by (Bedoya et al., 2017) in Kenya showed that the mean compliance across the five infection preventions and control domain was 0.38% and study conducted by (Komuhangi et al., 2019) showed 52% healthcare workers were none adherent to standard precautions in Kawempe referral hospital, Uganda. Therefore, HCW's none adherence to IPC practices could be improved through provision of; IPC supplies, IPC in-service training, IPC committee formation at hospitals. These factors are associated with healthcare workers' adherence to standard infection prevention and control practices.

In South Sudan, the burden of HAI and magnitude of none adherence to standard IPC practices among healthcare workers remain unknown because of limited research in the area. However, healthcare workers' none adherence to standard IPC practices was advanced by limited IPC supplies in most public hospitals in the country. This was revealed by a research survey conducted by (Batterman et al., 2004) in South Sudan, which showed that most public hospitals lacked IPC supplies such as color-coded bin for waste segregation and guidelines; these impacted on healthcare workers adherence to standard IPC practices.

In Juba teaching hospital, no study was conducted to assess healthcare workers' adherence to standard IPC practices. However, the impact of none adherence to Standard IPC practices

continues to happen. For example, findings from a study conducted by (Alemu et al., 2019) at Juba Teaching Hospital reported 18.1% cases of sepsis per 100 deliveries happened in the maternal ward at Juba Teaching Hospital. Findings from a survey conducted by (Batterman et al., 2004) showed that Juba Teaching Hospital lacks IPC supplies such as color-coded bins and inadequate waste boxes for infectious waste disposal which could be the possible cause of the problem. Research conducted by (Langoya and Fuller, 2015) focused only on hand hygiene knowledge among HCWs at Juba Teaching Hospital, it did not cover all standard IPC practices as recommended by WHO and CDC. Therefore, the research aimed at assessing the level of adherence to standard IPC practices, explored the availability of IPC supplies and determined the factors associated with adherence to standard IPC practices among healthcare workers at Juba Teaching Hospital, South Sudan.

CHAPTER TWO

2.0 Literature review

2.1 Overview of Infection prevention and control practices in South Sudan

In South Sudan, healthcare workers' adherence to standard IPC practices in most public hospitals has been affected by inadequate IPC supplies and training as result of the civil war. Although healthcare workers' adherence to standard IPC practices has been affected by limited supplies and training, some healthcare workers were trained by the WHO on few components of IPC practices during Ebola and COVID-19 outbreaks.

South Sudan to date does not have an integrated national infection prevention and control guideline that guides healthcare workers in adhering to infection prevention and control practices. However, few components of infection prevention and control practices have been included in the prevention and treatment guideline use by healthcare workers in health facilities.

It is important to strengthen adherence of healthcare workers to IPC practices by understanding the level of adherence, the availability of supplies and factors associated such that key interventions are established to facilitate their adherence. Therefore, a synthesis of various literatures by other scholars on level of adherence, IPC supplies and factors associated would give an in-depth picture on what has been done and knowledge gaps on adherence to standard IPC practices as deeply expressed below:

2.2 Healthcare workers' level of adherence to standard infection prevention and control practices

Understanding healthcare workers' level of adherence to standard infection prevention and control practices is important to establish intervention where adherence level is minimal. When adherence level is low, more effort is needed to improve adherence through training and provision of supplies in order to prevent the risk of acquiring nosocomial infections. Similarly, when adherence is high, effort is needed to maintain the level of adherence in order to prevent nosocomial infections. In a study conducted by (Otieno-Ayayo et al., 2015) in four-level Hospital in Kenya showed that, the overall mean compliance of healthcare workers to infection prevention and control practice was 60.8% which was moderately low due to inadequate

resources which affected IPC implementation. During the study, compliance to hand hygiene, especially among nurses was 70% but the findings showed that not all health workers wash their hands after removal of hand gloves which explains that there could have been limited water supply for effective hand hygiene and knowledge problem.

Furthermore, a study conducted by (Mpamize, 2016) to assess the level of health workers adherence to Universal precaution in Kabarole district in Uganda, showed that the level of adherence to standard precaution by health workers was 94%. However, the study did not assess whether there was waste segregation as mechanism of waste management in the health facilities and also the study assessed hand washing after treating a patient but hand washing before approaching a patient was not assessed in this study which could affect the adherence level stated.

More so, a study done by (Komuhangi et al., 2019) to assess the level of compliance of health workers to standard precaution in the management of labor at Kawempe National Referral Hospital, revealed that the overall compliance to standard precautions was 52% and also showed that 95% of health workers did not comply with hand hygiene at the hospital. The results showed high knowledge gap in hand hygiene which could contribute much to this research. Similarly, a study conducted by (Haile et al., 2017) which was assessing compliance with standard precaution and associated factors among healthcare workers in Gondar University, comprehensive specialized Hospital, North west Ethiopia, the findings showed that among the healthcare workers who participated in this study, 80.6%, 18.4%, and 39.6% reported that they always wash hands after removal of gloves, before touching a patient, and before clean or aseptic techniques, respectively. Only 32.4% of the respondents reported that they always protect themselves against body fluid exposure regardless of the diagnosis of patients, while 88.7% of HCWs reported that they always wear gloves whenever there is a possibility of exposure to any body fluids. The compliance of HCWs with wearing a waterproof apron , eye goggles whenever there is a possibility of body fluid splashing and compliance of HCWs in segregation of infectious and non-infectious wastes into appropriate dust bins were found to be below 50% .This was relevant to a study conducted by (Shewasinad Yehualashet et al., 2021) in North Shoe ,Ethiopia where the overall adherence level of the community towards the recommended safety measures of COVID-19 was 44.1% (95% CI = 41.1, 48.2) and only 9% of participants did not practice hand washing with soap and 42.2% of the respondents did not utilize sanitizers to clean hand. However, the gap in the study was that

it did not assess adherence level on other standard precaution such as sterilization, use of PPE, waste management, among others to ascertain complete safety measure to COVID-19.

Similarly, a cross-sectional study conducted by (Efifie, 2016) to assess the awareness and adherence of 125 health workers to Universal safety precaution in Kogi state Hospital in Nigeria revealed that awareness and adherence to the USP were observed to be 5.6% and 2.4% respectively. More so, 3% and 2.2% of the participants with the number of years in services within the ranges of 5-9 and 1-4 years had complete adherence to the USP. Post-exposure prophylaxis (PEP) and use of personal protective equipment (PPE) were the two USP principles with the lowest levels of awareness and adherence, with 46% and 47.6% on awareness and 43.8% and 44.6% on adherence respectively.

A study by (Kermode, Jolley et al. 2005) among HCWs in India revealed that only 11% had complete adherence to the USP. Similarly, (Kotwal and Taneja, 2010) found 'poor' overall adherence rate in India, even though 76% of the participants admitted to having been adequately trained on the USP, especially on use of PPE. (Efifie 2016), in a study of the knowledge and practice of the USP among professional HCWs in public and private health facilities in Uyo, South Nigeria, revealed average level of adherence to USP was at 62%.

A study conducted by (Chang et al., 2012) which was assessing adherence to major standard precaution, an audit of venipuncture and intravenous cannula insertion in pediatric unit in Hospital sultanah Amina, showed that the rate of adherence to standard precaution was low during performance of penepuncture and intravenous cannulation, therefore the lowest adherence rate was observed in the criterion of hand washing (20.9%), followed by hand gloving (35.2%), timely disposal of sharps (65.9%) and preparation of post producer dressing to secure the cannula in place (67%). From the findings, healthcare workers registered lowest adherence to hand hygiene which is one of the Standard IPC practices.

The level of healthcare workers' adherence to standard IPC practices vary across IPC domains as seen from various literatures for example study conducted by (Albeladi, 2021) which was assessing level of adherence to COVID-19 preventive measure among healthcare workers in Saudi Arabia, the findings showed that 95% of healthcare workers were committed to wearing glove ,environmental cleaning and disinfection , wearing google and use of gown were 84%, 68% and 85% respectively. Therefore, the findings showed that overall adherence to mask use was 82% among healthcare workers which showed that adherence among healthcare

workers to preventive measures improved because of COVID-19 outbreak. However, the research gap in the study was that the findings did not show results of some prevention practices before and after procedure. Therefore, the research focused much on mask use but health workers' adherence to hand hygiene which is key to COVID-19 prevention was not assessed. This was the major research gap in the study.

2.3 Explore the availability of supplies for IPC practices at Juba Teaching Hospital

The availability of supplies for infection prevention and control in any health facility facilitate healthcare worker's adherence to infection prevention and control practices. Inadequate supplies affect the sustainability of infection prevention and control in most health facilities. Juba Teaching Hospital was faced by shortage of infection prevention and control supplies. However, the hospital has been receiving support from Non-Governmental Organizations such as World Health Organization and Real Medicine Foundation, among others.

The shortage in IPC supplies has been advanced by attack of health care facilities, health facilities were looted and vandalized especially during civil war in South Sudan. Therefore, shortage of IPC supplies in health facilities affected healthcare workers' adherence to infection prevention and control practices. This was consistent with study conducted by (Martin-Delgado et al., 2020) in Brazil, which was assessing the availability of PPE and treatment facilities for health workers involved in COVID-19. The finding showed that 70% of participants lacked PPE mainly gown coverall (59.4%), N95 mask (55.5%) and face shield (52.6%). However, the gap in the study was that it did not assess health workers' knowledge on the use of PPE.

Moreso, a cross-sectional study conducted by (Berendes et al., 2014) to assess the quality of care in the new nation; South Sudan first national health facility assessment which involved 14-16 health facilities totaling to 156 randomly selected functional health facilities in 10 states of South Sudan. The findings showed that 3% of the health facilities in ten states of South Sudan had essential infection control supplies with 0% in upper Nile states, 0% in Jonglei state, 1% in unity state, 3% in Warrap state, 0% in northern Bar el ghazal state, 0% in western bar el ghazal state, 1% in lake state, 0% in Western Equatoria state, 1% in central Equatoria state and 0% in Eastern Equatoria state respectively. These findings clearly showed that there is shortage of infection control supplies in most health facilities in South Sudan. This supports the need for this research. IPC supplies availability and adequacy is important to healthcare worker's adherence to infection prevention and control practices.

It is true that most of these supplies are unavailable in most health facilities in Sub Saharan African countries. This was shown by a study conducted by (Wasswa, 2015) which was about the implementation of infection control in health facilities in Arua district, it was across sectional study where 202 healthcare workers were interviewed, 186 randomly selected and 16 purposive selected for key informants and then observation were conducted in 32 health facilities for compliance and availability of infection control supplies for infection control implementation. The findings revealed that most health facilities 93.8% lacked adequate supplies or equipment for infection control, 84.4% of health facilities had sharp disposal containers, also some supplies such as waste and placenta pit were unavailable in health facilities. Water and waste pit with sharps were the most available infection control supplies with 90.6 % and 100% while the least available item was alcohol hand rub with 31% respectively.

Furthermore, inaccessible IPC supplies such as PPEs, Alcohol hand rub, color coded bins in health facilities pose challenge to healthcare worker's adherence to infection prevention and control practices. Absence of these supplies place healthcare workers at the risk of acquiring nosocomial infections from hospital setting. So a study conducted by (Efstathiou et al., 2011) revealed that lack of protective equipment such as gloves and mask were perceived barriers to compliance with standard precautions therefore this study has contributed in shaping the body of knowledge of this dissertation report.

2.4 Factors associated with adherence to infection prevention and control practices

Knowledge on IPC: A study done by (Luo et al., 2010) which was assessing factors impacting compliance with standard precautions in nursing in China. The finding showed that there was positive correlation of standard precaution knowledge with compliance ($r = 0.24$), suggesting that the greater the standard precaution knowledge, the better the activity of compliance. This means that having knowledge on infection prevention and control practice is associated with adherence to infection prevention and control practice.

Furthermore, qualitative study conducted by (Efstathiou et al., 2011) which was assessing factors influencing nurses compliance with standard precautions in Cyprus, the findings found that when standard precautions are followed by a colleague with more knowledge or by senior nursing personnel, then the other staffs are then influenced to comply as well. A junior nurse said *"My supervisor uses gloves when she starts an intravenous line; I will certainly follow her*

example., In addition it was pointed by participants that when senior officer demand standard precaution as means of pressure over them they are influence to use them”.

Years of working experience: Healthcare workers with many years of working experience in healthcare setting have confidence in handling equipment and patients, therefore they have enough knowledge on IPC adherence practices. This was consistent with study conducted by (Nofal et al., 2017) which was mainly assessing factors influencing compliance among nurse and physician in Jordan. The findings showed that length of experience was one of the significant predictors of reported compliance. However, the research gap in the study was that it entirely relied on self reporting compliance which could give a different outcome when done by observation and also proportion of health workers with length years of experience at work was not indicated.

Availability of IPC Supplies: A study conducted by (Backman et al., 2011) which was assessing the barriers and facilitators to infection prevention and control, case of Canadian surgical units showed that another bridge to IPC practice adherence is the availability of hand washing sinks and ABHR on the unit. Hand hygiene is the most important practice to prevent healthcare associated infections (45). Despite the importance of hand hygiene, research has shown poor adherence with hand hygiene practices among health professionals (46). One of the barriers to adherence with hand hygiene practices is the inaccessibility to hand hygiene products.

Similarly, according to the studies conducted by (Bekele, 2020), (Beyamo, 2019) showed that the provision of supplies such water and personal protective equipment were factors associated with health workers' compliance to standard safety precaution in Hawassa University Hospital and Dawuro zone in Ethiopia. In these studies, availability of tap water AOR: 2.68(1.15, 6.2), accessibility of safety box AOR: 3.4(1.6, 7.17), having good hand hygiene and availability of personal protective equipment were independently associated with compliance to standard precaution practices among healthcare workers. This was the same with the findings of Thomas (2004) in U.S where the facilities that had a continuous supply of infection prevention materials had their staff 1.82 times more likely to adhere to universal precautions than facilities with limited supply of PPE, OR, 1.82 and 1.42, respectively.

Infection prevention and control committee: The existence of infection control team in health care institution enables healthcare workers' adherence to infection prevention and control

practices. This has been shown by a qualitative study conducted by (Barker et al., 2017) which was assessing the barriers and facilitators to infection control in northern India, where twenty semi structured interviews of nurses and physician were selected by convenient sampling. The findings revealed that creation of large infection control team, was a facilitator for adherence of health workers to infection prevention and control. From the findings, sixteen nurses were formed to make an infection control team, who were fully dedicated to infection control activities. Infection control nurses were responsible for ensuring nurses staffs complete infection control checklist for high risk patient at each shift. Most nurse and physician were receptive to the work of infection control nurses, *“if the nurse is seeing that someone is not doing it [hand hygiene] she will point it out, whether it is a doctor or nurse ,she is like a police woman [...] we always do whatever she says because we even forget that infection is such a problem in ICU. We gave to take advice from her; we do not mind”* ICU senior physician.

