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ASSESSING FACTORS INFLUENCING NURSES' ADHERENCE TO STANDARD PRECAUTIONS AMIDST COVID-19 AT THE TAMALE CENTRAL HOSPITAL

BY

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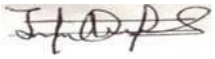
DECLARATION

I, Jones Sarfo Osei declare that with the exception of references made to other people's work which I have duly acknowledged, this work is the result of my own research work done under supervision and has neither in whole nor in part been presented to the University or elsewhere for another degree.

Signature:  Date: 4th March, 2022.

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Signature:  Date: 4th March, 2022.

DR. Prudence Tettey

(Supervisor)

DEDICATION

I dedicate this work to God, who provides me with knowledge, understanding and strength. I also dedicate this work to my family and beloved for their prayers, support and understanding.

ACKNOWLEDGMENT

My foremost appreciation goes to the Almighty God for his infinite favor and grace over my life to go through this program successfully. To my supervisor, Dr. Prudence Tettey, your relentless support, patience and optimum guidance are invaluable and I am grateful.

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I am grateful to the management of Tamale Central Hospital for granting me the permit to conduct this research in the facility. I am also grateful to my nursing colleagues in the hospital the support during data collection.

Finally, to my family, your support, love and care during this period cannot be overlooked. I am grateful. May God bless you all.

ABSTRACT

Background: Globally, it is reported that about half a million HCWs are infected with infectious diseases yearly. Preventing hospital-acquired illnesses and protecting patients and other healthcare personnel requires standard precautions. Breaking the cycle of infections, especially between health care staff and their patients, requires a high degree of knowledge, attitude, and adherence to conventional procedures. Information on the factors influencing HCW adherence to standard precautions at the Tamale Central Hospital is rare and hence increasing the risk of nosocomial infection among HCW and patients. The study aimed at assessing factors influencing nurses' adherence to standard precautions at the Tamale Central Hospital.

Methods: This study was a descriptive study design using a quantitative method to gather data involving 140 participants. A simple random sampling technique was applied for the selection of study participants using Stat Trek's random number generator. Using a structured questionnaire, socio-demographic characteristics, knowledge level on standard precautions, adherence to standard precautions, individual level factors that influence nurses' adherence to standard precautions, and questions in relation to availability of infection prevention and control resources, training, and monitoring were obtained from respondents. STATA software version 16.0 was used to perform the analysis. Chi-square test and Fisher's exact used to determine the association between adherence to standard precautions and socio-demographic characteristics, individual level factors, and health system related factors. Simple logistic regression analysis reporting odds ratio was used to determine the strength of the association. Variables that were statistically significant at the bivariate analysis level were selected and placed into a multiple logistic regression analysis model for statistical significance (p-value < 0.05).

Results: Majority 117 (83.6%) of nurses had good knowledge on standard precautions as they were able to correctly answer ≥ 80% of questions that assessed knowledge on standard precautions. Overall, nurses who were adherent to standard precautions were low (45.7%). Results of a multiple logistic regression analysis conducted on 6 variables that were statistically significant at 95% CI and P value < 0.05 at the bivariate level of analysis revealed only 2 were statistically significant and had an association with adherence to standard precautions. These variables include; receipt of motivation for sincere report and availability of clean water.

Conclusion: The study concludes that nurses in the study area had a very good knowledge on standard precaution. Also, the study concludes that, overall, nurses' adherence to standard precautions was low. The study recommends that nurses and other health professionals should have access to the resources they need to practice standard precautions in accordance with IPC policy guidelines, which should be provided by hospital management.

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LIST OFABBREVIATIONS

CDC - Centre for Disease Control

CFR - Case Fatality Rate

HCAI - Healthcare-Associated Infections

HCW - Health Care Workers

IPC - Infection Prevention and Control

MMDAs - Metropolitan Municipal District Assemblies

PEP - Post Exposure Prophylaxis

PPE - Personal Protective Equipment

SIR - Susceptible-Infected-Recovered

SPs - Standard Precautions

TCH - Tamale Central Hospital

WHO -World Health Organisation

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Health Care Workers (HCW) exposure to infectious disease has become a major concern for both policymakers and development practitioners over the years (Bandyopadhyay et al., 2020; Abebaw et al., 2017; Gyawali et al., 2013). Globally, it is reported that about half a million HCWs are infected with infectious diseases yearly (WHO, 2017). Because HCWs stay in healthcare centres frequently, they are most susceptible to infections and other microorganisms directly by contact with an infected person or indirectly through infected objects such as patients' care equipment, healthcare workers' clothes, and other environmental surfaces (Volgenant & De Soet, 2018; Beruni, 2017).

In an attempt to prevent and reduce HCWs exposure to infections and other microorganisms, the Word Health Organization (WHO) and other health development agencies proposed that all HCWs should adhere to standard precautions (SPs) as the surest way of helping minimize the rate of their exposure to infections and other microorganisms (Critical, 2021).

In any setting where health care is offered, standard precautions are infection prevention strategies that apply to all patients' treatment, regardless of whether they have a suspected or proven infection, to prevent the spread of infections among patients and colleagues (CDC, 2018).

According to CDC (CDC, 2020), standard precautions include; routine hand washing; surgical hand scrub; use of personal protective clothing including gowns,

masks, aprons, goggles, drapes (both sterile and unsterile); proper disposal of sharps, prevention of needle pricks, instrument processing; waste management; processing linens; housekeeping and respiratory hygiene/ cough etiquette. Nurses are exposed potentially to infections through contact with bodily fluids while discharging their duties and the use of standard precautions is a widely promoted practice from exposure to communicable diseases and infections according to Azeb and colleagues (Azeb et al., 2014). Health care institutions, on the other hand, can be a source of infection and epidemic disease for the general public if proper standard measures are not followed.

Per a latest report, epidemics of newly developing or re-emerging infectious illnesses pose a particular challenge and risk to healthcare professionals and other first responders. This is due to a lack of knowledge about the developing danger and a reliance on infection prevention and control (IPC) strategies that may not cater for all of the new diseases' transmission patterns. It was concluded that IPC strategies put into consideration all possible routes of transmission in reducing person-to-person infection (Islam et al, (2020)).

As of January 2021, COVID-19 had become a global menace, infecting 94 million people globally and inflicting approximately 2 million deaths (Barranco & Ventura, 2020). As the COVID-19 pandemic spreads, HCWs will become increasingly vital in providing treatment to patients on the front lines of the disease's fight. They are, however, at a higher risk of becoming infected, which might represent a significant challenge to the healthcare system (Alajmi et al., 2020; Labrague et al., 2012). According to a study, COVID-19 infection rates in HCWs are around 10%, with 29% of infections occurring as a result of unintentional exposure to a patient with the virus (Alajmi et al., 2020).

The best way to prevent frontline healthcare workers against COVID-19 infection is to limit their exposure to SARS-CoV-2, which can be done by following IPC guidelines and getting inoculated against the virus. The strongest weapon for safeguarding health professionals from the COVID-19 disease, however, is prevention. (Ashinyo et al., 2021). IPC aims to safeguard everybody in the hospital, including patients, staff, and visitors, by lessening healthcare-associated infection transmission; to improve the hospital's ability to respond to an epidemic; and to reduce or eliminate the risk of hospitals becoming an avenue for epidemic amplification. Adherence with infection prevention and control (IPC) measures is critical for reducing the incidence of coronavirus disease (COVID-19) transmission among health professionals (Ogboghodo et al., 2021). Non-compliance to IPC protocols by HCWs in handling infectious diseases such as COVID-19 places HCWs, patients, and communities at risk (Sahiledengle, 2018).

Although infection prevention in the workplace is an important component of occupational health in healthcare, it will not be effective if individual HCWs do not follow them. In order to protect HCWs' health and limit the danger of cross-transmission and infection in the workplace during infectious pandemic, healthcare facilities must establish agreeable and acceptable workplace infection control rules and methods.

The goal of this study was to see how well nurses followed standard precautions during the pandemic and what factors influenced their decisions including their knowledge levels, and challenges faced when trying to fully follow the standard precautions at all settings of patient care.

1.2 Problem Statement

For healthcare workers (HCWs), especially those in underdeveloped countries, implementing standard precautions (SPs) has been a serious difficulty, putting their safety and patient at risk and increasing their exposure to an infectious agent (Akagbo et al., 2017). Inadequate knowledge and non-adherence to SPs, particularly during a pandemic such as the Covid-19 outbreak increase the risk of infection among HCWs (Haile et al., 2017).

According to a survey of healthcare workers in the Lower Manya Krobo district, just 37.0% of HCWs were familiar with the core concepts of SP (Haile et al., 2017). Only a few participants in the same study were aware that SP requires hand washing before and after any direct contact with the patient. A comparable study conducted among HCWs in Ghana's Greater Accra Region found that HCWs with insufficient understanding in the field of SPs had low compliance (Sunkwa-Mills et al., 2020). In research of nurses in Tamale on hepatitis infections, it was discovered that while 94.4 percent of responders were aware of their susceptibility to viruses, few had an adequate understanding of SPs to prevent infections (Ashinyo et al., 2020). Hepatitis infections affect 40 to 60 percent of HCWs as a result of work exposure (Atlaw et al., 2021). Over 2000 doctors, nurses, and other healthcare personnel in Ghana were infected with Covid-19 in the year 2020 (Ashinyo et al., 2020). In Ghana, 8.2 percent of HCWs contracted hospital-acquired illnesses in 2019 (Sunkwa-Mills et al., 2020).

During outbreak situations, as discrepancies in theory and expertise among healthcare professionals are the fundamental driving force of disease amplification, IPC adoption within a facility is dependent on the sum amount of individual HCW's

learning and adherence with IPC protocols (Ogboghodo et al., 2021). Limited resources, lack of suitable training, unsuitable equipment, skin irritation, forgetfulness, remoteness from necessary facilities, and poor administrative assistance in creating a conducive work environment for compliance were all major factors affecting adherence to SPs (Wong et al., 2021).

However, there is little research on how HCWs feel about their workplace infection control policies and methods in healthcare settings, and the link between knowledge level and adherence during the pandemic is unclear. Also, there is not much information about standard precautions among nurses who are the largest workforce in every health setting including the Tamale Central hospital. Therefore, this study was undertaken to assess factors that influence nurses' adherence to standard precautions in the Tamale Central Hospital. The study specifically looked at their knowledge levels on SPs and factors that affect their adherence to standard precautions in the hospital.

1.3 Justification

The focus of this study is to assess nurses' knowledge and adherence level of standard precaution measures in the Tamale Central Hospital due to the emergence of the COVID19 pandemic as nurses are the main frontline of COVID-19 prevention and treatment.

Generally, nurses' and other Health Care Workers (HCWs) adherence and practice of standard precautionary measures are often not reported. This research will be the first of its kind to be performed in the Tamale Central Hospital.

Nurse safety is a major concern when it comes to monitoring and restricting COVID-19 transmission between nurses and patients. Following such quick and easy

precautions will minimize COVID-19 transmission and further lowering the cost of treating COVID-19 cases.

This research is intended to play a significant role in emphasizing the importance of nurses' understanding and adhering to standard precautionary measures during their everyday work. The findings will help the nurses and other health professionals to get a thorough understanding of the effective use of standard precautionary measures in their practices and make themselves healthy and their clients safe. The findings of this study will inform the management of the hospital of the possible gabs through implementing disciplinary measures against non-adherence to standard precautions (SPs).

This study will bring out a2 recommendation for considerations and enrichment in the field of nurses' preparedness and adherence level of standard precautionary measures working within health facilities in the country. Furthermore, this study will contribute to already existing literature on health care workers' adherence to standard precautionary measures.

It will also serve as a body of knowledge for academic purposes.

1.4 Figure 1: Conceptual framework

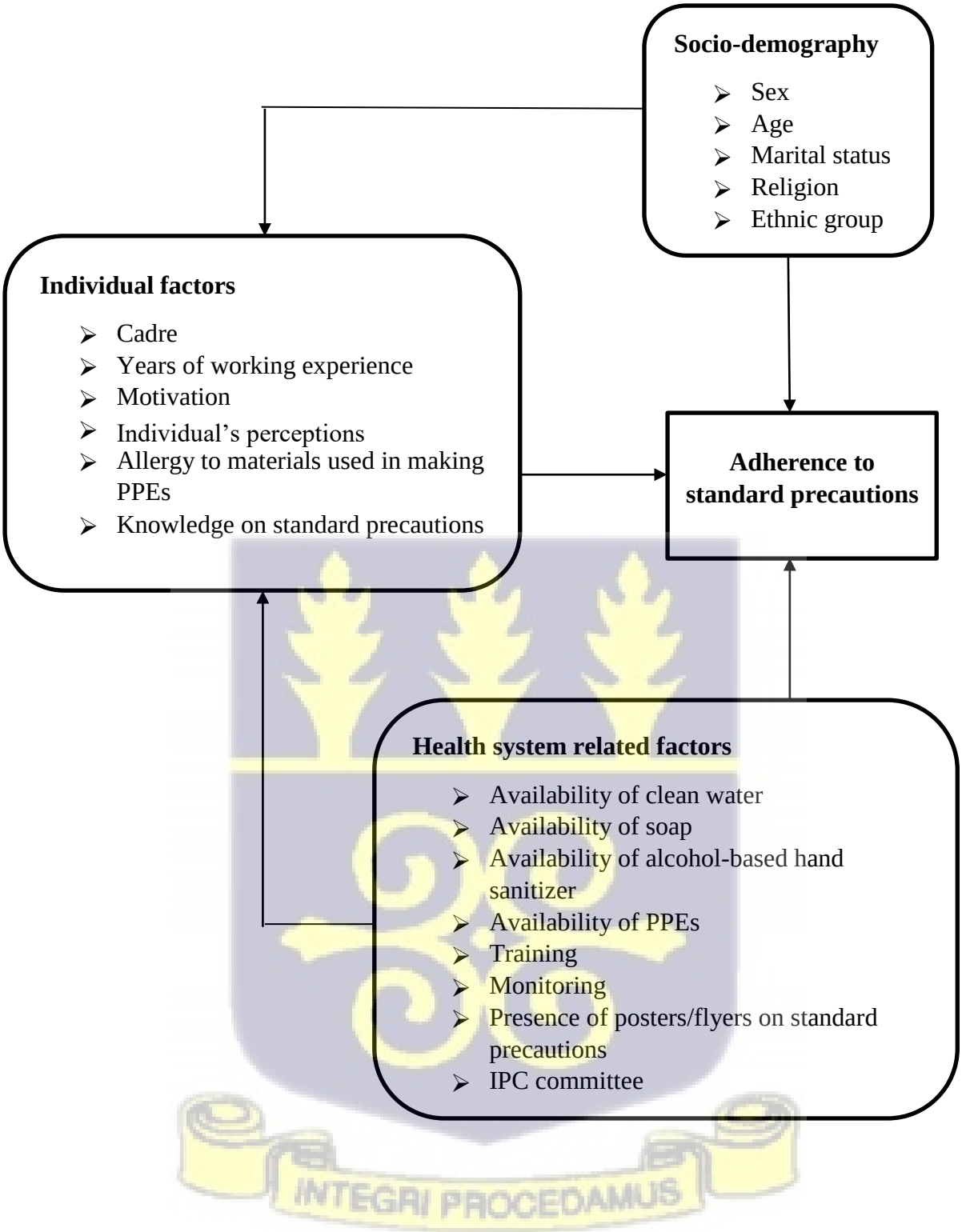


Figure 1: Conceptual framework of factors that influence nurses' adherence to standard precautions**.**

The major drivers of nurses adhering to SPs can be influenced by factors at the individual level, socio-demographic characteristics, and health systems related factors.

