CHAPTER ONE
INTRODUCTION

Background to the Study

Infections and infectious diseases have long been known in the history of mankind as part of the reasons people seek healthcare; thus making infection and healthcare settings inseparable. Healthcare facilities are meant to take care of the sick people, but they are also sources of infections because of the different kinds of ailment that are treated in the facilities. Infections constitute one of the most important causes of morbidity and mortality associated with clinical, diagnostic and therapeutic procedures (Centre for Disease Control, 2016). While healthcare workers perform all their roles in caring for patients, they are exposed to high risk of acquiring healthcare associated infections because they are exposed to various blood borne infections, air-borne infections, needle-stick injuries and infections from contact with body fluids. Likewise, patients are also exposed to numerous infections while on admissions in the hospitals which were not present in them as at the time of their admission. Healthcare-associated infections (HAI) include occupational infections acquired by health care providers in the process of health care delivery as well as infections that occur in a patient during the process of care in a hospital or other health-care facility that did not manifest or present in them as at the time of admission.

Healthcare workers, particularly nurses, are often exposed to health care associated infections, many of which cause infections that can lead to death (Twitchell, 2003; Park, Jeong, Huh, Toon, Lee and Cho, 2008). World Health Organization (WHO) estimated that in the year 2003, sharp injuries resulted in 16,000 hepatitis C virus and 1,000 HIV infections among health workers and these are mainly preventable. High incidence of occupational exposure to health care associated infections are observed among all health care professionals as variously documented by Kermode, Jolley, Langkham , Thomas, Holmes and Gifford (2005); Konte,(2007) but nurses are among those who are more highly exposed (Kosgeroglu, Ayranci, Vardareli and Dincers, 2004) due to the level of direct physical contacts they have with patients. In a study conducted by Ogoina, Pondei, Adetunji, Chima, Isichei and Gidado (2014) higher rates and more frequent occupational exposure to blood and body fluid was reported among nurses compared to other healthcare workers. This was also evident during the Ebola outbreak in Nigeria where a pregnant nurse was exposed to the virus. She eventually died with the growing foetus in her,

making her the first and probably only known Nigerian to die of Ebola Viral Disease. Lassa fever also claimed the life of a male nurse in Ebonyi state in January 2018. Lassa fever was first discovered in 1969 when it claimed the life of two missionary nurses in Lassa, Borno state. In the month of March, 2016 a nurse working at University College Hospital annex at Gbagi was infected with chickenpox virus and presented with all the symptoms two weeks after attending to a patient with chickenpox. She was on sick leave for two weeks which resulted in shortage of manpower and she also ended up transmitting the infections to one of her sons. There are also varying cases of nurses acquiring infections in the course of their duties but there is usually under reporting due to fear of stigmatization.

On the other hand, the nurse is a primary agent in transmission of healthcare associated infections from one patient to another patient, and from herself to her patients. Patients may spend extra days or weeks on the hospital bed due to infections that were not present as at the time of their admission. Some also get their drugs changed from mild drugs to strong drugs. This invariably increases the number of days they spend on the hospital beds, leading to extra cost on the part of the patient and on the health care system. This further causes strain on the health care facilities because this leads to limited bed space and prevent other sick patients in getting assess to bed space and treatment in the hospitals on time. Worldwide it is estimated that almost 10% of hospitalized patients acquire at least one healthcare associated infections (Humphreys , Newcombe, Enstone, Smyth, McIlvenny, Fitzpatrick, 2006) and the prevalence of health care associated infection in developing countries can be as high as 30-50% (Habibi, Wig, Agarwal, Sharma, Lodha, Pandey, 2008; Lahsaeizadeh, Jafari and Askarian, 2008) . The range of health care associated infection in developed countries is between 5.1%-11.6%, in developing countries the range is between 5.7-19.1% and in Africa surgical site health care associated infections range is between 10% - 30.90% with Nigeria having the highest incidence range between 23.60% -30.90% (Nejad, Allegranzi, Syed, Ellis and Pittet, 2011) .

Despite all the advances in health care services, health care associated infections` still remain a major global safety concern for both patient and health care professionals. In view of this, the Centre for Disease Control (CDC) in 1987 developed specific guidelines known as universal precautions which are aimed at preventing the transmission of pathogens within the hospital setting. Universal precautions as defined by CDC is a set of precautions designed to

prevent the spread of human immune deficiency virus (HIV), hepatitis B virus and other blood borne organisms when providing any type of health care. However, it was recognized that more infections control precautions are needed as the body fluids are potentially infectious. The CDC therefore in 1996 included the universal precaution in a new prevention concept called standard precautions which are devised to be used for the care of all patients in the hospitals regardless of their diagnosis or presumed infection status.

Standard precautions are evidence based clinical work practices published by the Centre for Diseases Control (CDC) in 1996 and updated in 2007 that prevent transmission of infectious agents in healthcare settings (Siegel, Rhinehart, Jackson, Chiarello, 2007). Standard precautions combine elements of universal precautions and body substance isolation to eliminate the confusion that exists in many healthcare institutions over what substances require precautions. It also includes employee health component, such as sharp instrument safety measures but shift the emphasis to health care associated infections in patients (Siegel et.al, 2007). Standard precautions promote basic infection control practices aimed at reducing the transmission of organisms and are applied to blood (including dried blood), all body fluids except sweat irrespective whether they are contaminated with blood, non-intact skin and mucous membranes. Recently with the emergence of Ebola Virus Disease, standard precautions are to be applied to sweat whether blood stained or not (Judson, Prescott and Munster, 2015).

Standard precautions guidelines include the following elements; hand hygiene, the use of personal protective equipment, the safe use and disposal of sharp, respiratory hygiene and cough etiquette, decontamination of equipment and the environment, patient placement, linen and waste management. Another important measure is adequate professional immunisation as this guarantees anticipated protection against immune-preventable diseases. Standard precautions are designed to protect healthcare workers from being exposed to infections by applying the fundamental principles of infection prevention through hand washing, utilisation of appropriate protective barriers such as gloves, mask, gown and eye wear (Motamed, Babamahmoodi, Khalilian, Peykanheirati and Nozari, 2006). It is also intended to protect the patient by ensuring that health care personnel do not transmit infectious agents to patients through their hands or equipments during patient care (Siegel et al, 2007)

Despite the simplicity and efficacy of standard precaution, compliance is still poor in many countries and in some it is still lacking (Gammon, Morgan-Samuel and Gould, 2008; Jawaid, Iqbal ; Shahbaz, 2009). Okechukwu and Chauke (2012) also submitted that in resource limited settings such as Nigeria and other third world countries, compliance with standard precautions is still low in public health settings thus exposing healthcare workers and patients to the risk of infection. Pereira, Lam, Chan, Toffano and Gir (2015) reported suboptimal compliance with standard precautions among Brazillian and Hong Kong nurses. In a recent study conducted by Powers, Armellino, Dolansky and Fitzpatrick (2016) among nurses it was reported that standard precautions compliance rates were so low despite being a self reported compliance. Compliance with standard precautions has also been found to be suboptimal among nurses in Nigeria (Ogoina, Pondei, Adetunji, Chima, Ischei and Gidado, 2014 and Abubakar, Haruna, Teryila, Dathini, Ahmadu, Babaji and Bulama, 2015).

Compliance with standard precaution measures is multi-faceted and involves many factors, some of which are demographic, intrapersonal and institutional factors. Years of nursing experience and age are demographic factors that could predict compliance with standard precautions. Variability has been shown in compliance with standard precaution based on age and years of nursing experience. Nurses' age and frequency of compliance with standard precautions were found by Efstathiou, Papastavrou, Raftopoulos and Merkouris (2011) to be significantly and positively correlated. Older nurses with more years of nursing experience have been shown to be more compliant than younger ones (Kirland 2011; Gershon 2007). This may be attributed to the wealth of experience which this category of nurses might have gathered over the years.

It is also generally believed that as one ages, life is taken more seriously this may cause older nurses to comply better with standard precautions so as to live a healthy life during their year of service and at retirement. In addition younger nurses are usually inexperienced due to limited years of working experience and this may affect their compliance with standard precautions In contrary the collaborative study of Gershon, Karkasshian, Vlahov, Kumner, Kasting, Green-Mckenzie, Escamilla, Kendig, Swetz and Martin (1999) revealed that there is less compliance with standard precaution with increased age and years of experience. Younger nurses may comply better with standard precautions than older nurses so as to age gracefully and

be healthy in order to care for their young family and be productive in life. Moreover some older nurses may feel that it is inevitable that one will die some day and be carefree when caring out clinical practices or believe that they have acquired enough experience that can prevent them from acquiring infections and hence may not comply with standard precautions.

Intrapersonal factors are individual characteristics that influence behavior such as knowledge, attitude and beliefs. Intrapersonal factors of knowledge on standard precaution and attitude towards standard precaution are major indices in standard precaution compliance. Knowledge has been indicated as one of the predictors of better compliance with standard precautions (Luw, He and Zhou, 2006; Chan, Ho and Day, 2008), since it is usually the first step toward modification of a desirable behaviour. Nevertheless, while knowledge is obviously important, studies such as those of Abdulraheem, Amodu, Saka Bolarinwa, and Uthman, (2012) Alnoumas, Eneze, Isaeed, Makboul and El-Shazly (2012) and Labrague, Rosales and Tizon, (2012) have shown that knowledge usually does not translate to improved compliance. It is believed conventionally that level of knowledge should correlate with preventive health behaviours but oftentimes knowledge does not always result in the adoption of healthful behaviours.

Attitude represents a person's disposition to a particular event and this can either be positive or negative. Hence attitude can either positively or negatively affect an individual's implementation of health behaviour. As opined by Roberts (2000) compliance with standard precautions requires appropriate attitude from healthcare workers over long periods of time, demanding motivation and technical knowledge from them. In addition, Alnoumas, Eneze, Isaeed, Makboul and El-Shazly (2012) noted that compliance with standard precaution has an attitudinal influence, it is normally related to personal opinions or feelings and studies have shown healthcare workers to have positive attitude toward compliance with standard precaution. Other studies done had shown negative attitude. Despite positive attitude towards standard precaution, the proportion of workers practicing infection control measure was less compared to when describing their attitude (Alnoumans et al, 2012).

Institutional factors according to Maynes and Haines (1997) are important predictors of employees' work behaviour. Availability of equipment, workload, and training on standard precaution are institutional factors that may predict nurses' compliance with standard precaution.

Availability of personal protective equipment is a major factor for consideration when assessing standard precautions compliance. Non availability of personal protective equipment has been identified as one of the reasons for non compliance (Krisshnan, Dick and Murphy 2006, Jawaid, Iqbal and Shahbaz, 2009, Okechukwu and Chauke, 2012; Alnoumas et al, 2012). However compliance is still low even when these equipments are made available and this is one of the reasons that have made compliance with standard precaution to be multifactoral and in the opinion of World Health Organization (2005), many a time interventions are available but are not used. Workload has also been associated with standard precaution compliance. Studies have shown that excessive patient care work load affects compliance to some extent. Cutter and Jordan (2004) affirmed that non compliance among healthcare workers could be due to their belief that their work load is increased by adhering to standard precautions and therefore these procedures are difficult to accommodate due to day to day current clinical pressures.

Askarian, Shiraly and McLawswork, (2005); Cooper, O'Carroll, Jenkin and Badger, (2007) also found workload to prevent workers from consulting the guidelines and implementing them. Training of healthcare workers on standard precautions and how to use personal protective equipment which is one of the responsibilities of the employer are of great importance as part of predictors of compliance with standard precautions. Training and education are important in developing awareness among healthcare workers as well as improving adherence to good clinical practice (Wang, Fenie and He, 2003; Heinrich, 2000). However, it is important to note that due to insufficient information retention and knowledge, compliance to taught practice may still be deficient in spite of training (Stein, Makarawo, and Ahmad, 2003; Trim, Adams, and Elliot, 2003).

Constant practice of and adherence to standard precautions are still grossly deficient in many parts of the world (WHO, 2005; Jawaid, Iqbal and Shahbaz, 2009; and in resource limited country like Nigeria (Okechukwu and Chauke, 2012). There is paucity of research on standard precaution compliance among nurses in teaching hospitals in Oyo State. As a result, this study aims at finding out factors that predict nurses' compliance to standard precautions in teaching hospitals in Oyo State. Oyo state which is the study area is located in the South Western part of Nigeria. The state was created in 1976 from the defunct Western Region and originally included

Osun state, which was carved out in 1991.The state is homogenous as it is mainly inhabited by the Yoruba ethnic group. The indigenes mainly comprise the Oyos, the Oke-Oguns, the Ibarapas, the Ogbomosos and the Ibadans. There are 33 Local Government Areas in Oyo state and the state headquarters is located in Ibadan (National Population Commission, 2006).

The state covers approximately an area of 28,454 square kilometers and is bounded in the south by Ogun state , in the north by Kwara state, in the east by Osun state, and in the west partly by Ogun state and partly by the Republic of Benin. The climate is equatorial notably with dry and wet season with relatively high humidity. The population is 14,993,752 based on the 2016 projected estimate. There are 11 Federal health institutions, 55 state health institutions, 656 local government institutions and 722 private owned institutions across the state (National Population Commission, 2006 and Oyo State Ministry of Health – Planning, Research and Statistics, 2010). There are 38 state and general hospitals admitting patients in Oyo state. There are three teaching hospitals in Oyo State namely University College Hospital, Ladoke Akintola Teaching Hospital and Bowen Teaching Hospital which was formerly known as Baptist Medical Centre, Ogbomosho.

University College Hospital (UCH) was officially opened on the 20th of November 1957 by her Royal Majesty, Queen Elizabeth II to meet the clinical training needs of medical students and to provide health care services to the Nigerian populace. The vision of the hospital still remains which is to be the flagship of tertiary health care institution in the West Africa sub- region, offering world class training, research and services, and the first choice for seeking specialist health care in a conducive atmosphere, renowned for a culture of continuing and compassionate care. UCH's mission is to render excellent, prompt, affordable and accessible health care in an environment that promotes hope and dignity, irrespective of status, and developing high quality personnel in an atmosphere that stimulates excellent and relevant researches (Information Technology Department, UCH, 2015*)*. Bowen Teaching Hospital (BUTH) was formerly known as Baptist Medical Centre (BMC), Ogbomosho. Baptist Medical Centre was dedicated and opened for use on 4th of July 1923 to meet the health needs of Ogbomosho people and its environs. The hospital is one of the means to complete the tripartite ministry of Jesus Christ which includes preaching, teaching and healing. Owing to the teeming need for clinical training

for Bowen University medical students, the Baptist Medical Centre was transformed to Bowen University Teaching Hospital in 2009. Ladoke Akintola Teaching Hospital, Ogbomosho (LTHOg) became fully operational in the year 2011. The hospital was also established to meet the clinical training needs of Ladoke Akintola University of Technology medical students. The mission of the hospital is to provide qualitative healthcare to patients , physicians and employees in south west Nigeria, and to be a prominent institution known for meeting the health care needs of the entire community through incomparable patient's care and wellness programme.

These tertiary hospitals provide general medical care and specialist care. They are equipped with state of the arts medical equipments and sound health professionals to cater for training needs of students and the healthcare of the country. This has made them to be referral centres for other health facilities in the country. Medical cases which could not be handled at the primary and secondary health care facilities are referred to them for expert management. This has made these hospitals to have patients whose health has to be safeguarded as well as that of the health workers caring for these patients. Oyo state was ranked 3rd among the states that have the highest TB prevalence rate in Nigeria, with 46.5% increase between 2008 and 2010 (United States Embassy in Nigeria, 2012). Oyo state also links Nigeria with neighboring countries and this makes its populace at risk of emerging diseases like the highly contagious ebola viral disease and lassa fever through immigrants that comes to Nigeria through these borders and emigrants that cross over for illegal business transactions and back to Nigeria, due to the porosity of its borders.

Therefore in order to ensure patients' and workers' safety in health care institutions, this study is designed to examine demographic, intrapersonal and institutional factors as predictors of standard precaution compliance among nurses in teaching hospitals in Oyo state.

Statement of the Problem

Sick people seek healthcare for various illnesses so as to get treated and cured. In recent times patients get infected during the course of their treatment with infections that were not present in them as at the time of their admission to the hospital. Likewise the caregivers sometimes get infected in the process of caring for the sick ones and this is more evident during

the recent Ebola and Lassa fever epidemic in Nigeria. Hence, in order to ensure patients' and healthcare workers' safety, the Centre for Disease Control and Prevention (CDC) formulated a set of guidelines to prevent infection transmission within the health care settings known as Standard Precautions.

However, studies have shown low compliance with standard precautions among nurses in many countries (Powers, Armellino, Dolansky and Fitzpatrick, 2016; Saidu, Habu, Kever, Dathini, Inuwa, Maigari and Kellu, 2015; Ogoina, Pondei, Adetunji, Chima, Ischei and Gidado, 2014) who spent most of their times and have more direct physical contact with patients compared to other health professionals. This low compliance has caused increase in healthcare associated infections which is now a major public health problem. These infections caused by multi resistant organisms take a heavy toll on patients, their families, health workers and health care system by causing illness; prolonged hospital stay, potential disability, excess cost, and sometimes death.