Similarly, relevant study conducted by (Backman et al., 2012) which was mainly assessing the barriers and bridges to infection prevention and control in Netherlands surgical unit. The findings showed that participants views and engaged leadership was important for IPC. The concept of engaged leadership as a critical form of IPC governance emerged as a key study finding in a variety of ways. At the Netherlands Hospital, the IPC Department, consisting of 1.32 FTEs per 250 beds, supports the overall IPC activities of the hospital. The IPC programme reports to the Infection Control Committee who advises the Board of Directors on the IPC policies. This committee meets every 2 months and discusses all IPC-related issues. If necessary, the IPC policies are reviewed and revised accordingly. The Infection Control Committee then reports the changes to the Board of Directors for endorsement. Twice a year a prevalence rate of nosocomial infections is calculated. These results are provided to the management teams of each specialty involved and to the Board of Directors. Furthermore, the Board of Directors receives a copy of the annual report of the IPC department (which includes all the work completed by the IPC department in the last year and details such as any outbreaks that have occurred, etc). Therefore, IPC committee and engaged leadership in IPC practices were the factors associated with health worker’s adherence to Standard IPC practices.

Moreso, a study conducted by (Abdella et al., 2014) which was assessing hand hygiene compliance and associated factors among health care providers in Gondar University Hospital, Northwest Ethiopia where 405 participants were interviewed and observed with a response rate of 96.4% revealed that the presence of infection control committee (AOR=2.6 95% CI 1.23-

5.57) was significantly associated with hand hygiene compliance which is one of the standard IPC practices.

Availability of IPC guidelines: The availability of IPC guidelines in the health facility guides and reminds healthcare workers to standard IPC practices. This facilitates adherence to infection prevention and control practice, which can result to risk reduction to hospital acquired infections among healthcare workers. Guidelines contains all required procedures for all the standard precaution, which when adhered to, could improve health worker adherence to IPC. This has been shown by a study conducted by (Desta et al., 2018) which was assessing knowledge, practice and factors associated among health care workers in Debre Markos referral hospital ,North west Ethiopia. The findings showed that healthcare workers who adhered to IPC guideline were four times more likely to practice infection prevention and control practices than those who did not adhere to infection prevention and control guideline.

Adherence to infection prevention and control guideline improves health workers' adherence to infection prevention and control practices. Similarly, a quantitative study conducted by (Mukwato et al., 2008) to assess Compliance with Infection Prevention Guidelines by Health Care Workers at Ronald Ross General Hospital Mufulira District in Zambia, revealed that, high compliance was associated with inclusion of Guidelines in the Curricular which become routine guideline available at work place. Guideline act as reference tool for health workers' adherence to IPC practices in hospitals. High compliance was statistically significant with inclusion of infection prevention guideline into the curricular (P value 0.000)

In-service training and education on IPC: Provision of in-service training and education to health workers at health facilities facilitate health workers' adherence to infection prevention and control practices. Training imparts more knowledge to healthcare workers on how they can prevent themselves from hospital acquired infections. Provision of in-service training and education is associated with adherence to infection prevention and control. This was shown by a study conducted by (Wasswa, 2015) to assess the implementation of infection control and predictors of hand washing in health facilities in Arua district, Uganda. Therefore, the findings showed that healthcare workers were more likely to wash their hands if they had received in-service training on infection prevention and control. This means that in-service training is a predictor of adherence to infection prevention and control practices. Having had in-service training on infection prevention and control was significantly associated with hand washing which is one of standard IPC practices.

Furthermore, , a cross-sectional descriptive study conducted by (Mpamize, 2016) which was assessing Universal precaution in infection prevention among health workers in Kabarole district, revealed that training of health workers on IPC was a predictor of health workers adherence to Universal precaution in Kabarole, Uganda. Therefore, trainings on universal precaution was statistically significant with adherence to universal precaution, trained health workers were 18.52 times more likely to adhere to Universal precaution than those who were not trained.

Similarly, a cross sectional study conducted by (Abdella et al., 2014) on hand hygiene compliance and associated factors among health care providers in Gondar University Hospital, North West Ethiopia showed that training about hand hygiene compliance was found to be significantly associated with hand hygiene compliance of health workers , those who were trained had 2.6 times more compliance than those who were not trained .This might be because training builds the capacity of healthcare workers which had significant association with hand hygiene compliance.

This was relevant to a study conducted by (Haile et al., 2017) which was mainly assessing compliance with standard precaution and associated factors among healthcare workers in Gondar University, comprehensive specialized Hospital, North west Ethiopia, the findings showed that having received training on standard precaution (AOR [95%CI] 2.9[1.2-7.02]), availability and accessibility to personal protective equipment (AOR [95%CI] 2.87 [1.41-5.86]) were found to be significantly associated with compliance to standard precaution.

Staffing: low staffing of health workers affects the few health workers from adhering to infection prevention and control practice. This was well articulated by a study conducted by (Travers et al., 2015) which was assessing the perceived barriers to infection prevention and control for Nursing homes certified Nursing Assistant in Columbia. It revealed that lack of effort to maintain enough staffing levels also affected Certified Nursing Assistant (CNA) IPC practices and that inadequate staffing is a prevalent issue in the nursing professions and is only expected to worsen in the future. Adherence was low because of increased workload and being in a hurry to finish one task and move on to another. Therefore, according to the findings it showed that increasing staffing level reduces workload which makes healthcare workers to adhere to infection prevention and control at the health facility. Therefore, reduced workload by increasing staffing level is associated with adherence to infection prevention and control practices.

CHAPTER THREE

3.0 Problem statement

The problem is none adherence of healthcare workers to standard infection prevention and control (IPC) practices which resulted into low infection prevention and control at Juba Teaching Hospital. The magnitude of none adherence to standard infection prevention and control practices by healthcare workers at Juba teaching Hospital is unknown.

However, a study done at Kawempe hospital, Uganda showed 52% overall none adherence of healthcare workers to standard IPC practices (Komuhangi, Kevin et al. 2019). Research findings by (Alemu et al., 2019) in Juba Teaching Hospital showed that the hospital registered 18.1% sepsis cases among 100 deliveries in a maternal ward and a project report by Real Medicine foundation (RMF) showed cases of reinfections at inpatient pediatric ward 5. It seems to suggest gaps in adherence of healthcare workers to all standard IPC practices. In absence of critical attention to addressing sepsis, maternal mothers and also healthcare workers remain at a high risk of numerous hospitals acquired infections (WHO, 2002a). Resulting into prolonged hospital stays among patients, it increases their vulnerability, the risk of antimicrobial resistance, increased socioeconomic burden and unnecessary deaths (Hensley and Monson, 2015), (Khan et al., 2017). The high bed occupancy rate of 73% at Juba Teaching hospital, lack of IPC guidelines, limited IPC in-service training, inadequate staffing and IPC supplies such as color-coded bins for waste segregation and the high prevalence of patients with wound injuries as a result of war are the major causes of the problem.

The National Ministry of Health, South Sudan and health partners such as WHO, RMF and among others, had put a lot of effort to improve healthcare workers' adherence to IPC practices through capacity building. Unfortunately, this was inadequate since it focused on fewer IPC practices and staff (WHO, 2020). Similarly, a study by (Langoya and Fuller, 2015) only focused on hand hygiene knowledge leaving other standard IPC practices among healthcare workers (HCWs). Therefore, due to these research gaps, this research assessed adherence to standard IPC practices and factors associated among healthcare workers at Juba Teaching Hospital.

3.1 Justification

Improved healthcare worker's adherence to standard IPC practices contributes to the reduction of hospital acquired infection such as sepsis. Their consequences such as long-term disability, prolonged hospital stays, increased antimicrobial resistance, increased in socio-economic disturbance and mortality rates (Khan et al., 2017) can therefore be minimized.

Juba Teaching Hospital being the only hospital that serves about 1million people and has high bed occupancy rate of 73%, addressing the bottlenecks in the adherence to standard IPC practices by healthcare workers provides a safety net for not only health workers but their communities as well.

The study was conducted to improve adherence to standard IPC practices in order to reduce nosocomial infections such as sepsis and the risk of Ebola outbreak as South Sudan borders Democratic Republic Congo. The study findings such as provision of enough IPC supplies, IPC policies/guidelines and presence of IPC committee to healthcare workers may be used to plan better preparedness for such infections and improves response to the current outbreak of COVID-19 pandemic. Policy makers may also use these findings to implement well informed interventions that facilitate adherence of healthcare workers to standard IPC practices.

CHAPTER FOUR

4.0 Study objectives

4.1 General objectives

To assess adherence to standard IPC practices, explore availability of IPC supplies and determine the factors associated among healthcare workers at Juba Teaching Hospital.

4.1 Specific objectives

1. To assess the level of adherence to standard infection prevention and control practices among healthcare workers at Juba Teaching Hospital.
2. To explore the availability of supplies for infection prevention and control practices at Juba Teaching Hospital.
3. To determine the factors associated with healthcare workers' adherence to standard infection prevention and control practices at Juba Teaching Hospital.

4.2 Research questions

1. What is the level of adherence to standard infection prevention and control practices among healthcare workers at Juba Teaching Hospital?
2. What supplies for infection prevention and control practices are available at Juba Teaching Hospital? What are the explanations for supplies availability and their adequacy for standard IPC practices at Juba Teaching Hospital?
3. What are the factors associated with healthcare workers' adherence to infection prevention and control practices at Juba Teaching Hospital?

4.3 A Conceptual framework on factors associated with healthcare workers' adherence to standard infection prevention and control practices

Independent variables.

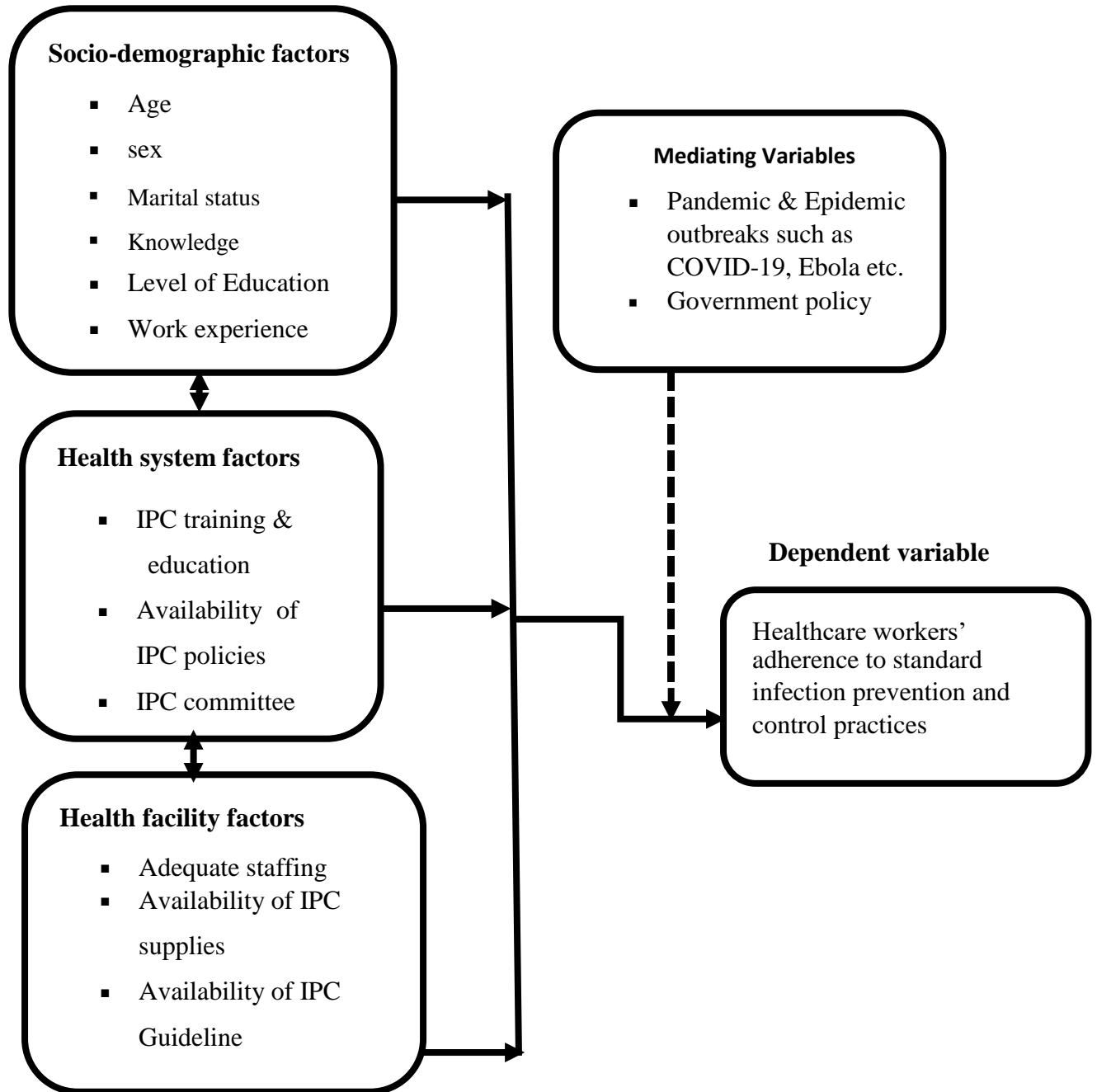


Figure 1: Conceptual framework

Narrative of the conceptual framework

The above conceptual framework explains the factors associated with healthcare workers' adherence to standard IPC practices.

Socio demographic factors

Socio demographic factors such as level of education of healthcare workers influence adherence to standard IPC practices. Healthcare workers with high level of education have more knowledge on adherence to IPC practices which makes them to exercise precaution during work at hospital hence facilitates their adherence to standard IPC practices. Furthermore, Socio-demographic factors also influence the health system factors for examples healthcare workers with many years of experience and high level of education influence training of other staffs on IPC practices and formation of IPC committee in the hospital. These increase knowledge and advises healthcare workers to adhere to standard IPC and exercise surveillance on Hospital Acquired Infection (HAI).

Health system factors

The health system factors such as IPC training and education reminds healthcare workers on adherence to standard IPC practices and IPC committee act as advisory body to healthcare workers on adherence to IPC practices .Therefore, healthcare workers who were trained on IPC and has IPC committee in the hospital are more likely to adhere to standard IPC practices than those who were not (Mpamize, 2016), (Barker et al., 2017). IPC training and committee reminds and advises healthcare workers on adherence to IPC practices Also the health system factors influence the health facility factors which results into the adherence of HCWs to standard IPC practices and the health facility factors in turn affect the health system factors for example development of IPC policies at health system level informs establishment of IPC guidelines which are distributed to health facilities to guide healthcare workers to adhere to standard IPC practices during their work at health facilities.

Moreso, the health system factors may also influence the socio-demographic factors for example the provision of IPC training and education improves HCWs' knowledge on standard IPC practices and lack of the IPC training and education affect health workers' knowledge on standard IPC practices which is socio-demographic factor.

Health facility factors

Health facility factors are directly associated with the outcome variable; healthcare workers' adherence to standard IPC practices. For examples; Availability of IPC guidelines. Guidelines contain operating procedures of IPC practices which when followed by healthcare workers can lead to their adherence to standard IPC practices in the hospital.

Availability of IPC supplies: the availability of IPC supplies such as PPE, waste bins, result into utilization of these supplies for infection prevention and control practices. Healthcare workers (HCWS) are more likely to adhere to IPC practices when enough IPC supplies are available than when there is shortage in IPC supplies in the health facility.