The socio-demographic variables such as sex, age, marital status, religion, ethnic group, and educational level have the potential of influencing an individual to adhere to SP measures directly or establishing the basis of accepting or exhibiting little effort to follow the SP measures.

The individual's sex, age, marital status, fear of being a source of infection for the family, religious group that promotes cleanliness, and formal education level have the potential to influence an individual's compliance with SP measures at work, either directly or indirectly.

The individual-level factors such as cadre and level of exposure to a source of infections, the number of years the nurse has been practicing, the experience and the motivation of the individual based on past experience on hospital-acquired infections have the likelihood influencing the individual to stick to the standard infection prevention measures at the workplace. Some individuals are also allergic to materials such as latex, soaps, and other materials that aid in infection preventions measures at the hospital. This has the tendency to compromise an individual adhering to the standard infection prevention measures. Poor knowledge level on IPC and SP can lead to ineffective measures for personal safety as well as the possibility of adhering to basic infection prevention methods at the hospital by nurses.

The health system setup also has the tendency of affecting the individual adhering to standard infection prevention measures at the workplace. Poorly infection prevention

set up at the working area such as poor hand washing apparatus including the availability of soap, running water, gloves and alcohol-based hand sanitizers can directly affect adherence to SP measures or can indirectly demotivate the individual from adhering to the SP measures at the working environment. Management commitment to supply the necessary PPEs to the service point, regular training of staff on IPC, availability of protocols in all service delivery points, organizational structures, and measures to ensure and enforce strict adherence to standard infection prevention measures, are likely to have a positive impact on nurses practicing standard precautions at work.

1.5 General objective

The main objective of this study is to assess factors influencing nurses' adherence to standard precautionary measures.

1.6 Specific objectives:

1. To assess nurses knowledge level on standard precautions
2. To assess nurses' adherence to standard precautions
3. To determine factors associated with nurses' adherence to standard precautions

1.7 Research questions

Following the above-highlighted objectives, the study answered the following research questions:

1. What is nurses' knowledge level on standard precautions?
2. What is nurses' level of adherence to standard precaution?
3. What are the factors associated with nurses' adherence to standard precautions?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Knowledge Levels on Standard Precautions

The US Centres for Disease Control and Prevention (CDC) introduced universal precautions as a core component of healthcare-associated infections (HCAI) prevention nearly 30 years ago, deeming them applicable to all healthcare workers (HCWs) in contact with all patients in all settings, regardless of whether an infectious agent was suspected or confirmed (Hessels & Larson, 2016). The CDC's universal precautions guidelines were modified in 1996, and they were renamed standard precautions' (SPs). Hand hygiene, the use of appropriate personal protective equipment (PPE), the safe use and disposal of sharps, disinfection of the environment and equipment, patient placement, and linen and waste management are all components of SP (Hessels & Larson, 2016). When emerging respiratory contagious illnesses spread far and wide, like the COVID-19 outbreak, adherence with infection prevention and control (IPC) methods becomes even more important. Among the measures specified in these guidelines are the use of personal protective equipment (PPE) such as masks, face shields, gloves, and gowns, as well as the isolation of patients with respiratory illnesses from others (Houghton et al., 2020).

Breaking the cycle of infections, especially between health care staff and their patients, requires a high degree of knowledge, attitude, and adherence to conventional procedures (Galal, Labib, & Abouelhamd, 2014). The covid-19 outbreak came to enforce the need to fully implement all aspects of SPs in all settings not only in healthcare centres (Jain et al., 2022). Major reported variables influencing adherence with standard precautions in Northwest Ethiopia, according to

the literature, include a lack of comprehension and knowledge among health professionals on SPs, time pressures to implement the precautions (work overload), resource constraints, inadequate training, inconvenient equipment, skin irritation, forgetfulness, distance from necessary facilities, and inadequate management assistance in implementing the precautions (Abeje & Azage, 2015). In tertiary hospitals in the southern part of Nigeria, overall, 457 (87.2%) of respondents had a strong understanding of SPs, while 293 (60.0 percent) had a good understanding of SPs. Clinical health practitioners were 2.5 times more likely (95%) to have high knowledge, while responders with low understanding were 0.5 percent less likely to comply with SPs. A study on HCWs in Pakistan had strong knowledge (93.2%) and good practice (88.7%) of COVID-19 according to the findings. The main hurdles to infection control, according to HCWs, were a lack of infection control materials and a lack of awareness about the transmission (40.6%) (Saqlain et al., 2020). According to a research conducted among Nigerian HCWs, the majority of respondents (89%) had adequate knowledge about healthcare infections and had a positive attitude toward preventive measures (Aluko et al., 2016).

Because respondents' high level of knowledge differed from practice, the provision of safety equipment, pre-placement and regular training of staff on safety protocols, and adequate reinforcement of staff capacity and capability through drills, among other indicators designed to promote safety practices and reducing exposure to hazards, should be institutionalized and made mandatory in all healthcare facilities (HCFs) (Aluko et al., 2016).

According to Abdel Wahed and colleagues, (2020) there was a favourable link between knowledge and attitude scores of HCWs in most tertiary health institutions

managing most patients during the peak of the COVID-19 pandemic in most African countries. Approximately 83.1 percent of the participants were frightened of contracting COVID-19. HCWs' overall expertise was typically good, particularly among physicians. Allied health professionals were shown to have a higher optimistic attitude than physicians. In Ghana, the majority of HCWs in the Lower Manya Krobo district had worked as health workers for 0–5 years (65.0%). The basic ideas of SP were generally poorly understood; only 37.0 percent of HCWs knew that SP comprises hand washing before and after any direct contact with the patient (Akagbo et al., 2017). Implementing and executing the precautions is not negotiable, just as it is not negotiable for any other infectious agent transmitted through touch, and other means including Covid-19.

The definition of standard precaution was examined by Adebayo et al. (2015). They went into detail about the concept's development throughout time. Their literature identified certain critical methods that healthcare personnel might use to improve the facility's basic precautions. Hand washing and hygiene, the use of protective barriers, environmental control, the handling and proper disposal of sharp instruments, such as needles, patient accommodation in accordance with infection transmission levels, respiratory hygiene, and cough etiquette are all examples of standard precautions.

1. Hand washing and hygiene:

   The hands are the most common vehicle for microbial transmission therefore hand washing reduces the number of potentially infectious agents on the hands. It is also an important means of reducing the incidence of infectious agents in healthcare facilities. Proven hand washing comes with stepwise

techniques, which involve using antiseptic soap or detergent; wash for 10 -15 seconds of all parts of the hands under running water with soap. In resource constraint environment, the hands should be washed while the assistant pours water. This is less standard practice. Alternatively, an alcohol-based agent can be used to disinfect the hands although should not be used on hands with dirt. After washing hands, use disposable towel or napkins if automated electric drier is not available. Other essential guides include washing hands immediately when contaminated with blood and body fluids. Such does not preclude washing hands even if worn gloves are removed and were intact. It is not proven that hand sanitizer does replace regular hand washing. Hand washing includes before touching a patient, even if gloves will be worn. It is essential before exiting the patient's care area after touching the patient or the patient's immediate environment to also wash the hands with or without contact with blood, body fluids or excretions, or wound dressings. In addition, it is an essential act prior to performing an aseptic task (e.g., placing an IV, preparing an injection). If hands will be moving from a contaminated-body site to a clean body site during patient care, it is also recommended after glove removal.

2. Use of protective barriers/Personal Protective Equipment (PPE):

The use of protective barriers/personal protective equipment lowers the danger of health providers' skin or mucous membranes being exposed to blood and body fluid by providing a barrier between them and the blood and body fluid. Such protective barriers include (e.g gloves, gown, cap, mask, protective eye wears, and face shields); equipment, and clothing used during care. It is however not adequate to merely use the protective barrier, it is also

important to take care to prevent injuries when using needles, scalpels, and other sharp instruments. Always deploy such protective barrier as appropriate when there is a potential exposure and immediate thorough washing of hand & skin if contaminated with blood or body fluids. If there is exposure, standard post exposure prophylaxis (PEP) protocol should be followed. The glove that can be used to achieve standard precaution may be intact latex or intact vinyl glove and this is necessary during phlebotomy, procedures involving direct contact with blood or body fluid, and direct contact with non-intact skin and mucosal membrane which must be for single usage. Specifically, the CDC guideline recommends the use of sterile gloves for procedures involving contact with normally sterile areas of the body, contact with mucous membrane, unless otherwise indicated. Examination gloves are also used for other non-invasive procedures. Aprons made of plastic should be worn during a surgical procedure, cleaning, and generally when body fluid or blood is anticipated. A well-fitting goggle is essential to safeguard the conjunctiva and this should be worn when there is a risk of splash or spilling of blood or body fluids. Mask is meant to protect the nostrils and mouth. It is not out of place for cuts and abrasions on a healthcare professional to be covered with a waterproof dressing.

3. Environmental control:

Surface processing techniques, as well as the handling and cleaning of medical waste, are all part of environmental control. The procedure for surface processing entails the assumption that work surfaces including bed, bed rails, patient examination tables, and bedside tables are contaminated therefore routinely cleaned. It is also necessary that the work surface should

be disinfected before the procedure when contamination is suspected and after procedures or tests. Health service waste handling is also very important and it includes cleaning and disinfecting soiled linen and avoidances of contact with soiled linen with bare hands. Furthermore, the contagious patient should be preferably kept in an isolation area or room especially in cases of viral hemorrhagic diseases.

Generally, non-sharp wastes are disposed off in biohazard bags, small sharps for sharp disposal bags but larger ones in canisters. All must be labelled as biohazard.

4. Proper handling and adequate discarding of sharp instruments including needles: Managing sharp instruments like hypodermic needles, scalpels, blades, and biopsy needles is essential for standard precautions. The use of safer devices like retractable lancets is being advocated. Other advocated dispositions during sharps usage include not recapping needles after usage, disposal of sharps in containers (closable, puncture-proof, leakproof, labelled colour coded to indicate biohazard) and generally, minimizing invasive procedure to avoid accidental injury. The risk of needle pricks commonly occurs during recapping, disassembly, and inappropriate disposal. Standard recommendations for finger-stick injury should be followed. In case of an accidental needle prick, the immediate effort to make is to follow post exposure prophylaxis (PEP) protocol.
5. Patient's accommodation in accord to requirement levels as an infection transmission source:

   For each disease, there are well-developed regimens. Following the instructions would go a long way toward preventing infection.

6. Respiratory hygiene and cough etiquette:

   Examples include; covering the mouth and nose when coughing or sneezing, hand hygiene following contact with respiratory secretions, and spatial separation of people with acute febrile respiratory symptoms. An N95 or P3 respirator may be required if viral hemorrhagic fever is present. Standard precautions must be taken continuously with all patients regardless of their diagnosis in all work practices at all times.

2.2 Susceptible-Infected-Recovered (SIR) Epidemiological Models

The seminal SIR model established by Kermack et al. (1927) is a crucial tool utilized by epidemiologists. An SIR model of the outbreak has been used in a variety of studies to estimate and anticipate illness scenarios for COVID-19 (Atkeson et al., 2020). There are three main stages of health in these models: a) Susceptible (S) (at risk of infection), b) Infected (I)/infectious, and c) Recovered/resistant (R) (previously infected). The disease is no longer communicable in those who have died from it. These models imply that infected people interact with vulnerable people at a certain rate. Infected persons heal at a set rate and gain immunity over time. As people build 'herd immunity' to COVID-19, the susceptible population eventually shrinks. The primary components of the SIR models are the various levels of infection, recovery, and their associated likelihoods.

The SIR models aid in simulating the impact of social distancing strategies on infection propagation. If only infected cases are isolated, the infection peaks in 4 months and then rapidly declines. The infection reaches a peak around the same time with social distancing measures, but the number of incidents is significantly lower.

There's a danger the infection will resurface if containment measures are abandoned too soon. These qualitative findings provide insight into the impact of social distance on COVID-19 transmission (Anderson et al., 2020).

In these epidemiological models, one of the fundamental assumptions is that transitions between conditions of health are exogenous in terms of economic effects. This means that SIR models do not account for the projected drop in consumption activities or hours worked as a result of COVID-19. Because of the "lives vs. livelihood" trade-off that weighs strongly in any broad examination of pandemics that includes public health and economic implications, this situation cannot be overlooked. The effectiveness of that trade-off, i.e., how to lower the incidence of diseases at the lowest feasible cost to economic wellbeing, is a primary emphasis of this strand of work.

Eichenbaum et al., (2020) used a macroeconomic general equilibrium model with the classic SIR model to answer this question. The prevalence of infection, according to their SIR-Macro model, is determined by the degree of contact between agents when eating and working, as well as the random chance of getting the virus. As a result, the sensitive populace can reduce their risk of infection by limiting their consumption and labour supply (outside of their residences). Eichenbaum et al. (2020) found that aggregate consumption declined by 9.3 percent during a 32-week period, based on their assumptions and calibration procedures. Labor supply, or hours worked, on the other hand, followed a U-shaped pattern, with a peak fall of 8.25 percent in the 32nd week after the epidemic began. Long-run losses in hours worked are smaller, however, since a bigger proportion of the population lives and returns to work than in the alternative scenario.

While the SIR-Macro model ignores real-world issues like bankruptcy costs, mass hysteria, and the loss of effective labour supply, as well as trends found in other models like consumption uncertainty and price rigidities (which would cause consumption and hours worked to fall even more), there are some caveats that have been addressed in the literature, such as incomplete data, disease externalities, and dangers across subpopulations. These are described in more detail below.

Infected individuals may be asymptomatic, causing infection to spread unintentionally. Berger et al. (2020) propose the Susceptible-Exposed-Infectious-Recovered (SEIR) model (SEIR).

Kermack et al. (1927) propose expanding testing of vulnerable groups to uncover infected-asymptomatic patients and confine this part of the community to accommodate for this incomplete knowledge. When compared to the normal uniform quarantine policy, the authors discovered that the tailored quarantine policy would have a lesser negative impact on the economy. Similarly, Eichenbaum et al. (2020) suggest that smart containment measures, which combine testing and quarantining of affected people, would improve the trade-off between economic activity and public health.