Varying factors have been attributed to the issue of compliance with standard precautions among nurses; whilst most of these studies were done in foreign countries few have been done in Nigeria. Studies done mostly in Nigeria were carried out to assess knowledge, attitude and practice of standard precautions among healthcare workers (Isara and Ofili (2010); Okechukwu and Chauke (2012); Amoran and Onwube 2013) while there is still a gap in knowledge on factors that can predict standard precautions compliance. Also, little work has been done among nurses, especially in teaching hospitals in southwest and most especially in Oyo State and often times these nurses are expected to handle various types of difficult cases including infectious diseases. This study therefore, examined demographic, intrapersonal and institutional factors as predictors of compliance with standard precautions among nurses in teaching hospitals in Oyo State.

General Objective of the Study

The main objective was to examine demographic, intrapersonal and institutional factors as predictors of compliance with standard precautions among nurses in teaching hospitals in Oyo state.

Specific Objectives of the Study

The following specific objectives were accomplished:

1. Examined the extent to which selected demographic factors of age and work experience explain compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state
2. Ascertained intrapersonal factors that predicts nurses compliance with standard precautions
3. Determined the relationship among institutional factors of availability of resources, workload and training on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state.
4. Examined the joint effect of demographic, intrapersonal and institutional factors on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state.
5. Determined the difference in standard precautions compliance rate among nurses in teaching hospitals based on working experience
6. Examined the difference in standard precautions compliance rate among nurses based on hospital types (tertiary, state and faith based)

Research Questions

The study provided answers to the following research questions;

1. Is there any relationship between the independent variables (demographic, intrapersonal and institutional factors) and dependent variable (compliance with standard precautions)?

2. Are there occurrences of health care associated infections among nurses in tertiary teaching hospitals in Oyo state?

3. Are there differences in standard precautions compliance rate among nurses in tertiary teaching hospitals in Oyo state (federal, state and faith based)?

Hypotheses

The following null hypotheses were tested in the study;

1. There will be no significant relative contributions of demographic factors (age and work experience) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state.
2. There will be no significant joint contributions of demographic factors (age and work experience) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state.
3. There will be no significant relative contributions of intrapersonal factors (knowledge and attitude) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state.
4. There will be no significant joint contribution of intrapersonal factors (knowledge and attitude) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state.
5. There will be no significant relative contribution of institutional factors (availability of equipment, workload and training) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state.
6. There will be no significant joint contribution of institutional factors (availability of equipment, workload and training) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state.
7. There will be no significant composite prediction of demographic, intrapersonal and institutional factors on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state.
8. There will be no significant difference in compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state based on working experience.
9. There will be no significant difference in compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state based on hospital type.

Delimitations of the Study

The study was delimited to the following;

1. Descriptive research design of correlation type.
2. All nurses in tertiary teaching hospitals in Oyo state as population.
3. Total enumeration technique.
4. Self-developed, validated questionnaire and focus group discussion as instruments for data collection.
5. Independent variables of demographic factors (age, years of experience) intrapersonal factors (knowledge, attitude) and institutional factors (availability of equipment, workload, training).
6. Dependent variable of compliance with standard precautions.
7. Descriptive statistics of frequency counts, percentages, mean and inferential statistics of multiple regression, t-test and analysis of variance at 0.05 level of significance.
8. Fifteen (15) trained research assistants.

Limitations of the Study

Some of the nurses were reluctant in participating in the study because of the nature of their job. The data collected was self report; hence some of the respondents may not be honest with their responses.

Significance of the Study

The study established and confirmed the low rate of compliance with standard precautions among nurses in teaching hospital in Oyo state.

The study added to existing body of knowledge on standard precaution compliance among nurses.

The study also provided empirical data on the predictive ability of demographic, intrapersonal and institutional factors on compliance with standard precautions among nurses.

The findings of this study would be helpful in facilitating implementation of programmes and interventions that contribute to avoidance of exposure and transfer of infections to health workers and individuals utilising health care facilities in Oyo state. This will help in preventing illness, death, prolonged hospital stay and increased medical costs.

The findings of the study would help to create more awareness on rate of occurrence of health care associated infections among nurses in Oyo state and thereby foster increase compliance with standard precautions.

The result of this study would also help health educators to develop programmes in line with the variables that predict better compliance with standard precautions.

It may further sensitize health educators in teaching individuals on what is expected of any caregiver caring for them in order to prevent infection transmission.

The findings of the study on difference in compliance with standard precautions among nurses in teaching hospitals in Oyo state may facilitate formulation of policies by the hospital administrators that will enhance strict compliance with standard precautions.

The outcome of the study will also contribute to the existing body of knowledge and further opportunities for researches on standard precaution compliance predicting factors.

Operational Definition of Terms

Health care associated infections (HCAI): These are also known as nosocomial infections. They are infections that patients acquire during the course of receiving treatments for other conditions within a health care setting as well as infections that health care workers acquire during the course of their duties. They also affect the health care system as a whole.

Standard precaution: These are sets of guidelines that aim at preventing transmission of pathogens within the healthcare settings.

Intrapersonal factors: These are individual characteristics that influence behaviour of nurses in Oyo state which are knowledge and attitude towards standard precautions compliance.

Institutional factors: This includes availability of protective equipment, staff workload and training opportunities for nursing staff in teaching hospitals in Oyo state.

Personal protective equipment: These are varieties of barriers such as gloves, face mask, eye shield, gowns that are used to protect mucous membranes, airway, skin and clothing from contact with infectious agents.

Compliance with Standard Precautions: The extent to which the set of guidelines that aims at preventing transmission of infections within the health care system are been adhered to by nurses in teaching hospitals in Oyo state.

CHAPTER TWO

REVIEW OF LITERATURE

The review of literature are hereby discussed under the following sub-headings:

1. Conceptual framework for the study
2. Theoretical framework for the study

a. Overview of Health Belief Model

3. Theoretical review of concepts

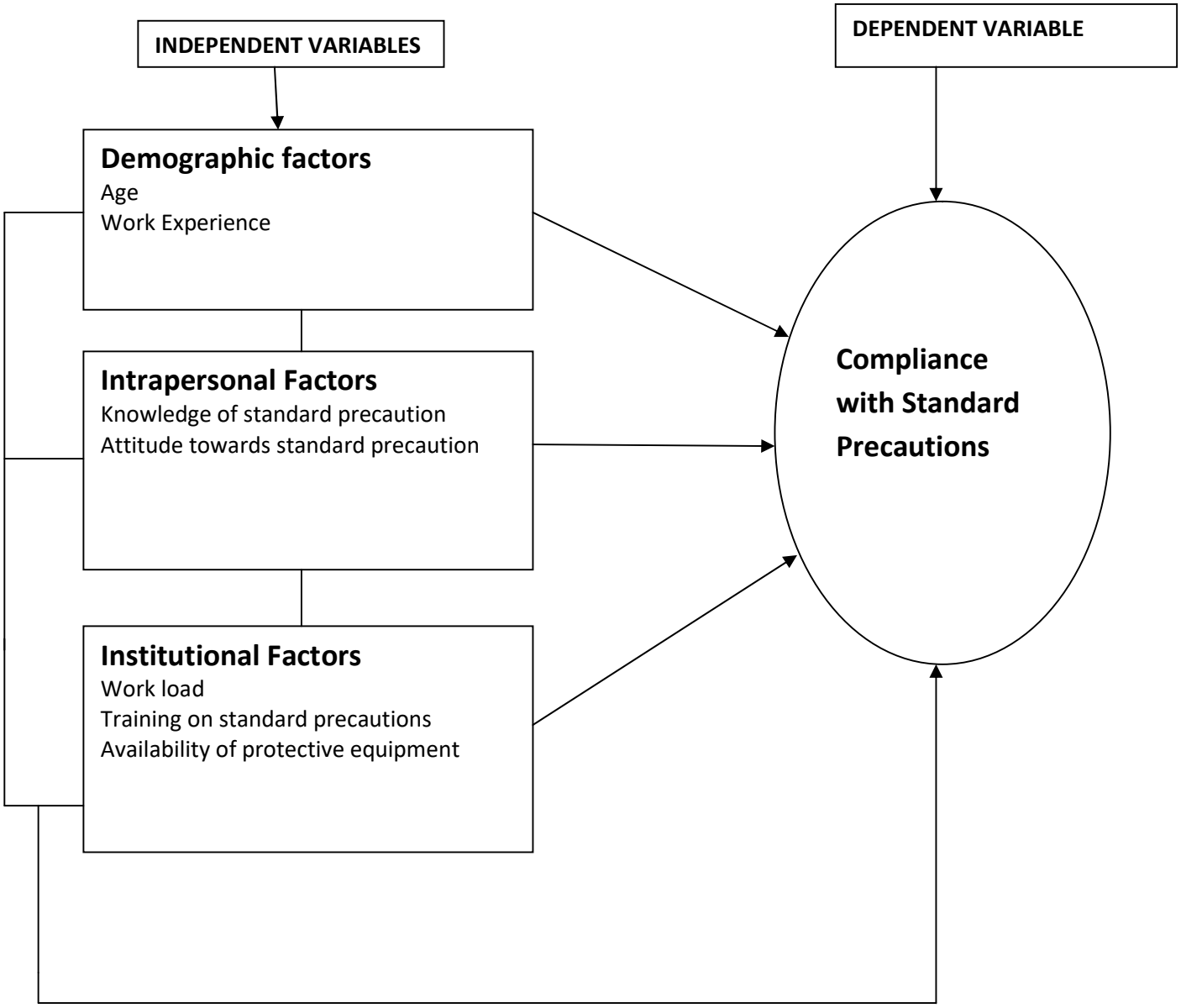
a. Overview of infectious diseases
b. Safety of patients within the health facilities
c. Safety of health workers in health facilities setting
d. Health care associated infections in tertiary teaching hospitals
e. Burden of health care associated infections in health care settings
f. Overview of infection control practices
g. Evolution of infection control guidelines
h. Concept of Standard Precaution
i. Elements of standard precaution

- Hand hygiene
- Personal protective equipment
- Safe injection practices
- Respiratory etiquette and cough hygiene
- Environmental cleaning
- Waste management

4. Empirical review
    a. Demographic factors as predictors of compliance with standard precautions among nurses
    b. Intrapersonal factors as predictors of compliance with standard precautions among nurses
    c. Institutional factors as predictors of compliance with standard precautions among nurses
5. Appraisal of literature reviewed

Conceptual framework for the study

Fig. 2.1: A framework showing interrelationship of predictors on compliance with standard precautions.



Source: Self developed by the researcher

The framework is a self developed concept that is structured in relation to how demographic factors, intrapersonal and institutional factors inter-relate with each other in predicting compliance with standard precautions. The framework is in three levels, with the illustration of

boxes showing the independent variables and an oval element showing the dependent variable. The three boxes with independent variables show that compliance with standard precaution is multi factorial in which there is interaction among demographic, intrapersonal and institutional factors in predicting its compliance. The objective of this framework is to show a virtual presentation which helps to locate and connect demographic, intrapersonal and institutional factors that predict nurses' compliance with standard precautions guidelines.

Theoretical Framework for the Study

For the purpose of this study Health Belief Model (HBM) was adopted to guide the design of the study. Health Belief Model is a psychological model which has been widely used and is considered as one of the most useful models in health care prevention and promotion (Roden, 2004). It attempts to explain and predict health behaviour. The model was originally developed by four psychologist; Hochbaum, Kegels, Rosenstock and Leventhal in the 1950s as a way to examine the reasons that prevented people from using free programs which could detect or prevent diseases (Hochbaum, 1956). The original model had four constructs, supplemented later by more. It is based on two axes: the perceived threat for acquiring a disease, which incorporate the perceived susceptibility and perceived severity constructs. This axis creates a pressure in an individual for action; nevertheless this action may not necessarily take place (Nejad, Wertheim & Greenwood, 2005). The second axis is the enabling factors that trigger the behaviour and this include perceived benefits and barriers. These constructs were later supplemented with self-efficacy and cues to action in order to overcome some limitation the model showed.

Application of Health Belief Model to Compliance with Standard Precautions.

The Health Belief Model has three major components which are the individual's perception about health, the modifying factors which include demographic, intrapersonal, structural or institutional variables and the benefits of taking preventive measures. Individual perceptions are a person's beliefs about one's own susceptibility to a disease and the severity to which one views the perceived threat of the illness. In this study, the individual perceptions are nurses' beliefs about patients and their own susceptibility to health care associated infections and their perceived severity of health care associated infections. Modifying factors like demographic,

intrapersonal and institutional variables may affect an individual perception and thus indirectly influence health- related behaviours. Demographic factors like age and years of experience could affect nurses' perceptions of susceptibility to and severity of suffering ill health resulting from health care associated infections and their perceived benefits to be expected from complying with standard precautions. Factors like intrapersonal and institutional variables could also modify nurse's decision to comply with standard precautions. The benefits of taking preventive actions in this study will be nurses' belief that complying with standard precautions will protect them and patients from being infected with health care associated infections.

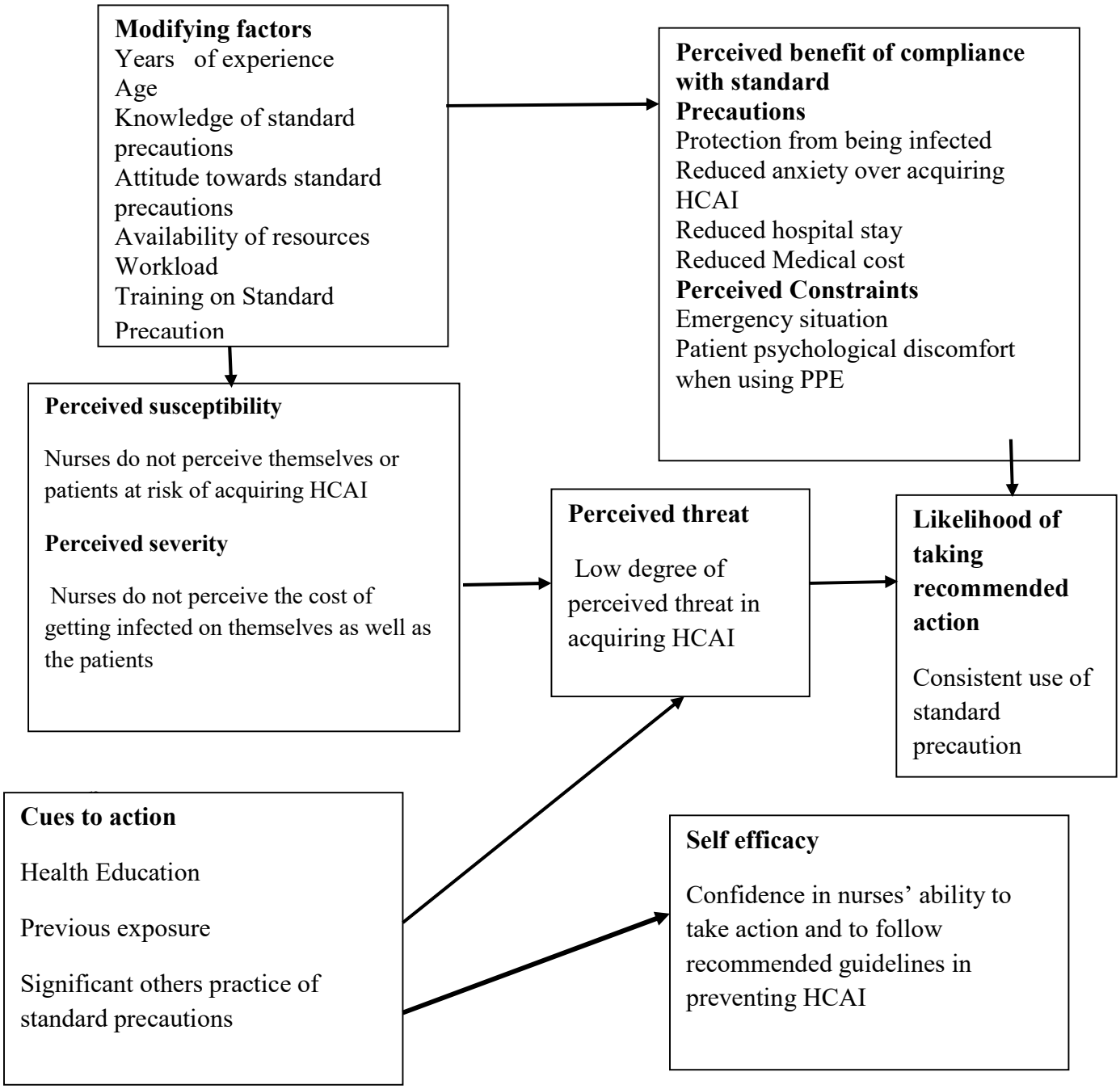
Furthermore the Health Belief Model is a value expectancy theory based on the following concepts: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self efficacy (Glanz, Rimer and Lewis, 2002). Perceived Susceptibility is the first concept of Health Belief Model and in this study, this defines nurses' belief about the chances of contracting health care associated infections as well as them being an agent of infection transmission from one patient to another. A person's perception that a health problem is personally relevant will contribute to taking the required action to prevent the health problem. For this to take place there must be activities that increase the individual's perception of one's vulnerability to the health condition. Nurses who perceive themselves to be susceptible to health care associated infections as well as being an agent of infection transmission from one patient to another would more likely comply with standard precautions.