Health facility factors affect health system factors for examples adequate staff influence formation of IPC committee. Adequate staff informs availability of enough healthcare workers to be trained on IPC practices leading to adherence to standard IPC practices.

Mediating variables.

The mediating variable such as COVID-19 Pandemic and Ebola Epidemic outbreaks mediates independent variables to the outcome variable. For example, the current outbreak of deadly COVID-19 virus has made all people to adhere to IPC practices. Also, government policy such as introduction of national IPC guideline at health facilities enable healthcare workers to adhere to it which facilities healthcare workers (HCWs) adherence to standard IPC practices.

CHAPTER FIVE

5.0 Methodology

This was a facility based cross-sectional study using quantitative and qualitative data collection methods.

5.1 Study area/site

Juba Teaching Hospital is the only government referral hospital located in the center of Juba city opposite St Joseph Catholic Church along Maduria-airport road and it is within Kator town block which is one of the administrative units of Juba City Council. The Hospital was formerly managed by International Committee of the Red Cross until April 2007 when it was handed over to the National Ministry of Health-GoSS.

The Hospital stands at GPS coordinates N4.8512 E 31. 6091. The Hospital has the bed capacity of 580 beds giving an occupancy rate of 73%. The Hospital offers both outpatient and inpatient health care services to about 1 million population of Juba and with other referral from the neighboring states (districts) of South Sudan.

The Hospital has about 299 healthcare workers of which 59 Medical doctors,141Nurses ,56 Clinical Officers,26 Laboratory technicians,15 Midwives, 2 Radiographers respectively (JTH HRIS 2021).

The Hospital is the only government referral hospital in the country and had reported cases of sepsis, reinfection of children in the pediatric ward, shortage of IPC supplies, high bed occupancy rate (73%), limited IPC in-service training and low hand hygiene knowledge as evidenced by previous studies in the hospital therefore it was because of these problems that made the hospital to be chosen as the study area for this research.

5.2 Study design

Facility based cross-sectional study design was used to assess the level, availability of IPC supplies and factors associated with adherence to standard infection prevention and control practices among healthcare workers at Juba Teaching Hospital.

Objective 1

To assess the level of adherence to standard infection prevention and control practices among healthcare workers at Juba Teaching Hospital, this was achieved through structured questionnaire to measure the level of adherence to all standard IPC practices as recommended by WHO and CDC.

Objective 2

To explore the availability of supplies for infection prevention and control practices at Juba Teaching Hospital, this objective was achieved through step-by-step observation of IPC supplies in the Hospital wards. Data was collected using an observation checklist, KII and in-depth interview guides to provide explanation on availability of IPC supplies in the Hospital.

Objective 3

To determine the factors associated with healthcare workers' adherence to infection prevention and control practices at Juba Teaching Hospital, this was achieved through structured questionnaire with close ended questions adopted from WHO IPC assessment framework at facility level with modification.

5.3 Study population.

The study population was healthcare workers working at Juba Teaching Hospital.

5.4 Inclusion and Exclusion Criteria

5.4.1 Inclusion criteria

All healthcare workers who were working at Juba Teaching Hospital and consented at the time of data collection were included in the study.

5.4.2 Exclusion criteria

All healthcare workers who were not present at the time of data collection, were excluded from the study.

5.5 Sample Size determination

To determine the actual sample size of healthcare workers for the study at Juba Teaching Hospital, cross-sectional study formula which is called the Kish Leslie formula (1965) was used. Since the prevalence of healthcare worker's adherence to IPC practices is unknown, then we estimated $P = 50\%$

Using Kish Leslie Formula (1965) $N = Z^2 P(1-P) / \delta^2$

Where,

$Z = 1.96$ (the standard normal deviate at 95% CI)

$P =$ Estimated prevalence (Taken from previous studies or a pilot)

$\delta =$ Maximum error the investigator is willing to allow.

The sample size "n" is assumed to be selected using random

$Z = 1.96$ (at 95% Confidence interval)

$P = 50\%$. (When the actual prevalence is not given)

$D = 0.05$ (level of significance) $n = (1.96)^2 \times 0.5 (1-0.5) / (0.05)^2$ $n = 3.8416 \times 0.5$

$(0.5) / 0.0025$ $n = 3.8416 \times 0.25 / 0.0025$ $n = 0.9604 / 0.0025$

$n = 384$ (Healthcare workers)

Sample size adjustment using Cochran formula for finite population was done since calculated sample size is greater than the actual number of healthcare workers at Juba teaching hospital, this was as given below: $n = no. N / no + (N - 1)$ where $n =$ required sample size, $no = 384$, $N = 299$ (Actual number of healthcare workers).

$n = 384 \times 299 / 384 + (299 - 1)$, $n = 114816 / 384 + (298)$, $n = 114816 / 682$

$n = 168$ (Healthcare workers)

Therefore, the Sample size was 168 Healthcare workers.

For study participant's representativeness, Probability proportionate to size was considered to ensure equal representation of participants from each profession.

Professions	Sample size
Medical officers 59	$59/299 \times 168 = 33$
Nurses 141	$141/299 \times 168 = 79$
Clinical officers 56	$56/299 \times 168 = 32$
Midwives 15	$15/299 \times 168 = 8$
Laboratory technician 26	$26/299 \times 168 = 15$
Radiographers 2	$2/299 \times 168 = 1$
Total = 299	Total=168

5.5 Sampling procedure

Stratified sampling technique

Stratified sampling was used to select representative sample from each profession of healthcare workers at Juba Teaching Hospital.

In the First place, the healthcare workers at Juba teaching hospital were stratified by their profession such as medical doctors, nurses, midwives, laboratory and X-ray technologist. Then the proportional numbers of participants were then selected by simple random sampling from the sampling frame by lottery method from each stratum without replacement.

On the qualitative method, based on the number of 2 trained data collectors and participants having first-hand information about the study topic and working experience in the Hospital, predetermined number of 6 Heads of department and 6 healthcare workers were selected through purposive sampling method for Key informant and in-depth interviews. The participants were identified by data collectors through visits into the department units, introducing the study topic and seeking consent to those willing for interviews. Sample size of 6 Heads of department and 6 Healthcare workers were convenient sample size for the data collection team and as well as the principle investigator. They were interviewed to explore the

availability of IPC supplies at Juba Teaching hospital and saturation was reached, when there was no new information from the participant about the topic.

5.6 Study Variables

5.6.1 Independent Variables

The independent variables were the perceived factors associated with healthcare workers' adherence to standard infection prevention and control practices which include: - Age, level of education, work experience, adequate staffing, training and education on IPC, IPC committee, availability of IPC supplies, IPC policies and guidelines, IPC education to patients using Visual Aids by healthcare workers.

Independent variables were measured by Yes or No close ended questions for examples on IPC committee as an independent variable, A healthcare worker was classified Yes, when he/she responded "Yes" they have IPC committee in the Hospital and "No" when a healthcare worker responded that "No", they do not have IPC committee or do not know whether IPC committee exist in the Hospital.

5.6.2 Dependent Variable

The dependent variable was healthcare workers' adherence to standard infection prevention and control practices at Juba Teaching Hospital.

Definition and measurement for the outcome variable (dependent variable).

Adherences to standard IPC Practices: was defined as the action of continuing always to obey the standard IPC practices as recommended by WHO and CDC in order to prevent hospital acquired infections.

Adherence to 8 standard IPC practices (Hand hygiene, PPE, Injection safety practices, Waste management, sterilization, disinfection, Isolation and PEP) were measured in dichotomous variable in which healthcare workers were categorized either "**adherent**" or "**not/none adherent**".

The responses for the 8 standard IPC practices were scored in a three Likert scale which were "**always**", "**sometimes**" and "**Never**" using direct structured questionnaire.

Participants who always practice standard IPC practices were considered as those who are **“adherent”** to standard IPC practices and those who **sometimes and Never practice** were considered as those who are **“not adherent”** to standard IPC practices (Haile et al., 2017).

The proportion of healthcare workers’ adherence and none adherence to each of the 8 standard IPC domains/practices were calculated. Healthcare workers/a Healthcare worker’s scores on ‘always’, ‘sometimes’ and ‘Never’ were/was divided by the total number of healthcare workers (HCWs) interviewed to get participants / individual percentage (%).

The overall individual score to given IPC domain such as five questions on hand hygiene was based on the individual responses on the three Likert scale of “ always”, “Sometimes” and “Never” and then the mean scores and proportion was calculated to assess adherent or none adherent of the individual.

Alternatively, 25 items on three Likert scale of (**2=always ,1=Sometimes and 0= Never**) (Cheung et al., 2015) was scored based on participants responses on three scales “always”, “Sometimes” and “Never”. A healthcare worker that scores mean of 25 and above of 25 sub-items in score of 2 =always were considered as “adherent” and a HCW who scores below the mean score was considered as “not/none adherence” to IPC practices. This was adopted from studies conducted by (Desta et al., 2018), (Komuhangi et al., 2019) .

Table 1 shows Indicators that were used as measure for adherence and none adherence are as shown below;

Table 1: Indicators that were used as measure for adherence and none adherence

Standard IPC practices	Indicators	Denotation
Hand hygiene	Proportion of healthcare workers who “always”, “sometimes” and “Never” practice hand hygiene using chlorine hand rub, hand washing within the five moment of hand hygiene as per WHO guideline	Always = Adherent Sometimes/Never=Not adherent
Use of Personal Protective Equipment (PPE)	Proportion of healthcare workers who “always”, “sometimes” and “Never” use PPE during work at hospital.	Always= Adherent Sometimes/Never=Not adherent
Disinfection	Proportion of healthcare workers who “always”, “sometimes” and “Never” disinfect their equipment and surfaces before and after work.	Always= Adherent Sometimes/Never=Not adherent
Sterilization	Proportion of healthcare workers who “always”, “sometimes” and “Never” sterilize their equipment using steam/autoclave before and after work.	Always= Adherent Sometimes/Never=Not adherent
Safe injection practices	Proportion of healthcare workers who “always”, “sometimes” and “Never” practice safe Injection practices such as use of one hand scope techniques. .	Always= Adherent Sometimes/Never=Not adherent
Waste management practices	Proportion of healthcare workers who “always”, “sometimes” and “Never ”practice waste management practices during work through disposal of sharp needles into safety box and conduct waste segregation.	Always= Adherent Sometimes/Never=Not adherent
Isolation	Proportion of healthcare workers who “always”, “sometimes” and “Never” practice isolating infectious patient to prevention transmission of infectious disease.	Always= Adherent Sometimes/Never=Not adherent
Post exposure prophylaxis practices	Proportion of healthcare workers who “always”, “sometimes” and “Never” practice post exposure prophylaxis in case of injury when handling a patient	Always=Adherent Sometimes/Never=Not adherent

IPC Indicator proportion score grade rating.

The scores based on the proportion for adherent and none adherent to IPC was graded as (0-59%) was low, (60-69 %) moderate and (70-79%) high and (80 -100 %) very high adherent and none adherent to standard IPC practices respectively.

Measurement of Knowledge on standard IPC practices.

Healthcare workers' knowledge on standard IPC practices was measured by "Yes or No" questions. A scoring system was used in which respondents' Yes (correct) and No (incorrect), healthcare workers who correctly answered questions was given "Yes" and regarded as knowledgeable while incorrectly answered questions was given "No" and regarded as not knowledgeable. Knowledge scores were added up and the mean was calculated based on "yes" or "No" responses to give a total knowledge score for a healthcare worker on each standard IPC practices. Also, answers provided for each standard IPC questions were allocated "1" or "0" point in which "1" was for "yes" and "0" for "No" answer.

The total score of knowledge questions ranging from 0 to 8 were classified into two categories of response for each standard IPC practices: Knowledgeable (mean score and above) and not Knowledgeable (below mean score).

5.7 Data collection

5.7.1 Tools

Structured questionnaire, observational checklist, key informant and in-depth interview guides were developed and use to collect information on the level of adherence, the availability of IPC supplies and factors associated with adherence to standard IPC practices among healthcare workers at Juba Teaching Hospital.

5.7.2 Pretesting of the tools

The data collection tools were pretested to 10 healthcare workers at Al-Shaba hospital that has similar characteristic to Juba Teaching Hospital to determine its relevancy and appropriateness. After the pretesting, major adjustment and modification were made.

5.7.3 Training of research Assistants:

Two (2) research assistants were trained by the principal investigator on how to use the developed tools mainly direct structured questionnaire, observation checklist, key informant and in-depth interview guides.

The research assistants were used to collect data from participants in the field under the strict supervision of the principal investigator. The data collected by the research assistants was cross checked by the principal investigator for accuracy and completeness.

5.7.4 Field editing of data

The research assistants were also being responsible for field double editing of data with technical support and supervision from the principal investigator.

5.7.5 Missing data

Missing data was cross checked and followed up for completeness. Data clean up and cross-checking was done before analysis.

5.8 Data Management and Analysis

5.8.1 Data management

Data was entered by data entry clerk in standard spreadsheets, cleaned and cross checked, which was then imported into Stata software version 14.0, college station, Texas 77845 USA for analysis. Data was checked for normality and transformation before assessing the level of adherence, and factors associated with healthcare workers' adherence to infection prevention and control practices using univariate, bivariate and multivariate logistic regression analysis. For continuous variables, mean (SD) and median (range) were calculated while proportion for categorical variables. Descriptive information was obtained to describe the socio-demographic data.

5.8.2 Data analysis

The presentation of data was in tables, bar graphs and logistic regression tables which were interpreted deeply for their meaning.

On the qualitative aspect, the presentation of information was derived from the themes. The participant's expression was presented as narratives which was quoted in the result section.

5.8.2.1 Analysis techniques

Data analysis was performed using Stata. Bivariate and multivariate logistic regression analysis was done to assess level of adherence and factors associated with adherence to standard IPC

practices among HCWs at Juba Teaching Hospital. Odds ratios and corresponding 95% confidence interval were used to assess the association between independent variables and outcome variable of interest (dependent variable).

Objective 1. Level of adherence to standard infection prevention and control practices among HCW: This was presented in tables and graphs which clearly showed the proportion of healthcare workers adherence to the 8 domain of standard IPC practices as recommended by WHO and CDC. This clearly showed which domain do healthcare workers adhere most and least.

Objective 2. To explore the availability of supplies for IPC practices at Juba teaching Hospital, the analysis techniques include;

Observational checklist was used and participants were interviewed. During interviews, participant's responses were recorded using a tape recorder by research assistant. The duration of the interview was 5 minutes per each participants and saturation was assessed when there was no new information from the participants. At the end of the interview, the participants were asked if they have question and feedback about the interview was given respectively.

The recorded audios were listened to, transcribed and content analysis of narration was conducted. Key meaningful units were cut and grouped from the narrative and the meaning units are further condensed to make condense meaningful units, codes of the same meaning were collapsed and codes were described, major themes, subthemes were finally constructed thematically and participant's responses narration were picked from the major themes and were quoted to show major findings.

Objective 3. Factors associated with healthcare workers' adherence to standard infection prevention and control practices; first, bivariate analysis was done using Pearson Chi-square test, then the factors that qualifies at bivariate analysis at significant level of $P < 0.05$ and other factors below 0.2 p-value were included into multivariate analysis using logistic regression to establish factors associated with healthcare workers' adherence to standard IPC practices at Juba Teaching Hospital. Odds ratios and 95% confidence interval were used to determine the strength of association between independent and dependent variables.