Eichenbaum et al. (2020) concentrate on the topic of infectious externality. They point out that the competitive equilibrium isn't Pareto optimal since agents aren't thinking about how their actions affect the infection and mortality rates of other economic agents. The writers argue that the best way to internalize the externality is to tighten containment measures over time in proportion to the spread of infection. If a strong confinement policy is implemented from the start, the economy will suffer significantly more. In a more formal way, Bethune and Korinek (2020) concentrate

on the infectious externality. The researchers use a decentralized and then a social planners' method to build

Susceptible-Infected-Susceptible (SIS) and SIR models to assess infection externalities. In a decentralized method, the researchers found that people infected remain engaged in economic activities in order to optimize their usefulness. Susceptible agents, on other hand, limit their activity to reduce the danger of infection. As a result of their failure to internalize the impact of their actions on the general infection risk, afflicted persons do not participate in proper social distancing. The results show that the infection lasts longer than two years, based on the model assumptions and calibration for the US economy. In the social planner technique, on the other hand, the planner forcibly lowers the activity of infected agents in order to reduce the risks to susceptible agents and, finally, to zero infections. Furthermore, the study estimates that the marginal cost of further infection in the decentralized strategy is $80,000 but in the social planner's approach it is $286,000 (nominal 2020 dollars). This demonstrates that private agents undervalue the externality's cost, and that the social planner's approach to diseased population containment is Pareto efficient when compared to a uniform containment strategy.

2.3 Knowledge and practice regarding standard precautions among nurses

Standard SPs were created to minimize the risk of nosocomial infection in hospitals from both known and unknown sources, so nurses and health care staff should be well-versed in the subject before practicing their careers (Stawicki et al., 2020). On an international, regional and national level, studies are conducted on the awareness and application of SPs steps. These studies revealed disparities in nurse awareness and experience of SP interventions.

Standard precautions are deemed a foundational measure that nurses must adhere to avoid hospital infections. As a result, nurses must be briefed on these SP steps and have a thorough understanding of these precautions (WHO, 2018). Tadesse-Alemayehu and Asse (2018) conducted a study at the Central Hospital of Ethiopia to determine nurse awareness and practice of standard precautions. The findings revealed that nurses' knowledge of SP measures was limited, with only 34.2 percent of nurses having heard of them. Refeai et al. (2020) conducted a cross-sectional analysis in a public hospital and found that 11% of all participants' thought SP was only intended to protect nurses, whereas 52.4% thought SP was meant to protect both nurses and patients.

Rungta et al., (2020) conducted another cross-sectional study in India to determine the level of information about SP steps. According to the study's results, roughly (50 percent) of participants were familiar with all SP scales. Marzo et al. (2021) conducted another study to assess awareness, attitude, and practice of SP steps. Just (3.4%) of the respondents had a high level of awareness about SP, according to the report. Ayed (2015) conducted a cross-sectional analysis to assess the awareness and degree of enforcement about standard precautions among student nurses.

A study by Abebaw, Aderaw and Gebremichael (2017) evaluate nurses' awareness and attitudes toward the use of SP steps. The findings of the awareness test on SP measures revealed that fewer than half of the nurses had heard of it. Hand grooming, wearing gloves, face protection (goggles, mask), gowning, and avoiding injury from needle sticks and other sharp instruments are all examples of SP interventions. Other components such as waste management, environmental sanitation, linen handling, and patient care equipment are also included. Almurr (2013) conducted a study in

Abuja, Nigeria, to assess awareness and practice of standard precautionary steps. The results of the information section revealed that 22.38 percent of participants were aware of the condition that necessitated hand washing. In terms of practice, 68.95 percent of participants said they still washed their hands. In comparison, 2.52 percent of participants never washed their hands, and 97.83 percent of participants said they wore gloves daily. Furthermore, goggles and gowns were identified by (68.95 percent) and (88.44 percent) of participants, respectively, when conducting procedures such as drawing blood or gathering body fluid. Another study conducted by Beghdadli et al. (2008) in a university hospital in Western Algeria assessed the adherence of participants to SP during their daily practice, found that approximately (95%) of respondents washed their hands after using gloves, compared to (69%) of respondents who washed their hands between patients and nearly two-thirds of nurses washed their hands between patients.

Labrague, Rosales, and Tizon (2012) conducted a study in the Philippines to determine nurses' awareness and practice of SP controls. It was discovered that 84.5 percent of respondents agreed that SP interventions were used on all patients and that 96.6 percent of respondents were aware of the importance of hand washing before and after interaction with patients. Just half of the participants (50%) washed their hands before and after interaction with patients. The percentages of people who knew how to wear a mask, goggles, and gown were 93.10 percent, 96.55 percent, and 94.3 percent, respectively. Also, when extracting blood, 65.52 percent of participants always wore gloves; 74.14 percent of participants did not recap used needles, and 82.76 percent of participants always disposed of used needles into sharp containers. Lakbala et al., (2012) conducted another study in Iran to assess awareness and practice of SP controls. It was carried out in a Shiraz medical centre.

The findings revealed that 95.6 percent of participants were aware that hands should be washed before and after providing treatment to patients, but only 31.9 percent of participants washed their hands before and after doing so. The findings also revealed that (97.4%) of participants were aware that hands should be washed after contact with blood or bodily fluid, compared to (89%) of participants who always washed their hands after contact with blood or bodily fluid. Furthermore, 86.6 percent of participants knew that goggles should be worn when there was a chance of exposure to blood or body fluid, compared to 90.1 percent and 89.4 percent who said masks and gowns should be worn, respectively. Furthermore, when there was a risk of exposure to blood or body fluid, (28.6%) of the participants always wore goggles, compared to (48.4%) who always wore masks and (35.9%) who wore gowns. About (27.8%) of participants were aware that used needles should not be bent before disposal, and (36.6%) had never bent a used needle before disposal. The results revealed that their mean awareness score for SP measures (mean SD) (6.711.10) was higher than their mean practice score for SP measures (3.521.09).

Alnoumas et al. (2012) assessed workers' knowledge, attitude, and behavior toward health-care-associated infection in a primary health care center in Kuwait. When there was a risk of exposure to blood or bodily fluids, 20.5 percent of respondents said they always wore goggles, while 31.5 percent said they always wore masks. When there was direct interaction with patients, however, (62.67 percent) of participants wore gloves. It also revealed that (36.8%) of participants always recapped needles and (67.8%) said they always disposed of used needles in sharp containers.

2.4 Compliance with standard precautions amongst nurses

The term "compliance" has been described in a variety of ways. Within health care environments, Leslie, Sun, and Kruk (2017) proposed a broadly accepted concept of enforcement. According to this concept, compliance refers to the degree to which a person's behaviour such as following the doctor's guidance or advice or adopting a healthy lifestyle. History, economic and social factors, self-efficacy, and a lack of expertise or means are all factors that can affect or monitor compliance. Individual behaviour guidelines can be used in a variety of environments (including health care settings), but people do not necessarily follow them (Wittkowski et al., 2020).

Nurse compliance with precautions to prevent exposure to microorganisms is poor (Aung et al., 2017). Compliance with hand hygiene standards, in particular, was found to be lacking. When working with body fluids, use gloves, eye protection, mouth and nose protection (mask use), gowning when necessary, avoid recapping the needle after it has been used on a patient, and provide treatment with the mindset that all patients are potentially infectious.

2.5 Factors affecting non -compliance to standard precaution

Following a study of the relevant literature, it is clear that nurses' compliance with the SP is influenced by a variety of factors. Akgur and Dal (2012) conducted a study in Cyprus to determine the factors that led to nurses refusing to comply with SP. The findings revealed that lack of supplies, negative effects of protective equipment on nurses such as skin discomfort, lack of nurses, and psychological factors, as well as the time-consuming implementation of protocols, working experiences, and impact on nurses' appearance, were all obstacles to implementing SP steps. Insufficient awareness of SP interventions, insufficient preparation, and the department where

nurses served was all contributing factors (Abbasinazari et al., 2012). Nurses in surgical departments were more likely to use SP interventions than nurses in medical departments. Meddling with the practice of care, lack of a leadership role from co-workers or superiors, high workload, or lack of access to sinks were factors and barriers that influenced and impeded non-compliance with the SP measures in a study conducted by Abou El-enein and El Mahdy (2011) in an Egyptian university hospital. Another important factor affecting adherence to SPs is an extra workload on HCWs (Lee et al., 2020). Washing hands before and after each contact with each patient, changing gloves between patient contacts, and sorting waste into various categories all take time, according to health care workers. Healthcare practitioners find it difficult to follow SPs due to increased workload and/or staff shortages (Pong, 2019).

2.6 Health Belief Model (HBM)

The HBM was one of the first models to apply behavioural science theory to health problems to study and promote the use of health services. The HBM assumes that an individual would take a recommended health action if he or she believes that a negative health condition can be avoided and that the presence of illness poses at least a moderate threat to some aspect of one's life (Champion, 1984). Using the HBM, two experiments attempted to assess perceived behaviours influencing SP adherence. A study was conducted to determine operating room nurses' behaviours, values, and level of adherence to SP, as well as to find influences on compliance (Aung & Dewi, 2016). They focused on SP habits such as double-gloving during surgical procedures and operating room nurses in the scrub position wearing proper eye protection. The perception of barriers had the greatest influence on adherence, while the constructs of vulnerability, intensity, and benefits all had varying degrees

of associations with adherence depending on the SP actions with which they were associated. Using the HBM, Watson et al. (2011) evaluated surgeon adherence with proper use of personal protective equipment as well as presumed values influencing their adherence. Except for perceived barriers, the researchers discovered a connection between all HBM subscales and adherence. The majority of previous studies on SP enforcement and the factors that influence it were performed in acute care settings and with high-risk populations.

Adherence to SP was suboptimal in all tests, and it differed depending on the SP activity being tested. Adherence to SP is a serious problem that requires immediate attention. Since there were few studies in ambulatory settings, the current study was conducted in an ambulatory medical group of a major health system in the north-eastern United States. The HBM is a useful theoretical tool for understanding why nurses do not follow protective behaviours.

Table 1: Adherence with standard precautions

1. I provide nursing care considering all patients as potentially contagious
2. I wash my hands after the removal of gloves
3. I avoid placing foreign objects on my hands
4. I wear gloves when exposure of my hands to the body fluids is anticipated
5. I avoid needle recapping
6. I avoid the disassembling of a used needle from a syringe
7. I use a face mask when exposure to air-transmitted pathogens is anticipated
8. I wash my hands after the provision of care

9. I discard used sharp materials into sharps containers

CHAPTER THREE

3.0 METHODS

3.1 Study design

The design for this study is quantitative descriptive cross-sectional.

3.2 Study area

Tamale Central Hospital is the study area. The hospital is the second largest referral secondary facility in the metropolis with various services being provided for its consumers. The facility has a very high patient turnout (workload), because of this; the facility needs to have in place adequate resources, periodic trainings and high level of knowledge on SPs. However, HCWs may or may not adhere to SPs; hence the area was chosen to assess factors that may influence the above. The study area was chosen to see how well nurses followed SPs during the pandemic and what factors influenced their decisions including their knowledge levels, and challenges faced when trying to fully follow the standard precautions at all settings of patient care.

3.3 Study population

Nurses in the Tamale Central Hospital of the Tamale Metropolis of the Northern Region constituted the study's target population. There are approximately 216 nurses in the Tamale Central Hospital as contained in the nominal roll provided by head of nursing services in the hospital, and this number served as the sample frame for this study.

3.4 Inclusion criteria

All nurses in the Tamale Central Hospital who has been working in the clinical setting for not less than 6 months. Includes nurses aged 18 years and above who are of sound mind and consent to take part in the study.

3.5 Exclusion criteria

Non-nurses and nurses who have worked for less than 6 months were excluded from this study. Also nurses who were not of sound mind and were not working in Tamale Central Hospital were in this criterion.

3.6 Sample size

Thus, this research targeted only nurses at Central Hospital in the Tamale Metropolis and as such the Yamane (1967), sample size determination formula was then applied in calculating the sample size. Applying Yamane (1967), sample size (n) computation formula as:

$$n = \frac{N}{1+Ne^2} \quad \ldots\ldots (1)$$

Where n = sample size N

= target population of

nurses e = marginal

error (5%)

N = 216

$$n = \frac{216}{1 + 216\ (0.05)^2} = 140.2$$

A sample size of 140 nurses was used for this study.

3.7 Sampling

The database for nurses in the hospital was used as a sampling frame. The names of these 216 nurses were numbered from 1 to 216. A simple random sampling technique was applied for the selection of study participants. A total of 140 random numbers were

generated using Stat Trek's random number generator (https://stattrek.com/statistics/random-number-generator.aspx). Structured questionnaire were administered to the selected study participants.

3.8 Variables

3.8.1 Dependent Variable

The dependent variable was adherence to standard precautions. Standard precautions are the minimum practices relative to infection prevention and control that apply to all patient care. Adherence to standard precautions is a study participant complying with these minimum practices with a score ≥ mean adherence score of study participants as found in the study.

3.8.2 Independent variables

The independent variables were grouped into socio-demographic characteristics, individual level factors and health system related factors. Details are seen in tables in Appendix A.

3.9 Data collection tools and techniques

Study participants were given self-administered questionnaire after they had consented to partake in the study. The questionnaire consisted of 5 sections. Data on participants' socio-demographic characteristics were collected in the first section. A total of 6 questions were asked in this section. The questions were in relation to nurses' age, sex, marital status, ethnicity, religion, and highest level of education. The second section collected data on nurses' knowledge level on standard precautions with 29 questions asked in this section. Two questions in this section were in relation to training while the remaining 27 questions were in relation to knowledge on the concept of standard precautions, knowledge on potential ways of occupational exposure, knowledge on hand washing and knowledge on the importance of standard precautionary measures. The third section collected data on nurses' adherence to standard precautionary measures. Questions asked in this section were 21 and they were 4-point likert scale in nature (never, sometimes, often, and always). They were in relation to hand hygiene, use of personal protective equipment, disinfection, and handling of sharps. The fourth section collected data on individual level factors that influence nurses' adherence to standard precautionary measures. Questions asked in this section were 15 and they were in relation to cadre of nurse, working experience, reporting errors, and individual perceptions. The fifth section collected data on health system related factors. There were 18 questions in this section. The questions were in relation to availability of infection prevention and control resources, training, and monitoring.

3.10 Data quality control

To ensure quality data is collected for analysis, the data collection tool was pretested prior to the study. At the end of each day, the principal investigator and research assistants thoroughly reviewed and cross-checked the questionnaires to ensure accuracy and completeness.

3.11 Data processing and analysis

Data analysis was performed using STATA software version 16.0 for analysis. Continuous variables were presented as mean and standard deviation. Continuous variables were further categorized. Categorical variables were presented as frequencies and percentages. Proportions were determined using cross-tabulations. Parameter estimates were reported as proportions with their corresponding 95% confidence interval. At the bivariate level, Chi-square test and Fisher's exact were done to determine the association between adherence to standard precautions and socio-demographic characteristics, individual level factors, and health system related factors.

A p-value < 0.05 was set as level of significance. Multiple logistic regression analysis reporting odds ratio was used to determine the strength of the association. Variables that were statistically significant at the bivariate analysis level were selected and placed into a multiple logistic regression analysis model for statistical significance (p-value < 0.05).

Knowledge level of nurses on standard precautionary measures were determined by asking 27 questions on the concept of standard precautionary measures, potential ways of occupational exposure, hand washing and the importance of standard precautionary measures. Knowledge statements on SPs were presented to nurses to

answer using yes or no, the right response was scored 1 and the wrong response was scored 0. Nurses who correctly answered ≥ 80% of the questions under knowledge level were classified as having good knowledge while poor knowledge was classified as having correctly answered < 80% of the questions under knowledge. The study adopted Bloom's cut-off of ≥ 80% which has been used by several other studies to assess knowledge level (Kaliyaperumal, 2014; Kanu et al., 2021).