Perceived Severity which is the second concept of Health Belief Model refers to nurses' belief of how serious health care associated infections are and its consequences. Nurses must perceive health care associated infections as serious infections that have severe consequences and implications on them and patients' physical and social lives before they would comply with standard precautions. When one recognizes ones' susceptibility to a certain problem or condition, it does not necessarily motivate one to take the necessary preventive actions unless one realizes that getting the condition would have serious physical and social implications. It is when one realizes the magnitude of the negative consequences of a condition that one would take the necessary actions to prevent them (Resources Centre for Adolescent Pregnancy Prevention, 2005). Perceived benefits refer to one's belief in the efficacy of the advised action to reduce the

risk or seriousness of impact (Resource Centre for adolescent Pregnancy, 2007). Nurses need to believe that by complying with standard precautions it will prevent transmission of infections. It is this belief that that will give the nurse confidence to practice standard precautions because of the expected outcome.

Perceived Barriers is the fourth concept of Health Belief Model and it refers to one's belief in the tangible and psychological costs of the advised behaviours (Groeneworld, Bruijn and Bilsborrow, 2006). There could be several barriers that affect people's decision to take particular actions. In this study perceived barriers to standard precautions compliance could include demographic, intrapersonal and institutional factors. It is only when nurses realize that they have the capacity to deal with these barriers that they would be able to practice standard precautions (Polit and Hungler, 1999). Health Belief Model cues to action are events or experiences, intrapersonal, interpersonal or environmental that motivate a person to take action. Cues to action are when an individual feels the desire to take the necessary action after believing that one has the capacity to do so. In this study the cues to action is when the nurse feels the desire to comply with standard precautions after believing that she has the capacity to practice it. Self Efficacy is the sixth concept of Health Belief Model and it is the strength of an individual's belief in one's own ability to respond to novel or difficult situations and to deal with any associated setbacks. Self efficacy is the ability of the nurse to comply with standard precautions. The nurse should feel that she is capable of practising standard precautions correctly because it is that confidence that will motivate her to practice it (Groeneworld, Bruijn and Bilsborrow, 2006).

Fig. 2.2: Health Belief Model Applied to Predictors of Compliance with Standard Precautions.



Source: Adapted from The Health Belief Model

Theoretical review of concepts

Overview of Infectious Diseases

Disease is a disordered or incorrectly functioning organ, part, structure or system of the body resulting from the effect of genetic or developmental errors, infections, poisons, nutritional deficiency or imbalance toxicity or unfavourable environmental factors. Infectious diseases are disorders caused by pathogenic microorganisms such as bacterias, viruses, fungi or parasites. The diseases can be spread indirectly or directly from one person to another. Patients are exposed to variety of infections during their stay in the hospital. Likewise health care workers are also exposed to variety of infectious diseases during the performance of their duties. According to Centre for Disease Control (1992) in order for infection to occur in an individual, a process involving six related components must occur. This process is referred to as the chain of infections. To stop, the spread of disease one or more of the links must be broken. The six links in the chain are (a) aetiologic agent (b) reservoir (c) portal of exit (d) mode of transmission (d) portal of entry and (e) susceptible host

A. Aetiologic Agent

There are seven categories of biological agent that can cause infectious diseases (Mckenzie and Pinger, 2015). Each has its own particular characteristics and these agents are metozoa, protozoa, fungi, bacteria, rickketsia, viruses and prions.

Metazoa : They are multi cellular animals, many of which are parasites. Among the diseases they cause are trichinellosis, hookworm and schistosomiasis. Trichinellosis is a zoonotic disease caused by trichinella parasites transmitted through raw or under cooked meal. Many animals may act as reservoirs but those most frequently involved in cases of human infections are pigs and horses (European Centre for Diseases Prevention and Control, 2016). Infection is initiated by ingestion of viable larvae present in raw or undercooked meat. Digestive action liberates the larvae and the larvae develop into adults in the duodenum and jejunum where they mate and bear offspring. According to Neghina, Moldovan, Marincu, Calma and Neghina (2012) the earliest human infection is reported to have been documented in an Egyptian mummy that dates to

approximately 1300 BC. Religious injunctions on the consumption of pork may reflect early cultural awareness of this human- animal infection link (Dupouy-Camet and Bruschi, 2012).

Hookworm disease is a common helminth infection that is cuased by the nematode parsites Necator americanus and Ancylostoma duodenale. According to Haburchak (2016) approximately four hundred and forty million (440million) people are infected with hookworm worldwide. Although most of those affected are asymptomatic (De Silva, Brooker, Hotez, Montresor, Engels and Savioli, 2003), approximately 10% experience anaemia. Hookworm infection is acquired through skin exposure to larvae in soil contaminated by human faeces. Soil become infectious in about nine days after contamination and remains so for weeks. Hookworm may persist for many years in the host and impair the physical and intellectual development of children and the economic development of communities (Haburchak, 2016). Also according to WHO (2016) hookworm disease contribute substantially to the incidence of anaemia and malnutrition in developing nations. Schistosomiasis is a disease caused by parasitic worm. According to Centre for Disease Control (2018) schistosomiasis is second only to malaria as the most devastating parasitic disease and more than two hundred million people worldwide are infected with it. The parasites that cause schistosomiasis live in certain types of freshwater snails. The infectious form of the parasite known as cercariae, emerge from the snail and contaminate the water. Individuals can become infected when their skin come in contact with contaminated water.

Protozoa: They are single cell organisms with a well defined nucleus and some of these are human parasites. Examples of diseases caused by protozoa include malaria, giardiasis, toxoplasmosis and pneumocystis carinii pneumonia (PCP). Malaria is a mosquito–borne disease that is one of the top three infectious diseases in the world along with tuberculosis and HIV. Giardiasis is an infection of the upper small intestine that causes a diarrheal illness. It is a major diarrhea diseases found throughtout the world. Flagellate protozoan known as Gardia intestinalis is the causative agent and it is the most commonly associated identified parasite in the United States and the most common protozoal intestinal parasite isolated worldwide (Daley, Roy, Blaney, 2010). Infection is more common in children than in adults (Huston, 2006) and outbreaks can be difficult to control especially in child care setting. Toxoplasmosis is transmitted

to humans from cats and under cooked meat Pneumocystis carinii Pneunomia (PCP) is often fatal especially in people with compromised immune systems such as those infected with HIV. .

Fungi: They are non motile, filamentous organisms that cause disease which can be very difficult to treat. Some examples important to public health are histoplasmosis and candidiasis. Histoplamosis is transmitted by inhaling dust from soil that contains birds droppings. The severity varies widely, with the lungs the most common site of infections. Candidiasis which is transmitted by contact with human patients and carriers causes lesions on the skin or mucous membrane including thrush and vulvovaginitis. Symptoms can be severe in immune compromised people.

Bacteria: They are single-celled organisms that lack nucleus. They are responsible for a wide range of human diseases including tuberculosis which is a chronic lung disease that is a major cause of disability and death in many parts of the world. Tuberculosis is a top infectious disease killer worldwide. According to WHO (2016), 9.6 million people fell ill with tuberculosis and 1.5 million people died from the disease in 2014. Tuberculosis is caused by mycobacterium tuberculosis that most often affects the lungs. Tuberculosis is curable and preventable. Staphylococcal is also bacterial disease which affects almost every organ system. Chalmydia and gonorrhea are the most widespread sexually transmitted diseases. Tetanus and diphtheria are two diseases that were once major public health problems but are now well controlled through immunization. Other vaccine preventable diseases caused by bacteria are pertusis, haemophilus influenzas type b, and pneumococcal

Rickkettsia: They are genus of bacterial usually found in the cells of lice, ticks, fleas and mites. They are smaller than most bacterial and share some characteristics of viruses. Diseases caused by rickettsia include rocky mountain spotted fever typhus. Rocky mountain fever is a tick borne disease caused by Rickettsia rickettsii. It has been described as a wolf in sheep's clothing and great imitator of other disease processes (Sexton and Corey, 1992).

Viruses: They are very small consisting of RNA or DNA core and an outer coat of protein. They can reproduce and grows only inside of living cells. Many viral illnesses are significant to public health and they include influenza, HIV, Rabies, measles, mumps, rubella and poliomyelitis.

Prions : These are infectious agents that do not have any gene; they seem to consists of a protein with an aberrant structure which somehow replicates in animal or human tissues. Examples of diseases caused by prions are kuru, bovine spongiform encephalopathy, variant Creutzfeldt Jakob Disease (vCJD), Gertsmann- Strausssler- Scheinker syndrome (GSS). Creutzfeldt-Jakob disease (CJD) is a rapidly progressive, degenerative, neurologic disorder of humans and it is believed to be caused by a transmissible proteinaceous infectious agent termed a prion. Infectious prions are isoforms of a host-encoded glycoprotein known as the prion protein. The incubation period varies from two years to many decades. However, death typically occurs within 1 year of the onset of symptoms. Approximately 85% of CJD cases occur sporadically with no known environmental source of infection and 10% are familial. Iatrogenic transmission has occurred with most resulting from treatment with human cadaveric pituitary-derived growth hormone or gonadotropin (Frasier and Foley, 1994), from implantation of contaminated human dura mater grafts or from corneal transplants . Transmission has been linked to the use of contaminated neurosurgical instruments or stereotactic electroencephalogram electrode (Rutala and Weber, 2001).

Epidemiologically important organisms

Any infectious agents transmitted in healthcare settings may, under defined conditions, become targeted for control because they are epidemiologically important. According to Siegel et al. *(*2007), in determining what constitutes an epidemiologically important organism, the following characteristics apply:

1. A propensity for transmission within healthcare facilities based on published reports and the occurrence of temporal or geographic clusters of 2 or more patients, (e.g., *Closridium difficile*, norovirus, respiratory syncytial virus (RSV), influenza, rotavirus, *Enterobacter* spp; *Serratia* spp., group A streptococcus). According to Sabria and Camprins, (2003) ; Bille, Marchetti and Calandra, (2005) a single case of healthcare-associated invasive disease caused by certain pathogens is generally considered a trigger for investigation and enhanced control measures because of the risk of additional cases and severity of illness associated with these infections.

2. Organisms that are resistance to first-line therapies (e.g., Methicillin- resistant Staphylococus aureus (MRSA), Vancomycin Intermediate Staphylococcus aureus(VISA), Vancomycin Resistantant Staphylococcus aureus (VRSA), Vancomycin Resistant Enterococci (VRE), Extended–spectrum beta- lactamase (ESBL) - producing organisms).

3. Common and uncommon microorganisms with unusual patterns of resistance within a health facility.

4. Difficult to treat microorganisms because of innate or acquired resistance to multiple classes of antimicrobial agents (e.g., *Stenotrophomonas maltophilia, Acinetobacter spp.*).

5. Microorganisms that are associated with serious clinical disease, increased morbidity and mortality (e.g., Methicillin resistant staphylococcus aureus (MRSA) and Methicillin sensitive staphylococcus aureus(MSSA), group A streptococcus)

6. A newly discovered or re emerging pathogen

Epidemiologically important organisms include the following:

Clostridium. Difficile –This is a spore-forming gram positive anaerobic bacillus that was first isolated from stools of neonates in 1935 and identified as the most commonly identified causative agent of antibiotic-associated diarrhoea and pseudomembranous colitis in 1977 (George, Sutter and Finegold, 1977). This pathogen is a major cause of healthcare-associated diarrhea and has been responsible for many large outbreaks in healthcare settings that were extremely difficult to control. According to McFarland, Mulligan, Kwok and Stamm (1989) important factors that contribute to healthcare-associated outbreaks include environmental contamination, persistence of spores for prolonged periods of time, resistance of spores to routinely used disinfectants and antiseptics, hand carriage by healthcare personnel to other patients, and exposure of patients to frequent courses of antimicrobial agents. Antimicrobials most frequently associated with increased risk of *C. difficile* include third generation cephalosporins, clindamycin, vancomycin, and fluoroquinolones.

Since 2001, outbreaks and sporadic cases of *C. difficile* with increased morbidity and mortality have been observed in several U.S. states, Canada, England and the Netherlands

(McDonald, Kilgore, Thompson et al., 2005). The same strain of *C. difficile* has been implicated in these outbreaks. A recent survey of U.S. infectious disease physicians found that 40% perceived recent increases in the incidence and severity of *C. difficile* diseas. Standardization of testing methodology and surveillance definitions is needed for accurate comparisons of trends in rates among hospitals. Considering the greater morbidity, mortality, length of stay, and costs associated with *C. difficile* disease in both acute care and long term care facilities, control of this pathogen is now even more important than previously. Prevention of transmission focuses on syndromic application of standard precautions for patients with diarrhea, accurate identification of patients, environmental measures (e.g., rigorous cleaning of patient rooms) and consistent hand hygiene. Use of soap and water, rather than alcohol based handrubs, for mechanical removal of spores from hands, and a bleach-containing disinfectant for environmental disinfection, may be valuable when there is transmission in a healthcare facility.

Multidrug-Resistant Organisms (MDROs) - MDROs are defined as microorganisms predominantly bacteria that are resistant to one or more classes of antimicrobial agents. Although the names of certain MDROs suggest resistance to only one agent (e.g., methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin resistant enterococcus (VRE), these pathogens are usually resistant to all but a few commercially available antimicrobial agents. This latter feature defines MDROs that are considered to be epidemiologically important and deserve special attention in healthcare facilities (Shales, Gerding, John, 1997). Other MDROs of current concern include multidrug-resistant *Streptococcus pneumoniae* (MDRSP) which is resistant to penicillin and other broad-spectrum agents such as macrolides and fluroquinolones, multidrug-resistant gram-negative bacilli (MDR- GNB), especially those producing extended spectrum beta-lactamases (ESBLs); and strains of staphylococcus aureus that are intermediate or resistant to vancomycin (i.e., VISA and VRSA .MDROs are transmitted by the same routes as antimicrobial susceptible infectious agents.

Patient-to-patient transmission in healthcare settings, usually via hands of health care workers has been a major factor accounting for the increase in MDRO incidence and prevalence, especially for MRSA and VRE in acute care facilities (Tammelin, Klotz, Hambraeus, Stahle and Ransjo, 2003). Preventing the emergence and transmission of these pathogens requires a

comprehensive approach that include s administrative involvement and measures (e.g., nurse staffing, communication systems, performance improvement processes to ensure adherence to recommended infection control measures), education and training of medical and other healthcare personnel, judicious antibiotic use, comprehensive surveillance for targeted MDROs, application of infection control precautions during patient care, environmental measures (e.g., cleaning and disinfection of the patient care environment and equipment, dedicated single-patient-use of non-critical equipment), and decolonization therapy when appropriate (Siegel, 2007).

Agents of Bioterrorism

Centre for Disease Control (2000) has designated the agents that cause anthrax, smallpox, plague, tularemia, viral haemorrhagic fevers and botulism as Category A (high priority) because these agents can be easily disseminated environmentally or transmitted from person to person; can cause high mortality and have the potential for major public health impact; might cause public panic and social disruption; and require public health preparedness. Health care facilities confront a different set of issues when dealing with a suspected bioterrorism event as compared with other communicable diseases. An understanding of the epidemiology, modes of transmission, clinical course of each disease, carefully drafted plans that provide an approach and relevant websites, other resources for disease specific guidance to health care, administrative and support personnel are essential to managing a bioterrorism event.

Infection control issues to be addressed include: identifying persons who may be exposed or infected; preventing transmission among patients, healthcare personnel, and visitors; providing treatment, chemoprophylaxis or vaccine to potentially large numbers of people; protecting the environment including the logistical aspects of securing sufficient numbers of Airborne Infection Isolation Rooms (AIIRs) or designating areas for patient cohorts when there are an insufficient number of AIIRs available; providing adequate quantities of appropriate personal protective equipment; and identifying appropriate staff to care for potentially infectious patients (e.g., vaccinated healthcare personnel for care of patients with smallpox). The response is likely to differ for exposures resulting from an intentional release compared with naturally occurring disease because of the large number persons that can be exposed at the same time and possible

differences in pathogenicity. Sources of information on specific agents include: anthrax; smallpox ; plague ; botulinum toxin tularemia and hemorrhagic fever viruses e.g ebola virus and lassa fever virus .

B. Reservoir

This is the next link in the chain of infectious process and it is the usual habitat in which the agents lives and multiplies. It is the source that provides a pathogen with adequate conditions for survival and multiplication and an opportunity for transmission. A reservoir of infection is any person, animal, arthropod, plant , soil or substance or combination of all these in which an infectious agent normally lives and multiplies, on which it depends primarily for survival and where it produces itself in such manner that it can be transmitted to a susceptible host. Depending on the agent, the reservoir may be animal reservoir and this includes human beings, insects, birds and other animals. It could also be inanimate reservoirs, this includes soil, water, food, faeces, intravenous fluids and equipments

C. Portal of entry

This is the route through which microorganisms enter the susceptible host and cause disease or infections. Infectious agents enter the body through various portals, these portals include respiratory, genitourinary, alimentary, skin (superficial lesion & percutaneous) and transplacental. Pathogens often enter the host through the same route they exited the reservoir; for example airborne pathogens from one person's sneeze can enter through the nose of another person. The skin normally serves as a barrier to infection, but any break in the skin invites the entrance of pathogens such as tubes placed in body cavities (catheters) or punctures produced by invasive procedures (intravenous line)

D. Mode of transmission

A mode of transmission is necessary to bridge the gap between the portal of exit from the reservoir and the portal of entry into the host. According to Centre for Diseases Control (2007) the modes of transmission vary by type of organism and some infectious agents may be transmitted by more than one route: some are transmitted primarily by direct or indirect contact, (e.g., Herpes simplex virus [HSV], respiratory syncytial virus, Staphylococcus aureus), others by

the droplet, (e.g., influenza virus, B. pertussis) or airborne routes (e.g. tuberculosis). Other infectious agents, such as bloodborne viruses (e.g., hepatitis B and C viruses [HBV, HCV] and HIV are transmitted rarely in healthcare settings, via percutaneous or mucous membrane exposure. Importantly, not all infectious agents are transmitted from person to person. Among patients and health care personnel, microorganisms are spread to others through three principal routes of transmission: contact (direct and indirect), respiratory droplets, airborne spread.