5.8.2.2 Test of significant

A P-value < 0.05 was considered to indicate statistical level of significance.

5.8.2.3 Ethics consideration

Permission to conduct the research at Juba Teaching Hospital was obtained from Research Ethics Committee at National Ministry of Health, Juba and Ethical approval was obtained from Makerere University, School of Public Health Research and Ethics committee.

All healthcare workers who were enrolled for the study, were provided with written informed consent to show their voluntary participation into the study at Juba Teaching Hospital. Patient's names were not used on any study related documents such as questionnaire and inform consent. Therefore, each patient was assigned a unique identity number for identification. Study documents were kept and locked for information protection and confidentiality.

CHAPTER SIX

6.0 Results

6.1 Socio-demographic characteristics

A sample of 168 healthcare workers at Juba Teaching Hospital (JTH) participated in the study from Jan to April 2021, of which (42%) were males and (58%) were females. Females (58%) were the majority interviewed compared to males (42%). The mean and the median age of healthcare workers at Juba Teaching Hospital were 32 (SD 9.5218) and 28 years respectively. The participant age group between 25-29 years were the majority (38%) compared to 55 and above (4%), which was the least age group that participated in the research study. Almost all of the participants (99%) at least attended secondary school and of which 52% of them were married. Those with the profession of registered Nurse (26%) were the majority interviewed compared to other respective cadres at Juba Teaching Hospital as shown on socio-demographic table 2 below.

Table 2: Socio-demographic characteristics

Socio-demographic Variables	Frequency N=168	Percentage (%)
Sex		
Male	70	42%
Female	98	58%
Age		
15-24	28	17%
25-29	64	38%
30-34	31	19%
35-44	22	13%
45-54	16	10%
55 and above	7	4%
Marital status		
Single	78	46%
Married	87	52%
Widowed	2	1%
Divorced	1	1%
Education		
Primary	1	1%
Secondary	30	18%
Advance level	21	13%
University	116	69%
Qualification/Profession		
Medical Doctor	33	10%
Clinical officers	32	19%
Midwives	8	5%
Laboratory Technician	15	10%
Registered Nurse	49	29%
Enrolled Nurse	11	7%
Certificate Nurse	8	5%
Nursing Assistant	11	7%
Radiographers	1	1%
Years of work experience		
0-9	138	82%
10-19	13	8%
20-29	10	6%
> 30	7	4%

6.1.1 Knowledge of Healthcare workers on Infection Prevention and Control practices at Juba teaching Hospital

To measure adherence practice, 168 healthcare workers were interviewed to assess their knowledge on standard IPC practices at Juba Teaching Hospital. The findings showed that 67% of healthcare workers had correct definition of standard IPC practices and 87% has ever heard of hand hygiene and knows it's' definition. 17% of healthcare workers (HCW) did not mention 5 and 4 moments of hand hygiene, 69% of the healthcare workers mentioned at least one of the five moments of hand hygiene and 14% incorrectly mentioned the five moments of hand hygiene according to WHO. Moreover, healthcare workers were more knowledgeable on wearing gloves before a procedure that involve risk of body contact 96%, sterilization (96%), post exposure prophylaxis (96%), isolation (95%), Needle and sharp disposal (95%), and disinfection (92%) respectively compared to Needle recapping (89%). Therefore 88% of healthcare workers were knowledgeable and 12% were not knowledgeable to standard IPC practices at Juba Teaching Hospital. The findings showed that the overall knowledge of healthcare workers to standard IPC practices was 88% at Juba Teaching Hospital.

Table 3: Knowledge of Healthcare workers (HCWs) on standard IPC practices at JTH.

Knowledge on IPC practices	Frequency N=168	Percentage (%)
Definition of IPC Practices		
Yes	112	67%
No	56	33%
Ever heard of Hand Hygiene ,if yes define		
Yes	147	87%
No	21	13%
5 moment of Hand hygiene (WHO)		
Yes, correctly mentioned at least one of the five moment of hand hygiene.	116	69%
Yes , incorrectly mentioned the five moment of hand hygiene.	24	14%
Yes, but did not mention any of the five moment of hand hygiene.	28	17%
Wearing gloves before procedure that involves a risk of contact with body fluid.		
Yes	161	96%
No	7	4%
Disinfection		
Yes	154	92%
No	14	8%
Sterilization		
Yes	161	96%
No	7	4%
Needle and Sharpe disposable		
Yes	159	95%
No	9	5%
Needle recapping		
Yes	150	89%
No	18	11%
Isolation		
Yes	159	95%
No	9	5%
Post Exposure Prophylaxis (PEP)		
Yes	161	96%
No	7	4%

6.2 Adherence levels to standard infection prevention and control practices among healthcare workers at Juba Teaching Hospital

The adherence levels to specific sub items of each standard IPC practices(domain) was assessed based on the three Likert scale of “always”, “sometimes” and “Never”. The findings on hand hygiene components showed that 87% of healthcare workers stated that they always wash hands before touching a patient,86% before aseptic procedure, 91% after body fluid exposure risk,75% after touching patient and 68% after touching patient surrounding respectively.

On PPE, 83% of healthcare workers were wearing gloves before giving an injection which was higher to other PPE practices,35% of healthcare workers observed and responded that they wear Goggles shield before a high risk or splashing procedure, which was the least adherent level sub-item practice compared to other PPE practices such as wearing gloves before procedure that involves a risk of contact with body fluid, which was always practiced among 80% of the healthcare workers.

On injection safety practices, 70% of healthcare workers discarded Needles and sharps into resistance container (Safety Box) and discard sharps box when sharps reached the warning line max volume (70-80%), 42% healthcare workers always practice use of recapping devise or one-handed scoop, which was the least adherence level compared to other safe injection practices.

On disinfection, 81% healthcare workers always ensure that disinfection containers are not left open and 73% of them always ensured that equipment, surfaces are cleaned and disinfected before and after procedure. 60% of healthcare workers always practice sterilization of equipment before and after a procedure. 36% of healthcare workers always practice waste segregation (black, yellow and red) at department units, this was the least adherent level sub item on waste management compared to other waste management practices such as wear appropriate PPE when handling clinical, chemical waste and when placing clinical waste in red plastic waste bags for disposal respectively. Furthermore, 48% and 61 % of healthcare workers adhere to isolation and post exposure prophylaxis practices at Juba Teaching Hospital. The healthcare worker’s responses and their proportions on “always”, “sometimes” & “Never” Likert scale of sub-items to each standard IPC practices were summarized on the table below.

Table 4: Adherence levels to (25 sub-items) of Standard IPC practices among healthcare workers at Juba Teaching Hospital.

Adherence to standard IPC practices	Frequency N=168	Percentage (%)
1.Hand hygiene		
Before touching patient		
Always	146	87%
Sometimes	22	13%
Never	0	0%
Before clean/aseptic procedure		
Always	144	86%
Sometimes	22	13%
Never	2	1%
After body fluids exposure risk		
Always	153	91%
Sometimes	14	8%
Never	1	1%
After touching a patient		
Always	126	75%
Sometimes	39	23%
Never	3	2%
After touching patient surrounding		
Always	114	68%
Sometimes	53	31%
Never	1	1%
2.Personal Protective Equipment (PPE)		
wear gloves before procedure that involves a risk of contact with body fluid		
Always	135	80%
Sometimes	33	20%
Never	0	0%
Wear gloves before giving injection		
Always	139	83%
Sometimes	28	17%
Never	1	1%
Wear gloves between patient contact		
Always	102	61%
Sometimes	62	37%
Never	4	2%
Surgical mask worn when staff or clean present with respiratory symptoms		
Always	91	54%
Sometimes	69	41%
Never	8	5%

Goggles shield worn by staff before for high risk or splashing procedure

Always	58	35%
Sometimes	58	35%
Never	52	31%

Disposable PPE should be discarded in lidded waste receptacles properly after use

Always	134	80%
Sometimes	32	19%
Never	2	1%

3.Injection safety Practices**Contaminated needle/sharp should not be bent**

Always	110	65%
Sometimes	47	28%
Never	11	7%

Use recapping devise or one-handed scoop

Always	71	42.2%
Sometimes	51	30.4%
Never	46	27.4%

Needles and sharps are discarded into resistance container (Safety Box)

Always	117	70%
Sometimes	48	29%
Never	3	2%

Discard sharps box when sharps reached the warning line max volume (70-80%)

Always	117	70%
Sometimes	48	29%
Never	3	2%

Sharps boxes are sealed up and discarded into red plastic bags marked with international biohazards sign

Always	83	49%
Sometimes	52	31%
Never	33	20%

4. Disinfection**No topping up of disinfection**

Always	94	56%
Sometimes	55	33%
Never	19	11%

Equipment and surface are cleaned and disinfected before and after procedure

Always	123	73%
Sometimes	41	24%
Never	4	2%

Disinfection containers are not left open

Always	136	81%
Sometimes	30	18%
Never	2	2%

5. Sterilization

How often do you sterilize equipment before and after use

Always	100	60%
Sometimes	51	30%
Never	17	10%

6. Waste Management

Conduct waste segregation (black, yellow and red)

Always	61	36%
Sometimes	53	32%
Never	54	32%

Clinical waste is placed in red plastic waste bags for disposal

Always	96	57%
Sometimes	39	23%
Never	33	20%

Wear appropriate PPE when handling clinical and chemical waste

Always	136	81%
Sometimes	27	16%
Never	5	3%

7. Isolation

How often do you practice isolating infectious patient to prevent transmission of infectious disease

Always	80	48%
Sometimes	67	39.9%
Never	21	12.5%

8. Post Exposure Prophylaxis (PEP)

How often do you practice PEP

Always	102	61%
Sometimes	62	37%
Never	4	2%

6.2.1 Adherence levels to individual standard IPC practices among healthcare workers (HCWs) at Juba Teaching Hospital

The levels of healthcare workers' adherence to eight (8) individual standard IPC practices were assessed by calculating the mean of the participants responses on Likert scale "always" of each sub item of standard IPC practices in 6.2 Table 4 above. After the mean calculation of the sub-items of each standard IPC practices above, the overall proportion percentage of adherence to each standard IPC practices was calculated which shows the percentage adherence level to each standard IPC practices among healthcare workers at Juba Teaching Hospital. From the findings, healthcare workers' percentage adherent level to hand hygiene was high 81.3%, followed by disinfection 70%, PPE 65.4%, PEP 60.7%, sterilization 59.5% and injection safety practices 59.3% respectively. The least adherence levels were in waste management 58.1% and Isolation 47.6% respectively. Most of the healthcare workers were adherent to hand hygiene (81.3%) compared to other IPC practices. These levels of adherence to each standard IPC practices among healthcare workers at Juba Teaching Hospital were as shown on the bar graph below.

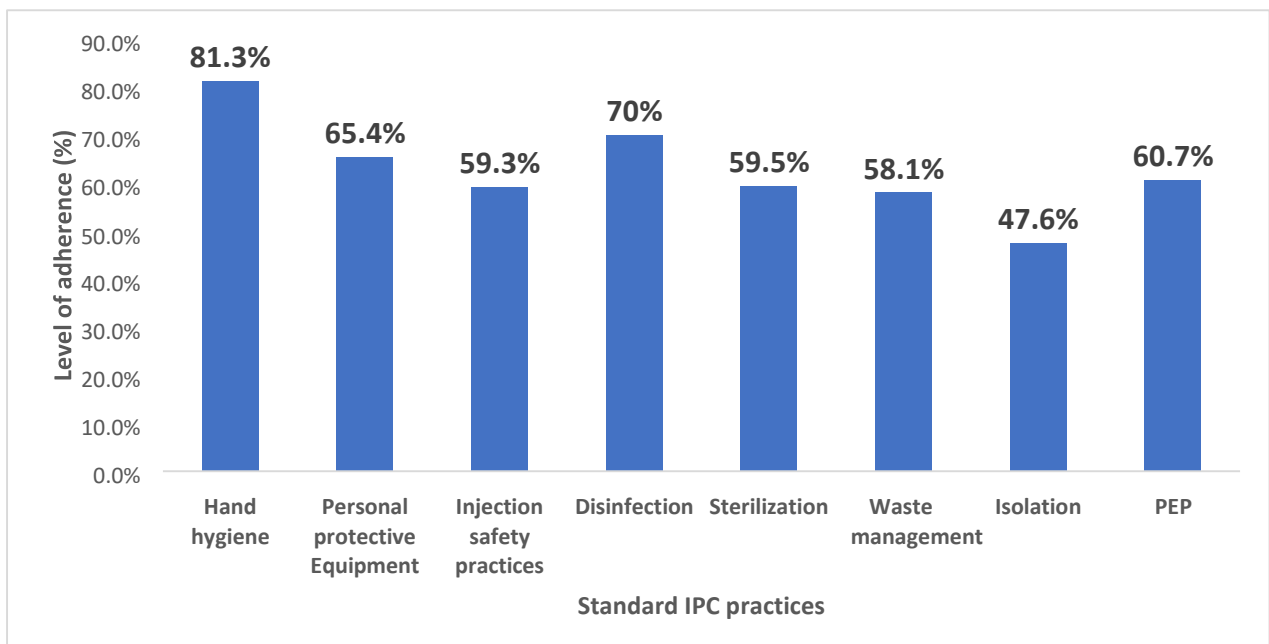


Figure 2: Adherence levels to individual standard IPC practices among healthcare workers (HCWs) at Juba Teaching Hospital

6.2.2 Overall adherence levels to standard Infection Prevention and Control Practices

The overall level of adherent to 8 IPC practices, was calculated by getting the adherent and none adherent mean score to all 8 IPC practices (Hand hygiene, Personnel Protective Equipment, Injection safety practices, disinfection, sterilization, waste management, Isolation and Post exposure prophylaxis's (PEP) in 6.2.1, Figure 2 above. After the overall mean score calculations, the overall proportion of adherent and none adherent levels to all 8 standard IPC practices was calculated from the total of 168 healthcare workers interviewed. The findings showed that the overall adherence and none adherence levels to standard IPC practices among healthcare workers at Juba Teaching Hospital was 62.7% and 37.4% respectively as shown on the Pie chart below.