Nurses' adherence to standard precautionary measures was determined using questions related to practices of nurses on standard precaution. A 4-point liker scale with scoring as never - 1, sometimes - 2, often - 3, and always – 4 were used on 21 questions that assessed adherence to precautionary measures. Overall, maximum obtainable score for all 21 questions put together was 84. Participants scoring ≥ mean score were considered adherent to standard precautionary measures while participants scoring < mean score were considered non-adherent as was used in a similar study in South West Ethiopia (Beyamo, Dodicho and Facha, 2019).

3.12 Ethical Consideration

3.121 Ethical approval

Permission and approval for ethical clearance for the study was sought from Noguchi Memorial Institute for Medical Research (NMIMR). All participants gave their consent after the study's goals and methods were clarified to them in a language they understand.

3.122 Study area approval

The management of Tamale Central Hospital and the nurse in-charges for the wards and units were informed ahead of time and given permission before commencement of the study.

3.13 Informed Consent

As participants in the study, the principles of confidentiality and the provision of appropriate information to enable an informed judgment to be made by the participants was safeguarded. The researcher was duty bound to ascertain that the research was approved by the appropriate body and ensured that the rights of the participants are protected. The right to self-determination and autonomy of participants was respected throughout the study. Participation in the study was voluntary and participants will had the right to withdraw at any time.

Potential risk

No known risk was associated with participating in the study

Benefits

Participation in the study provided no direct benefit. The study's findings, on the other hand, will add to our understanding on adherence to standard precautions and also help management in instituting protocols and providing logistics that will improve personnel adherence.

Cost

Participation in the study was free of charge.

Compensation

There was no monetary reward for taking part in the study.

Confidentiality

The participants were guaranteed of their anonymity. On the questionnaires, the identity of the participants was not recorded. Their data was safeguarded by enclosing completed questionnaires in an envelope, ensuring that no one other than members of the research team had access to it and that it was only used for this study. Participants' identities were never revealed to a third party or in the study report.

Voluntary participation/withdrawal

Participation in the study was entirely voluntary, and participants were free to withdraw at any time.

Outcome and feedback

The information gathered was only used for this study. Participants received no direct feedback on the data.

Funding information

The research was self-funded by the principal investigator.

Provision of information and information and consent for participants

Participants were given a copy of the information sheet to keep after it was signed.

CHAPTER FOUR

4.0 RESULTS

4.1.1 Socio-demographic characteristics of respondents

The survey results (Table 4.1) showed that majority of nurses 78 (55.7%) were females. Majority, 64 (45.7%) were above 40 years. From the survey, the results revealed that 88 (62.9%) of the nurses were Muslims. Half of nurses 70 (50.0%) were certificates holders. Majority of nurses 81 (57.9%) were married. Furthermore, the analysis revealed that most of nurses (60.0%) belonged to Dagbon ethnic group.

4.2 Nurses' knowledge level on standard precautions

This section of the analysis presents nurse's knowledge level on standard precautions at their workplace.

4.2.1 Nurses training on standard precautions and source of training

The study revealed that all 140 (100.0%) nurses interviewed were of the view that they have undergone training on standard precautions. The analysis further revealed that, majority (67.9%) of the nurses had undergone training through an in-service education program. Also, 23 (16.4%) of the nurses had undergone training through a workshop organized by their hospital. Finally, 22 (15.7%) of the nurses had undergone training during their schooling days (see Figure 4.1 in Appendix B).

4.2.2 Knowledge on standard precautions

From the analysis in Table 4.2, it was evident that all 140 (100.0%) of the nurses interviewed acknowledged hand washing before and after any direct contact with a patient, consideration of the potential for transmission of infectious agents to patients, cough etiquette such as directing patients/relatives with symptoms of a

respiratory infection to cover their mouths/noses when coughing or sneezing, safe injection practices such as aseptic techniques, careful handling sharps and Needle stick/sharp injury. Furthermore, over 70% of the nurses interviewed were knowledgeable on segregation of refuse into color-coded bins, careful handling and processing of soiled linen, decontamination, splash on the eye, touching contaminated surfaces, before any direct contact with patients, immediately on arrival to the facility or ward and after touching body fluids such as blood, sweat and other bodily fluids. However, on the use of goggles, only a few 48 (34.3%) of the nurses used goggles at work.

4.2.3 Overall knowledge level of nurses on standard precautions

Overall, majority 117 (83.6%) of nurses had good knowledge on standard precautions as they were able to correctly answer ≥ 80% of questions that assessed knowledge of nurses on standard precautions. Nurses with poor knowledge were 23 (16.4%) (see Figure 4.2).

4.3 Nurses' adherence to standard precautions

The maximum adherence scores a nurse could have obtained after answering the 21 questions on adherence was 84. However, the maximum and minimum adherence score found in the study were 52 and 72 respectively. The mean ± Standard Deviation of the adherence score was 60 ± 4. Participants scoring ≥ mean score (60) were considered adherent to standard precautionary measures while participants scoring < mean score (60) were considered non-adherent (Table 4.3). Overall, nurses who were adherent to standard precautions were 64 (45.7%). The proportion of adherence to standard precautions amongst nurses was 45.7% (95%CI = 37.6 – 54.1) (see Figure 4.3).

4.4 Association of socio-demographic characteristic with adherence to standard precautions amongst nurses

Out of the 64 nurses who were adherent, 28 (43.8%) were diploma holders. Out of the 76 nurses who were non-adherent, majority 45 (59.2%) were certificate holders. Association between educational level and adherence to standard precautions was statistically significant (p-value = 0.018). No association was found between the other socio-demographic characteristics and adherence to standard precautions (Table 4.4).

4.5 Association of individual level factors with adherence to standard precautions amongst nurses

The results of the association of individual level factors with adherence to standard precautions amongst nurses are presented in Table 4.5a and 4.5b. Of the 64 nurses who were adherent and the 76 nurses who were non-adherent, 43 (67.2%) and 30 (39.5%) respectively indicated receipt of motivation for sincere report. There was statistically significant association between receipt of motivation for sincere report and adherence to standard precautions (x^2 = 10.69, p-value = 0.001). Of the 64 nurses who were adherent and the 76 nurses who were non-adherent, 49 (76.6%) and 68 (89.5%) respectively were allergic to materials (such as latex) used in making PPEs. Association between allergy to materials used in making PPEs and adherence to standard precautions was statistically significant (x^2 = 4.22, p-value = 0.04). Of the 64 nurses who were adherent and the 76 nurses who were non-adherent, 46 (71.9%) and 65 (85.5%) respectively had the perception that wearing PPEs might cause fear in patients. There was statistically significant association between perception that wearing PPEs might cause fear and adherence to standard precautions (x^2 = 3.94, p-value = 0.047) (Table 4.5a and 4.5b).

4.6 Association of health system related factors with adherence to standard precautions amongst nurses

Of the 64 nurses who were adherent and the 76 nurses who were non-adherent, 18 (28.1%) and 9 (11.8%) respectively indicated there was clean water adequately availability at the facility all the time. Association between availability of clean water in adequate quantity at facility and adherence to standard precautions was statistically significant (x^2 = 5.92, p-value = 0.015). Of the 64 nurses who were adherent and the 76 nurses who were non-adherent, 47 (73.4%) and 70 (92.1) respectively were aware of the presence of infection prevention committee at the facility. There was statistically significant association between awareness of infection prevention committee at the facility and adherence to standard precautions (x^2 = 8.82, p-value = 0.003) (Table 4.6a and 4.6b).

4.7 Crude and adjusted analysis of factors associated with nurses' adherence to standard precaution

Multiple logistic regression analysis was conducted on 6 variables that were statistically significant at 95% CI and P value < 0.05 at the bivariate level of analysis. Out of the 6 variables included in the model, only 2 were statistically significant and had an association with adherence to standard precautions in the multiple logistic regression model (p-value < 0.05). These variables include, receipt of motivation for sincere report, and availability of clean water. Table 4.7 below details how the related factors are associated with adherence to standard precautions using simple and multiple logistic regression analysis to determine the crude and adjusted odds ratios respectively, their corresponding 95%CI and p-values.

Adjusting for other variables, there was 4.43 times increased odds of adherence to standard precautions amongst nurses who receive motivation for sincere report compared to nurses who do not receive motivation for sincere report (aOR = 4.43, 95%CI = 1.93 – 10.17). With

other variables controlled for, there was 4.34 folds increased odds of adherence to standard precautions amongst nurses who indicated the availability of clean water in adequate quantity at the facility compared to nurses who indicated the non-availability of clean water in adequate quantity at the facility (aOR = 4.34, 95%CI = 1.53 – 12.35) .

CHAPTER FIVE

5.0 DISCUSSION

Summary

The knowledge level of nurses on standard precaution was high, however adherence to standard precautions was low. The study revealed that educational level of nurses had a statistically significant influence on nurses' adherence to standard precautions. Among other factors influencing nurses' adherence to standard precautions, the study revealed that nurses' awareness of infection prevention committee at the facility and availability of water had a statistical significance on nurses' adherence to standard precautions.

5.1 Nurses' knowledge level on standard precautions

The knowledge base of nurses and other healthcare workers on standard precautions is of great importance to ensure their safety. As a result, this study assessed the knowledge level of nurses on standard precautions. The study revealed a high level of training nurses on standard precautions since all 140 (100.0%) of nurses acknowledged that they have undergone training on standard precautions. Nurses undergoing training on standard precautions is a basic requirement for all healthcare workers across the nation and the world at large (Wong et al., 2020). Also, the study revealed a high level of nurse's knowledge on standard precautions as majority 117 (83.6%) of nurses had good knowledge on standard precautions as respondents correctly answered ≥ 80% of questions that assessed knowledge on standard precautions. According to a research conducted among Nigerian healthcare workers, the majority of respondents (89%) had adequate knowledge about healthcare infections and had a positive attitude toward preventive measures (Aluko et al., 2016). On the contrary, studies on nurse's knowledge on standard precautions have always shown a mixed result as Alice et al. (2013), reported that only a few (3.4%) of participants had a high level of knowledge (score ≥80%)

on standard precautions. However, Asmr et al., (2019) also reported that (89.7%) of healthcare workers had good knowledge (score ≥63%) on standard precautions.

Tadesse-Alemayehu and Asse (2018) conducted a study at the Central Hospital of Ethiopia to determine nurse awareness and practice of standard precautions. The findings revealed that nurses' knowledge of SP was limited, with only 34.2 percent of nurses having heard of them. Breaking the cycle of infections, especially between health care staff and their patients, requires a high degree of knowledge, attitude, and adherence to conventional procedures. Refeai et al. (2020) conducted a cross-sectional analysis in a public hospital and found that 11% of all participants' thought SP was only intended to protect nurses, whereas 52.4% thought SP was meant to protect both nurses and patients.

Rungta et al., (2020) conducted another cross-sectional study in India to determine the level of information about SP steps. According to the study's results, roughly (50 percent) of participants were familiar with all SP scales.

5.2 Nurses' adherence to standard precautions

The maximum adherence scores a nurse could have obtained after answering the 21 questions on adherence was 84. However, the maximum and minimum adherence score found in the study were 52 and 72 respectively. The mean ± Standard Deviation of the adherence score was 60 ± 4. Participants scoring ≥ mean score (60) were considered adherent to standard precautions while participants scoring < mean score (60) were considered non-adherent. Overall, nurses who were adherent to standard precautions were low. The proportion of adherence to standard precautions amongst nurses was 45.7% (95%CI = 37.6 – 54.1). The impact of non-adherence to standard precaution is increased rate of nosocomial infection among nurses and clients.

On the various parameters of standard precaution, the study revealed all participants (100%) performed sterilization of all reusable equipment before being used on another patient. Again,

there was high level of adherence for putting used needles into sharp containers (63.6%), promptly wipes all blood or bodily fluid spills (60%), clean and disinfect environmental surfaces (79.3). However, adherence to other parameters of SP was low. Similarly, there was low adherence when this result was compared to other studies. According to a study, overall adherence with standard precautions by healthcare workers' was found to be very low, with a rate of adherence of only 12%, though there were better adherence results with some specific SP parameters like washing hands after body fluid exposure, washing hands immediately after removing gloves, and wearing clean gloves whenever there is a possibility of exposure to body fluids. (Haile, Engeda, & Abdo, 2017).

5.3 Factors associated with nurses' adherence to standard precautions

These factors were grouped into socio-demographic factors, individual level factors and health system related factors.

5.3.1 Socio-demographic factors that influence nurses' adherence to standard precautions

The study reported a highly female-dominated field of respondents 78 (55.7%) being females. This result confirms a study by [Barrett-Landau and Henle (2014)], nursing is a female-dominated field. Additionally, the study revealed that most of the nurses in the hospital are within their production age. Most of the nurses 64 (45.7%) interviewed are more than 40 years with more working experience as nurses. However, a worrying trend was observed among nurses in the hospital as majority 70 (50.0%) of the nurses interviewed were certificate holders with a very few 3 (2.1%) specialized nurses with master's degree.

The study revealed that educational level of nurses had a statistically significant influence on nurses' adherence to standard precautions. According to [Abebaw and colleagues (Abebaw et al., (2017)], higher educational attainment had direct relationship with doctor's adherence to

standard precautions. Generally, educational status of health care workers has reported to influence health care workers adherence to standard precautions positively.

However, the other socio-demographic characteristics were not statistically significant on nurse's adherence to standard precautionary measures.

5.3.2 Individual level factors that influence nurses' adherence to standard precautions

The study revealed that, of the 64 nurses who were adherent and the 76 nurses who were non-adherent, 43 (67.2%) and 30 (39.5%) respectively indicated receipt of motivation for sincere report. There was statistically significant association between receipt of motivation for sincere report and adherence to standard precautions (x^2 = 10.69, p-value = 0.001). Of the 64 nurses who were adherent and the 76 nurses who were non-adherent, 49 (76.6%) and 68 (89.5%) respectively were allergic to materials (such as latex) used in making PPEs. Association between allergy to materials used in making PPEs and adherence to standard precautions was statistically significant (x^2 = 4.22, p-value = 0.04). There was statistically significant association between perception that wearing PPEs might cause fear and adherence to standard precautions (x^2 = 3.94, p-value = 0.047). Akgur and Dal (2012) conducted a study in Cyprus to determine the factors that led to nurses refusing to comply with SP. The findings revealed that lack of supplies, negative effects of protective equipment on nurses such as skin discomfort, lack of nurses, and psychological factors, as well as the time-consuming implementation of protocols, working experiences, and impact on nurses' appearance, were all obstacles to implementing SP steps. Of the 64 nurses who were adherent and the 76 nurses who were non-adherent, 46 (71.9%) and 65 (85.5%) respectively had the perception that wearing PPEs might cause fear in patients.