Contact transmission - The most common mode of transmission, contact transmission is divided into two subgroups: direct contact and indirect contact. Direct contact transmission **-** This occurs when microorganisms are transferred from one infected person to another person without a contaminated intermediate object or person. Opportunities for direct contact transmission between patients and healthcare personnel include:

1. Blood or other blood-containing body fluid from a patient directly enters a caregiver's body through contact with a mucous membrane or breaks (i.e., cuts, abrasions) in the skin. (Rosen, 1997)

2. Mites from a scabies-infested patient are transferred to the skin of a caregiver while he or she is having direct ungloved contact with the patient's skin.(Obasanjo, Wu, Conlon et al., 2001)

3. A healthcare provider develops herpetic whitlow on a finger after contact with herpes simplex virus when providing oral care to a patient without using gloves or herpes simplex virus is transmitted to a patient from a herpetic whitlow on an ungloved hand of a healthcare worker. (Avitzur and Amir, 2002).

Indirect contact transmission- indirect transmission involves the transfer of an infectious agent through a contaminated intermediate object or person. In the absence of a point-source outbreak, it is difficult to determine how indirect transmission occurs. However, extensive evidence suggests that the contaminated hands of healthcare personnel are important contributors to indirect contact transmission. Examples of opportunities for indirect contact transmission include:

a. Hands of healthcare personnel may transmit pathogens after touching an infected or colonized body site on one patient or a contaminated inanimate object, if hand hygiene is not performed before touching another patient. (Duckro,Blom,Lyle,Weinstein and Hayden, 2005)

b. Patient-care devices (e.g., electronic thermometers, glucose monitoring devices) may transmit pathogens if devices contam inated with blood or body fluids are shared between patients without cleaning and disinfecting between patients. (CDC, 2005)

c. Shared toys may become a vehicle for transmitting respiratory viruses (e.g., respiratory syncytial virus (Hall, 2000) or pathogenic bacteria for example Pseudomonas aeruginosa among paediatric patients (Butterty, Alabaster, Heine et al., 1998)

d. Instruments that are inadequately cleaned between patients before disinfection or sterilization for example endoscopes or surgical instruments (Schelenz and French, 2000 ; Weber and Rutala , 2001) or that have manufacturing defects that interfere with the effectiveness of reprocessing (Kirschke, Jones, Craig, *et al.,* 2003; Srinivasan, Wolfenden, Song, *et al*., 2003) may transmit bacterial and viral pathogens.

Clothing, uniforms, laboratory coats, or isolation gowns used as personal protective equipment (PPE), may become contaminated with potential pathogens after care of a patient colonized or infected with an infectious agent, (e.g., MRSA, VRE , and C. difficile.) Although contaminated clothing has not been implicated directly in transmission, the potential exists for soiled garments to transfer infectious agents to successive patients.

Droplet transmission- Droplet transmission is, technically, a form of contact transmission, and some infectious agents transmitted by the droplet route also may be transmitted by the direct and indirect contact routes. However, in contrast to contact transmission, respiratory droplets carrying infectious pathogens transmit infection when they travel directly from the respiratory tract of the infectious individual to susceptible mucosal surfaces of the recipient, generally over short distances, necessitating facial protection. Respiratory droplets are generated when an infected person coughs, sneezes, or talks (Papineni and Rosenthal, 1997) or during procedures such as suctioning, endotracheal intubation (Fowler, Guest, Lapinsky, et al., 2004) cough induction by chest physiotherapy(Ensor, Humphreys, Peckham, Webster and Knox, 1996)

cardiopulmonary resuscitation. Studies have shown that the nasal mucosa, conjunctivae and less frequently the mouth, are susceptible portals of entry for respiratory viruses. The maximum distance for droplet transmission is currently unresolved, although pathogens transmitted by the droplet route have not been transmitted through the air over long distances, in contrast to the airborne pathogens discussed below.

Historically, the area of defined risk has been a distance of ≤3 feet around the patient and is based on epidemiologic and simulated studies of selected infections (Feijin, Baker, Herwaldt, Lampe, Mason and Whitney, 1982; Dick, Jennings, Minkwartgow and Inhorn, 1987). Using this distance for donning masks has been effective in preventing transmission of infectious agents via the droplet route. However, experimental studies done on smallpox by Fenner, Henderson, Arita, Jezek, Ladnyi, (1988) and investigations during the global SARS outbreaks of 2003 (Wong, Lee, Tam, et al., 2004) suggested that droplets from patients with these two infections could reach persons located six feet or more from their source. It is likely that the distance droplets travel depends on the velocity and mechanism by which respiratory droplets are propelled from the source, the density of respiratory secretions, environmental factors such as temperature and humidity, and the ability of the pathogen to maintain infectivity over that distance. Thus, a distance of ≤3 feet around the patient is best viewed as an example of what is meant by a short distance from a patient" and should not be used as the sole criterion for deciding when a mask should be donned to protect from droplet exposure. Based on these considerations, it may be prudent to don a mask when within 6 to 10 feet of the patient or upon entry into the patient's room, especially when exposure to emerging or highly virulent pathogens is likely. More studies are needed to improve understanding of droplet transmission under various circumstances.

Droplet size is another important variable. Droplets traditionally have been defined as being greater than 5 μm in size. Droplet nuclei, particles arising from desiccation of suspended droplets, have been associated with airborne transmission and defined as less than or equal to 5 μm in size (Duguld, 1946) , a reflection of the pathogenesis of pulmonary tuberculosis which is not generalizeable to other organisms. Observations of particle dynamics have demonstrated that a range of droplet sizes, including those with diameters of 30μm or greater, can remain suspended in the air (Cole and Cook, 1998). The behaviour of droplets and droplet nuclei affect

recommendations for preventing transmission. Whereas fine airborne particles containing pathogens that are able to remain infective may transmit infections over long distances, requiring AIIR to prevent its dissemination within a facility; organisms transmitted by the droplet route do not remain infective over long distances, and therefore do not require special air handling and ventilation. Examples of infectious agents that are transmitted via the droplet route include *Bordetella pertussis ,* influenza virus , adenovirus , rhinovirus , *Mycoplasma pneumoniae* , SARS-associated coronavirus (SARS-CoV) , group A streptococcus , and *Neisseria meningitidis* . Although respiratory syncytial virus may be transmitted by the droplet route, direct contact with infected respiratory secretions is the most important determinant of transmission and consistent adherence to Standard Precautions prevents transmission in healthcare settings. Rarely, pathogens that are not transmitted routinely by the droplet route are dispersed into the air over short distances. For example, although staphylococcus aureus is transmitted most frequently by the contact route, viral upper respiratory tract infection has been associated with increased dispersal of staphylococcus aureus from the nose into the air for a distance of 4 feet under both outbreak and experimental conditions and is known as the "cloud baby" and "cloud adult" phenomenon.

Airborne transmission- this occurs through dissemination of either airborne droplet nuclei or small particles in the respirable size range containing infectious agents that remain infective over time and distance (e.g., spores of *Aspergillus* spp, and *Mycobacterium tuberculosis*). Microorganisms carried in this manner may be dispersed over long distances by air currents and may be inhaled by susceptible individuals who have not had face-to-face contact with (or been in the same room with) the infectious individual (LeClair, Zaia, Levin, Congdon, Goldman, 1980). Preventing the spread of pathogens that are transmitted by the airborne route requires the use of special air handling and ventilation systems (e.g., AIIRs) to contain and then safely remove the infectious agent. Infectious agents to which this applies include *Mycobacterium tuberculosis,* rubeola virus (measles), and varicella-zoster virus (chickenpox). In addition, published data suggest the possibility that variola virus (smallpox) may be transmitted over long distances through the air under unusual circumstances and AIIRs are recommended for this agent as well; however, droplet and contact routes are the more frequent routes of transmission for smallpox (Fenner, Henderson, Arita, Jezek and Ladnyi, 1988). In addition to AIIRs, respiratory protection

with NIOSH certified N95 or higher level respirator is recommended for healthcare personnel entering the AIIR to prevent acquisition of airborne infectious agents such as *M. tuberculosis.* For certain other respiratory infectious agents, such as influenza and rhinovirus and even some gastrointestinal viruses (e.g., norovirus and rotavirus) there is some evidence that the pathogen may be transmitted via small-particle aerosols, under natural and experimental conditions. Such transmission has occurred over distances longer than three feet but within a defined airspace (e.g., patient room), suggesting that it is unlikely that these agents remain viable on air currents that travel long distances. AIIRs are not required routinely to prevent transmission of these agents.

E. Portal of Exit

A portal of exit is the site from where microorganisms leave the host to enter another host and cause disease or infections. For example, a micro organism may leave the reservoir through the nose or mouth when someone sneezes or in faeces. The portal of entry into the host is usually the same as the portal of exit from the reservoir. However in some diseases the exit and entry portals may differ.

F. Susceptible Host

This is the final component in the chain of infectious process. The susceptibility of the host is also influenced by genetic factors, general resistance factors, and specific acquired immunity.

Safety of Patients within the Health Care Facilities

Patient safety is the absence of avoidable harm to patients during the process of health care. The International Classification for Patient Safety describes patient safety as the reduction of risk or unnecessary harm associated with health care to an acceptable minimum. An acceptable minimum refers to the collective notions of given current knowledge, resources available and the context in which care was delivered. According to WHO (2018) patient safety has become a global public health problem patient harm is the fourteenth leading cause of the global disease burden, comparable to diseases such as tuberculosis and malaria. There is a 1 in 300 chance of a patient being harmed during health care because every year, tens of millions of patients worldwide suffer disabling injuries or death due to unsafe medical care. Estimates show that in

developed countries as many as one in ten patients is harmed while receiving hospital care. The harm can be caused by a range of errors or adverse events.

An adverse event is an incident which resulted in harm to a patient (including omission). Adverse events in health care include health care associated infections, blood safety, unsafe surgery, injection safety and counterfeit drugs. In high income countries of every hundred patients hospitalized at any given time seven will acquire health care associated infections; while ten in developing countries will acquire health care associated infections out of hundred hospitalized patients.

The ten domains of patient safety in developing countries in order of relevance are:

1. Health care associated infections (HCAI)
2. Preventable adverse drug events
3. Adverse events in mother and/or baby related to prenatal, labor and postnatal care period.
4. Adverse events due to surgical and anaesthetic care
5. Adverse events related to wrong and/or late diagnosis
6. Adverse events related to injection practices
7. Adverse events related to unsafe use of blood and blood products
8. Adverse events related to medical device use
9. Patients falls and injuries due to falls
10. Pressure ulcers

Ten strategies were developed by World Health Organisation (2001) so as to ensure safer care for all patients and these includes:

i. Clean Care is Safer Care – These are strategies and tools to reduce health care-associated infection, through hand hygiene which is a major component of standard precautions; government engagement to support global and national hand hygiene campaigns.

ii. Safe Surgery Saves Lives Checklist - This embedded in an implementation strategy to save lives by ensuring safe surgical practices are followed.

iii. Safe Childbirth Checklist - For ensuring safe practices during pregnancy and childbirth.

iv. The African Partnerships for Patient Safety- This is for building links between Africa and Europe to help tackle patient safety in Africa.

v. The International Classification for Patient Safety Framework –This is for defining patient safety information linked to applying the reporting and learning systems, to identify causes of risk and promote learning.

vi. Research – This is to ensure better knowledge to make care safer, through establishing priorities, knowledge management, developing tools to assess harm and supporting research in developing countries.

vii. Solutions for Patient - Safety to translate knowledge into practical solutions.

viii. Standardized patient safety protocols –This is to achieve sustainable reductions in the occurrence of serious patient safety problems.

ix. Patient Safety Curricula Guides – This is to educate and train future health care workers as leaders in patient safety.

x. Patient for Patient Safety – This involves creating honourable partnerships between patients and the health care community and giving patients a voice.

According to Lopez (2006) the challenges of patient safety in developing countries including African countries are; patient safety is a new concept and not always easy to understand ; patient

safety is not seen as a priority when health systems are faced with other pressing health issues; there is a blame culture which leads to occultism and fatality mentality which means things are like this here!

Patient safety problem is a two sided coin and according to Sir Liam Donaldson (2005) a former Chief Medical Officer, UK "It also affects the lives of doctors, nurses and other health care staff who become the 'second victims' in a chain of events.“

Safety of health workers in health facilities settings

Healthcare is the fastest-growing sector of the most developed countries' economy. Women represent nearly 80% of the healthcare work force. Health care workers face a wide range of hazards on the job, including needle stick injuries, back injuries, latex allergy, violence, and stress. Although it is possible to prevent or reduce healthcare worker exposure to these hazards, healthcare workers continue to experience injuries and illnesses in the workplace. According to Centre for Disease Control (2017) cases of nonfatal occupational injury and illness among healthcare workers are among the highest of any industry sector. By contrast, two of the most hazardous industries, agriculture and construction, are safer today than they were a decade ago. Workers employed in the health care sector have to deal with a wide range of activities and environments that pose a threat to their health and put them at risk of occupational disease or work-related accidents. Healthcare workers have a legal obligation to care for the safety of others in the workplace, which includes colleagues and patients; but many of the settings in which health care workers carry out their jobs and the multiplicity of tasks they perform can present a great variety of hazards. The nature of their work, whether delivering frontline care for the physically or mentally impaired, or handling patients or providing cleaning services, makes it absolutely vital that health and safety is a priority in this sector

According to the Institute for Work and Health fact sheet, healthcare workers, due to illness and disability, are one and a half time more prone to miss work than workers in the other sectors. Because of accidental needle-stick injuries, infections, illnesses, stress, and workplace abuse and violence, the healthcare workers are a high risk group and nurses is the most suffering group from on the job injuries among health-care workers (Institute for Work and Health, 2008).

Nurses are the largest hospital workforce all over the world. Owning to the nature of their work and the number of hours they spend with patients they are exposed to numerous occupational infections and hazards. According to the International Council of Nurses fact sheet, nurses suffer from on average 1-4 needle stick and other sharps injuries per year that cause them to be exposed to over twenty different blood borne pathogens and make them as the most exposed group among healthcare workers. Baumann et al. (2001) also asserted that high vulnerability to injury makes nurses have higher absenteeism and disability rates that costs the healthcare system a great deal of money.

Healthcare workers' safety issue is very critical also for patient safety and this is stated in the Institute of Medicine Report (2000) as "Workers' safety is often linked with patient safety. If workers are safer in their jobs, patients will be safer also."

Healthcare Associated Infections in Health Care Settings

According to WHO (2005), every year, the treatment and care of hundreds of millions of patients worldwide is complicated by infections acquired during health care. Hence healthcare associated infection has become a major global safety concern for both patients and healthcare professionals (Burke, 2003; Bates et al., 2009). As a result, some patients become more seriously ill than they would otherwise have been. Some have prolonged stays in hospital, some experience long-term disability and some die. As well as the human cost, health-care systems carry a massive additional financial burden. Healthcare can and does save lives, and has brought unprecedented benefits to generations of patients and their families. However, it also carries risks. Healthcare associated infection is sometimes the unfortunate consequence of modern medicine: new procedures, new treatments for advanced cancers, organ transplantation and intensive care are associated with an increased risk of infection.

Healthcare associated infection (HAI), also referred to as nosocomial or hospital infection, is an infection occurring in a patient during the process of care in a health-care facility which was not present or incubating at the time of admission. This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff (WHO, 2002) Health care-associated infections are the most frequent adverse event in health-care

delivery worldwide. Hundreds of millions of patients are affected by health care-associated infections worldwide each year, leading to significant mortality and financial losses for health systems. Endemic burden of health care-associated infection is also significantly higher in low- and middle income than in high-income countries, in particular in patients admitted to intensive care units and in neonates. While urinary tract infection is the most frequent health care-associated infection in high-income countries, surgical site infection is the leading infection in settings with limited resources, affecting up to one-third of operated patients; this is up to nine times higher than in developed countries. Healthcare associated infections in low- and middle-income countries cannot be accurately assessed due to limited data, often of low quality. However, recent analysis by WHO found that healthcare associated infections are more frequent in resource-limited settings than in developed countries. The most common sites of healthcare associated infections are urinary tract, lung, surgical site and blood. Several factors can cause health care-associated infections. Some of these factors are present regardless of the resources available and they include; prolonged and inappropriate use of invasive devices and antibiotics; high-risk and sophisticated procedures; immuno-suppression and other severe underlying patient conditions and insufficient application of standard and isolation precautions.

Burden of Healthcare Associated infection

Health care associated infections or nosocomial infections are infections that patients acquire during the course of receiving treatment for other conditions within a health care setting and also occupational infections among health workers (CDC, 2008). In recent years HAI have reached epidemic proportion and are one of the main concerns in the health care system (Jackson, Chiarello, Gaynes & Gerberding, 2002). Healthcare associated infection is a major public health problem. These infections caused by multi resistant pathogens, take a heavy toll on patients and their families by causing illness, prolonged hospital stay, potential disability, excess costs and sometimes death (Pittet &Donaldson, 2005; Archibald & Jarvis, 2007; Allegranzi & Pittet,2008).