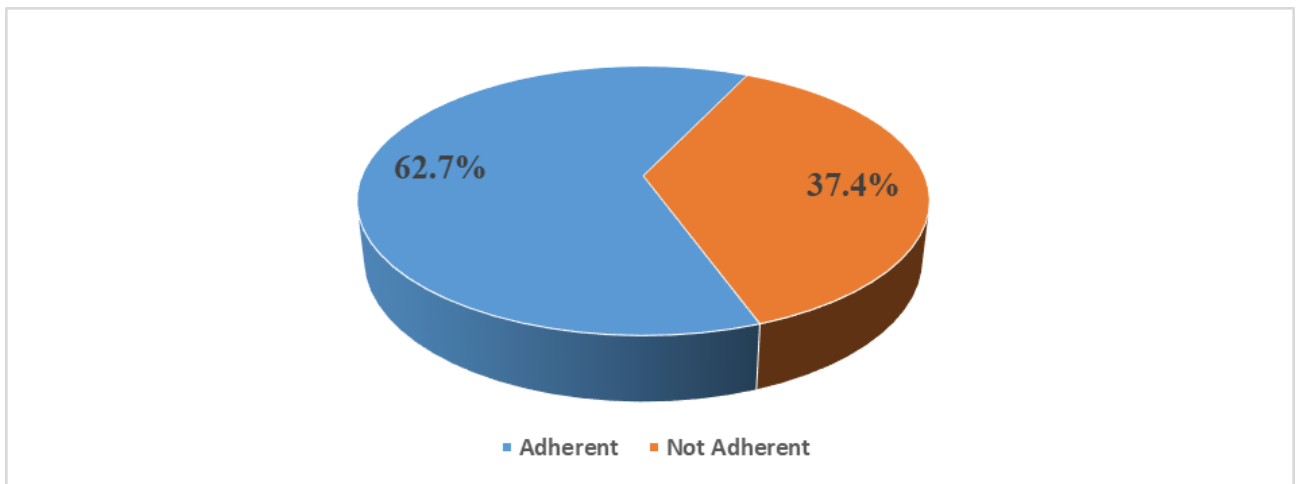


Figure 3: Overall adherence levels to standard Infection prevention and control practices

6.3 Explore the availability of IPC supplies at Juba Teaching Hospital

6.3.1 Observation checklist

Availability of IPC supplies play a role in the implementation of standard IPC practices by healthcare workers in health facility settings. During the observation of IPC supplies at Juba Teaching Hospital, 10 wards were observed for availability of IPC supplies using observational checklist.

From the observations, the most available IPC supplies were; sharp disposal containers /safety boxes 9 (90%), Hand washing facility 9(90%), waste disposable containers 9 (90%), Gown/Apron/lab coat 8 (80%), water 6 (60%), soap at washing point 5 (50%). The least available IPC supplies observed were; Alcohol hand rub 4(40%), Disposal gloves 3 (30%), Ordinary single use syringes 2 (20%), Detergent 2(20%) ,Strong gloves for waste disposal 1(10%), Protective eye wear 1 (10%) , and Facemask 1(10%). Unavailable infection prevention and control (IPC) supplies observed at the wards were; disinfectant (0%), placenta pit (0%), color coded bin (0%), Waste pit with sharps (0%) and waste pit for non-infectious waste respectively.

The findings from the observation of 10 wards at Juba Teaching Hospital were summarized on table 4 below: -

Table 4: Availability of IPC supplies at Juba Teaching Hospital using Observation Checklist

IPC Supplies	Frequency	(%)	Total N
Hand hygiene			
Alcohol hand rub	4	40%	10
Soap at washing points	5	50%	10
Detergent	2	20%	10
Water	6	60%	10
Handwashing vessel/facility	9	90%	10
Personal protective Equipment			
Protective eye wear	1	10%	10
Face mask	1	10%	10
Disposal gloves	3	30%	10
Gown/Apron/lab coat	8	80%	10
Injection safety			
Ordinary single use syringes	2	50%	10
Sharp disposal containers /safety boxes	9	90%	10
Sterilization			
Functional Autoclaves (with pressure gauge working)	0	0%	10
Disinfection			
Disinfectant	0	0%	10
Waste Management			
Color coded bins	0	0%	10
Waste disposal containers	9	90%	10
Functional Incinerator	0	0%	10
Strong gloves for waste disposal	1	10%	10
Waste pit for non-infectious waste	0	0%	10
Waste pit with sharps	0	0%	10
Functional placenta pit	0	0%	10
Latrine			
Functional	7	70%	10
Clean	5	50%	10
Soap	1	10%	10
Water available for hand washing	5	50%	10

N= 10 (Total number of wards observed at JTH)

6.3.2 Findings from Key informant interviews (Heads of units) at Juba Teaching Hospital

The Key Informant interviews were administered to heads of units at Juba Teaching Hospital because of having first-hand information about IPC supplies in the Hospital.

The Key Informant underwent content analysis through coding and thematic analysis process which resulted in three themes: availability of IPC supplies at Juba Teaching Hospital; supportive supervision at the Hospital and Recommendation to National and State Ministry of Health on IPC supplies.

Most of the key informant interviewed were able to mention the common available IPC supplies and major stock out of IPC supplies at Juba Teaching Hospital. They also suggested recommendation to National and State Ministry of Health on IPC supplies in order to protect them from Hospital acquired infection in the Hospital. However, based on thematic analysis, below were the findings quoted from the key informants' responses that participated in the study;

Theme: Availability of IPC supplies at Juba Teaching Hospital.

On availability of IPC supplies, majority of key informants interviewed expressed the common available IPC supplies at Juba Teaching Hospital; One of the key informants mentioned that;

“The common one we have are; face mask, disposable gloves, disposable gown, hand sanitizers and hand washing facilities with soaps”. (Key informant 04 JTH).

On stock-out of IPC supplies, most of the participants stated that they had experienced IPC stock out at Juba teaching Hospital. One of the key informants expressed that, *“The stock out that we sometimes experience, most commonly are PPE such as; gloves, they are not supplied at the right time, sometimes staff work with bare hands, which is most risky for staff, those are the stock outs, we don't have gloves, we ran short of it”.* (Key informant 03JTH)

Theme: Supportive supervision at Juba Teaching Hospital

On supportive supervision, some of the key informant interviewed expressed that most of the time, they had not been visited by the National Ministry of Health in order to assess the availability of IPC supplies in the hospital.

One of the participants stated that; *“We need close monitoring of the units, someone has to come, see what is here, how the work is going and then before we ran short, they supply, if we have weekly supply that will be provided for us for the whole week , we can work in a good environment and we will be able to control the infections”* (Key informant 05JTH)

Theme: Recommendations to National and State Ministry of Health.

Key informant as participants with first-hand information about the topic expressed their views of how the availability of IPC supplies can be improved in the hospital. The participants interviewed sighted limited visits by the health authority to assess the IPC availability at Juba Teaching Hospital.

One of the participants stated that; *“At least we should be visited from time to time to see whether the materials which were supplied are still there or not, if we are not visited from time to time, we will lack some of these things, we go astray and will not prevent infection from one person to another”*. (Key informant 02JTH)

More so, a participants interviewed responded that more supplies should be supplied at Hospital by the National and state Ministry of health, this was quoted from the respondent that;

“The state and national MOH need to cooperate, they need to give more supplies of IPC such as gloves, face mask, hand sanitizers, chlorine, and washing soap”. (Key informant 04JTH)

6.3.3 Finding from In-depth interviews (Healthcare workers) at Juba Teaching Hospital

The in-depth interview was conducted to healthcare workers because of their experience in working at the Hospital. The in-depth interview was analyzed through thematic analysis process which resulted in two themes: availability of IPC supplies at Juba Teaching Hospital; Mitigation measures to stock out at Juba Teaching Hospital. It was the first theme that was of interest as per the research objective. Most healthcare workers (HCWs) interviewed had knowledge on IPC supplies. They stated the common available and the most stocked out IPC supplies at Juba Teaching Hospital.

However, the participants also stated their experience of stock out of IPC supplies and they suggested some mitigation measure to stock out at the Hospital. This was quoted from the participant’s responses under each theme;

Theme: Availability of IPC supplies at Juba Teaching Hospital

Availability of IPC supplies plays a great role in reduction of hospital acquired infection among healthcare workers. During key in-depth interviews, majority of participants interviewed expressed the common available IPC supplies at Juba Hospital. One of the healthcare workers state that;

“What we have currently in the hospital are; face mask, gloves, aprons, gumboot and eye googles to support the daily activity of the hospital “(In-depth interviewee 06JH)

Stock out of IPC supplies has been an existing problem in most government hospitals. Most of the participants interviewed stated that stock out duration takes about 1-2 days in the hospital.

On Stock out of IPC supplies in Juba Teaching Hospital, one participant stated;

“I have ever experienced that, there was time we ran out of masks that were provided by the government, so it took us awhile like 1-2 days for them to bring, based on that, we decided to purchase for one self to facilitate for that day” (In-depth interviewee 05JTH).

Most of the participants, stated that the providers of IPC supplies at Juba Teaching Hospital were; Ministry of Health and Non-Governmental organizations.

On providers of IPC supplies at Juba teaching Hospital, one participant stated that; *“The providers of IPC supplies for infection prevention and control at my hospital is the Ministry of Health, South Sudan and UNFPA ”. (In-depth interviewee 01JTH).*

Theme: Mitigation of IPC supplies stock out at Juba teaching Hospital

Most of the interviewed healthcare workers gave their views on how to mitigate stock out of IPC supplies at Juba Teaching Hospital. They said developing mechanism of mitigating stock-out at the hospital reduces stockout of IPC supplies. One of the participants stated that; *“The best way to address stockout, is to write a request and give to the Ministry of health to respond and help us out” (In-depth interviewee 04JTH).*

One of the interviewed participants was quoted saying; *“The best way to stockout mitigation is close supervision, by monitoring the availability of supplies before they get finish.” (In-depth interviewee 05JTH)*

6.4 Factors associated with adherence to standard infection prevention and control practices

6.4.1 Bivariate analysis of socio-demographic variables and standard IPC practices

Bivariate analysis was conducted between the socio-demographic variables, the perceived factors associated with the outcome of interest, “adherence to standard IPC practices”. Variables that were statistically significant at bivariate analysis at P-value < 0.05 and others with p-value 0.2 and below were considered for multivariate logistic regression analysis to establish model of factors associated with adherence to standard IPC practices among healthcare workers (HCW) at Juba Teaching Hospital. At Bivariate analysis, the factors that are statistically significant at P-value < 0.05 were; Marital status, Education, IPC committee, IPC guideline/policies, enough IPC supplies and in-service trainings as shown on the Bivariate table below;

Table 5: Bivariate Analysis

Variables	Adherent N= 105	Not adherent N=63	X2	P-value
Sex				
Female	60(61.2%)	38 (38.8)		
Male	45(64.3)	25 (35.7)	0.16	0.69
Age				
15-24	22 (78.6%)	6 (21.4%)		
>25	83 (59.3%)	57 (40.7%)	3.68	0.06
Marital status				
Single/Divorced/Widowed	57 (70.4%)	24 (29.6%)		
Married	48(55.2%)	39 (44.8%)	4.11	0.04
Education				
Primary/secondary	24 (77.4%)	7 (22.6%)		
Education beyond secondary	81 (59.1%)	56 (40.9%)	3.59	0.06
Qualification				
Nursing Assistant /Certificate nurse	22 (73.3%)	8 (26.7%)		
Qualified beyond Nursing Assistant/certificate nurse	83(60.1%)	55 (39.9%)	1.82	0.18
Years of working experience				
0-9	84 (60.9%)	54(39.1%)		
>10 yrs.	21(70.0%)	9 (30.0%)	0.87	0.35
IPC committee				
No=85	44 (51.7%)	41(48.2%)		
Yes=83	61(73.5%)	22 (26.5%)	8.41	0.004
Adequate staff				
No=119	70 (58.8%)	49 (41.2%)		
Yes=49	35 (71.4%)	14 (28.6%)	2.34	0.13
IPC education				
No=57	33 (57.9%)	24 (42.1%)		
Yes=111	72 (64.7%)	39 (35.1%)	0.78	0.38
IPC policies and guidelines				
No=90	50 (55.6%)	40 (44.4%)		
Yes=78	55(70.5%)	23 (29.5%)	3.97	0.047
Enough IPC supplies				
No=103	55 (53.4%)	48(46.6%)		
Yes=65	50(76.9%)	15 (23.1%)	9.35	0.002
IPC In-service training				
No=80	43 (53.8%)	37 (46.3%)		
Yes=88	62 (70.5%)	26 (29.5%)	4.96	0.026
Enough space				
No=33	18 (54.6%)	15 (45.5%)		
Yes= 135	87 (64.4%)	48 (35.6%)	1.1	0.29

6.4.2 Logistic regression to determine factors associated with adherence to standard IPC practices

To determine the factors associated with adherence to standard IPC practices among healthcare workers at Juba Teaching Hospital, multivariate logistic regression was conducted between the outcome variable of the study “Adherence to standard IPC practices” and various independent variables which are statistically significant at bivariate analysis these include Marital status, Education, IPC policies /guidelines, IPC committee, enough IPC supplies and IPC in-service training.

However, P-value <0.05 was considered to be statistically significant. Logistic regression model was built by obtaining adjusted model with respective Adjusted odd ratios, confidence interval and P-values. From logistic regression output below, the factors associated with adherence to standard IPC practices among healthcare workers (HCWs) at Juba Teaching Hospital were; Marital status AOR 0.43 [0.21-0.87] P-value=0.019 , Education beyond Secondary AOR 0.29 [0.11-0.78] P-value = 0.015, IPC committee AOR 2.07 [1.03-4.15] P-value= 0.041, enough IPC supplies AOR 2.35 [1.11-4.96] P-value = 0.025 , IPC policies / guideline COR 1.91 [1.01-3.63] P-value=0.047 and IPC in-service training COR 2.05 [1.09-3.87] P-value= 0.026 . This was shown on the logistic regression output, table 6 below.

Table 6: Logistic regression table showing factors associated to standard IPC practices

Variables	Adherent	Not adherent	COR [95%CI]	P-value	AOR [95%CI]	P-value
	N=105	N=63				
Age						
15-24 years	22 (78.6%)	6 (21.4%)	1		1	
>25 years	83 (59.3%)	57 (40.7%)	0.40 [0.15-1.04]	0.06	0.81 [0.27-2.42]	0.709
Marital status						
Single/widowed/Divorced	57 (70.4%)	24 (29.6%)	1		1	
Married	48(55.2%)	39 (44.8%)	0.52 [0.27-0.98]	0.043	0.43 [0.21-0.87]	0.019
Education						
Educated at primary/Secondary	24 (77.4%)	7 (22.6%)	1		1	
Education beyond secondary	81 (59.1%)	56 (40.9%)	0.42 [0.17-1.05]	0.063	0.29 [0.11-0.78]	0.015
Qualification						
Nursing Assistant /Certificate nurse	22 (73.3%)	8 (26.7%)	1		1	
Qualified beyond Nursing Assistant/certificate nurse	83(60.1%)	55 (39.9%)	0.55 [0.23-1.32]	0.18	0.90 [0.26-3.13]	0.863
Years of working experience						
0-9	84 (60.9%)	54(39.1%)	1		1	
>10 yrs.	21(70.0%)	9 (30.0%)	1.5 [0.64-3.52]	0.351	1.23 [0.37-4.11]	0.735
IPC committee						
(No=85)	44 (51.7%)	41(48.2%)	1		1	
(Yes= 83)	61(73.5%)	22 (26.5%)	2.58 [1.35-4.93]	0.004	2.07 [1.03-4.15]	0.041
Adequate staff						
(No=119)	70 (58.8%)	49 (41.2%)	1		1	
(Yes=49)	35 (71.4%)	14 (28.6%)	1.75 [0.85-3.60]	0.127	0.91 [0.36-2.31]	0.843
IPC education to patients						
(No=57)	33 (57.9%)	24 (42.1%)	1		1	
(Yes=111)	72 (64.7%)	39 (35.1%)	1.34 [0.70-2.58]	0.378	0.92 [0.43-1.98]	0.839
IPC policies and guidelines						
(No=90)	50 (55.6%)	40 (44.4%)	1		1	
(Yes=78)	55(70.5%)	23 (29.5%)	1.91 [1.01-3.63]	0.047	1.54 [0.73-3.22]	0.255
Enough IPC supplies						
(No=103)	55 (53.4%)	48(46.6%)	1		1	
(Yes =65)	50(76.9%)	15 (23.1%)	2.91[1.45- 5.83]	0.003	2.35 [1.11-4.96]	0.025
IPC In-service training						
(No=80)	43 (53.8%)	37 (46.3%)	1		1	
(Yes=88)	62 (70.5%)	26 (29.5%)	2.05 [1.09-3.87]	0.026	1.57 [0.76-3.25]	0.224
Enough space						
No=33	18 (54.6%)	15 (45.5%)	1		1	
Yes=135	87 (64.4%)	48 (35.6%)	1.51 [070-3.26]	0.294	1.45 [0.62-3.40]	0.393

Statistically significant at P= < 0.05

Interpretation

The odds of being adherent to IPC if a healthcare worker was married was 0.43 times compared to the odds of 1 if a healthcare worker was single/divorced/widowed. The 95% (CI), AOR [0.21-0.28], because the 95% CI does not include 1, a healthcare worker if married was associated with adherence to Standard IPC practices. The association was statistically significant at P-value < 0.05.