5.3.3 Health system related factors that influence nurses' adherence to standard precautions

The study revealed that the availability of clean water in adequate quantity at facility had a statistically significant (x^2 = 5.92, p-value = 0.015) influence on nurses' adherence to standard precautions. This result contradict the findings of a study which reported most health facilities do not have the requisite resource such as water and soup for washing of hands during working hours (Njovu, 2016). However, [Wong and colleagues (Wong et al., 2020), found a positive relationship between water resource availability in health facilities and adherence to standard precautions. Furthermore, nurses' awareness of infection prevention committee at the facility had a statistically significant influence on nurses' adherence to standard precautions. These findings support a study by Porto and Marziale (2016), as they reported that institutional monitoring and evaluation on standard precautions is a major drive of influencing healthcare workers adherence to standard precautions. Usually, most healthcare workers are afraid that they might lose their job if they fail to adhere to institutional standard precautions. This fear factor of losing one's job could be a reason for it recording a positive relationship between awareness of infection prevention committee at the facility and adherence to standard precautions in the study area. Here, nurses' awareness of infection prevention committee at the facility can be attributed to their high level of adherence to standard precautions.

5.4 Limitations

1. The findings of this study may not apply to all professions or healthcare facilities. The research was carried out in a secondary health facility in the Northern region. As a result, the findings may not be applicable to other levels of healthcare facilities as conditions elsewhere may be different than those described in this study
2. The cross sectional nature of the study makes it difficult to establish causality

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

In the hospital environment, standard precautions help in minimizing or preventing the nurses and healthcare workers in general from contracting infections. In assessing nurses' knowledge level on standard precautions, the study concludes that, nurses in the study area had a high level of knowledge on standard precautions. This was attributed to trainings from in-service education, workshop and school.

The study further assessed nurse's adherence to standard precautions in the study area. It concludes that, the overall nurse's adherence to standard precautions was low.

Again, in determining the socio-demographic factors that influence nurses' adherence to standard precautions, the study concludes that, the association between educational level and adherence to standard precautions was statistically significant. However, no association was found between the other socio-demographic characteristics and adherence to standard precautions.

Furthermore, in determining individual level factors that influence nurses' adherence to standard precautions, the study concludes that there was statistically significant association between receipt of motivation for sincere report and adherence to standard precautions. It also concludes that, the association between allergy to materials used in making PPEs and adherence to standard precautions was statistically significant. Again, the study concludes that, there was statistically significant association between perception that wearing PPEs might cause fear and adherence to standard precautions.

Lastly, in determining health system related factors that influence nurses' adherence to standard precautions, the study concludes that, the association between availability of clean

water in adequate quantity at facility and adherence to standard precautions was statistically significant. It also concludes that, there was statistically significant association between awareness of infection prevention committee at the facility and adherence to standard precautions.

6.2 Recommendations

Based on the study findings the following recommendations were made:

1. To improve health-care delivery practices in terms of standard precautions, regular workshops and in-service training should be maintained. Despite the fact that IPC training is ongoing and nurses have a high level of standard precaution knowledge, management should continue to update and refresh staff on standard precautions.
2. Nurses and other health professionals should have access to the resources they need to practice standard precautions in accordance with IPC policy guidelines, which should be provided by hospital management.
3. Hospital management should institute awards or motivation for those adhering to standard precautions.

REFERENCES

Abbasinazari, M., Zareh-Toranposhti, S., Hassani, A., Sistanizad, M., Azizian, H., & Panahi, Y. (2012). The effect of information provision on reduction of errors in intravenous drug preparation and administration by nurses in ICU and surgical wards. *Acta Medica Iranica*, 771-777.

Abebaw, T. A., Aderaw, Z., & Gebremichael, B. (2017). Hepatitis B virus vaccination status and associated factors among health care workers in Shashemene Zonal Town, Shashemene, Ethiopia: a cross sectional study. *BMC research notes*, *10*(1), 1-9.

Abou El-Enein, N. Y., & El Mahdy, H. M. (2011). Standard precautions: a KAP study among nurses in the dialysis unit in a University Hospital in Alexandria, Egypt. *The Journal of the Egyptian Public Health Association*, *86*(1 and 2), 3-10.

Akgur, M., & Dal, U. (2012). The prevalence of needle stick and sharps injuries in nurses in North Cyprus. *Pakistan Journal of Medical Sciences Quarterly*, *28*(3), 437.

Alice, T. E., Akhere, A. D., Ikponwonsa, O., & Grace, E. (2013). Knowledge and practice of infection control among health workers in a tertiary hospital in Edo state, Nigeria. *Direct Res J Health Pharm*, *1*(2), 20-27.

Almurr, B. J. (2013). *Knowledge and Practice of Standard Precaution and Sharp Injures among Nurses in the Northern West Bank Hospitals; Palestine* (Doctoral dissertation).

Alnoumas, S. R., Enezi, F. A., Isaeed, M. M., Makboul, G., & El-Shazly, M. K. (2012). Knowledge, attitude and behavior of primary health care workers regarding health care-associated infections in Kuwait. *Greener Journal of Medical Sciences*, *2*(4), 092-098.

Aluko, O. O., Adebayo, A. E., Adebisi, T. F., Ewegbemi, M. K., Abidoye, A. T., & Popoola, B. F. (2016). Knowledge, attitudes and perceptions of occupational hazards and safety practices in Nigerian healthcare workers. *BMC research notes*, *9*(1), 1-14.

Asmr, Y., Beza, L., Engida, H., Bekelcho, T., Tsegaye, N., & Aschale, Y. (2019). Assessment of knowledge and practices of standard precaution against blood borne pathogens among doctors and nurses at adult emergency room in Addis Ababa, Ethiopia. *Emergency medicine international*, *2019*.

Aung, S. S., & Dewi, Y. S. (2016). Improving compliance with standard precautions among Myanmar nurses using health belief model. *The Malaysian Journal of Nursing (MJN)*, *8*(2), 21-28.

Aung, S. S., Nursalam, N., & Dewi, Y. S. (2017). Factors Affecting the Compliance of Myanmar Nurses in Performing Standard Precaution. *Jurnal Ners*, *12*(1), 1-8.

Ayed, A. (2015). Knowledge and practice of nursing staff towards infection control measures in the Palestinian hospitals.

Bakry, S. H., Mustafa, A. F., Eldalo, A. S., & Yousif, M. A. (2012). Knowledge, attitude and practice of health care workers toward Hepatitis B virus infection, Sudan. *International Journal of Risk & Safety in Medicine*, *24*(2), 95-102.

Bandyopadhyay, S., Baticulon, R. E., Kadhum, M., Alser, M., Ojuka, D. K., Badereddin, Y., ... & Khundkar, R. (2020). Infection and mortality of healthcare workers worldwide from COVID-19: a scoping review. *medRxiv*.

Barrett-Landau, S., & Henle, S. (2014). Men in Nursing: Their Influence in a Female Dominated Career. *Journal for Leadership and Instruction*, *13*(2), 10-13.

Beghdadli, B., Belhadj, Z., Chabane, W., Ghomari, O., Kandouci, A. B., & Fanello, S. (2008). " Standard precautions" practices among nurses in a university hospital in Western Algeria. *Sante publique (Vandoeuvre-les-Nancy, France)*, *20*(5), 445-453.

Beruni, M. Z. A. (2017). Operation and supply chain management of Eskayef Pharmaceuticals Limited.

Beyamo, A., Dodicho, T., and Facha, W. (2019). Compliance with standard precaution practices and associated factors among health care workers in Dawuro Zone, South West Ethiopia, cross sectional study. *BMC Health Services Research*, 19, 381.

Bizzoca, M. E., Campisi, G., & Muzio, L. L. (2020). Covid-19 pandemic: What changes for dentists and oral medicine experts? A narrative review and novel approaches to infection containment. *International journal of environmental research and public health*, *17*(11), 3793.

Bizzoca, M. E., Campisi, G., & Muzio, L. L. (2020). Covid-19 pandemic: What changes for dentists and oral medicine experts? A narrative review and novel approaches to infection containment. *International journal of environmental research and public health*, *17*(11), 3793.

Bouchoucha, S. L., Kilpatrick, M., Lucas, J. J., Phillips, N. M., & Hutchinson, A. (2021). The Factors Influencing Adherence to Standard Precautions Scale–Student version (FIASP-SV): A psychometric validation. *Infection, Disease & Health*, *26*(2), 85-94.

Boyce, J. M., & Pittet, D. (2002). Guideline for hand hygiene in health-care settings: recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. *American journal of infection control*, *30*(8), S1-S46.

Boyce, J. M., & Schaffner, D. W. (2021). Scientific Evidence Supports the Use of Alcohol-Based Hand Sanitizers as an Effective Alternative to Hand Washing in Retail Food and Food Service Settings When Heavy Soiling Is Not Present on Hands. *Journal of food protection*, *84*(5), 781-801.

Burki, T. (2020). Global shortage of personal protective equipment. *The Lancet Infectious Diseases*, *20*(7), 785-786.

Burnett, L. C., Lunn, G., & Coico, R. (2009). Biosafety: guidelines for working with pathogenic and infectious microorganisms. *Current Protocols in Microbiology*, *13*(1), 1A-1.

Burton, M. J., Clarkson, J. E., Goulao, B., Glenny, A. M., McBain, A. J., Schilder, A. G., ... & Worthington, H. V. (2020). Antimicrobial mouthwashes (gargling) and nasal sprays administered to patients with suspected or confirmed COVID-19 infection to improve patient outcomes and to protect healthcare workers treating them. *Cochrane Database of Systematic Reviews*, (9).

Champion, V. L. (1984). Instrument development for health belief model constructs. *Advances in nursing science*.

Chou, R., Dana, T., Buckley, D. I., Selph, S., Fu, R., & Totten, A. M. (2020). Epidemiology of and risk factors for coronavirus infection in health care workers: a living rapid review. *Annals of internal medicine*, *173*(2), 120-136.

Cirillo, N. (2020). COVID-19 outbreak: succinct advice for dentists and oral healthcare professionals. *Clinical Oral Investigations*, *24*, 2529-2535.

Collins, C. S., & Stockton, C. M. (2018). The central role of theory in qualitative research. *International Journal of Qualitative Methods*, *17*(1), 1609406918797475.

Critical, A. (2021). Infection Prevention and Control in the. *Essentials of Nursing Critically Ill Adults*, 55.

Desrochers, C. (2017). *Are nurses protected? Observing the risk of skin contamination when donning and doffing personal protective equipment, using a Canadian protocol* (Doctoral dissertation, Laurentian University of Sudbury).

Efstathiou, 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), 1-12.

Flaherty, E., & Bartels, S. J. (2019). Addressing the community-based geriatric healthcare workforce shortage by leveraging the potential of interprofessional teams. *Journal of the American Geriatrics Society*, *67*(S2), S400-S408.

Forrester, J. D., Nassar, A. K., Maggio, P. M., & Hawn, M. T. (2020). Precautions for operating room team members during the COVID-19 pandemic. *Journal of the American College of Surgeons*, *230*(6), 1098-1101.

Galal, Y. S., Labib, J. R., & Abouelhamd, W. A. (2014). Impact of an infection-control program on nurses' knowledge and attitude in pediatric intensive care units at Cairo University hospitals. *The Journal of the Egyptian Public Health Association*, *89*(1), 22-28.

Gravetter, F. J., & Forzano, L. A. B. (2018). *Research methods for the behavioral sciences*. Cengage Learning.

Gyawali, S., Rathore, D. S., Bhuvan, K. C., & Shankar, P. R. (2013). Study of status of safe injection practice and knowledge regarding injection safety among primary health care workers in Baglung district, western Nepal. *BMC international health and human rights*, *13*(1), 1-7.

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*.

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*.

Hariri, R. H., Fredericks, E. M., & Bowers, K. M. (2019). Uncertainty in big data analytics: survey, opportunities, and challenges. *Journal of Big Data*, *6*(1), 1-16.

Hassan, Z. M. (2018). Improving knowledge and compliance with infection control standard precautions among undergraduate nursing

Hessels, A. J., Genovese-Schek, V., Agarwal, M., Wurmser, T., & Larson, E. L. (2016). Relationship between patient safety climate and adherence to standard precautions. *American journal of infection control*, *44*(10), 1128-1132.

Hessels, A. J., & Larson, E. L. (2016). Relationship between patient safety climate and standard precaution adherence: a systematic review of the literature. *Journal of Hospital Infection*, *92*(4), 349-362.

https://stattrek.com/statistics/random-number-generator.aspx

Itodo, G. E., Enitan, S. S., Oyekale, A. O., Agunsoye, C. J., Asukwo, U. F., & Enitan, C. B. (2020). COVID-19 among healthcare workers: risk of exposure, impacts and biosafety measures–a review. *International Journal of Health, Safety and Environment*, *6*, 534-548.

Jain, N., Hung, I. C., Kimura, H., Goh, Y. L., Jau, W., Huynh, K. L. A., ... & Huy, N. T. (2022). The global response: How cities and provinces around the globe tackled covid-19 outbreaks in 2021. *The Lancet Regional Health-Southeast Asia*, *4*, 100031.

Joseph, B., & Arasu, S. (2020). Occupational Risks and Health Promotion for Healthcare Workers. *Handbook of Global Health*, 1-29.

Kaliyaperumal, K. (2004). Guideline for conducting a knowledge, attitude and practice (KAP) study. *AECS Illumination*, *4*(1), 7–9.

Kanu, S., Bah, A. J., Ellen, C., Williams, E., & Kanu, J. S. (2021). Healthcare Workers ' Knowledge , Attitude , Practice and Perceived Health Facility Preparedness Regarding COVID-19 in Sierra Leone. *Journal of Multidisciplinary Healthcare*, *14*, 67–80.

Kimura, M. (2020). Introduction to population genetics. In *My Thoughts on Biological Evolution* (pp. 85-101). Springer, Singapore.

Kretzer, D. (2018). STANDARD PRECAUTIONS (INCLUDING HAND HYGIENE AND USE OF PPE). *Policy*.

Labrague, L. J., Rosales, R. A., & Tizon, M. M. (2012). Knowledge of and compliance with standard precautions among student nurses. *International journal of advanced nursing studies*, *1*(2), 84-97.

Lakbala, P., Azar, F. E., & Kamali, H. (2012). Needlestick and sharps injuries among housekeeping workers in hospitals of Shiraz, Iran. *BMC research notes*, *5*(1), 1-5.

Lee, J., Venugopal, V., Latha, P. K., Alhadad, S. B., Leow, C. H. W., Goh, N. Y. D., ... & Lee, J. K. W. (2020). Heat stress and thermal perception amongst healthcare workers during the covid-19 pandemic in india and singapore. *International Journal of Environmental Research and Public Health*, *17*(21), 8100.

Leslie, H. H., Sun, Z., & Kruk, M. E. (2017). Association between infrastructure and observed quality of care in 4 healthcare services: A cross-sectional study of 4,300 facilities in 8 countries. *PLoS medicine*, *14*(12), e1002464.

Livshiz-Riven, I., Nativ, R., Borer, A., Kanat-Maymon, Y., & Anson, O. (2014). Nursing students' intentions to comply with standard precautions: an exploratory prospective cohort study. *American journal of infection control*, *42*(7), 744-749.

MacIntyre, C. R., Wang, Q., Rahman, B., Seale, H., Ridda, I., Gao, Z., ... & Dwyer, D. E. (2014). Efficacy of face masks and respirators in preventing upper respiratory tract bacterial colonization and co-infection in hospital healthcare workers. *Preventive medicine*, *62*, 1-7.