A continuously increasing prevalence, 10% of patients on general hospital units will acquire a nosocomial infection during their hospital stay. Presently, two million patients each year acquire HAI, approximately 90,000 succumbing to death. The risk of these infections poses a potential patient safety threat (Safdar & Abad, 2008). The risk of acquiring healthcare

associated infection is 2 to 20 times higher in developing countries compared to developed countries and 5% -10% of patients admitted to the hospitals in developed countries acquire these infections (WHO, 2010). In Nigeria HAI rate of 2.7% was reported from Ife, 3.8% from Lagos and 4.2% from Ilorin among hospitalized patients (Odimayo, Nwabuisi & Adegboro, 2008)

Healthcare associated infections not only affect patient health and safety but also affect healthcare workers health and safety. It is not surprising that patient and worker safety often go hand in hand and share organizational safety culture as their foundation, but less well known is the elevated incidence of work related injuries and illness among health care workers that occurs in the work settings and the impacts these injuries and illness have on the worker, their families, healthcare institutions and ultimately on patient safety (OSHA). In 1998, the Centre for Diseases Control and Prevention estimated that approximately 800,000 health care workers in the United States were injured by patient needles and about 2,000 of those workers tested positive for hepatitis (virus HIV) infection, 400 for hepatitis b virus (HBV) and 35 for human immunodeficiency virus (CDC, 1998). The World Health Organization has estimated that in developing regions 40%-65% of HBV and HIV infections in HCWs are attributable to percutaneous occupational exposure (Pruss, Ustun, Rapiti & Hutin, 2003).

According to Dressner (2017) there is still high prevalence of injuries and illnesses among hospital workers. United States Bureau of Labour Statistics 2017 data revealed that 22 of recorded illness and injuries requiring time away from work indicated the rate of occupational injuries and illness requiring days away from work per 100 workers was 1.7 for general hospital, 2.5 for nursing and residential care facilities and 1.4 for home health care. An injury or illness is considered by the Occupational Safety and Health Administration (OSHA) to be work related if an event or exposure occurs in the work place. According to the Institute for Work and Health fact sheet, healthcare workers due to illness and disability are one and a half time more prone to miss work than workers in the others sectors. Because of accidental needle-stick injuries infection, illness, stress and work place abuse and violence, the healthcare workers are a high risk group and nurses are the most group suffering from on the job injuries among health-care workers (Institute for Work and Health, 2008). According to International Council of Nurses Fact Sheet (2010) nurses suffer from average 1-4 needle sticks and other sharp injuries per year

that cause them to be exposed to over 20 difference blood borne pathogens and make them as the most exposed group among healthcare workers. According to Baumann et al (2001) high vulnerability to injury makes nurses have higher absenteeism and disability rates that cost the healthcare system of great deal of money. Healthcare workers safety issues is critical to patient safety, if workers are safer in their job, patients will be safer also.

Healthcare associated infection not only affect patient and workers health and safety but also the health care system as a whole. It is estimated that HAI increase the cost of health care between $4.5 and $5.7 billion in patient care (Cronin, Leo & Mccleany, 2008). In addition to monetary resources spent in treating HAI, the number of days a patient spent in the hospital requiring additional medical care and hour spent providing patient care is increased. These costly infections divert funding and precious staff and nursing time from possible implementation of patient safety and infection control measures to protect patients (Safdar & Abad, 2008) and health care workers. Standard precaution has been identified as the key factor in preventing HAI and non compliance to it is one of the most pertinent factors leading to HAI.

Overview of infection control practice

Health care associated infection must have existed from the time a number of people with various ailments were brought together for care, but were only readily acknowledged in the middle of the 19th century. During this period, some clinicians notably Oliver Wendel Holmes in Boston and Ignaz Philip Semmelweis in Vienna emphasized on the contagious nature of puerperal sepis or child-bed fever. Semmelweis noticed that 8.3% of women admitted to maternity services died of nosocomial peuperial sepsis. He was able to demonstrate a dramatic reduction to 2.3% in the incidence of this disease by insisting on stringent hand-washing in a solution of chlorinated lime by students coming from the postmortem room before the women could be examined. This is the first evidence that suggested that cleaning hands with an antiseptic agent between patient contacts may reduce cross transmission of an infectious agent. Today, he is considered as the father of hand hygiene due to his intervention as a model of epidemiology-driven infection prevention strategy developed from observation, careful analysis deductive hypothesis and action to stop the diseases process (Najeeb, 2007).

In 1863 Florence Nightingale wrote a book titled Notes on Hospitals. She wrote on direct association between sanitary condition and post operative complication as well as comprehensive description of ward construction and the concept of air control. In addition she observed high mortality rate among hospital nurses compared to the general population from contagious disease and emphasized nurses to do a survey on hospital acquired infection. Hence she was considered as the first nurse epidemiologist (Pittet, 2005).

The field of hospital infection was first conceptualized and implemented in England in late 1959 when Dr. Brendon Moore, Director of the Public Health Laboratory in Exeter had a nurse in today hospital appointed as an infection control sister (Gardner, Stamp & Bowgen 1962). In 1970, Dr. Moore still initiated the appointment of a second sister at the Exeter hospital. The mission of the two nurses was to improve efforts in combating and controlling the widespread of nosocomial infection. In 1963, the United States followed England's lead into the field of infection control and appointed the first infection control nurses Kathryn Wensel, a registered nurse at Stanford University California (Mehtar, 1998) The appointment of infection control nurses in the United Kingdom and the United States marked the beginning of a new era, the recognition of infection control as a specialty in its own right.

Evolution of infection control guidelines

In 1983 CDC first published guideline, which contained a section entitled "Blood and Body fluid Precaution" (Garner & Simmons, 1983). These were recommendations to be used when a patient was known or suspected to be infected with blood borne pathogens. In 1987 the CDC published "Recommendations for prevention of HIV Transmission in Health-Care setting (CDC, 1987a). This document was referred to as "Universal Blood and Body Fluid Precautions or "Universal Precautions". The Universal Precautions were designed to be used on blood and certain body fluids of all patients to minimize the risk of occupational exposure. Blood and certain body fluids should be considered as potentially infections for HIV and hepatitis B virus (HBV) and other blood- borne pathogens (CDC, 1988). In 1989, due to concern about occupational exposure to blood-borne pathogens, the Occupational Safety and Health Administration (OSHA) published proposed regulations regarding exposure to HIV and other blood pathogens in healthcare settings (Department of Labour, 1989). These regulations were based on the CDC concept of Universal

Precautions. As of July 1992, the regulations became enforceable, giving OSHA the authority to conduct inspections of health-care settings to ensure a safe working environment (Department of Labour, 1991). However, it was recognized that more infection control precautions are needed as all body fluid are potentially infection. The CDC therefore in 1996 included the universal precaution in a new prevention concept called standard precaution.

Concept of Standard Precautions

Standard precautions are the latest and most comprehensive infection control guidelines (CDC, 2004; WHO, 2004) that has to be followed in preventing transmission of infections in health care facilities. The concept of Standard Precautions in Healthcare setting did not assume its present form in nomenclature and principle at once (Vaz, McGrowder, Alexander-Lindo, Gordon, Brown and Irving, 2010). The concept emerged with the emergence of HIV/AIDs in the early 1980s'.In 1983, Centre for Disease Control and Prevention (CDC) of United States of America published a document titled Guidelines for Isolation Precautions in Hospitals that recommended blood and body fluid precautions when a patient was known or suspected to be infected with blood borne pathogens (CDC, 1988)

Standard precautions aim to protect healthcare workers and patients from infectious diseases arising from blood borne pathogens and reduce the risk of cross transmission of microorganisms Moreover, standard precautions is regarded as an effective means of protecting health care workers, patients and the public thus reducing health care associated infections (Wang, Fennie, Burgess and Williams, 2003). Standard precautions are to be used for the care of all patients in the hospital regardless of their diagnosis or presumed infection. The 1997 guidelines for standard precaution procedures applied to (a) blood (b) all body fluids, secretions and excretion except sweat, regardless of whether or not they contain visible blood, (c) non–intact skin and (d) mucous membrane. Recently with the emergence of Ebola Virus Disease, standard precautions are to be applied to sweat whether blood stained or not (Judson, Prescott and Munster, 2015).

Standard Precautions consist of the following elements:

Hand Hygiene

Hand hygiene refers to both washing with plain or anti-bacterial soap and water and to the use of alcohol gel to decontaminate the hand. From ancient world to the present, hand washing is known to be the single most important measure to prevent spread of pathogenic micro organisms from one person to another person. Hand can become contaminated with infectious agent through contact with a patient, patient surrounding, other health workers and the environment. Hand hygiene should be performed before and after contact with a client immediately after touching blood, body fluids, non-intact skin, mucous membranes, contaminated items (even when gloves are worn during contact), immediately after removing gloves, when moving from contaminated sites to clean body sites during client care, after touching objects and medical equipments in the immediate client-care vicinity, before eating, after using the restroom, and after coughing or sneezing into a tissue as part of respiratory hygiene (CDC, 2006).

Healthcare associated infection represents one of the greatest risks associated with healthcare (Burke, 2003) and hand hygiene (i.e. hand-washing with either plain or antiseptic soap and water or alcohol-based product is frequently cited as the single most important means of preventing the transmission of infectious agents, (Siegel et al., 2007). This is a known fact often neglected by health workers. Studies have shown that only 50-70% of health care workers comply with hand hygiene recommendation (Pittet, Mourouga, Perneger, 1999; Bischoff, Reynolds, Sessler, Edmond, Wenzel, 2000; Pittet, Hugonnet, Harbath, Mourouga ,Sauvan, Touveneau & Perneger, 2000; Pittet, Simon Hugonnet, Pessoa-Silva, Sauvan & Perneger, 2004). Pittet et al. (1999) reported a hand washing compliances rate of 48% among health workers. In the study, non compliance was higher among physicians, nursing assistants and other health care workers than among nurses. Gould (1996) also found higher rates of compliance with hand washing among nurses.

These are in contrast with the findings of Alex-Hart & Opara (2011) who found out in their study on hand washing practices amongst health workers in University of Port-Harcourt teaching hospital that hand washing was found to be low amongst nurses. Studies such as those

of Stein, Makarawo and Ahmad (2003); Pan, Domenighini ,Signorini, Assini, Catenazzi,Lorenzetti,Patroni,Carosi and Guerrini, (2008) had also shown that compliance with standard precautions among nurses in order to prevent health care associated infections is low, specifically compliance was found inadequate concerning hand hygiene guideline. Recapping of used needle was found to still be high among nurses (Kermode, Jolley Langkham, Thomas, Holmes and Gifford 2005) and provision of care considering all patients as potentially infectious was found not to be adhered to (Kelen, DiGiovanna, Celentano, Kalainov, Bisson, Junkins ,Stein, Lofty, Scott and Sivertson 1990; Roup, 1997).

During daily activities, health workers progressively accumulate microorganisms on their hands from direct patient contact or contact with contaminated environmental surfaces and devices. These organisms are easily removed by hand washing and with soap, Larson & Kretzer, 1995; Pittet *et al.,* 1999, Masadeh & Jaran, 2009: Chakraborty, 2010). Failure to wash hands appropriately could predispose health workers and patients to diseases caused by the organisms.

Experts have argued that hand drying is as important as hand washing in maintaining hand hygiene (Pittet et al., 1999; Tibballs, 1996). Despite conflicting findings, the general opinion seems to be that single use of paper towels are the most appropriate hand drying method (Alex-Hart & Opara, 2011. They are said to rub away transient organisms and dead skin cells and remove bacteria from deeper layers due to associated friction from rubbing (Tibballs, 1996). They also lack the potential electric hazards associated with electric hand dryers. Common cloth and handkerchiefs which become damp and contaminated can act as reservoirs for bacterial and therefore have the potential to become significant sources of infections (Tibballs, 1996; Gould, 1994; WHO, 2008). So many varying factors have been reported to contributes to poor hand washing compliance and these include: unavailability of hand washing sinks, shortage of water, time required to perform hand hygiene, patient condition, effect of hand hygiene products on the skin and inadequate knowledge on hand hygiene guidelines (Doebbeling et al., 1992; Larson and Kretzer, 1995; Voss and Widmer, 1997; Simmons et al, 1999).

Personal Protective Equipment (PPE)

These are special devices, clothing or equipment worn for protection against hazardous materials. Infectious agent transmitted by contact or droplet route can potentially be transmitted by contamination of health workers' hand, skin or clothing. Cross- contamination can then occur between the health workers and other patients or health worker, or between the health worker and the environment. Infectious agents transmitted through droplets can also come in contact with mucous membrane of the health worker. Personal protective equipments prevent contact with an infectious agent or body fluid which may contain an infectious agent by creating a barrier between the potential infectious materials and the healthcare worker and also between the potential infectious materials and the patient. PPE used as part of standard precautions includes items such as gloves, gowns, masks, respirators and eyewear used to create barriers that protect skin, clothing, mucous membranes and the respiratory tract from infectious agents. PPE is used as a last resort when work practices and engineering controls alone cannot eliminate workers exposure. The items selected for use depend on the type of interaction a health worker will have with a client and the likely modes of diseases transmission.

Gloves are essential component of standard precautions which are used to prevent contamination of the healthcare worker's hands. It can protect both patients and healthcare workers from exposure to infectious agents that may be carried on the hands. As with all PPE the need for the use of gloves is based on careful assessment of the task to be carried out and the related risk of transmission of microorganism to the patient and the risk of contamination of healthcare worker's clothing and skin by the patients' blood and body substances. Gloves should be worn when touching blood, body fluids, non-intact skin, mucous membranes and contaminated items. Gloves must always be worn during activities involving vascular access such as performing phlebotomies.

International guidance suggests that gloves should be changed between episodes of care for different patients to prevent transmission of infectious material (Siegel et al., 2007); during the care of a single patient to prevent cross contamination of body sites (Boyce and Pittet, 2002); if the patient interaction involves touching portable computer keyboards or other mobile equipment that is transported from room to room (Siegel et al, 2007). Prolonged and indiscriminate use of

gloves should be avoided as it may cause adverse reactions and skin sensitivity. Hand hygiene should be performed before putting on gloves and after removal of gloves. Gloves must be worn as a single use item for each invasive procedure; contact with sterile sites and non- intact skin or mucous membrane; and activity that has been assessed as carrying a risk of exposure to blood, body substances, secretions and excretions. There are mainly three types of gloves viz; non-sterile gloves, sterile gloves and reusable utility gloves.

Non- sterile single-use medical gloves are available in a variety of materials, the most common being the natural rubber latex (NRL) and synthetic materials. NRL remains the material of choice due to its efficacy in protecting against blood- borne viruses and properties that enable the wearer to maintain dexterity (Pratt, 2001).When selecting glove type the indication for its use should be borne in mind. Indications for the use of non-sterile gloves are when there is potential exposure to blood, body substance, secretions or excretions; and when contact with non-intact skin or mucous membrane is anticipated. Examples of such are venepuncture, vaginal examination, dental examination, emptying urinary catheter, nasogastric aspiration and management of minor cuts and abrasion. Sterile gloves are used when there is potential for exposure to blood, body substances, secretions or excretions; and contact with susceptible sites or clinical devices where sterile conditions should be maintained. Reusable utility gloves are indicated for non- patient care activities such as handling of cleaning contaminated equipment or surfaces, general cleaning duties and instrument cleaning in sterilizing services unit.

Compliance with the use of gloves when exposure to body fluid was anticipated was found to be low among nurses despite the protection it affords. (Tait, Voepel- Lewis, Tuttle and Malviga, 2000; Stein, Makarawo and Ahmad, 2003; Kermode, Jolley, Langkham, Thomas, Holmes and Gifford, 2005). Non availability of gloves, skin reactions to gloves and availability of gloves with inappropriate sizes have been shown to be part of the reasons for non compliance.

Aprons and Gowns are protective clothing that should be worn by all healthcare workers as recommended by international guidelines when close contact with patient, material or equipment may lead to contamination of skin, uniforms or other clothing with infectious agent; or when there is risk of contamination with blood, body substances, secretions or excretions.(Pratt, Pellow and Wilson, 2007). The type of gowns and aprons to be worn depends

on the degree of risk , including the anticipated degree of contact with infectious materials and the potential for blood and body substance to penetrate through to the clothes or skin. Gowns and aprons should be appropriate to the task to be undertaken. They should be worn for a single procedure or episode of patient care and removed in the area where the episode of care takes place.

Face and Eye Protection is worn as part of standard precautions. The mucous membranes of the mouth, nose and eyes are portals of entry for infectious agents, as are other skin surfaces if skin integrity is compromised e.g. by acne, dermatitis (Hosoglu, Celen and Alkalin , 2003). Face and eye protectors reduce the risk of exposure of healthcare workers to splashes or sprays of blood and body substances and is an important part of standard precautions. Procedures that generate splashes or sprays of blood, body substances, secretions or excretions require either a face shield or a mask worn with protective eyewear. They should be worn during routine care like general examination when caring for patients with droplet infection. They are also to be worn when performing procedures that generate splashes or sprays like nasogastric aspiration, emptying of wound or catheter bag. When carrying out procedures involving the respiratory tract including the mouth like intubation and nasogastric sunctioning. Surgical masks, goggles, face shields, P2 respirator and N95 respirator are different types of face and eye protector.