The odds of being adherent to IPC if a health worker was educated beyond secondary was 0.06 times compared to 1 if a health worker was educated at primary/secondary level. The 95% (CI), AOR [0.11-0.78], because the 95% CI does not include 1, a healthcare worker if educated beyond secondary was more likely to adhere to standard IPC practices than those educated at secondary/primary level at Juba Teaching Hospital. The association was statistically significant at P-value < 0.05.

A healthcare worker if has IPC committee in the hospital was more likely to adhere to standard IPC practices; AOR 2.07[1.03-4.15] than when IPC committee does not exist. This was statistically significant at P<0.05.

A healthcare worker, if the hospital has enough IPC supplies was more likely to adhere to standard IPC practices than when hospital has inadequate IPC supplies. therefore, this was found to be associated with IPC practices at AOR 2.35 [1,11-4.96]. The association was statistically significant at P value <0.05.

The odds of a health worker who had in-service training on IPC and available policies / guidelines were COR 2.05 and 9.91 times compared to the odd of 1 if healthcare worker never had in-service training and IPC polices/guidelines in the Hospital. Therefore,IPC in-service training, availability of IPC policies and guidelines are associated with healthcare workers adherence to standard IPC practices.

CHAPTER SEVEN

7.0 Discussion section

Based on various literature, healthcare workers' (HCWs) none adherence to IPC practices has been reported to have caused HAI such as COVID-19, Sepsis, among others, to patients and healthcare workers at Hospital settings. However, to our knowledge, this was one of the first studies to document adherence to standard IPC practices and factors associated among healthcare workers in hospital-based, representative sample of Juba Teaching Hospital.

The discussion on the findings from this study was as follows;

First, in the assessment of adherence to IPC practices, healthcare workers' knowledge was examined to determine their adherence practices to standard IPC at Juba Teaching Hospital. Therefore, the findings showed that 88% of healthcare workers had high knowledge of standard IPC practices at Juba Teaching Hospital. This was consistent with studies conducted by (Wong, 2021) in Hong Kong and (Alhumaid et al., 2021), which showed high knowledge of healthcare workers to standard precautions. The similarity in findings in the two studies could be attributed to high educational levels and in-service training attained by healthcare workers as knowledge empowers practices.

Secondly, on the level of adherence under each specific item, the findings showed that 87% of healthcare workers always wash hands before touching a patient, 86% wash hands before aseptic procedure and 75% wash hands after touching a patient at Juba Teaching Hospital, which was higher than the findings from the study conducted by (Haile et al., 2017) which showed that 18.2% of healthcare workers wash hands always before touching a patient, 39.6% wash hands before aseptic procedure, 27.7% wash hands after touching a patient. The different in adherence levels to these practices could have been caused by variation in situation. The study conducted at Juba Teaching Hospital was conducted in 2021 during COVID-19 outbreak and that in Gondar university was conducted in 2017, therefore, COVID-19 pandemic outbreak might have contributed to increased adherence level to these practices among healthcare workers (HCW) at Juba Teaching Hospital. Moreover, the findings from the study showed that overall adherence level to hand hygiene was 83% which was higher than 20.9% adherence to hand washing criterion found in study conducted by (Chang et al., 2012) in Aminah, Bohru. Also, the difference in adherence levels could be attributed to difference in healthcare system,

hand hygiene supplies availability and period of study where study at JTH was conducted during COVID-19 outbreak which influence increase in adherence to the practice.

Moreso, on PPE, the findings showed 83% of healthcare workers (HCW) always wear gloves before giving an injection and 80% wear gloves before procedure that involves a risk of contact with body fluid, this was consistent with study conducted by (Kim and Park, 2021) where compliance with the use of Gloves was 96.7% among healthcare workers (HCW) which was higher than the findings from Juba Teaching Hospital. The reason for the difference could be due to differences in sample size and health system. Furthermore, the findings from this study showed that 35% of healthcare workers always wear Goggles shield before for high risk or splashing procedure, which was relatively similar to studies conducted by (Kim and Park, 2021) and (Pereira et al., 2013), where adherence to wearing google before high risk or splashing procedure was at 43.26% and 58.4% respectively. The difference in adherence levels to wear goggle shield before high risk or splashing procedures could be attributed to insufficient google shield supplies to support adherence which explains reasons for low adherence level to wear goggle shield before high risk or splashing procedures in the two studies.

Furthermore, after taking the mean of sub- items and proportion to each standard IPC practices (Hand Hygiene, PPE, Injection safety practices, waste management, Disinfection, sterilization, Isolation and PEP), the findings showed that the overall adherence to hand hygiene was 81.3%, disinfections 70%, PPE 65.4%, PEP 60.7%, sterilization59.5%, injection safety 59.3%, waste management 58.1% and Isolation 47.6% respectively. This was similar to a study conducted by (Ashinyo et al., 2021) in Ghana where the overall compliance to hand hygiene was 88.4% , PPE was 90.4% during health care interaction with COVID-19 patients. It was also relevant to a study conducted by (Powell-Jackson et al., 2020) in Tanzania where the findings showed overall compliance to hand hygiene was (6.9%), glove use (74.8%),disinfection (4.8%) and waste management (43.3%).These findings' variation with that of Juba Teaching Hospital could be attributed to variation in health system and availability of enough IPC supplies among healthcare workers.

Also, the findings from this study showed that the overall level of adherence to all standard IPC practices among healthcare workers (HCW) at Juba Teaching Hospital was moderate at 62.7%. This was consistent with a study conducted by (Kim and Park, 2021) in South Korea where adherence to IPC practices was found to be moderate. The reason for moderate overall

adherence level from the study could be because of inadequate IPC supplies, limited in-service training to healthcare workers. Inadequate IPC supplies and training drawback healthcare workers' adherence to standard IPC practices.

On IPC supplies availability, the findings showed that the most common available IPC supplies observed at JTH were; sharp disposal containers /safety boxes 9 (90%), Hand washing facility 9(90%), waste disposable containers 9 (90%), Gown/Apron/lab coat 8 (80%), water 6 (60%), soap at washing point 5(50%) . The least available IPC supplies were; Alcohol hand rub 4(40%), Disposable gloves 3(30%), Ordinary single use syringes 2 (20%), Detergent 2 (20%), Protective eye wear 1 (10%), Face mask 1 (10%) and Strong gloves for waste disposal 1(10%). Unavailable IPC supplies observed were; placenta pit (0%), color-coded bin (0%), waste pit for sharp and non-infectious waste (0%) respectively. Similarly, on qualitative study, one of the key informants interviewed stated that sometimes they experience stock out of gloves, This was quoted from the respondent *"The stock out that we sometimes experience, most commonly are PPE such as; gloves, they are not supplied at the right time, sometimes staff work with bare hands, which is most risky for staff, those are the stock outs ,we don't have gloves, we ran short of it"* (Key informant 03JTH).

These findings were contrary with a study conducted by (Wasswa, 2015) where the common available IPC supplies observed were; ordinary single use syringes 26 (81.3%), disposable gloves 27 (84.4%).The difference in the common available IPC supplies in the two studies could be due to irregular supply of these IPC supplies in one of the study areas. However, the least available IPC supplies were consistent with study conducted by (Wasswa, 2015) where ; protective eye wear 2 (6.3%)and alcohol hand rub 1(31%) were unavailable . The variation in percentage availability of these IPC supplies in the two studies could be due to inadequacy of these of IPC supplies in one of the study areas and utilization rate of these supplies by healthcare workers.

To advance, the findings from this study showed that a health worker if married AOR 0.43 [0.21-0.87] was most likely to adhere to IPC practices compared to one who is single, divorced and widowed. This was consistent with a study conducted by (Desta, 2018) where marital status was found to be factor associated with adherence to infection prevention practices among healthcare workers. Therefore, the reason could be because married healthcare workers fear getting infections from the hospital which might be transmitted to their family members, this makes them to take care and adhere to IPC practices.

Moreso, the findings from the study showed that a healthcare worker if was educated beyond secondary was more likely to adhere to IPC practices compared to those educated at primary/secondary level, AOR 0.29 [0.11-0.78], also a healthcare worker if has enough IPC supplies AOR 2.35 [1.11-4.96], IPC committee AOR 2.07 [1.03-4.15] , IPC policies/guideline COR 1.91 [1.01-3.63] and in-service training COR 2.05 [1.09-3.87] was most likely to adhere to standard IPC practices than one who does not have. These findings were consistent with studies conducted by (Cheung et al., 2015) ,Alshamari (Alshammari et al., 2018) in Saudi Arabia, (Wasswa, 2015) in Arua, Uganda, where education beyond secondary level, enough IPC supplies, IPC committee ,in-service training and availability of policies /guidelines were found to be associated with adherence to infection prevention and control practices among healthcare workers .The reason was that a healthcare worker with education beyond secondary has increased knowledge on adherence to IPC practices , which makes them to exercise care. Enough IPC supplies enable healthcare workers to maximally use IPC supplies that facilitate adherence to IPC practices. IPC committee act as advisory body that gives guidance to healthcare workers to adhere to IPC practices and in-service training reminds healthcare workers about adherence to standard IPC practices.

7.1 Strength of the study

This was a cross-sectional study, therefore, the key strength of the study was that, it was inexpensive, saved time and also first-hand data from the required participants were obtained. The implication of the findings to policy makers and public health practioners is that, based on the findings, there is evidence that adherence to standard IPC practices is still moderate therefore due to ongoing spread of COVID-19 and remerging nosocomial infections at health care settings. Healthcare workers at Juba teaching hospital have to be provided with enough IPC supplies, in-service training, IPC committee. IPC policies and guidelines to improve their overall adherence level to standard IPC practices.

7.2 Study limitation

A number of methodological limitations in this study were recognized.

First, this was a cross-sectional study; therefore, the limitation was that it was difficult to infer causality.

Secondly, the study was conducted only in Juba Teaching Hospital, which was not representative of other hospitals in the country, hence making the generalization of the study findings difficult. Furthermore, the use of both direct and indirect data collection tools for interviews with participants can result into information bias. Information bias was minimized in this study by developing standardized data collection tools and training of research assistants to collect accurate data from study participants. Moreover, independent and dependent variables were clearly defined also to prevent information bias during the data collection process.

CHAPTER EIGHT

8.0 Conclusion section

In the predominant, facility-based population of Juba Teaching Hospital, the findings showed that the overall adherence to standard IPC practice was moderate at 62.7% and non-adherent was 37.4%. Moreover, healthcare workers were more adherent to hand hygiene practices 81.3% compared to other IPC practices. The most common available IPC supplies observed were; sharp disposal containers /safety boxes 9 (90%), Hand washing facility 9(90%) and waste disposable containers 9 (90%). However, the least IPC supplies were; Alcohol hand rub, Disposable gloves, Ordinary single use syringes 2 (20%), Detergent 2 (20%), Protective eye wear 1 (10%), Face mask 1 (10%), strong gloves for waste disposal 1(10%) and unavailable IPC supplies were disinfectant (0%), placenta pit (0%), color coded bin (0%), Waste pit with sharps (0%) and waste pit for non-infectious waste (0%) respectively. These possibly might have contributed to adherence and non-adherence to some standard IPC practices.

Furthermore, the findings also showed that a healthcare worker, if married, had education beyond secondary level, had an IPC committee, enough IPC supplies, had IPC in-service training and policies/guidelines was more likely to adhere to infection prevention and control practices than one who never had at Juba Teaching Hospital. Therefore, based on these findings, it is time to focus on providing healthcare workers at Juba Teaching Hospital with enough IPC supplies, IPC in-service training and education, IPC policies, guidelines and strengthen IPC committee to facilitate their adherence to standard IPC practices which in turn will reduce the risk of hospital acquired infections among them.

CHAPTER NINE

9.0 Recommendations

Based on the study findings, the recommendations were as shown below;

1. The National Ministry of Health has to provide enough IPC supplies to healthcare workers at Juba Teaching Hospital as the finding showed that enough supplies, AOR 2.35 [1.11-4.96] was statistically associated with healthcare workers' adherence to IPC practices. Also, findings showed the least and unavailable IPC supplies and revealed that 46.6 % of 103 healthcare workers who do not have enough IPC supplies were not adherent to IPC practices which shows the need of IPC supplies among healthcare workers at Juba Teaching Hospital. Provision of enough IPC supplies to healthcare workers enable them to utilize these supplies which enhance their adherence to IPC practices.
2. The study recommends the National Ministry of Health, South Sudan, together with Juba Teaching Hospital administration to strengthen IPC committee at Juba Teaching Hospital in order to act as advisory body on healthcare workers' adherence to standard IPC practice, as the findings from this study found IPC committee AOR 2.07 [1.03-4.15] as a significant associated factor with healthcare worker's adherence to standard IPC practice. Also the findings showed that 48.2% of those who said "No" they do not have IPC committee were not adherent to IPC practices. IPC committee in hospital advises healthcare workers to adhere to standard IPC practices.
3. The study recommends provision of more IPC in-service trainings to healthcare workers at Juba Teaching Hospital (JTH), as the findings from this study showed that a healthcare worker if had in-service training on IPC practices was more likely to adhere to IPC practices compared to those who never had IPC in-service training. Moreover, the finding showed that 46.3 % of healthcare workers who said No they did not receive IPC in-service training were not adherent to IPC practices at Juba Teaching Hospital. In-service training reminds healthcare worker's knowledge and skills on IPC practices which facilitate their adherence to IPC practices.
4. The study recommends the Ministry of Health to develop and provide a national IPC policy/guideline to healthcare workers (HCWs) at Juba Teaching Hospital (JTH) and the country as whole. As the findings from this study found that 44.4% % of 90 healthcare workers who said No, they do not have IPC policies and guideline as they

do their service were not adherent to IPC practices at Juba Teaching Hospital. The findings showed that IPC policies/guideline was associated with healthcare worker's adherence to IPC practices. IPC policies /guideline provides guidance to IPC practices and improves their adherence to IPC practices.