Magiorakos, A. P., Burns, K., Baño, J. R., Borg, M., Daikos, G., Dumpis, U., ... & Weber, J. T. (2017). Infection prevention and control measures and tools for the prevention of entry of carbapenem-resistant Enterobacteriaceae into healthcare settings: guidance from the European Centre for Disease Prevention and Control. *Antimicrobial Resistance & Infection Control*, *6*(1), 1-17.

Maroldi, M. A. C., da Silva Felix, A. M., Dias, A. A. L., Kawagoe, J. Y., Padoveze, M. C., Ferreira, S. A., ... & Figueiredo, R. M. (2017). Adherence to precautions for preventing the transmission of microorganisms in primary health care: a qualitative study. *BMC nursing*, *16*(1), 1-8.

Marzo, R. R., Keat, T. S., Min, M. T. S., Lee, S. T. S., & Vin, C. K. (2018). Zika Virus-The Perfect Storm. *Emergency Med*, *8*(384), 2.

Mehta, Y., Gupta, A., Todi, S., Myatra, S. N., Samaddar, D. P., Patil, V., ... & Ramasubban, S. (2014). Guidelines for prevention of hospital acquired infections. *Indian journalof critical care medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine*, *18*(3), 149.

Musu, M., Lai, A., Mereu, N. M., Galletta, M., Campagna, M., Tidore, M., ... & Coppola,

R. C. (2017). Assessing hand hygiene compliance among healthcare workers in six Intensive Care Units. *Journal of preventive medicine and hygiene*, *58*(3), E231.

Nardi, P. M. (2018). *Doing survey research: A guide to quantitative methods*. Routledge.

Nieradko-Iwanicka, B. (2020). Hygiene–gold standard not only in prevention of COVID-19 infection. *Reumatologia*, *58*(4), 191.

Nkrumah, D. O., Ofosuhene, E. Y., & Gyasi, K. (2020). COVID-19 pandemic and presidential directives: the brutalities of the Ghana Police Service. *Acta Criminologica: African Journal of Criminology & Victimology*, *33*(3), 1-27.

O'Cathain, A., & Thomas, K. (2006). Combining qualitative and quantitative methods. *Qualitative research in health care*, *3*, 102-111.

Okechukwu, E. F., & Motshedisi, C. (2012). Knowledge and practice of standard precautions in public health facilities in Abuja, Nigeria. *International Journal of Infection Control*, *8*(3).

Pong, S. M. (2019). *Increasing Hand Hygiene Performance in Health Care Workers with Electronic Real-time Prompting* (Doctoral dissertation, University of Toronto (Canada).

Porto, J. S., & Marziale, M. H. P. (2016). Reasons and consequences of low adherence to standard precautions by the nursing team. *Revista gaucha de enfermagem*, *37*.

Quinn, M. M., Henneberger, P. K., Braun, B., Delclos, G. L., Fagan, K., Huang, V., ... & Zock, J. P. (2015). Cleaning and disinfecting environmental surfaces in health care: toward an integrated framework for infection and occupational illness prevention. *American journal of infection control*, *43*(5), 424-434.

Refeai, S. A., Kamal, N. N., Ghazawy, E. R. A., & Fekry, C. M. (2020). Perception and barriers regarding infection control measures among healthcare workers in Minia city, Egypt. *International journal of preventive medicine*, *11*.

Rungta, R., DeWan, A. T., Gawali, V., de Witte, L., & Hassan, S. (2020). Using a Screening Toolkit to Determine the Prevalence of Non-Communicable Diseases in an Urban Slum of Mumbai, India: A Cross-Sectional Study.

Rutala, W. A., & Weber, D. J. (2019). Best practices for disinfection of noncritical environmental surfaces and equipment in health care facilities: A bundle approach. *American journal of infection control*, *47*, A96-A105.

Seaton, R. A., Mueller, D., Miljković, N., Ogunleye, O. O., Basu, D., Sneddon, J., ... & Wamboga, J. (2020). Response to the novel Corona virus (COVID-19) pandemic across Africa: successes, challenges, and implications for the Future.

Serdar, C. C., Cihan, M., Yücel, D., & Serdar, M. A. (2021). Sample size, power and effect size revisited: simplified and practical approaches in pre-clinical, clinical and laboratory studies. *Biochemia Medica*, *31*(1), 27-53.

Shen, L., Li, S., Zhu, Y., Zhao, J., Tang, X., Li, H., ... & Lan, J. (2020). Clinical and laboratory-derived parameters of 119 hospitalized patients with coronavirus disease 2019 in Xiangyang, Hubei Province, China. *Journal of Infection*, *81*(1), 147-178.

Stawicki, S. P., Jeanmonod, R., Miller, A. C., Paladino, L., Gaieski, D. F., Yaffee, A. Q., ... & Garg, M. (2020). The 2019–2020 novel coronavirus (severe acute respiratory syndrome coronavirus 2) pandemic: A joint american college of academic international medicine-world academic council of emergency medicine multidisciplinary COVID-19 working group consensus paper. *Journal of global infectious diseases*, *12*(2), 47.

Sun, N., Wei, L., Shi, S., Jiao, D., Song, R., Ma, L., ... & Wang, H. (2020). A qualitative study on the psychological experience of caregivers of COVID-19 patients. *American journal of infection control*, *48*(6), 592-598.

Tadesse Alemayehu, A. W., & Assea, N. (2018). Knowledge and practice of healthcare workers about standard precaution: Special emphasis on medical waste management in Ethiopia. *International Journal of Infection Control*, *14*, i2.

Tavory, I. (2020). Interviews and inference: Making sense of interview data in qualitative research. *Qualitative Sociology*, *43*(4), 449-465.

Van Doremalen, N., Bushmaker, T., Morris, D. H., Holbrook, M. G., Gamble, A., Williamson, B. N., ... & Munster, V. J. (2020). Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *New England journal of medicine*, *382*(16), 1564-1567.

Volgenant, C. M. C., & De Soet, J. J. (2018). Cross-transmission in the dental office: does this make you ill?. *Current oral health reports*, *5*(4), 221-228.

Watson, C. M., Duval-Arnould, J. M., McCrory, M. C., Froz, S., Connors, C., Perl, T. M., & Hunt, E. A. (2011). Simulated pediatric resuscitation use for personal protective equipment adherence measurement and training during the 2009 influenza (H1N1) pandemic. *The Joint Commission Journal on Quality and Patient Safety*, *37*(11), 515-AP1.

Wittkowski, K., Klein, J. F., Falk, T., Schepers, J. J., Aspara, J., & Bergner, K. N. (2020). What gets measured gets done: Can self-tracking technologies enhance advice compliance?. *Journal of Service Research*, *23*(3), 281-298.

Wong, J., Goh, Q. Y., Tan, Z., Lie, S. A., Tay, Y. C., Ng, S. Y., & Soh, C. R. (2020). Preparing for a COVID-19 pandemic: a review of operating room outbreak response

measures in a large tertiary hospital in Singapore. *Canadian Journal of Anesthesia/Journal canadien d'anesthésie*, *67*(6), 732-745.

World Health Organization. (2018). *Managing epidemics: key facts about major deadly diseases*. World Health Organization.

World Health Organization. (2020). *Rational use of personal protective equipment for COVID-19 and considerations during severe shortages: interim guidance, 23 December 2020* (No. WHO/2019-nCoV/IPC_PPE_use/2020.4). World Health Organization.

APPENDICES

APPENDIX A: INDEPENDENT VARIABLES

Table 3.1: Operational definition of socio-demographic characteristics

Variables	Operational definition	Variable type	Source of data
Sex	Biological make-up	Binary Male / Female	Questionnaire
Age	Age at last birthday	Categorical 20 - 30years 31 - 40years > 40years	Questionnaire
Marital status	Status of nurse in relation to marriage	Nominal Married Single Divorced Widowed	Questionnaire
Religion	Faith practices by nurse	Nominal Christianity Islam Traditional Other	Questionnaire
Ethnic group	Cultural background of nurse	Nominal Akan	Questionnaire

		Dagbon Frafra Konkomba Gonja Other	
Educational level	Highest formal education attained	Ordinal Specialty Masters BSc Diploma Certificate	Questionnaire

Table 3.2a: Operational definition of individual level factors

Variables	Operational definition	Variable type	Source of data
Cadre	Category of nurse	Nominal General nurse Enrolled nurse Midwife Specialist	Questionnaire
Years of working Experience	Number of years nurse spent by nurse working after leaving nursing school	Continuous (in years)	Questionnaire
Safety practice for all Patients	Nurse performs task with minimum risk to patients	Binary (No/Yes)	Questionnaire
Report errors when handling patients	Nurse reporting errors committed when caring for patients	Binary (No/Yes)	Questionnaire
Receipt of motivation for sincere report	Nurse receiving commendation for reporting errors by self	Binary (No/Yes)	Questionnaire
Perception that compliance during emergency put patient	Nurse perceiving that strictly adhering to standard precaution	Binary (No/Yes)	Questionnaire

at risk	exposes patient to risk		
Perception that compliance increases load of work	Nurse perceiving that strictly adhering to standard precautions can increase work load	Binary (No/Yes)	Questionnaire
Not being comfortable with wearing and using PPEs	Nurse having difficulties performing procedures when PPEs are worn	Binary (No/Yes)	Questionnaire
Perception that using PPEs increases work time	Nurse perceiving that strictly adhering to standard precautions can increase time needed to execute task	Binary (No/Yes)	Questionnaire
Adhering to SP interferes with the ability to provide care	Nurse perceiving that strictly adhering to standard precautions can cause interference to patient care	Binary (No/Yes)	Questionnaire
Allergy to materials used in making the PPEs e.g latex	Nurse being allergic to Latex	Binary (No/Yes)	Questionnaire

Table 3.2b: Operational definition of individual level factors

Variables	Operational definition	Variable type	Source of data
Perception that wearing protective equipment might cause fear in patients	Nurse perceiving that downing PPE can be scary for patients	Binary (No/Yes)	Questionnaire
Perception that practice of SP is time consuming	Nurse perceiving that strictly adhering to standard precautions will require more time	Binary (No/Yes)	Questionnaire
Perception that patients do not pose a risk	Nurse perceiving that they are not exposed since their patients do not pose as source of infection	Binary (No/Yes)	Questionnaire
Reliance on experience and confidence in skills hence no need to use PPEs	Nurse perceiving that his/her experience makes her less prone to risk of infection, hence no need to use PPEs	Binary (No/Yes)	Questionnaire
Overall knowledge level on SP	Overall knowledge score (i.e using Bloom's cut-off) of nurses on	Binary (Poor/Good)	Questionnaire

standard precautions

Table 3.3a: Operational definition of health system related factors

Variables	Operational definition	Variable type	Source of data
Availability of clean water	Availability of clean water in adequate quantity at facility always	Binary (No/Yes)	Questionnaire
Availability of soap	Availability of soap in adequate quantity at facility always	Binary (No/Yes)	Questionnaire
Availability of alcohol-based hand sanitizers	Availability of alcohol-based hand sanitizers in adequate quantity at facility always	Binary (No/Yes)	Questionnaire
Availability of PPEs	Availability of PPEs in adequate quantity at facility	Binary (No/Yes)	Questionnaire

Table 3.3b: Operational definition of health system related factors

Variables	Operational definition	Variable type	Source of data
Training in the last 3months on standard precautions	The occurrence of training on standard precaution in the last 3 months at the hospital	Binary (No/Yes)	Questionnaire
Trained on hand hygiene	Nurse trained on hand hygiene by hospital	Binary (No/Yes)	Questionnaire
Trained on PPEs	Nurse trained on PPEs by Hospital	Binary (No/Yes)	Questionnaire
Trained on safe injection Practices	Nurse trained by hospital on safe injection practices	Binary (No/Yes)	Questionnaire
Trained on handling and disposing sharps	Nurse trained by hospital on handling and disposing sharps	Binary (No/Yes)	Questionnaire
Trained on instrument processing and waste management	Nurse trained by hospital on instrument processing and waste management	Binary (No/Yes)	Questionnaire
Monitoring and evaluation of standard precautions in the facility	The existence of monitoring and evaluation of nurses on practices of standard precautions in the hospital	Binary (No/Yes)	Questionnaire
Punishment giving for non-adherence to standard	The existence of punishment of nurses for	Binary (No/Yes)	Questionnaire

precautions at the facility	non-adherence to standard precautions in the hospital		
Presence of posters/flyers of standard precautions	Presence of posters/flyers of standard precautions at vantage points in the facility	Binary (No/Yes)	Questionnaire
Training on patient safety culture in the facility	Nurse trained by hospital on patient safety culture	Binary (No/Yes)	Questionnaire
Training on staff safety culture in the facility	Nurse trained by hospital on staff safety culture	Binary (No/Yes)	Questionnaire
Training on prevention of COVID-19 infection in the Facility	Nurse trained by hospital on prevention of COVID-19 infection in the hospital	Binary (No/Yes)	Questionnaire
Awareness of infection prevention committee at the facility	Nurse awareness of the existence of infection prevention committee at the hospital	Binary (No/Yes)	Questionnaire
COVID-19 pandemic affecting the way patients are handled	Occurrence of negative impact of COVID-19 on patient care at the hospital	Binary (No/Yes)	Questionnaire

APPENDIX B: RESULTS

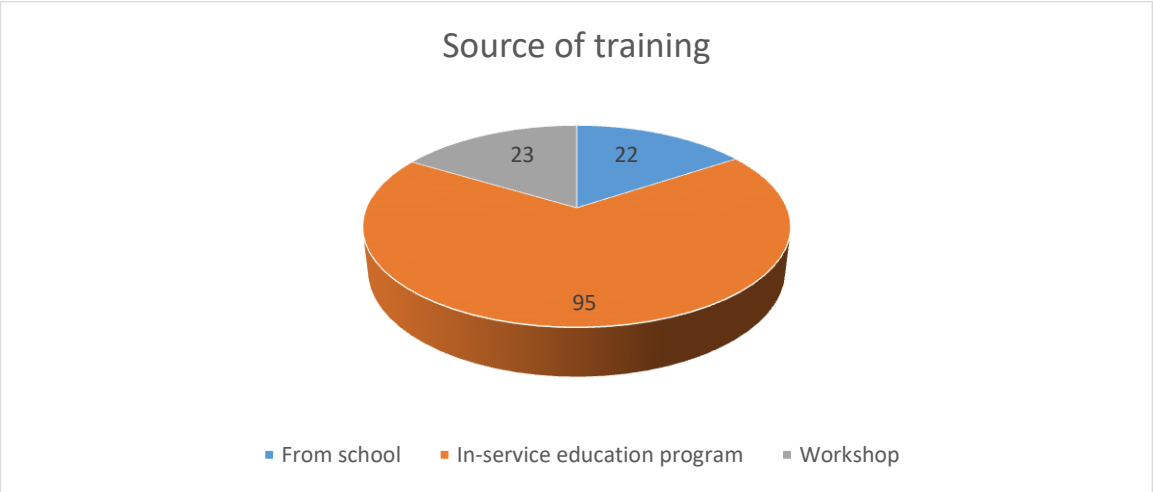
Table 4.1: Socio-demographic characteristics of respondents