It is important to remove PPE in the proper order to prevent contamination of skin or clothing. Whenever PPE or other disposable items are saturated with blood or body fluids such that fluid may be poured, squeezed, or dripped from the item discard into a biohazard bag. PPE that is not saturated may be placed directly in the trash. Saturated waste should be placed in sealable leak proof plastic bags before placing in regular trash bags for disposal. The Occupational Service Health Agency (OSHA), United States PPE Standards 1910.132 and 1910-133 required employed to provide PPE for employee with hazard exposure in the workplace, train employees on the proper use of PPE and properly maintain, store and dispose of PPE.

Compliance with the use of PPE in many studies reported has been found not to be optimal. In a study conducted in Abuja among nurses and doctors in public health facilities in Abuja it was reported that though majority of the respondents always use gloves when they anticipate contact with body fluids, non-intact skin and mucus membrane. However, the use of other

personal protective equipment such as gowns or plastic apron, mask and eye protector by respondents during procedures likely to generate droplets/splashes of blood or body fluid was low (Okechukwu & Modteshi, 2012). In another study conducted in Kuwait among doctors and nurses in primary healthcare center it was reported that lower proportion of physicians and nurses wear protective eye wear or mask when in direct contact with patient (Alnoumas et al., 2012). Compliance with the use of gloves when exposure to body fluid was anticipated was also found to be low (Tait, Voepel- Lewis, Tuttle and Malviga, 2000; Stein, Makarawo and Ahmad, 2003; Kermode, Jolley, Langkham, Thomas, Holmes and Gifford, 2005). Compliance with the use of eye, mouth and nose protection (mask use) was as well found to be low (Gershon, Vlahov, Felknor, Vesley, Johnson, Delclos and Murphy 1995; Chan, Molassistis, Chan, Chan, Ho, Lai, Lam, Shit and Yiu, 2002; Madan, Raafat, Hunt, Rentz, Whale and Flint, 2002). Wearing of gown when required was also found to be low among nurses (Madan, Raafat, Hunt, Rentz, Whale and Flint, 2002; Kermode, Jolley, Langkham, Thomas, Holmes and Gifford, 2005). Recapping of used needle was found to still be high among nurses (Kermode, Jolley Langkham, Thomas, Holmes and Gifford 2005) and provision of care considering all patients as potentially infectious was found not to be adhered to (Kelen, DiGiovanna, Celentano, Kalainov, Bisson, Junkins ,Stein, Lofty, Scott and Sivertson 1990; Roup, 1997).

Safe Injection Practice

Safe handling of needles and other sharp devices are components of standard precautions that are implemented to prevent exposure to blood borne pathogens. According to WHO safe injection practices is the one that does not harm the recipient, the provider and which does not result in waste dangerous to the community. The Needle-stick Safety and Prevention Act (2000) of United States of America mandates the use of sharps with engineered safety devices when suitable devices exist. Used needles should be discarded immediately after use and not recapped, bent, cut or removed from the syringe or tube holder or otherwise manipulated. The safety devices on needles and other sharps should be activated immediately after use. It includes that any used needles lancets or other contaminated sharps should be placed in a leak proof, puncture-resistance sharp container that is either red in colour or labeled with a biohazard label. Sharp containers should not be overfilled. Containers should be discarded when 2/3 full or when

contents are at the full line indicated on the containers and should be sealed properly before disposal (The Australian College of Dermatologists, 2004).

Recapping of needles has been the source of many needle stick injuries but the practices of recapping have not been eliminated. Nurses have the highest rate of documented needle stick injuries, yet do not always comply with mandated guidelines (Logan, 2002). Becker et al (1990) examined the contents of needle disposal boxes of 12 hospitals units and found that recapped needles comprised more than 25% of the discarded needles and in four cases exceeded 50% of all discarded needles. The authors explained the risky behaviours by inadequate knowledge and suggested that too little attention has been directed toward over coming specific risky behaviours in in-services education about prevention of occupational exposure to infectious diseases. Mangione , Gerbeding & Cummings (1991) noted that certain common activities involving needle use such as needle disposal and recapping led to more frequent injury. They also observed that 22% of the needle stick injuries would have been avoided if CDC guidelines had been followed. Not all accidents in the workplace can be prevented which could be interpreted to mean that needle-stick injuries should not exceed 15%. Recapping of used needle was found to still be high among nurses (Kermode, Jolley Langkham, Thomas, Holmes and Gifford 2005) and provision of care considering all patients as potentially infectious was found not to be adhered to (Kelen, DiGiovanna, Celentano, Kalainov, Bisson, Junkins ,Stein, Lofty, Scott and Sivertson 1990; Roup, 1997).

In a similar study conducted among healthcare workers in public and private healthcare facilities in Abeokuta metropolis in Nigeria it was reported that about one-third of all respondents always recapped used needles (Sadoh, Fawole , Sadoh , Oladimeji & Sofiloye, 2006). A key component of needle stick injuries is underreporting. Though underreporting of needle stick injuries has been documented for some time, the rate of under reporting of needle stick injuries varied widely from 10%(Mangione et al., 1991) to 18.5% (Henry & Campbell, 1995). Knowledge of under reporting is important because of the resultant under estimation of the risk of acquiring HIV and other blood borne diseases. In addition, unreported exposures do not permit post-exposure treatment or follow-up of universal precaution and may reinforce the improper use of personal protective equipment. (Haiduven, Simpkins, Phillips, Stevens, 1999, Mangione et al., 1991).

According to Juni (2003) contaminated sharps, are potential source of biohazard to the community. Therefore it is essential to dispose sharps in an efficient and environmental friendly manner. He also reports that overuse of injections in the developing world is evidential. Based on the statistics he also reported that sixteen thousand million injections are administered each year for a ratio of 3.5 injection per individual.

Moreover, findings indicate that unsafe injections accounted for 32% hepatits B virus infections 40% of hepatis C virus infections, 28% of liver cancer, 24% of liver cirrhosis an d 5% of HIV infection in the year 2000 (Harri et al, 2004). The World Health Organization (WHO) has estimated that in developing regions 40%-65% hepatitis B virus and hepatis C virus infection in healthcare workers are attributable to percutaneous occupational exposure (Pruss, Rapiti & Hutin, 2003). Needles have been essential to puncture the skin but often have been used in situations that did not require needles and according to Dan-Johnson (1992) more than half of all needle stick injuries occur with unnecessary use of needles.

Respiratory hygiene (Cough Etiquette)

Respiratory Hygiene are interventions to reduce the risk of transmission of micro-organisms from patient to patient, patient to health worker, and healthcare worker to patients. It evolved because of learnt lessons during SARS epidemic in 2003 and the strategy was reinforced during swine flu pandemic in 2009 and the term cough etiquette came from source control measures for tuberculosis. Respiratory illnesses like influenza are caused by a virus that infects the nose, throat and lungs. Influenza and common colds are familiar respiratory illness. The strategy is targeted at people with undiagnosed transmissible respiratory illness. They often appear to be seasonal in nature but persist in the community at any time. The SARs epidemic and avian influenza have heightened the awareness of respiratory infections to both health workers and general public. Respiratory illness spreads from person to person when an infected person coughs or sneezes and droplets are deposited on another person or the environment.

Respiratory hygiene should be applied as a standard precaution at all times. It should be implemented at first point of contact or recognition of any patient or staff member displaying respiratory symptoms such as coughing, sneezing, congestion, rhinorrhea, or increased

secretions. Patients and accompanying family members and friends with undiagnosed transmissible respiratory infections will practice Respiratory hygiene and cough etiquette. Staff should instruct patients and visitors on the respiratory hygiene and cough etiquette procedure. Visual alerts should be posted in appropriate language at the entrance to the outpatients facilities. Patients and persons who accompany them should be instructed to inform healthcare worker of symptoms of a respiratory infection when they first register for care and to practice respiratory hygiene/cough etiquette. Anyone with signs and symptoms of a respiratory illness should follow or be instructed to follow respiratory hygiene and etiquette as follows:

1. Nose and mouth should be covered with single-use tissues when coughing, sneezing, wiping and blowing nose.
2. Use tissue to contain respiratory secretions.
3. Dispose of tissues in the nearest waste receptacle or bin after use.
4. If no tissues are available, cough or sneeze into the inner elbow rather than the hand.
5. Practice hand hygiene after contact with respiratory secretions and contaminated objects / materials
6. Keep contaminated hands away from the mucous membranes of the eyes and nose.

Respiratory hygiene and cough etiquette require healthcare facilities to;

1. Provide hand hygiene facilities & supplies of alcohol gel, tissues, waste bins in communal area
2. Physically separate coughing/sneezing patients from others (>1 metre)
3. Offer surgical masks to coughing/sneezing patients
4. Educate HCWs/patients/visitors
5. Promote respiratory hygiene e.g. patient leaflets, posters and texts.

6. Encourage HCWs/visitors to wear a surgical mask for close contact with patients with respiratory illness
7. Offer Flu vaccine to HCWs and persons "at risk"
8. Undertake point of care risk assessment (PCRA)

Environmental cleaning

Patient care areas common waiting areas and other areas where clients may have potentially contaminated surfaces or objects that are frequently touched by staff and clients (doorknobs, sinks toilets, other surfaces and items in close proximity to patients) should be cleaned routinely with disinfectants following the manufacturer's instruction for amount, dilution and contact time. Housekeeping surface such as floors and walls do not need to be disinfected unless visibly soiled with blood or body fluids. They may be routinely cleaned with a detergent only or a detergent/disinfectant product. Most disinfectants are not effective in the presence of dirt and organic matter, therefore cleaning must be done first before disinfecting. Cloth should be wet with disinfectant to wipe away dirt and organic materials, then with a clean cloth. Disinfectant should be applied to the item and allowed to air dry for the time specified by the product manufacturer. Some pathogens such as noro virus and clostridum difficult are not inactivated by commercial disinfectants routinely used in local public health settings. In situations where contamination with these pathogens is suspected a bleach solution (1:10) is recommended for disinfecting contaminated surfaces and items.

Waste Management

Waste management is a key element in standard precaution. Hospital waste is a growing concern and one of the problems is improper segregation of infection and non-infectious waste (Najeeb, 2007). Waste product produced per bed per day is estimated 2kg (Shaheen, 2005). The Australian College of Dermatologists (2004) describes that clinical waste includes sharps, human tissues, bulk of body fluids, visibly stained body fluids and visibly blood stained disposable materials and equipment. Regardless of where waste is generated the principles of determining whether it is to be treated as clinical or general waste remain the same. Waste contaminated with blood, body fluids, secretions and excretions should be treated as clinical waste. Human tissue

and laboratory waste that is directly associated with specimen processing should also be treated as clinical waste. When handling waste the following must be done:

1. Apply other components of standard precaution as appropriate to protect against exposure to blood and body substance during handling of waste.

2. Hands must be thoroughly washed after handling waste.

3. Segregation of waste should occur at point of generation

4. Waste should be contained in the appropriate receptacle identified by colour and labelled and disposed off according to the facility waste management plan.

Sharps are part of waste generated in healthcare settings. Sharp items should be disposed of in containers that are puncture resistant, leak-proof, closable and labeled with the biohazard symbol or are labeled in red. Sharps containers should be replaced when filled up to the indicated full line. Items generated by health facilities that should be discarded into sharps containers include contaminated items that may easily cause cuts or punctures in the skin(used needles, lancets, broken glass or rigid plastic vials) and unused needles and lancets that are being discarded. Syringes or blood collection tube holders attached to needles must also be discarded still attached to the needles. Non sharps disposable items saturated with blood or body fluids should be discarded into biohazard bags that are puncture resistant, leak-proof and labeled with a biohazard symbol or red in colour. Such items may include PPE and disposable rags or cloth

A healthcare facility that generates infectious waste is required to maintain a log of waste that is transported from the facility, regardless of the amount or how it is transported. The log must contain the following information: date of disposal, location to which waste is transported, name of person transporting the waste and the type of transported (e.g., two sharps boxes of four biohazard bags) .Care must be taken to contain the waste during transport , keep waste separate from clean items in the transport vehicle and to clean and disinfect areas of the vehicle containing infectious waste before hauling clean items and materials.

Predictors of Compliance with Standard Precautions

Demographic factors as predictors of compliance with standard precautions

Demographic factors such as age, work experience, have not been found to be consistently associated with compliance with standard precautions. There is variability in compliance with standard precaution based on age and years of nursing experience. Literature provides conflicting reports on age and years of experience as predictors of standard precautions compliance. In a study done by Nichol, Bigelow, O'Brien, Mcheer, Manno & Holness (2008) it was found out that nurses with longer years of working experience were more likely to report compliance than new nurses. Another study showed that longer job tenure was related to health care worker compliance with universal precautions and suggests that health care workers with more time on the job have had the opportunity to incorporate experience and judgment into their clinical practice, which could promote the use of appropriate preventive behaviours (McGovern, Vesley, Kochevar, Gershon, Rhame & Anderson,2000)

Based on the findings of Kirkland (2011) also older nurses with more years of nursing experience were consistently more likely to be strictly more compliant with standard precaution guidelines. This is further corroborated by Imad, Ahmad, Mahdiah and Safaa (2016) that there is an association between age and standard precautions compliance. This is also supported by other studies done on age and years of nursing experience. Gershon et al., 1995; Gershon et al., 2007; Dement et al., 2004).

On the contrary, other studies had shown less compliance with increased age and years of nursing experience. Gershon et al. (1999) in a study done on compliance with universal precautions in correctional healthcare facilities found out that there is less compliance with increased age and experience. Najeera (2009) in her study also found out that work experience had no significant association with standard precautions compliance. However in a study done by Amoran and Onwube (2013) it was submitted that there was no significant difference in standard precautions compliance based on years of work experience. Years of experience was also found to have influence on knowledge on standard precaution. In a study done among

university nurses in United Arab Emirate it was observed that nurses with more than 10 years of nursing experience had correct knowledge of standard precaution compared to those with less than 10 years of nursing experience.

Intrapersonal factors as predictors of compliance with standard precautions.

Knowledge is usually the first step towards modification of a desirable behaviour. Most research has indicated that knowledge on standard precaution does not necessarily impact compliance and that, on the other hand, insufficient knowledge had been shown to be a factor in non-compliance with standard precaution. In a study conducted by Beghdadli, Belhadj,Chabane,Ghoman,Kandouci and Fanello (2008) it was found out that lack of knowledge on standard precaution resulted in lack of adherence to standard precaution. A similar study conducted among postgraduate nurses in Spain revealed a high degree of confusion and lack of adequate knowledge regarding standard precaution (Lopez et al., 2006). In 2009, university nurses knowledge on standard precautions guidelines and implementation was found not be up to standard despite high level of awareness (Sreedharan, Muttappillymyali & Venkatramana, 2009). Okechukwu and Modteshi (2012) also reported suboptimal knowledge on and compliance with standard precautions among health care workers in secondary health facilities in Abuja. Several studies had also reported that lack of appropriate knowledge of standard precautions and infection control was the main predictor for poor compliance (Nelsing, Nielsen & Nelsing,1997; Ayranci & Kosgeroglu,2004).

Many studies have indicated that better knowledge of standard precaution among health care workers was one of the predictors of better compliance (Chan,Ho & Day, 2008; Luw, He & Zhou, 2010). Other studies done on nurses' knowledge on standard precautions had shown nurses to be knowledgeable on standard precautions guidelines. In a study done on knowledge awareness and compliance with universal precaution among health care workers at the university hospital of West Indices Jamaica it was found out that nurses were the most knowledgeable on standard precaution guidelines (90.0%) compared with other healthcare workers, doctors (88.0%, medical technologists (70.0%) (Vaz et al., 2010). Abdulrahem, Amodu, Saka Bolarinwa and Uthman (2012) also found out that the knowledge of standard precaution was highest among nurses (85.5%) compared with other health workers.

Despite high level of knowledge on standard precautions, compliance was still found to be unacceptably below standard to guarantee infection safety among health workers and patients. In a study conducted by Labrague, Rosales and Tizon (2012) the central finding of their study was lack of significant association between knowledge and compliance with standard precautions. Akyol, Ulusoy and Ozen (2006); Tipple, Mendonca, Melo, Souza, Pereira et al (2007); Abdulraheem et al (2012) based on their findings postulated that education and knowledge although fundamental but not sufficient enough to foster a behavioural change regarding hand hygiene. This implies that knowledge on standard precautions do not necessarily affect compliance and application. However, other studies had suggested that standard precautions was positively correlated with compliance which means that the higher the standard precautions knowledge the better the compliance rate (Taneja 2009; Chan et al., 2008; Luo, He, Zhou & Luo 2010). This has shown that knowledge alone may not be the determining factor for the compliance of the standard precaution practices. This has also shown that there is an existing dichotomy between theory and practices.

Studies have shown that the practice of standard precaution has attitudinal influences. It is related to personal opinions or feelings. Attitude towards compliance with standard precautions like any other health behaviour has varying responses. Studies have shown health care workers to have positive attitude towards standard precautions. In a study done by Elbouzedi (2012) among health care workers it was found out that majority (62.5%) has positive attitude towards implementing standard precaution and 37.5% had negative attitudes towards it (Makboul & El-Shazhly (2012) also reported that their respondents (nurses and doctors) had positive attitude towards implementing standard precaution guidelines.