5. More so, Juba Teaching Hospital Administration have to establish waste and placenta pits for waste segregation and disposal of delivery waste to avoid injuries and risk of infection to healthcare workers. The findings showed that there was no functional placenta pit and waste pit for waste segregations observed at Juba Teaching Hospital.
6. The study recommends the government (MOH) in particular and other supporting partners to ensure surveillance of HAI, AMR, IPC stock monitoring, promotion of data for action and leveraging quality improvement activities at Juba Teaching Hospital as findings showed stockout of some IPC supplies and impacts of none adherence to standard IPC practices.

REFERENCES

- ABDELLA, N. M., TEFERA, M. A., EREDIE, A. E., LANDERS, T. F., MALEFIA, Y. D. & ALENE, K. A. 2014. Hand hygiene compliance and associated factors among health care providers in Gondar University Hospital, Gondar, North West Ethiopia. *BMC public health*, 14, 1-7.
- ALEMU, F. M., FUCHS, M. C., VITALE, T. M. & SALIH, M. A. M. 2019. Severe maternal morbidity (near-miss) and its correlates in the world's newest nation: south sudan. *International journal of women's health*, 11, 177.
- ALHUMAID, S., AL MUTAIR, A., AL ALAWI, Z., ALSULIMAN, M., AHMED, G. Y., RABAAN, A. A., AL-TAWFIQ, J. A. & AL-OMARI, A. 2021. Knowledge of infection prevention and control among healthcare workers and factors influencing compliance: a systematic review. *Antimicrobial Resistance & Infection Control*, 10, 1-32.
- ALSHAMMARI, F., CRUZ, J. P., ALQUWEZ, N., ALMAZAN, J., ALSOLAMI, F., TORK, H., ALABDULAZIZ, H. & FELEMBAN, E. M. 2018. Compliance with standard precautions during clinical training of nursing students in Saudi Arabia: A multi-university study. *The Journal of Infection in Developing Countries*, 12, 937-945.
- ASHINYO, M. E., DUBIK, S. D., DUTI, V., AMEGAH, K. E., ASHINYO, A., ASARE, B. A., ACKON, A. A., AKORIYEA, S. K. & KUMA-ABOAGYE, P. 2021. Infection prevention and control compliance among exposed healthcare workers in COVID-19 treatment centers in Ghana: A descriptive cross-sectional study. *PloS one*, 16, e0248282.
- BACKMAN, C., MARCK, P. B., KROGMAN, N., TAYLOR, G., SALES, A., BONTEN, M. J. & GIGENGACK-BAARS, A. C. 2012. Barriers and bridges to infection prevention and control: results of a qualitative case study of a Netherlands' surgical unit. *BMJ open*, 2, e000511.
- BACKMAN, C., MARCK, P. B., KROGMAN, N., TAYLOR, G., SALES, A. & ROTH, V. R. 2011. Barriers and bridges to infection prevention and control: results of a case study of a Canadian surgical unit.

- BARKER, A. K., BROWN, K., SIRAJ, D., AHSAN, M., SENGUPTA, S. & SAFDAR, N. 2017. Barriers and facilitators to infection control at a hospital in northern India: a qualitative study. *Antimicrobial Resistance & Infection Control*, 6, 1-7.
- BATTERMAN, S., WATER, S. & ORGANIZATION, W. H. 2004. Findings on an Assessment of Small-scale Incinerators for Health-care Waste. World Health Organization.
- BEDOYA, G., DOLINGER, A., ROGO, K., MWAURA, N., WAFULA, F., COARASA, J., GOICOECHEA, A. & DAS, J. 2017. Observations of infection prevention and control practices in primary health care, Kenya. *Bulletin of the World health Organization*, 95, 503.
- BEKELE, I., YIMAM, I. & AKELE, G. 2018. Adherence to Infection prevention and factors among nurses in jimma university medical center. *Immunome Research*, 14, 1-7.
- BERENDES, S., LAKO, R. L., WHITSON, D., GOULD, S. & VALADEZ, J. J. 2014. Assessing the quality of care in a new nation: South Sudan's first national health facility assessment. *Tropical Medicine & International Health*, 19, 1237-1248.
- CHANG, D., LAI, N., SQNG, N., HOW, Y., TAN, T., CHUA, J. & MAT BAH, M. 2012. Adherence to Major Standard Precautions: An Audit of Venepuncture and Intravenous Cannula Insertion in The Pediatric Unit of Hospital Sultanah Aminah, Johor Bahru, Malaysian. *Journal of Paediatrics and Child Health*, 2, 1-11.
- CHEUNG, K., CHAN, C. K., CHANG, M. Y., CHU, P. H., FUNG, W. F., KWAN, K. C., LAU, N. Y., LI, W. K. & MAK, H. M. 2015. Predictors for compliance of standard precautions among nursing students. *American Journal of Infection Control*, 43, 729-734.
- 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, 1-10.

- EFIFIE, U. E. 2016. Assessing the awareness of and adherence to the Universal Safety Precautions (USP) among Health Care Workers (HCWs) in Kogi State Specialist Hospital (KSSH), Lokoja, Kogi State, Nigeria
- EFTATHIOU, G., PAPASTAVROU, E., RAFTOPOULOS, V. & MERKOURIS, A. 2011. Factors influencing nurses' compliance with Standard Precautions in order to avoid occupational exposure to microorganisms: A focus group study. *BMC Nursing*, 10, 1.
- FEDELE, S. & PORTER, S. 2020. COVID-19 NHS infection control strategy: Errare humanum est, perseverare autem diabolicum. *Oral diseases*.
- 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.
- HENSLEY, B. J. & MONSON, J. R. 2015. Hospital-acquired infections. *Surgery (Oxford)*, 33, 528-533.
- KHAN, H. A., BAIG, F. K. & MEHBOOB, R. 2017. Nosocomial infections: Epidemiology, prevention, control and surveillance. *Asian Pacific Journal of Tropical Biomedicine*, 7, 478-482.
- 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, 2373.
- KOMUHANGI, G., KEVIN, N. U., FELEX, I. O. & KABIRI, L. 2019. Factors Associated with Compliance with Infection Control Guidelines in the Management of Labour by Healthcare Workers at Mulago Hospital, Uganda. *Open Journal of Nursing*, 9, 697.
- KOTWAL, A. & TANEJA, D. 2010. Health Care Workers and Universal Precautions: Perceptions and Determinants of Non-compliance. *Indian Journal of Community Medicine*, 35, 526–528.

- LANGOYA, C. O. C. & FULLER, N. J. 2015. Assessment of knowledge of hand washing among health care providers in Juba Teaching Hospital, South Sudan. *South Sudan Medical Journal*, 8.
- 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, e1106-e1114.
- MARTIN-DELGADO, J., VITERI, E., MULA, A., SERPA, P., PACHECO, G., PRADA, D., CAMPOS DE ANDRADE LOURENÇÃO, D., CAMPOS PAVAN BAPTISTA, P., RAMIREZ, G. & MIRA, J. J. 2020. Availability of personal protective equipment and diagnostic and treatment facilities for healthcare workers involved in COVID-19 care: A cross-sectional study in Brazil, Colombia, and Ecuador. *PloS one*, 15, e0242185.
- MINISTRY OF HEALTH, U. 2013. Uganda National Infection Prevention and control Guidelines. 109.
- MPAMIZE, G. 2016. Adherence to Universal Precautions in Infection Prevention among Health Workers in Kabarole District. *Journal of Health, Medicine and Nursing*, 26.
- MUKWATO, K. P., NGOMA, C. & MAIMBOLWA, M. 2008. Compliance with infection prevention guidelines by health care workers at Ronald Ross General Hospital Mufulira District. *Medical journal of Zambia*, 35.
- NOFAL, M., SUBIH, M., AL-KALALDEH, M. & AL HUSSAMI, M. 2017. Factors influencing compliance to the infection control precautions among nurses and physicians in Jordan: A cross-sectional study. *Journal of infection prevention*, 18, 182-188.
- OTIENO-AYAYO, Z. N., GICHUHI, A. W., KAMAU, S. M. & NYANGENA, E. 2015. Health care workers adherence to infection prevention practices and control measures: A case of a level four district hospital in Kenya.
- PEREIRA, F. M. V., MALAGUTI-TOFFANO, S. E., SILVA, A. M. D., CANINI, S. R. M. D. S. & GIR, E. 2013. Adherence to standard precautions of nurses working in intensive care at a university hospital. *Revista da Escola de Enfermagem da USP*, 47, 686-693.

- 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, e780-e789.
- SHEWASINAD YEHUALASHET, S., ASEFA, K. K., MEKONNEN, A. G., GEMEDA, B. N., SHIFERAW, W. S., AYNALEM, Y. A., BILCHUT, A. H., DERSEH, B. T., MEKURIA, A. D. & MEKONNEN, W. N. 2021. Predictors of adherence to COVID-19 prevention measure among communities in North Shoa Zone, Ethiopia based on health belief model: A cross-sectional study. *PLoS One*, 16, e0246006.
- TRAVERS, J., HERZIG, C. T., POGORZELSKA-MAZIARZ, M., CARTER, E., COHEN, C. C., SEMERARO, P. K., BJARNADOTTIR, R. I. & STONE, P. W. 2015. Perceived barriers to infection prevention and control for nursing home certified nursing assistants: a qualitative study. *Geriatric Nursing*, 36, 355-360.
- WASSWA, P. 2015. Implementation of infection control in health facilities in Arua district, Uganda: a cross-sectional study. *BMC Infectious Diseases*, 15.
- WHO 2002a. Prevention of hospital-acquired infections: a practical guide. Geneva, Switzerland: World Health Organization.
- WHO 2002b. The World Health Report 2002: Reducing Risks, Promoting Healthy Life.
- WHO 2009. WHO guidelines on hand hygiene in health care: a summary.
- WHO 2014. Guidelines on post-exposure prophylaxis for HIV and the use of co-trimoxazole prophylaxis for HIV-related infections among adults, adolescents and children: recommendations for a public health approach: December 2014 supplement to the 2013 consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection.
- WHO 2018. Infection, prevention and control
- WHO 2020. South Sudan: WHO and Ministry of Health provide essential training to health care workers thanks to funding from the African Development Bank.

- WONG, E. L., HO, K. F., DONG, D., CHEUNG, A. W., YAU, P. S., CHAN, E. Y., YEOH, E. K., CHIEN, W. T., CHEN, F. Y., POON, S., ZHANG, Q., & WONG, S. Y. 2021. Compliance with Standard Precautions and Its Relationship with Views on Infection Control and Prevention Policy among Healthcare Workers during COVID-19 Pandemic. *International journal of environmental research and public health*, 18, 3420.
- ZAIDI, A. K., HUSKINS, W. C., THAVER, D., BHUTTA, Z. A., ABBAS, Z., & GOLDMANN, D. A. 2005. Hospital-acquired neonatal infections in developing countries. *Lancet (London, England)*, 365, 1175–1188.

APPENDICES

Appendix 1: Participant's Consent Form

Participant consent Form (Quantitative component)

Title: Adherence to standard Infection prevention & control practices and factors associated among Healthcare workers at Juba teaching Hospital.

Introduction

Am _____ a student from Makerere University, College of health sciences, school of public health. Am conducting a study to assess Adherence to standard infection & control practices & factors associated among healthcare workers at Juba Teaching Hospital. Before you decide whether to take part in the study, we would like to explain the purpose of the study, the risks and benefits, and what would be expected of you if you agree to participate in this study.

If you agree to take part in this study, you will be asked to sign or make a mark in front of a witness and you will be given a copy. This form may contain some words that are unfamiliar to you, please ask and we shall explain to you.

Purpose of the study: None adherence to standard IPC practices is one of the problems practiced by healthcare workers in South Sudan which can result into healthcare workers and patient acquiring hospital acquired infection. The infections can cause long hospital stay, increase patient vulnerability, decrease work productivity Therefore, the purpose of this study is to assess the level of adherence of healthcare workers and factors associated with standard infection prevention and control practices at Juba teaching Hospital. Through interview, your response may support in understanding the level of adherence and factors associated with standard infection prevention and control practices Participation in the study.

Your participation in this study is voluntary. You may decide not to take part or withdraw at any time without losing your rights as a participant. You are free to not answer any question that makes you feel uncomfortable. You will not be penalized.

Study procedures

If you decide to take part in the study, you will start today, after you read, discuss, and sign or make your mark on this form and you will answer a few questions in regard to the study purpose.

Risk and benefits

There is no risk that you may encounter in this study. You may get no direct benefit when you take part in this study but you may benefit from the information learned from this research because it will help us understand the study topic under investigation.

Confidentiality

We will make every effort to keep your information safe. Any publication of this research will not include your name. The study staff will make every effort to protect your privacy

Statement	Participant Initials (on each box)
I have received and read/had it read to me the information form provided to me by the researchers that explain in detail the purpose of the study, benefits and the risks. I have asked all the questions that I have and I feel happy that I have understood the purpose of the study.	
I understand that my interview may be recorded for study purposes.	

I understand that my information may be looked at by other researchers and regulatory bodies	
I understand that my participation or no participation in this study is out of my free will and I may withdraw at any point without losing my rights as a participant. I may choose to answer the questions am comfortable with and the researchers will not penalize me.	

I voluntarily agree to participant in the study

.....
Name of Participant

.....
Date

.....
Signature

.....
Name of Interviewer

.....
Date

.....
Signature

Appendix 2: Questionnaire

Title: Adherence to standard Infection prevention & control practices and factors associated among healthcare workers at Juba teaching Hospital, South Sudan	
Questionnaire code:	
Participation consent check: The respondent agrees to interview Yes <input type="checkbox"/> continue, if No <input type="checkbox"/> END	
Hospital Information	
Name of health facility	
Date of interview	
Tick (✓) appropriately in the given boxes below.	
Socio-demographic characteristics & respective coding categories	
1. Sex	
1. Male <input type="checkbox"/>	2. Female <input type="checkbox"/>
1. Age	
What is your age in years?	<input type="text"/>
3. Marital status	
What is your marital status?	
1. Married	<input type="checkbox"/>
2. Single	<input type="checkbox"/>
3. Widowed	<input type="checkbox"/>
4. Divorced	<input type="checkbox"/>

3. Education

What is your education level?

Primary	<input type="checkbox"/>	Secondary	<input type="checkbox"/>
Advanced level	<input type="checkbox"/>	University	<input type="checkbox"/>

4. Qualification / profession

What qualification / profession do you hold?

Nursing Assistant	<input type="checkbox"/>	Enrolled Nurse	<input type="checkbox"/>
Registered Nurse	<input type="checkbox"/>	Midwives	<input type="checkbox"/>
Lab technician	<input type="checkbox"/>	Clinical officer	<input type="checkbox"/>
Medical doctor	<input type="checkbox"/>		

5. Years of work experiences

What are your years of working experience in this hospital?

6. Health workers' knowledge on Standard infection prevention & control practices

1. Do you know what standard IPC practices are?

Yes -----1

No -----0

If yes, define what standard IPC practices are?

.....
.....

3. Have you heard of hand hygiene?

Yes ----1

No -----0

4. Do know the five moment of hand hygiene according to WHO? Yes --1 No.

skip

if yes, List them accordingly

(I).....

(ii).....

(iii).....

(iv).....

(v).....