Variables	Frequency	Percentage
Sex of respondent		
Female	78	55.7
Male	62	44.3
Age of respondent		
20-30years	19	13.6
31-40years	57	40.7
more than 40 years	64	45.7
Marital status		
Married	81	57.9
Single	43	30.7
Divorced	11	7.9
Widowed	5	3.6
Religion		
Christianity	43	30.7
Islam	88	62.9
Traditional	9	6.4
Ethnic group		
Akan	7	5

Dagbon	84	60
Frafra	14	10
Konkomba	17	12.1
Gonja	18	12.9
Educational level		
Speciality	5	3.6
Masters	3	2.1
BSc degree	15	10.7
Diploma	47	33.6
Certificate	70	50

Source: Field survey data (2021)

Figure 4.1: Training on standard precautionary measures



Source: Field Survey Data, (2021)

Table 4.2: Knowledge on the concepts of standard precautions

Knowledge on Standard Precautions	Responses	
	Yes *f (%)*	No *f (%)*
Concepts of Standard Precautions		
Hand washing before and after any direct contact with patient	140 (100.0)	0 (0.0)
Consideration of the potential for transmission of infectious agents to patients	140 (100.0)	0 (0.0)
Cough etiquette such as directing patients/relatives with symptoms of a respiratory infection to cover their mouths/noses when coughing or sneezing	140 (100.0)	0 (0.0)
Safe injection practices such as aseptic techniques	140 (100.0)	0 (0.0)
Segregation of refuse into color-coded bins	122 (87.1)	18 (12.9)
Glowing	122 (87.1)	18 (12.9)
Use of goggles	48 (34.3)	92 (65.7)
Use of PPEs	122 (87.1)	18 (12.9)
Careful handling and processing of soiled linen	114 (81.4)	26 (18.6)
Careful handling sharps	140 (100.0)	0 (0.0)
Decontamination	119 (85.0)	21 (15.0)
Potential ways of occupational exposure		
Needle stick/sharp injury	140 (100.0)	0 (0.0)
Splash on the eye	109 (77.9)	31 (22.1)

Inhalation	140 (100.0)	0 (0.0)
Talking to patients	107 (76.4)	33 (23.6)
Touching contaminated surfaces	131 (93.6)	9 (6.4)
Touching patients	119 (85.0)	21 (15.0)
When to perform hand washing		
Before any direct contact with patients	109 (77.9)	31 (22.1)
Between patients' contact	140 (100.0)	0 (0.0)
Immediately on arrival to the facility or ward	118 (84.3)	22 (15.7)
Immediately after removing gloves	120 (85.7)	20 (14.3)
After touching body fluids such as blood, sweat and other bodily fluids	101 (72.1)	39 (27.9)
Importance of standard precautions		
know the importance of standard precautions	140 (100.0)	0 (0.0)
The adherence to Standard precautions has a main objective of protecting only the health care workers	90 (64.3)	50 (35.7)
The necessary use of Standard precautions can reduce nosocomial infection	127 (90.7)	13 (9.3)
Do standard precautionary safety measures consider all patients to have risk in transmitting diseases	140 (100.0)	0 (0.0)
Do you think your workplace is safe in terms of hospital related infections	111 (79.3)	29 (20.7)

Source: Field Survey Data, (2021)

Figure 4.2: Overall knowledge level of nurses on standard precautions

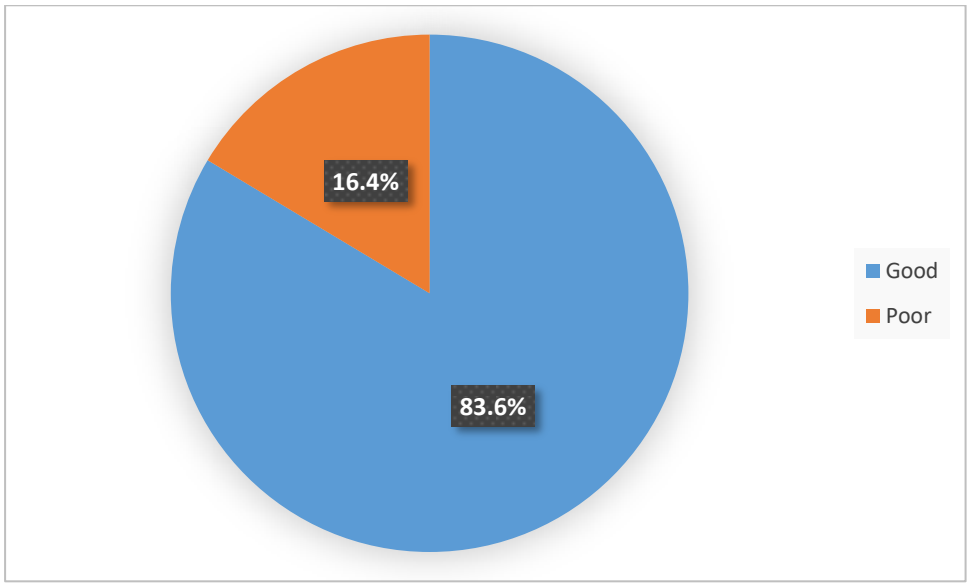


Table 4.3: Nurses' adherence to standard precautions

Variables	Degree of adherence			
	Never	**Sometimes**	**Often**	**Always**
	N (%)	**N (%)**	**N (%)**	**N (%)**
Wash hands after removing gloves	0 (0.0)	20 (14.3)	94 (67.1)	26 (18.6)
Wears gloves	0 (0.0)	99 (70.7)	12 (8.6)	29 (20.7)
Puts used needles into sharp container	0 (0.0)	11 (7.9)	40 (28.6)	89 (63.6)
Covers broken skin	0 (0.0)	20 (14.3)	82 (58.6)	38 (27.1)
Promptly wipes all blood or bodily fluid spills	0 (0.0)	14 (10.0)	42 (30.0)	84 (60.0)
Use alcohol-based sanitizers	0 (0.0)	28 (20.0)	70 (50.0)	42 (30.0)
Wears eye protection	5 (3.6)	102 (72.9)	27 (19.3)	6 (4.3)
Wears waterproof apron	5 (3.6)	95 (67.9)	34 (24.3)	6 (4.3)
Wears face masks	5 (3.6)	90 (64.3)	32 (22.9)	13 (9.3)
Encourages the practise of cough etiquette	20 (14.3)	93 (66.4)	22 (15.7)	5 (3.6)
Supervisors encourage training	5 (3.6)	90 (64.3)	29 (20.7)	16 (11.4)
Staff have training in standard precautions	3 (2.1)	93 (66.4)	38 (27.1)	6 (4.3)
Do you sterilize all reusable equipment before being used on another patient?	0 (0.0)	0 (0.0)	0 (0.0)	140 (100.0)
Do you clean and disinfect equipment and environmental surfaces?	0 (0.0)	0 (0.0)	29 (20.7)	111 (79.3)
Do you practice social distance among your colleagues in the ward?	0 (0.0)	101 (72.1)	30 (21.4)	9 (6.4)

How often do you follow techniques to avoid needle stick or sharp injuries;				
Avoid recapping and other hand manipulation of needles	0 (0.0)	88 (62.9)	24 (17.1)	28 (20.0)
Use of safety boxes	0 (0.0)	22 (15.7)	88 (62.9)	30 (21.4)
Avoid disassembling sharps	0 (0.0)	26 (18.6)	83 (59.3)	31 (22.1)
Avoid overpassing sharps with other persons	0 (0.0)	41 (29.3)	71 (50.7)	28 (20.0)
Do you encourage others to use standard precautionary measures?	0 (0.0)	28 (20.0)	66 (47.1)	46 (32.9)
Do you feel the need to confront colleagues when they are not using standard precautionary measures?	0 (0.0)	0 (0.0)	69 (49.3)	71 (50.7)

Adherence scoring; Never=1, Sometimes=2, Often=3, Always=4

Source: Field Survey Data, (2021)

Figure 4.3: Overall adherence of nurses to standard precautions

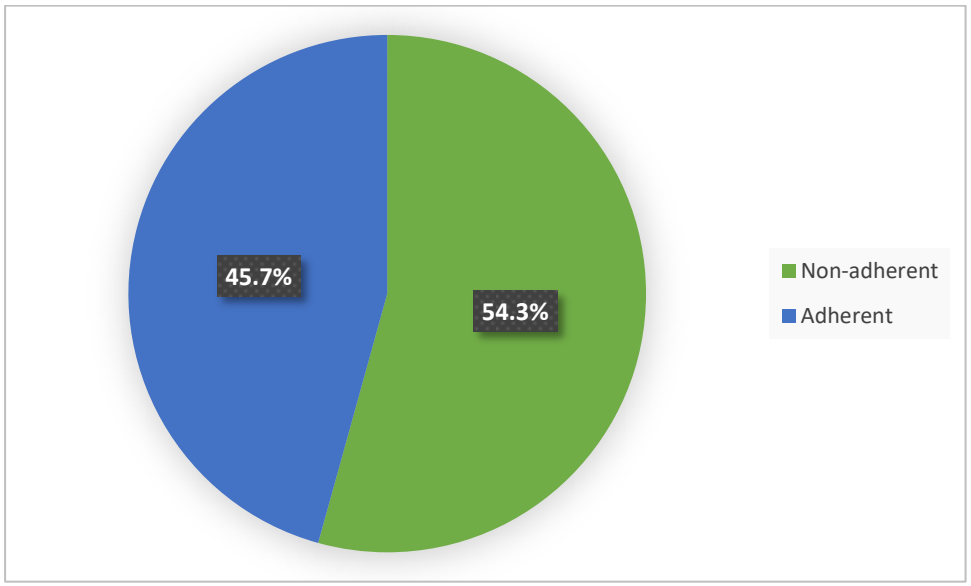


Table 4.4: Bivariate analysis of socio-demographic characteristics for adherence to standard precautions

Variables	**Adherent**	**Non-adherent**	x^2	**P-value**
	N= 64 (45.7%)	**N= 76 (54.3%)**		
Sex of respondent			0.01	0.907
Female	36 (56.2)	42 (55.3)		
Male	28 (43.8)	34 (44.7)		
Age of respondent			2.99	0.224
20-30years	12 (18.8)	7 (9.2)		
31-40years	23 (35.9)	34 (44.7)		
more than 40 years	29 (45.3)	35 (46.1)		
Marital status				0.447†
Married	36 (56.3)	45 (59.2)		
Single	23 (35.9)	20 (26.3)		
Divorced	3 (4.7)	8 (10.5)		
Widowed	2 (3.1)	3 (4.0)		
Religion				0.821†
Christianity	20 (31.3)	23 (30.3)		
Islam	39 (60.9)	49 (64.5)		
Traditional	5 (7.8)	4 (5.3)		
Ethnic group				0.205†
Akan	3 (4.7)	4 (5.3)		

Dagbon	32 (50.0)	52 (68.4)	
Frafra	9 (14.1)	5 (6.6)	
Konkomba	10 (15.6)	7 (9.2)	
Gonja	10 (15.6)	8 (10.5)	
Educational level			**0.018†***
Speciality	4 (6.3)	1 (1.3)	
Masters	0 (0.0)	3 (4.0)	
BSc degree	7 (10.9)	8 (10.5)	
Diploma	28 (43.8)	19 (25.0)	
Certificate	25 (39.1)	45 (59.2)	

†Fisher's exact test; †*Significant (p<0.05) using Fisher's exact test

Table 4.5a: Bivariate analysis of individual level factors for adherence to standard precautions

Variables	Adherent N=64 (45.7%)	Non-adherent N=76 (54.3%)	x^2	P-value
Cadre of nurse				0.505†
General nurse	18 (28.1)	20 (26.3)		
Enrolled nurse	30 (46.9)	44 (57.9)		
Midwife	12 (18.8)	9 (11.8)		
Specialist	4 (6.3)	3 (4.0)		
Years of working experience				0.129†
1 - 3 years	1 (1.6)	5 (6.6)		
4 - 6 years	49 (76.6)	47 (61.8)		
≥ 7 years	14 (21.9)	24 (32.6)		
Safety practice for all patients				
No	0 (0.0)	0 (0.0)		
Yes	64 (100.0)	76 (100.0)		
Report errors when handling patients			0.61	0.433
No	18 (28.1)	17 (22.4)		
Yes	46 (71.9)	59 (77.6)		
Receipt of motivation for sincere report			10.69	**0.001***
No	21 (32.8)	46 (60.5)		

Yes	43 (67.2)	30 (39.5)

†Fisher's exact test; *Significant (p<0.05) using chi-square test

Table 4.5b: Bivariate analysis of individual level factors for adherence to standard precautions

Variables	Adherent N=64 (45.7%)	Non-adherent N=76 (54.3%)	x^2	P-value
Perception that compliance during emergency puts patients at risk			1.45	0.229
No	8 (12.5)	5 (6.6)		
Yes	56 (87.5)	71 (93.4)		
Perception that compliance increases load of work			0.12	0.734
No	8 (12.5)	11 (14.5)		
Yes	56 (87.5)	65 (85.5)		
Not being comfortable with wearing and using PPEs			1.86	0.173
No	14 (21.9)	10 (13.2)		
Yes	50 (78.1)	66 (86.8)		
Perception that using PPEs increases work time			3.29	0.07
No	15 (23.4)	9 (11.8)		
Yes	49 (76.6)	67 (88.2)		
Adhering to SP interferes with the ability to provide care			0.83	0.361

No	13 (20.3)	11 (14.5)		
Yes	51 (79.7)	65 (85.5)		
Allergy to materials used in making the PPEs e.g latex			4.22	**0.04***
No	15 (23.4)	8 (10.5)		
Yes	49 (76.6)	68 (89.5)		
Perception that wearing protective equipment might cause fear in patients			3.94	**0.047***
No	18 (28.1)	11 (14.5)		
Yes	46 (71.9)	65 (85.5)		
Perception that practice of SP is time consuming			1.31	0.253
No	15 (23.4)	12 (15.8)		
Yes	49 (76.6)	64 (84.2)		
Perception that patients do not pose a risk			0.09	0.768
No	5 (7.8)	7 (9.2)		
Yes	59 (92.2)	69 (90.8)		
Reliance on experience and confidence in skills hence no need to use PPEs			0.05	0.821
No	6 (9.4)	8 (10.5)		
Yes	58 (90.6)	68 (89.5)		

Overall knowledge level on SP			2.55	0.11
Poor	14 (21.9)	9 (11.8)		
Good	50 (78.1)	67 (88.2)		

***Significant (p<0.05) using chi-square test**

Table 4.6a: Bivariate analysis of health system related factors for adherence to standard precautions.