Institutional factors as predictors of compliance with standard precautions

Studies have shown that low compliance with standard precaution has causes not only in personal factors as previously thought but also in factors related to work and institutional factors that comprised the climate of safety at work (Gerhson, Karkashian, Groch, Murphy, Escamilla_Cejudo & Flanagan, 2000; Brevidelli & Cianciarullo, 2009). Yassi et al. (2007) findings on determinants of health care workers self reported compliance with standard precaution showed a strong correlation between institutional factors and self reported

compliance. The researchers thus concluded that standard precaution compliance is united to environmental factors and organizational factors.

Compliance with standard precaution has been attributed to institutional factors of safety climate in an organization which strongly affect the safety behaviour of workers (Rigobello, Carvalho Cassiani, Galon, Capucho & Deus (2012). When the safety climate is deficient the working process can show itself vulnerable putting the health of workers at risk. In institution with a strong safety climate workers suffer fewer accidents not only due to security programs in place but also because the very existence of these programs shows employees the commitment of the administration with their safety (Dejoy, Schaffer, Wilson, Vandenberg & Butts, 2004; Gershon, Stone, Zetser, Faucett, MacDavitt & Chou, 2007). Studies in other areas of occupational safety and health have shown that institutional factors are important predictors of employee work behaviour (Shannon, Mayr & Haines 1997; Hoffman, Jacobs & Landy, 1995). According to Dejoy, Searcy, Murphy and Gershon (2000) the potential importance of such factor has been discussed with respect to health care in general and universal precaution in particular but these factors have not been addressed in empirical research. Zohar (2010) stated that the aim of climate perception is to reveal what behaviour should be reinforced by the organization. Through safety climate perceptions of employees, the association between organizational policies, procedures and practices and the priority levels among them are aimed to be uncovered to give future directions for both organizations and individuals. According to Neal and Griffin (2002) safety climate measure's factors are one of the no exact consensus areas in safety literature. However Flin , Mearns, and Bryden (2004) stated that factors underlying safety climate range from two to nineteen based on the reviews in the literature. Zohar's research identified eight factors of safety climate and these are training, management attitude, status of safety officer (infection control personnel), status of safety committee on safety issues, work pace or workload, severity of the condition of the patients and availability of PPE. For this study, training on standard precautions, availability of PPE and workload will be reviewed as institutional factors.

Availability of personal protective equipment as predictor of compliance with standard precautions.

Personal protective equipment are specialized clothing or equipment worn by an employee for protection against hazard which includes, face mask, gloves, gowns, goggles etc. Availability of PPE has been cited as one of the factors in compliance variation. Reasons for low compliance in published studies have included limited availability of gloves, supplies, equipment, non-use by older mentors and the perception that gloves interfered with fine manipulation during procedure. According to Kirkland (2011) availability of PPE may influence compliance since one of the major reasons given by her respondents for not using eye shields was lack of availability. In a study done by Okechukwu et al. (2011) in public health facilities in Abuja, it was found out that the main constraint given for low compliance with the use of PPE is lack of regular supplies. Also in a similar study conducted by Jawaid et al. (2009), it was reported that non availability of relevant modalities remained the most important factor for non compliance in their study. Vaz et al. (2010) also reported that just over one half of their respondents indicated that they were provided with protective equipment most times. Hence they posited that availability of supplies is among the main suggestion for compliance.

Training on Standard Precaution as Predictors of its Compliance

Health education training is the cornerstone of improved standard precautions compliance. Healthcare workers need scientific information about standard precautions, healthcare-associated infections, and resistant organism transmission rates. They need to know how to cleanse their hands and use appropriate and efficacious antiseptic and protective agents. Written guidelines should be available to everyone, including visitors. New employees should receive these guidelines during their initial orientation. Then, all caregivers should be observed and given feedback about how consistently they are adhering to established hand hygiene protocols. Continuous health education programme or training or sponsor for workshop and seminars has been found to be a long lasting means to health workers knowledge and foster compliance with standard precautions. Annual educational programs highlighting standard precautions and infection control guidelines have been shown to increase retention of knowledge and improve attitudes, with an overall improvement in compliance and a decrease in the risk of exposure

(Cole, 2007; Suchitra and Lakshmi, 2007). According to Wang et al. (2003) training and education have been found to be of paramount importance to developing awareness among health workers as well as improving adherence to good clinical practice. Training programs have been identified among the main suggestion for better compliance.

Study conducted by Brooks, Phipsopn and Potigieter (1999) reported a significant improvement in compliance with standard precaution from 48% to 74% after an educational symposium. Richman, Dorsey and Stayer (2000) study also showed increased compliance with standard precautions after a 30mins educational program. In a recent study done by Giard et al. (2013) it was reported that among 81.3% health workers who reported having participated in training session on standard precaution,69.9% had had it in the last five years. Felix, Victor, Malagutti and Gir (2013) also reported that health workers who had training on standard precautions guidelines were more likely to always comply with standard precautions compared to non trained health workers. Furthermore Haile et al. (2017) also affirmed that improved compliance with standard precaution is associated with training on standard precautions guidelines. Though other studies have shown that training in standard precaution does not necessarily increase compliance, there is a general agreement that there is the need for training and reinforcement of such training since lack of training will obviously do nothing for compliance. According to Kirkland (2011) there was lack of training in standard precaution among her respondents with more than half of them receiving 30mins or less in annual training. It was found out that higher workplace safety climate was positively associated with additional training and compliance with eyes shield and respiratory shield compliance.

Workload as Predictor of Compliance with Standard Precautions

When patient-care units are understaffed and healthcare providers are overworked, they tend to cut corners. Often times one of those corners is non- compliance with standard precautions. As a result, infection rates rise; death rates mount; and the health of caregivers, visitors, and patients suffers. Jawaid *et al.* (2009) opined that excessive patient workload affect compliance to some extent and different correlational studies have also shown that non-adherence to standard precaution guidelines are associated with workload. According to Cutter and Jordan (2004) non-compliance among health care workers could be due to their belief that their work load is

increased by adhering to universal precaution and therefore these procedures are difficult to accommodate due to day to day current clinical pressures.

In a study done by Brevidelli and Cianciarullo (2009) revealed that the perception of work load had a positive influence on standard precaution. In a similar study by Johnson, Hall, Ford, Mead, Levine and Way (1998) in which relationship between perception of job demands and job dissatisfaction among physicians was examined, it was revealed that those who reported a greater perception of job demands revealed lower levels of dissatisfaction. Likewise in the study of Brevidelli et al., high perceived job demands were considered to be associated with great responsibility and concentration and which in turn favoured compliance with standard precautions.

Appraisal of Literature Reviewed

The purpose of this study was to find out the demographic, intrapersonal and institutional factors that may predict standard precaution compliance among nurses in teaching hospitals in Oyo state. As a result, the review of literature focused on the factors that are relevant to the study. A conceptual framework was developed to explain the three independent variables (demographic, personal and institutional factors) as well as the link of each to the dependent variable (standard precaution compliance).

Theoretical review covered areas such as infectious diseases, burden of health care associated infections, history of infection control practices, infection control guidelines, standard precaution and elements of standard precautions. Empirical review was also made on factors that predict standard precaution compliance. The reviewed variables under demographic factors were age and years of nursing experience, variables reviewed under intrapersonal factors were knowledge and attitude and variables reviewed under institutional factors were availability of equipment, training on standard precaution and work load.

The summary of the literature reviewed is that compliance with standard precautions is still low among nurses who are the largest workforce within the health care system countries (Powers, Armellino, Dolansky and Fitzpatrick, 2016; Saidu, Habu, Kever, Dathini, Inuwa, Maigari an d Kellu, 2015; Ogoina, Pondei, Adetunji, Chima, Ischei and Gidado, 2014). This

invariably causes increase in health care associated infection and endangers the lives of the nurses and the patients they care for. Health care associated infections have reached epidemic proportions and have become one of the main concerns in the health care system recently. Standard precautions have been shown to be effective in combating transmission of pathogens within the health care settings. It is a means through which the safety of patients and health care workers can be safeguarded within the health care settings.

In most of the literature reviewed, age and year of experience as demographic variables were found to be inconsistently associated with compliance with standard precautions. Some studies documented that older nurses comply better with standard precautions compared to younger nurses (McGovern, Vesley, Kochevar, Gershon, Rhame and Anderson, 2000; Nichol, Bigelow, O'Brien, McGeer, Manno and Holness, 2008 ; Kirkland, 2011) while other studies submitted that younger nurses comply with standard precautions more than older nurses. Knowledge an intrapersonal variable which is usually the first step towards modification of desirable behaviour was found to predict better compliance in some studies (Beghdadli, Belhadj, Chabane, Ghoman, Kandouci and Fanello*, 2008;* Chan, Ho and Day, 2008; Luw, He and Zhou*,* 2010). while some other studies reported that good knowledge of standard precaution does not translate to strict compliance (Akyol, Ulusoy and Ozen, 2006; Tipple, Mendonca, Melo, Souza, Pereira et al 2007; Abdulraheem et al., 2012; Labrague, Rosales and Tizon, 2012). Attitude which is another intrapersonal variable has also been shown in the literature reviewed as predictor of standard precaution compliance. Standard precautions requires appropriate attitude from health workers for it to be practised.

Availability of equipment, workload and training as predictors of standard precaution compliance in most literature reviewed revealed conflicting results. Availability of equipment was shown to enhance compliance with standard precautions in some studies. On the contrary other studies done on availability of equipment revealed that compliance is still low even when the equipment are available. Some studies reported that lesser workload promotes better compliance with standard precaution whereas other studies done in this area revealed that increased workload is associated with great responsibilities and concentration which in turn enhance better compliance with standard precautions.

CHAPTER THREE

METHODOLOGY

This chapter presents the research methodology that was adopted for the study. These were discussed under the following sub-headings;

1. Research design
2. Population
3. Sample and sampling techniques
4. Research Instruments
5. Validity of the Instrument
6. Reliability of the Instrument
7. Field testing.
8. Ethical consideration.
9. Procedure for Data Collection
10. Procedure for Data Analysis

Research Design

The descriptive research design of correlational type was adopted for the study. The design was considered to be appropriate due to its merit in describing, examining, analyzing and interpreting variables studied as they were. The study is also an *ex- post facto* design because the human characteristics of the population were not manipulated while the study examined how the independent variables of demographic, intrapersonal and institutional factors present prior to the study predict compliance with standard precautions which is the dependent variable.

Population

The population for this study comprised all nurses in all the tertiary teaching hospitals in Oyo state

Sample and Sampling Technique

Total enumeration technique was used to include one thousand six hundred and eighty (1686) male and female nurses working in the three tertiary teaching hospitals in Oyo state. One thousand five hundred and eighteen nurses who were available at the time of study were enumerated.

Table3.1: Distribution of Nurses in Tertiary Teaching Hospitals in Oyo State.

Serial No	Name of Hospital	Category	Number of nurses
1	University College Hospital Ibadan	Federal	1284
2	Ladoke Akintola Teaching Hospital, Ogbomosho	State	300
3	Bowen Teaching Hospital, Ogbomosho	Faith based	102
Total			1686

Source: National Association of Nigerian Nurses and Midwives (NANNM) chapter in each hospital.

Table 3.2: Distribution of nurses who were available at the time of study

Serial No	Name of Hospital	Category	Number of nurses	Number of nurses who were available at the time of the study
1	University College Hospital Ibadan	Federal	1284	1156
2	Ladoke Akintola Teaching Hospital, Ogbomosho	State	300	270
3	Bowen Teaching Hospital, Ogbomosho	Faith based	102	92
Total			1686	1518

Research Instruments

The instruments for this study were self developed questionnaire and self developed Focus Group Discussion (FGD) guide. The focus group discussion was used to provide qualitative information for the study. The questionnaire used for the study was divided into five sections, namely section A-E. The items in the questionnaire were developed in line with the review of concept and empirical studies on compliance with standard precautions.

Section A: Demographic information

This was used to elicit information on socio-demographic characteristics of the respondents. Seven (7) items were generated in this section and the items covered were place of work, designation, medical sections, age, sex, marital status and years of experience.

Section B: Demographics Factors as Predictor of Compliance with Standard Precautions Scale (DFPCSPS)

This scale was used to elicit information on age and work experience as predictors of standard precautions compliance. It consists of eight (8) items. Each response will be scored on a 4-point modified Likert format of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) with allotment of points in the following order; SA = 4, A=3, D=2, SD =1

Section C: Intrapersonal Factors as Predictors of Compliance with Standard Precautions Scale (IFPCSPS)

This scale was used to elicit information from respondents on knowledge and attitude towards standard precaution compliance. It consists of nineteen (19) items**.** Each response on knowledge will be scored on a 3-point format of True (T), False (F) and I don't Know (IDK), with allotment of points in the following order; T=3, F= 2 and IDK=1. Attitude responses was scored on a 4-point modified Likert format of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) with allotment of points in the following order; SA = 4, A=3, D=2, SD =1.

Section D: Institutional Factors as Predictors of Compliance with Standard Precautions Scale (INFPCSPS)

Institutional Factors Scale was used to elicit information from respondents on availability of PPE, training and workload. It consists of fifteen (15) items. Each response on availability of PPE will be scored on a 3-point format of Always Available (AA), Sometimes Available (SA) and Not Available (NA); with allotment of AA=3, SA=2 and NA=1. Similarly, each response on training and work load was scored on a 4-point modified Likert format of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) with allotment of points in the following order; SA = 4, A=3, D=2, SD =1.

Section E: Compliance with Standard Precautions Scale (CSPS)

Standard Precaution Compliance Scale was used to elicit information from the respondents about their compliance with standard precautions. It consists of twenty (20) items. Each response on compliance was scored on a 4-point format of Always (A), Sometimes (S), Rarely (R) and Never (N); with allotment of A=4, S=3, R=2 and N=1.

Finally Focus Group Discussion (FGD) was used to elicit information on factors that predict compliance with standard precautions among nurses.

Validity of the Instrument

The validity of an instrument is defined as the soundness or appropriateness of the test instrument in measuring what it is designed to measure. To ensure validity of the instrument, a draft of the questionnaire was presented to the researcher's supervisor, lecturers in the department of Human Kinetics and Health Education, University of Ibadan and infection control experts at University College Hospital Ibadan. The items of the questionnaire were developed based on the initial exploratory discussion with people that share similar characteristics with the actual study population. In the first stage, ninety-seven (97) items were generated based on the exploratory survey discussion after which the questionnaire was presented to researcher's supervisors, professional Nurses, Infection Control Experts, Health Educators and an expert in psychometrics. This implication is that the instrument was validated through expert and peer review.

The validation helped to remove ambiguities and item construction problems. This led to subtraction, addition and modification of the items of the questionnaire, leaving the questionnaire with eighty-four (84) items. The questionnaire was then subjected to exploratory factor analysis. A Kaiser-Meyer-Olkin (KMO) of 0.65 was obtained which is above the benchmark of 0.60. This means that the sample size is adequate for the conduct of factor analysis. The test of sphericity was statistically significant which support the factorability of the correlation matrix as the p-value stands at 0.000. In the final stage the instrument was further subjected to psychometric analysis (item by item) in order to ensure that the instrument have all the necessary required psychometric properties as well as measure what it is purported to measure. Out of the eighty-four (84) items, three (3) items from the DFPCSP scale, ten (10) items from IFPCSP scale , five (5) items from INFPCSP scale and four (4) items from CSP scale making a total of twenty-two (22) items were expunged completely because they did not meet up with the retention criterion of 0.60. The expunged items were not replaced because the remaining sixty items (62) will adequately measure what they were purported to measure.

Reliability of the instrument

To determine the reliability of the instrument the validated version of the questionnaire was administered on forty (40) nurses at Obafemi Awolowo Teaching Hospital, Ile-ife, Osun state, who were not within the coverage of the study but share the same characteristics with the population of the study. The data collected were thereafter subjected to Cronbach Alpha to test the internal consistency of DFPCSPS, IFPCSPS, INFPCSPS and CSPS. The scale yielded reliability values of r=0.78, r=0.90, r=0.84 and r=0.86 respectively.

Field Testing of the Instrument

Field testing of the instrument was carried on forty nurses at Obafemi Awolowo Teaching Hospital, Ile-ife Osun state who were not part of the actual study. This has helped in determining the reliability of the instruments and also has given opportunity to assess the feasibility of the study.

Ethical Consideration

Ethical clearance for the study was obtained from Ethical Review Committee of University of Ibadan in conjunction with Collaborative Institutional Training Initiative (CITI). The ethical approval number is **UI/SSHEC/2016/0038.** The study obtained the principle of voluntariness and confidentiality.

Procedure for Data Collection

The researcher obtained a letter of introduction from the Head of Department of Human Kinetics and Health Education, University of Ibadan for identification purpose. The instruments were administered personally with the help of fifteen (15) trained research assistants. The administered questionnaires were retrieved immediately on completion from the respondents to ensure high rate of return. One thousand five hundred and eighteen (1518) nurses were enumerated while one thousand four hundred and ninety-nine (1499) questionnaires were correctly filled.

Procedure for Data Analysis

The completed copies of the questionnaire were collated, coded and analyzed using both descriptive and inferential statistics. The descriptive statistics of frequency counts, percentages and mean were employed for demographic variables of the respondents and inferential statistics of regression analysis, t-test and analysis of variance were used to test the hypotheses at 0.05 level of significance. Thematic-content analysis was used for focus group discussion. Identified pattern and themes were supported by direct quotes from respondents.

CHAPTER FOUR

DATA ANALYSIS, INTERPRETATION AND DISCUSSION OF FINDINGS

This chapter focused on the analysis of data with respect to research questions and hypotheses earlier stated. The chapter is divided into three (3) sections. Section A presented the demographic information of the respondents; section B provided answers to the research questions while section C provided the results of the tested hypotheses.