3. Wearing gloves before procedures that involve a risk of contact with body fluid shows

that the Health care worker is knowledgeable use of PPE

Yes -----1

No ----0

4. Disinfection is a process which reduces the number of pathogenic micrograms except

spores

Yes1

No0

5. Sterilization is the process of killing microorganism including spores?

Yes ----1

No --0

6. Needles and sharps should be discarded into puncture resistant containers /sharp boxes

Yes -----1

No

7. Contaminated needle should not be recapped?

Yes --1 -----0

8. Infectious patient should be put into isolation by health care worker to prevent transmission of infectious disease from one patient to another or health worker (Optimum spacing between beds 1-2 meters)

Yes ---1

NO ----0

9. Post exposure prophylaxis (PEP) should be done within 72 hours to prevent the healthcare worker from being infected by nosocomial infection such as HIV, HeP B

Yes ----1

No ----0

7. Healthcare workers' level of adherence to standard infection prevention and control practices.

Adherence to all IPCs practices below is coded as **Always=2 Sometimes = 1 and Never = 0**

Hand hygiene:

How often do you follow the practice below	Always	Sometimes	Never
Before touching a patient	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Before clean/ aseptic procedure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
After body fluid exposure risk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
After touching a patient	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E After touching patient surrounding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(II) Personal protective equipment

How often do you follow and practice the following practice?	Always	Sometimes	Never
Never	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A) wear gloves before procedures that involve a risk of contact with body fluid.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B) wear gloves before giving an injection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C) wear gloves between patient contacts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D) Surgical mask is worn when client / staff present with respiratory symptoms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D) Goggles / face shield is worn by, staff before for high risk or splashing procedure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G) Disposable PPE should be discarded in lidded waste receptacles properly after use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Injection safety Practices

How often do you practice the following?	Always	Sometimes	Never

injection safety practices?

A) contaminated needle/sharp should
not be bent or recapped

B) Use recapping device or one-handed scoop
technique if recapping of needle is unavoidable

C) Needles and sharps are discarded into
puncture resistant containers /sharp boxes

D) Discard the sharps box when sharps reached the warning line for maximum volume (~70-
80% full)

E) Sharps boxes are sealed up and discarded
into red plastic bags marked with
international biohazard sign

III) Disinfection

How often do you practice and adhere with given practice? **Always Sometimes**

Never

A) There is no topping up of disinfectants

B) Equipment and surfaces are cleaned & disinfected before and after procedure

C) Disinfectant containers are not left open

IV) Sterilization

How often do you sterilize equipment before and after use? **Always** **Sometimes**

Never

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------

V) Waste Management

How often do you follow and practice given standards below? **Always** **Sometimes**

Never

A) conduct waste segregation according to color coded bin (black, yellow and red)

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------

B) Clinical waste is placed in red plastic waste bags for disposal

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------

C) Wear appropriate PPE when handling clinical and chemical wastes

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------

VI. Isolation

How often do you practice isolating an infectious patient to prevent transmission of infectious disease from one patient to another or healthcare worker in hospital?

Always **Sometimes** **Never**

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------

(VII) Post exposure prophylaxis

How often do you perform PEP immediately after injury with sharps/medical needle	Always	Sometimes	Never
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Factors associated with adherence to standard Infection prevention and control Practices

12. At your institution, do you have or know that you have active infection prevention control team/Committee?

Yes ---1

No ---0

13. Do you think the hospital has adequate staffs to perform all duties to patient care?

Yes ---1

No ---0

14. Have you ever conducted IPC education to patients in the Hospital?

Yes ----1

No ---0

15. Do you have infection prevention and control policies /guidelines in your unit?

Yes ---1

No ----0

Do you have enough IPC Supplies such as color-coded bin, Alcohol hand rub, PPEs, water, sterilization equipment, in your departmental Unit?

Yes ---1

No ---0

Have you ever received In-service training on infection prevention and control practices in this Hospital?

Yes ---1

No ---0

If Yes, how many times _____

Do you have enough space to perform your clinical work in your Unit?

Yes ---1

No ---0

Thank you for your participation

THE END

Appendix 3: Observation checklist for IPC supplies at Juba Teaching Hospital

Observation checklist for IPC supplies				
Name of the Hospital				
Date of observation				
(Tick the available /not available IPC supplies in the given spaces and keep the quantity if Not available)				
IPC supplies				
Hand Hygiene	Available	Not Available	Quantity	Number of Wards
Alcohol hand rub solution.				
Soap at Washing points				
Detergent				
Water				
Hand washing Vessel /can				
Personal protective Equipment				
Protective eye wear				
Face mask				
Disposal gloves				
Gown/Apron/lab coat				
Injection safety practices				
Ordinary single use syringes				

Sharp disposal containers/boxes (puncture proof and water resistant)				
Sterilization				
Functional Autoclave (with pressure gauge working)				
Disinfection				
disinfectant				
Waste Management				
Color coded bins				
Functional incinerator				
Strong gloves for waste disposal				
Waste pit for non infectious waste				
Waste pit with Sharps				
Functional Placenta pit				
Latrines				
Functional				
clean				
Soap				
Water available for hand washing				

Appendix 4: Key Informant Consent Form

Title: Explore the availability of supplies for infection prevention and control practices at Juba Teaching Hospital

Introduction:

Am _____ a student from Makerere University, College of health sciences, school of public health. Am conducting a study to assess Adherence to standard infection prevention & control & factors associated among healthcare workers at Juba teaching Hospital. Before you decide whether to take part in the study, we would like to explain the purpose of the study, the risks and benefits, and what would be expected of you if you agree to participate in this study.

You have been chosen because of your responsibility and knowledge in this area therefore If you agree to take part in this study, you will be asked to sign or make a mark in front of a witness and you will be given a copy. This form may contain some words that are unfamiliar to you, please ask and we shall explain to you.

Purpose of the study

None-adherence is one of the problems practices by healthcare workers in South Sudan which can result into health workers and patient acquiring Hospital acquired infection which can cause long hospital stay, increase patient vulnerability, decrease work productivity Therefore, the purpose of this study is to explore the availability of supplies for infection prevention and control practices at Juba teaching Hospital. Through this key informant interview, your in-depth explanation on the availability of supplies for infection prevention and control practice among healthcare worker is very important.

Participation in the study

Your participation in this study is voluntary. You may decide not to take part or withdraw at any time without losing your rights as a participant. You are free to not answer any question that makes you feel uncomfortable. You will not be penalized.

Study procedures

If you decide to take part in the study, you will start today, after you read, discuss, and sign or make your mark on this form and you will answer a few questions in regard to the study purpose.

Risk and benefits: There are no risks that you may encounter in this study. You may get no direct benefit when you take part in this study but you may benefit from the information learned from this research because it will help us understand the study topic under investigation.

Confidentiality

We will make every effort to keep your information safe. Any publication of this research will not include your name. The study staff will make every effort to protect your privacy.

Statement	Participant Initials (on each box)
I have received and read/had it read to me the information form provided to me by the researchers that explains in detail the purpose of the study, benefits and the risks. I have asked all the questions that I have and I feel happy that I have understood the purpose of the study.	
I understand that my interview may be recorded for study purposes.	

I understand that my information may be looked at by other researchers and regulatory bodies	
I understand that my participation or no participation in this study is out of my free will and i may withdraw at any point without losing my rights as a participant. I may choose to answer the questions am comfortable with and the researchers will not penalize me.	

I voluntarily agree to participant in the study

..... /...../.....

Name of Participant Date Signature

..... /...../.....

Name of Interviewer Date Signature

Appendix 5: Key Informant Interview Guide

Participant ID: _____

Name of interviewer: _____

Date of interview: _____ dd/mm/yyyy

[START TIME]: _____ am / pm

In your understanding, what are Infection prevention and control Supplies?

How is your hospital able to monitor Hospital acquired infection?

In your opinion, what are the common available supplies for infection prevention and control in your hospital?

Drawing from your experience in the hospital, explain any stockout of IPC supplies in your Hospital?

Probe: describe IPC supplies which are commonly stock out and for how long does the stock out last?

As head of this unit, what advice would you give to national and state MOH to improve stock out of IPC supplies in this Hospital?

Closing Remarks

We've gone through all of the questions I have. Do you have any other comments you would like to make? Was there anything that we did not talk about that you would like to discuss?

Summary

Thank you for your time and for the information you have given to us.

[END TIME]: _____ am /Pm

Appendix 6: Indepth-Interview Consent Form

Title: Explore the availability of supplies for infection prevention and control practices at Juba Teaching Hospital

Introduction:

Am _____ a student from Makerere University, College of health sciences, school of public health. Am conducting a study to assess Adherence to standard infection prevention and control and factors associated among Healthcare workers at Juba teaching Hospital. Before you decide whether to take part in the study, we would like to explain the purpose of the study, the risks and benefits, and what would be expected of you if you agree to participate in this study.

You have been chosen because of your responsibility and knowledge in this area therefore If you agree to take part in this study, you will be asked to sign or make a mark in front of a witness and you will be given a copy. This form may contain some words that are unfamiliar to you, please ask and we shall explain to you.

Purpose of the study

None adherence is one of the problems practiced by Healthcare workers in South Sudan which can result into healthcare workers and patient acquiring hospital acquired infection which can cause long hospital stay, Increase patient vulnerability, decrease work productivity and mortality Therefore, the purpose of this study is to explore the availability of supplies for infection prevention and control practices at Juba teaching Hospital. Through this in-depth interview, your in-depth explanation on the availability of supplies for infection prevention and control practice among healthcare worker is very important.

Participation in the study

Your participation in this study is voluntary. You may decide not to take part or withdraw at any time without losing your rights as a participant. You are free to not answer any question that makes you feel uncomfortable. You will not be penalized.

Study procedures

If you decide to take part in the study, you will start today, after you read, discuss, and sign or make your mark on this form and you will answer a few questions in regard to the study purpose.

Risk and benefits: There are no risks that you may encounter in this study. You may get no direct benefit when you take part in this study but you may benefit from the information learned from this research because it will help us understand the study topic under investigation.

Confidentiality

We will make every effort to keep your information safe. Any publication of this research will not include your name. The study staff will make every effort to protect your privacy.

Statement	Participant Initials (on each box)
I have received and read/had it read to me the information form provided to me by the researchers that explains in detail the purpose of the study, benefits and the risks. I have asked all the questions that I have and I feel happy that I have understood the purpose of the study.	
I understand that my interview may be recorded for study purposes.	

I understand that my information may be looked at by other researchers and regulatory bodies	
I understand that my participation or no participation in this study is out of my free will and i may withdraw at any point without losing my rights as a participant.	
I may choose to answer the questions am comfortable with and the researchers will not penalize me.	

I voluntarily agree to participant in the study

..... /...../.....

Name of Participant Date

Signature

..... /...../.....

Name of Interviewer

Date

Signature

Appendix 7: In-Depth Interview Guide

Participant ID: _____

Name of interviewer: _____

Date of interview: _____ dd/mm/yyyy [START TIME]: _____ am / pm

In your Understanding, what do you think are supplies for Infection prevention and control Practices in your hospital?

From your experience explain who provides IPC supplies for infection and control at your hospital?

In your opinion, why do you think it is important to have supplies for infection prevention and control in your hospital?

Drawing from your experience in the hospital, what are the available supplies for infection prevention and control at your hospital?

Probe. Explain the adequacy of the available supplies for infection prevention and control at your hospital?

What is your experience with stockout of IPC supplies in your hospital?

What do you think are the best possible ways to address stockout of IPC supplies in this Hospital?

Closing Remarks

We've gone through all of the questions I have. Do you have any other comments you would like to make? Was there anything that we did not talk about that you would like to discuss?

Summary

Thank you for your time and for the information you have given to us.

[END TIME]: _____ am /Pm

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COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

HIGHER DEGREES, RESEARCH AND ETHICS COMMITTEE

30th October, 2020

Chubang Augustine Saturlino Khamsa
Master student
School of Public Health, Makerere University



Re: Approval of a research Proposal titled: Adherence to standard infection prevention and control practices and factors associated among health care workers at Juba Teaching hospital, Juba-South Sudan

This is to inform you that the Higher Degrees, Research and Ethics Committee (HDREC) has approved your study documents for the above referenced research study.

Note that your study was first approved by the HDREC on 26/10/2020, and therefore approval expires at every annual anniversary of this approval date. The current approval is therefore valid until: 25/10/2021

Continued approval is conditional upon your compliance with the following requirements:

- 1) No other consent form(s), questionnaire and/or advertisement documents should be used. The consent form(s) must be signed by each subject prior to initiation of any protocol procedures. In addition, each subject must be given a copy of the signed consent form.
- 2) All protocol amendments and changes to other approved documents must be submitted to HDREC and not be implemented until approved by HDREC except where necessary to eliminate apparent immediate hazards to the study subjects.
- 3) Significant changes to the study site and significant deviations from the research protocol and all unanticipated problems that may involve risks or affect the safety or welfare of subjects or others, or that may affect the integrity of the research must be promptly reported to HDREC.

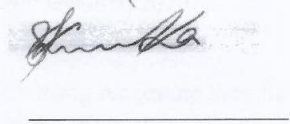
4) For Masters Students in the School of Public Health, you are required to submit 2 copies of your proposal plus a letter of intention to submit a dissertation giving a period of 3 months to the School of Graduate Studies before you commence data collection

• Please complete and submit reports to HDREC as follows:

a) Renewal of the study approval – complete and return the continuing Review Report – Renewal Request (Form 404A) at least 60 days prior to the expiration of the approval period. The study cannot continue until re-approved by HDREC.

b) Completion, termination, or if not renewing the project – send a final report within 90 days upon completion of the study.

Yours sincerely,



Dr. Suzanne Kiwanuka

Chairperson: Higher Degrees, Research and Ethics Committee

REPUBLIC OF SOUTH SUDAN



Ministry of Health, Research Ethics Review Board (MOH-RERB), Juba.

Date: 20th January 2021

MOH/RERB /NO.41/30/12/2020 & MOH /RERB/ A NO.36/2020

TO: Mr. Chubang Augustine

Makerere University

RESEARCH APPROVAL LETTER

Dear Mr. Augustine

SUBJECT: ADHERENCE TO INFECTION PREVENTION & CONTROL PRACTICES AND FACTORS ASSOCIATED AMONG HEALTH CARE WORKERS AT JUBA TEACHING HOSPITAL.

I am writing in response to the request for authorization for the study on **"Adherence to infection Prevention & control practices and Factors associated among Health care workers at Juba Teaching Hospital .**

After close review of the proposal, I am glad to inform you that the ethics review board at the Ministry of Health for the Republic of South Sudan has approved the study. The Ministry acknowledges the importance of getting baseline information aimed at providing evidence-based information on **infection prevention**, in improving management of Health care workers issue across South Sudan.

Please, keep the Ministry informed in case of any changes regarding the study and on its progress. I look forward to the report, especially the recommendations that will be generated from the study.

Note that any information generated from the study should not be published without the consent of the Ministry of Health Republic of South Sudan.

Good luck and don't hesitate to get in touch should there be any queries.

Mr. Amany Jacob Kasio

Deputy Director Research

Ministry of Health, Republic of South Sudan -Juba

CC: Undersecretary -MOH-RSS

CC: Director General, Preventive Health services -MOH-RSS

CC: Director General Juba Teaching Hospital



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