Variables	Adherent N=64 (45.7%)	Non-adherent N=76 (54.3%)	x^2	P-value
Availability of clean water			5.92	**0.015***
No	46 (71.9)	67 (88.2)		
Yes	18 (28.1)	9 (11.8)		
Availability of soap			1.97	0.16
No	11 (17.2)	7 (9.2)		
Yes	53 (82.8)	69 (90.8)		
Availability of alcohol-based hand sanitizers				0.509†
No	3 (4.7)	6 (7.9)		
Yes	61 (95.3)	70 (92.1)		
Availability of PPEs				0.575†
No	3 (4.7)	3 (4.0)		
Yes	61 (95.3)	96.0)		
Training in the last 3months on standard precautions			0.0001	0.992
No	27 (42.2)	32 (42.1)		
Yes	37 (57.8)	44 (57.9)		

Trained on hand hygiene				0.754†
No	4 (6.3)	7 (9.2)		
Yes	60 (93.7)	69 (90.8)		
Trained on PPEs			3.38	0.066
No	14 (21.9)	8 (10.5)		
Yes	50 (78.1)	68 (89.5)		
Trained on safe injection practices				0.515†
No	5 (7.8)	5 (6.6)		
Yes	59 (92.2)	71 (93.4)		
Trained on handling and disposing sharps				0.332†
No	3 (4.7)	1 (1.3)		
Yes	61 (95.3)	75 (98.7)		

†Fisher's exact test; *Significant (p<0.05) using chi-square test

Table 4.6b: Bivariate analysis of health system related factors for adherence to standard precautions.

Variables	Adherent N=64 (45.7%)	Non-adherent N=76 (54.3%)	x^2	P-value
Trained on instrument processing and waste management			0.24	0.627
No	13 (20.3)	13 (17.1)		
Yes	51 (79.7)	63 (82.9)		
Monitoring and evaluation of standard precautions in the facility			0.03	0.867
No	7 (10.9)	9 (11.8)		
Yes	57 (89.1)	67 (88.2)		
Punishment giving for non-adherence to standard precautions at the facility			0.01	0.908
No	8 (12.5)	10 (13.2)		
Yes	56 (87.5)	66 (86.8)		
Presence of posters/flyers of standard precautions			1.86	0.173
No	14 (21.9)	10 (13.2)		
Yes	50 (78.1)	66 (86.8)		
Training on patient safety culture in the facility				

No	0 (0.0)	0 (0.0)		
Yes	64 (100.0)	76 (100.0)		
Training on staff safety culture in the facility				
No	0 (0.0)	0 (0.0)		
Yes	64 (100.0)	76 (100.0)		
Training on prevention of COVID-19 infection in the facility				
No	0 (0.0)	0 (0.0)		
Yes	64 (100.0)	76 (100.0)		
Awareness of infection prevention committee at the facility			8.82	**0.003***
No	17 (26.6)	6 (7.9)		
Yes	47 (73.4)	70 (92.1)		
COVID-19 pandemic affecting the way patients are handled			1.16	0.282
No	9 (14.1)	16 (21.0)		
Yes	55 (85.9)	60 (79.0)		

***Significant (p<0.05) using chi-square test**

Table 4.7: Crude and adjusted analysis of factors associated with nurses' adherence to standard precautions

Variables	Crude OR (95%CI)	p-value	Adjusted OR (95%CI)	p-value
Educational level				
Speciality	Ref		Ref	
Masters	Ref		Ref	
BSc degree	0.22 (0.02 - 2.45)	0.217	0.24 (0.02 - 3.63)	0.301
Diploma	0.37 (0.04 - 3.56)	0.388	0.44 (0.04 - 5.58)	0.529
Certificate	0.14 (0.01 - 1.31)	0.085	0.17 (0.01 - 2.11)	0.166
Receipt of motivation for sincere report				
No	Ref		Ref	
Yes	3.14 (1.57 - 6.29)	**0.001***	4.43 (1.93 - 10.17)	**<0.001***

Allergy to materials used in making the PPEs e.g latex					
No	Ref			Ref	
Yes	0.38	(0.15 - 0.98)	**0.045***	0.39 (0.12 - 1.23)	0.109
Perception that wearing protective equipment might cause fear in patients					
No	Ref			Ref	
Yes	0.43	(0.19 - 1.00)	**0.005***	0.42 (0.15 - 1.20)	0.105
Availability of clean water					
No	Ref			Ref	
Yes	2.91	(1.20 - 7.05)	**0.018***	4.34 (1.53 - 12.35)	**0.006***
Awareness of infection prevention committee at the facility					
No	Ref			Ref	
Yes	0.24	(0.09 - 0.65)	**0.005***	0.35 (0.11 - 1.15)	0.085

***Significant (p-value < 0.05)**

APPENDIX C

CONSENT FORM

Title of study: Assessing factors influencing nurses' adherence to standard precautions amidst covid-19 at the Tamale Central Hospital.

Introduction: I am Jones Sarfo Osei (Principal investigator), an MSc Occupational Hygiene student of School of Public Health, University of Ghana. I am taking this research in partial fulfillment for the award of MSc Occupational Hygiene. My contact details are, Mobile: 0242262577 and Email: jonesosei2000@gmail.com

Background and purpose of research: Health Care Workers' (HCW) exposure to infectious disease over the years has become a major concern for both policymakers and development practitioners. Preventing hospital-acquired illnesses and protecting patients and other healthcare personnel requires standard precautions. This raises questions about the most likely factors influencing nurses' adherence to standard precautions.

Nature of research: This is a descriptive cross-sectional study and it will take place at the Tamale Central Hospital. One hundred and forty (140) nurses will be included in the study. The study aims to assess nurses knowledge level, adherence and factors influencing their adherence to standard precautions. The findings of the study will help hospital management in improving supply of resources needed for adherence to standard precautions

Duration/what is involved: It is required for participants to be a nurse at the Tamale Central Hospital. Your participation in the study will require you answer certain questions on socio-demography (age, sex, marital status, level of education, religion, ethnic group), individual-level factors (cadre, years of working experience, motivation, Individual's perceptions, allergy to materials used in making PPEs, knowledge on standard precautions) and health

system related factors (availability of water, availability of soap, availability of alcohol-based hand sanitizer, availability of PPE, training, monitoring, presence of posters/flyers on standard precautions, IPC committee). This will approximately take 25 minutes. Either the Principal Investigator or Research Assistants will do the administration of the questionnaire.

Potential risk

No known risk is associated with participating in the study.

Benefits

Participation in the study will provide no direct benefit. The study's findings, on the other hand, will add to our understanding on adherence to standard precautions and also help management in instituting protocols and providing logistics that will improve personnel adherence

Cost

Participation in the study is free of charge.

Compensation

There is no monetary reward for taking part in the study.

Confidentiality

Participants are guaranteed of their anonymity. On the questionnaires, the identity of the participants will not be recorded. Their data will be safeguarded by enclosing completed questionnaires in an envelope, ensuring that no one other than members of the research team can have access to it and that, it will only be used for this study. Participants' identities will never be revealed to a third party or in the study report.

Voluntary participation/withdrawal

Participation in the study is entirely voluntary, and participants are free to withdraw at any time.

Outcome and feedback

The information gathered will only be used for this study. Participants will receive no direct feedback on the data.

Funding information

The research is self-funded by the principal investigator.

Provision of information and information and consent for participants

Participants will be given a copy of the information sheet to keep after it is signed.

Who to contact for further clarification/questions: If you have further questions or issues regarding this study, which require clarification, you may cantact:

Jones Sarfo Osei (Principal Investigator) – 0242262577

Dr Prudence Tettey, University of Ghana (Supervisor) – 0550424815

Your rights as a participant

This research has been reviewed and approved by the Institutional Review Board of Noguchi Memorial Institute for Medical Research (NMIMR-IRB). If you have any questions about your rights as a research participant, you can contact the IRB office between the hours of 8am-5pm through the landline 0302916438 or email address: nirb@noguchi.ug.edu.gh

VOLUNTEER AGREEMENT

The above document describing the benefits, risk and procedures for the research title (assessing factors influencing nurses' adherence to standard precautions amidst covid-19 at the Tamale Central Hospital) has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

Date: Name and signature or mark of volunteer:

If volunteer cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

Date: Name and signature of witness:

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual

Date: Name and signature of person who obtained consent:

Appendix D

QUESTIONNAIRE: ASSESSING FACTORS INFLUENCING NURSES'ADHERENCE TO STANDARD PRECAUTIONS AMONGST NURSESAMIDST COVID-19 AT THE TAMALE CENTRAL HOSPITAL

This questionnaire is designed as part of a research on assessing factors influencing nurses' adherence to standard precautions amidst covid-19 at the tamale central hospital.

This study is in partial fulfillment of an award of MSc Occupational Hygiene from the department of Biological, Environmental and Occupational Health, University of Ghana. This study will further help inform policy makers in controlling and managing COVID-19 pandemic. Every answer given will be kept confidential.

Section A. Demographic data

1. Sex of respondent 1 = Male [ ] 2 = Female [ ]
2. Age of respondent 1 = 20-30years [ ] 2 = 31-40years[ ] 3 = more than 40 years [ ]
3. Marital status 1= Married [ ] 2 = Single [ ] 3= Divorced [ ] 4= Widowed [ ]
4. Religion 1 = Christianity [ ] 2 = Islam [ ] 3 = Traditional [ ] 4 = Other (specify)……
5. Ethnic group 1 = Akan [ ] 2 = Dagbon [ ] 3 = Frafra [ ] 4 = Konkomba [ ] 5 = Gonja [ ] Other (specify)……
6. Educational level 1= Speciality [ ] 2= Masters [ ] 3= BSc [ ] 4= Diploma [ ] 5=certificate [ ]

Section B. Nurses' knowledge level on standard precautions

1. Have you ever received any training on standard precaution measures? 1= Yes [ ] 2 =

No [ ]

2. If yes, through what means did you receive your training? 1 = from school [ ] 2= Inservice education program [ ] 3= Workshop [ ] 4= other, specify……..

No	Question/variables	Yes	No
The concept of standard precautions includes:			
3	Hand washing before and after any direct contact with patient		
4	Consideration of the potential for transmission of infectious agents to patients		
5	Cough etiquette such as directing patients/relatives with symptoms of a respiratory infection to cover their mouths/noses when coughing or sneezing		

6	Safe injection practices such as aseptic techniques		
7	Segregation of refuse into color-coded bins		
8	Gloving		
9	Use of goggles		
10	Use of other PPEs		
I1	Careful handling and processing of soiled linen		
12	Careful handling sharps		
13	Decontamination		
Potential ways of occupational exposure includes:			
14	Needle stick/sharp injury		

15	Splash on the eye		
16	Inhalation		
17	Talking to patients		
18	Touching contaminated surfaces		
19	Touching patients		
According to the Standard Precautions, hand washing is performed:			
20	Before any direct contact with patients		
21	Between patients' contact		
22	Immediately on arrival to the facility or ward		
23	Immediately after removing gloves		

24	After touching body fluids such as blood, sweat and other bodily fluids		
Other Standard Precautions:			
25	Do you know the importance of standard precautions?		
26	The adherence to Standard precautions has a main objective of protecting only the health care workers		
27	The necessary use of Standard precautions can reduce nosocomial infection		
28	Do standard precautionary safety measures consider all patients to have risk in transmitting diseases?		
29	Do you think your workplace is safe in terms of hospital related infections?		

Section C. Nurses' adherence to standard precautions

No	Variables	Degree of adherence			
		Never	Sometimes	Often	Always
1	Wash hands after removing gloves				
2	Wears gloves				
3	Puts used needles into sharp container				
4	Covers broken skin				
5	Promptly wipes all blood or bodily fluid spills				
6	Use alcohol-based sanitizers				
7	Wears eye protection				

8	Wears waterproof apron				
9	Wears face masks				
10	Encourages the practise of cough etiquette				
11	Supervisors encourage training				

12	Staff have training in standard precautions				
13	Do you sterilize all reusable equipment before being used on another patient?				
14	Do you clean and disinfect equipment and environmental surfaces?				
15	Do you practice social distance among your colleagues in the ward?				
16	**How often do you follow techniques to avoid needle stick or sharp injuries;**				

17	Avoid recapping and other hand manipulation of needles				
18	Use of safety boxes				
19	Avoid disassembling sharps				
20	Avoid overpassing sharps with other				
	persons				
21	Do you encourage others to use standard precautionary measures?				
22	Do you feel the need to confront colleagues when they are not using standard precautionary measures?				

Section D. Individual level factors that influence nurses' adherence to standard precautions (SPs)

1. Cadre of respondent 1= General nurse [ ] 2= Enrolled nurse [ ] 3= Midwife [ ] 4=

Specialist nurse [ ] 5 = Other (specify)……

2. How long have you worked in this facility? (Number of years):

……

	Parameters	**Answer**	
		Yes	**No**
3	Do you practice safety for all patients you encounter?		

4	Do you report when you make errors when handling patients?		
5	Do you receive any motivation for being sincere to report?		
6	Perceives that compliance during emergency puts patients at risk		
7	Perceive that compliance increases Load of work		
8	Not comfortable with wearing and using PPEs		
9	Using PPEs increases work time		

10	Adhering to SPM interferes with the ability to provide care		
11	Allergy to materials used in making the PPEs e.g latex		
12	Wearing protective equipment might cause fear		
	in patients		
13	Practice of SP is time consuming		
14	Patients do not pose a risk		
15	Reliance on experience and confidence in skills hence no need to use PPEs		

Section E. Health system related factors that influence nurses' adherence to standard precautions (SPs)

	Parameters	Yes	No

1	Is there enough supply of each item in B below to apply standard precautions in your unit;		
2			
	Clean water		
	Soap		
	Alcohol- based hand sanitizers		
	PPEs		
3	Has there been any training on standard precautions used within the last 3 months		
4	Which of the standard precautions were you trained on?		
	Hand hygiene		
	Personal protective equipment		

	Safe injection practices		
	Handling and disposing sharps		
	Instrument processing and waste management		
5	Is there monitoring and evaluation on standard precautions in this facility?		
6	Are there punishments given when anyone is seen not adhering to SPs?		
7	Are there posters or flyers at vantage points to remind staff on use of SP		
8	Has there been any training in patient safety culture in this facility?		
9	Has there been any training on staff safety culture in this facility?		

10	Has there been training on COVID-19 infection prevention in this facility?		
11	Do you know if there is an infection prevention committee at the hospital?		
12	Has the pandemic affected the way you handle clients?		

UNIVERSITY OF GHANA

NOGUCHI MEMORIAL INSTITUTE FOR MEDICAL RESEARCH (NMIMR)
COLLEGE OF HEALTH SCIENCES
INSTITUTIONAL REVIEW BOARD

2nd February 2022

ETHICAL CLEARANCE

FEDERALWIDE ASSURANCE FWA 00001824 **IRB 00001276**

NMIMR-IRB CPN 026/21-22 **IORG 0000908**

On 2nd February 2022, the Noguchi Memorial Institute for Medical Research (NMIMR) Institutional Review Board (IRB) at a full board meeting reviewed and approved your protocol titled:

TITLE OF PROTOCOL : **Assessing adherence to standard precautions amongst nurses during patient care amidst covid-19 at the Tamale central hospital**

PRINCIPAL INVESTIGATOR : **Jones Osei Sarfo**

Please note that a final review report must be submitted to the Board at the completion of the study. Your research records may be audited at any time during or after the implementation.

Any modification of this research project must be submitted to the IRB for review and approval prior to implementation.

Please report all serious adverse events related to this study to NMIMR-IRB within seven days verbally and fourteen days in writing.

This certificate is valid till 1st February 2023. You are to submit annual reports for continuing review.

Signature of Chair: .....

Dr. Abraham Hodgson
(NMIMR – IRB CHAIR)