Section A: Demographic Information of the participants

TABLE 4.1: Distribution of participants according to selected demographic characteristics

Items	Frequency	Percentage
Place of work		
UCH	1142	76.2
LAUTECH	266	17.7
BOWEN	91	6.1
Total	**1499**	**100.0**
Designation		
Nursing Officer II	384	25.6
Nursing Officer I	278	18.5
Senior Nursing Officer	202	13.5
Principal Nursing Officer	128	8.5
Assistant Chief Nursing officer	272	18.1
Chief Nursing Officer	235	15.7
Total	**1499**	**100.0**
Section where you work		
Medical unit	308	20.5
Surgical unit	362	24.1
Obstetrics and gynecology	106	7.1
Paediatrics	143	9.5
Accident and emergency	78	5.2
Theatre/intensive care unit	336	22.4
Others	166	11.1
Total	**1499**	**100.0**
Age in years		
Less than 25	119	7.9
25-29	291	19.4
30-34	334	22.3
35-39	248	16.5
40-44	99	6.6

45-49	246	16.4
50-54	126	8.4
55 and above	36	2.4
Total	**1499**	**100.0**
Gender		
Male	160	10.7
Female	1339	89.3
Total	**1499**	**100.0**
Marital status		
Single	261	17.4
Married	1055	70.4
Divorced	86	5.7
Widowed	58	3.9
separated	39	2.6
Total	**1499**	**100.0**
Years of work experience		
Less than 5years	298	19.9
5-9years	490	32.7
10-14years	239	15.9
15-19years	91	6.1
20years and above	381	25.4
Total	**1499**	**100.0**

Table 4.1 above shows that 1142 (76.2%) were from UCH, 266 (17.7%) from LTHOg while 91 (6.1%) were from BUTH showing that majority of the respondents were from UCH. On designation, 384 (25.6%) were nursing officer II, 278 (18.5%) were nursing officer I, 202 (13.5%) were senior nursing office, 128 (8.5%) were principal nursing officer, 272 (18.1%) were assistant chief nursing officer while 235 (15.7%) were chief nursing officer showing that majority of the respondents were nursing officer II. Also 308 (20.5%) work at medical unit, 362 (24.1%) at surgical unit, 106 (7.1%) at obstetrics and gynecology unit, 143 (9.5%) at paediatrics unit, 78 (5.2%) at accident and emergency, 336 at Theatre/intensive care unit while 166 (11.1%) worked at other units apart from the ones mentioned above. This revealed that majority of the respondents works at surgical unit.

On age, 119 (7.9%) were below 25years, 291 (19.4%) were between the ages of 25 and 29years, 334 (22.3%) were between the ages of 30 and 34years, 248 (16.5%) were between 35 and 39years, 99 (6.6%) were between 40-44years, 246 (8.4%) were between 45-49, 126 (2.4%) were between 50 and 54years while 36 (2.4%) were 55years and above showing that majority of

the respondents were between the ages of 30 and 34. Out of the 1499 respondents, 160 (10.7%) are male while 1339 (89.3%) are female showing that majority of the respondents are female. Concerning marital status, 261 (17.4%) were single, 1055 (70.4%) were married, 86 (5.7%) were divorced, 58 (3.9%) were widowed while 39 (2.6%) were separated, showing that majority of the respondents were married. On years of work experience, 298 (19.9%) had below 5years of work experience, 490 (32.7%) had between 5 and 9years, 239 (15.9%) had 10 and 14years, 91 (6.1%) had between 15 and 19years while 381 (25.4%) had 20years and above years of work experience. This shows that majority of the respondents had between 5 and 9 years of work experience.

Section B

This section provided answers to the research questions

Research question 1: Is there any relationship between the independents variables (demographic, intrapersonal and institutional factors) and dependent variable (compliance with standard precautions)

Table 4.2: Correlation matrix table indicating the degree of relationship between independent and dependent variable.

S/N	Variables	1	2	3	4	5	6	7	8
1	Age	**1**	.663**	.515**	.438**	.381*	.551**	.493**	.671**
2	Work experience	.663**	**1**	.583**	.446**	.506**	.610**	.519**	.530**
3	Knowledge	.515**	.583**	**1**	.462**	.496**	.631**	.392*	.636**
4	Attitude	.438**	.446**	.462**	**1**	.501**	.469**	.394*	.514**
5	Availability of PPE	.381*	.506**	.496**	.501**	**1**	.399*	.443**	.582**
6	Training	.551**	.610**	.631**	.469**	.399*	**1**	.614**	.548**
7	Workload	.493**	.519**	.392*	.394*	.443**	.614**	**1**	.521**
8	Standard precaution compliance	.671**	.530**	.636**	.514**	.582**	.548**	.521**	**1**

Table 4.2 above shows the degree of relationship that exist between each of the independent variables and the dependent variable. The table revealed a strong relationship between age and work experience, age and compliance with standard precautions, knowledge and compliance with standard precautions. The table also revealed a moderate relation between age and attitude, availability of PPE and attitude as well as between availability of PPE and Training. Compliance with standard precautions has a strong positive relationship with workload, training, attitude, knowledge, age and work experience.

Research question 2: Are there occurrences of health care associated infections among nurses in tertiary teaching hospitals in Oyo State?

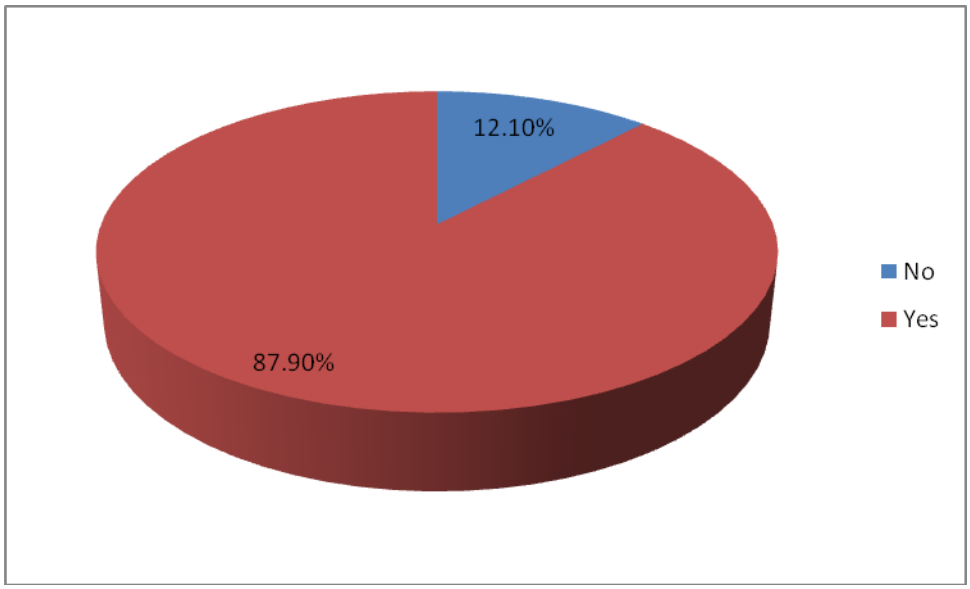


Fig.4.1: Pie chart showing the occurence of health care associated infections among nurses

The chart above revealed that there is a high occurence of health care associated infections among nurses in teaching hospital. The chart shows that 87.9% have contacted one form of health care associated infections or the other before while only 12.1% have never contacted any health care associated infections before. This shows that majority of the respondents have contacted one health care associated infections or the other before.

Research question 3: Are there differences in standard precaution compliance rate among nurses in teaching hospitals in Oyo state (federal, state and faith based)

Table 4.3: Descriptive analysis on difference in compliance with standard precaution based on types of hospital

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Federal	1142	65.5324	19.03588	.56330	64.4272	66.6376	20.00	80.00
State	266	42.5526	24.42530	1.49761	39.6039	45.5014	20.00	80.00
Faith based	91	51.1099	17.33683	1.81739	47.4993	54.7205	20.00	76.00
Total	1499	60.5791	21.94214	.56673	59.4674	61.6907	20.00	80.00

Table 4.3 shows that respondents from federal hospitals had the highest mean score ($\bar{x}$ = 65.5324) followed by respondents from faith based hospitals with a mean score of ($\bar{x}$ = 51.1099). Respondents from state hospital have the lowest mean score ($\bar{x}$ = 42.5526). This means that nurses from federal teaching hospitals had better compliance with standard precaution than those from state and faith based while those from faith based are better than those from state teaching hospital.

Hypotheses Testing

This section presents the result of the tested hypotheses

Hypothesis 1: There will be no significant joint contribution of demographic factors (work experience and age) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State.

Table 4.4: Multiple regression analysis on composite contribution of demographic factors on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State

R = .842 R^2 = .708 Adjusted R^2 = .708 Analysis of Variance					
Model	Sum of square	Df	Mean square	F	P
Regression	510919.234	2	255459.617	1817.214	.000
Residual	210304.148	1496	140.578		
Total	721223.382	1498			

Table 4.4 revealed that there was a significant joint contribution of demographic factors (work experience and age) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State ($F_{(2,1496)=}$ 1817.214. The independent variable also yielded a coefficient of multiple regression (R^2) of 0.708 indicating that about 71% of the variation is accounted for by the independent variables. Hence, the null hypothesis was rejected. This implies that demographic factors (age and work experience) jointly contributed significantly to compliance with standard precautions among nurses in teaching hospitals in Oyo State.

Hypothesis 2: There will be no significant relative contribution of demographic factors (work experience and age) on compliance with standard precautions among nurses in teaching hospitals in Oyo State.

Table 4.5: Table showing the relative contribution of demographic factors on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	28.921	1.794		16.118	.000
	Work experience	4.554	.085	.760	53.451	.000
	Age	2.359	.135	.248	17.449	.000

The table above shows for each demographic factors, the unstandardised regression weight (**ß),** the standardized error of estimate (SEß), the standardized coefficient, the t-ratio and the level at which the t-ratio is significant. As indicated in the table, the two variables were independently significant. Work experience has the highest contribution of 76.0% (ß=.760, t=53.451, $p<0.05$) while age contributed 24.8% (ß=.248, t=17.449, $p<0.05$). The hypothesis is therefore rejected. This implies that work experience will enhance higher compliance with standard precautions than age.

Hypothesis 3: There will be no significant joint contribution of intrapersonal factors (knowledge and attitude) on compliance with standard precautions among nurses in teaching hospitals in Oyo State.

Table 4.6: Multiple regression analysis on composite contribution of intrapersonal factors on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State.

R = .866 R^2 = .750 Adjusted R^2 = .749 Analysis of Variance					
Model	Sum of square	Df	Mean square	F	P
Regression	540649.039	2	270324.520	2239.551	.000
Residual	180574.343	1496	120.705		
Total	721223.382	1498			

Table 4.6 revealed that there was a significant joint contribution of intrapersonal factors (knowledge and attitude) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State ($F_{(2,1496)=}$ 2239.551. The independent variable also yielded a coefficient of multiple regression (R^2) of 0.750 indicating that about 75% of the variation is accounted for by the independent variables. Hence, the null hypothesis was rejected. This implies that intrapersonal factors (knowledge and attitude) jointly contributed significantly on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State.

Hypothesis 4: There will be no significant relative contribution of intrapersonal factors (knowledge and attitude) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State.

Table 4.7: Table showing the relative contribution of intrapersonal factors (knowledge and attitude) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.008	.931		2.157	.031
	Knowledge	1.467	.055	.669	26.630	.000
	Attitude	.728	.083	.221	8.815	.000

The table above shows for each intrapersonal factors, the unstandardised regression weight (**ß),** the standardized error of estimate (SEß), the standardized coefficient, the t-ratio and the level at which the t-ratio is significant. As indicated in the table, the two variables were independently significant. Knowledge has the highest contribution of 66.9% (ß=.699, t=26.630, $p<0.05$) while attitude contributed 22.1% (ß=.221, t=8.815, $p<0.05$). The hypothesis is therefore rejected.

Hypothesis 5: There will be no significant joint contribution of institutional factors (availability of PPE, Training by hospital and workload) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State.

Table 4.8: Multiple regression analysis on composite contribution of institutional factors on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State.

R = .868 R^2 = .754 Adjusted R^2 = .753 Analysis of Variance					
Model	Sum of square	Df	Mean square	F	P
Regression	543494.722	3	181164.907	1523.905	.000
Residual	177728.660	1495	118.882		
Total	721223.382	1498			

Table 4.8 revealed that there was a significant joint contribution of institutional factors (availability of PPE, Training by hospital and workload) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State ($F_{(3,1495)=}$ 1523.905). The independent variable also yielded a coefficient of multiple regression (R^2) of 0.754 indicating that about 76% of the variation is accounted for by the independent variables. Hence, the null hypothesis was rejected. This implies that institutional factors (availability of PPE, Training by hospital and workload) jointly contributed significantly on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State.

Hypothesis 6: There will be no significant relative contribution of institutional factors (availability of PPE, Training by hospital and workload) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State.

Table 4.9: Table showing the relative contribution of institutional factors (availability of PPE, Training by hospital and workload) on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.938	1.515		6.558	.000
	Availability of PPE	2.294	.078	.555	29.452	.000
	Training by hospital	2.098	.134	.308	15.616	.000
	Workload	1.277	.088	.199	14.519	.000

The table above shows for each institutional factors, the unstandardised regression weight (**ß),** the standardized error of estimate (SEß), the standardized coefficient, the t-ratio and the level at which the t-ratio is significant. As indicated in the table, the three variables were independently significant. Availability of PPE has the highest contribution of 55.5% (ß=.555, t=29.452, $p<0.05$), followed by training of staffs by hospital with a contribution of 30.8% (ß=.308, t=15.616, $p<0.05$) while workload contributed least 19.9% (ß=.199, t=14.519, $p<0.05$). The hypothesis is therefore rejected.

Hypothesis 7: There will be no significant composite prediction of demographic, intrapersonal and institutional factors on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state.

Table 4.10: Multiple regression analysis on composite contribution of demographic, intrapersonal and institutional factors on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State

R = .868 R^2 = .756 Adjusted R^2 = .756 Analysis of Variance					
Model	Sum of square	Df	Mean square	F	P
Regression	545564.215	3	181854.738	1547.729	.000
Residual	175659.167	1495	117.498		
Total	721223.382	1498			

Table 4.10 revealed that there was a significant joint contribution of demographic, intrapersonal and institutional factors on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State ($F_{(3,1495)=}$ 1547.729). The independent variable also yielded a coefficient of multiple regression (R^2) of 0.756 indicating that about 76% of the variation is accounted for by the independent variables. Hence, the null hypothesis was rejected. This implies that demographic, intrapersonal and institutional jointly contributed significantly on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State.

Hypothesis 8: There will be no significant difference in compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state based on working experience.

Table 4.11: T-test on difference in compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State based on years of work experience.

	Years of work experience	N	Mean	Std. Deviation	Mean diff	t	Df	p
Standard precaution compliance	Short	788	65.0934	16.98218	5.13821	2.969	1497	.003
	Long	711	59.9552	22.47596				

Table 4.11 revealed that there was a significant difference in standard precaution compliance among nurses in teaching hospitals in Oyo State based on years of work experience. The table shows that nurses with short years of work experience had a greater mean of (65.0934) than nurses with long years of work experience with a mean of (59.9552). This means that nurses with short years of experience comply more with standard precaution than nurses with long years of experience. Based on this, the null hypothesis was rejected.

Hypothesis 9: There will be no significant difference in standard precaution compliance among nurses in teaching hospitals in Oyo state based on hospital type.

Table 4.12: Analysis of Variance (ANOVA) on difference in compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state based on hospital type.

Source	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	122616.417	2	61308.208	153.218	.000
Within Groups	598606.965	1496	400.138		
Total	721223.382	1498			

Table 4.12 revealed that there was a significant difference in compliance with standard precautions among nurses in teaching hospitals in Oyo state based on hospital type ($F_{(2,1496)}$=153.218, $p<.05$). This means that there was a significant difference between the different types of hospital. Hence, the null hypothesis was rejected. This implies that there was variation in compliance with standard precaution based on types of hospital among nurses in tertiary teaching hospitals

Table 4.13: Scheffe post hoc multiple comparisons analysis on difference in compliance with standard precautions based on type of hospital

(I) type of hospital	(J) type of hospital	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Federal	State	22.97977*	1.36186	.000	19.6429	26.3166
	Faith based	14.42251*	2.17888	.000	9.0838	19.7612
State	Federal	-22.97977*	1.36186	.000	-26.3166	-19.6429
	Faith based	-8.55726*	2.42928	.002	-14.5095	-2.6050
Faith based	Federal	-14.42251*	2.17888	.000	-19.7612	-9.0838
	State	8.55726*	2.42928	.002	2.6050	14.5095

The result of post hoc test in the table above showed that there was a significant difference in compliance with standard precaution based on types of hospital. A significant difference was found between compliance with standard precautions between federal and state as well as between state and faith based. The result also showed that there was a significant difference between federal and faith based tertiary teaching hospitals. Based on this, the null hypothesis was rejected

Summary of Findings

Hypothesis 1: Demographic factors (age and work experience) had a significant joint contribution on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state. In addition 71% of the total variation is accounted for by the demographic factors (age and work experience)

Hypothesis 2: Each of the demographic factors (work experience and age) was independently significant. Work experience had the highest contribution of 76% on compliance with standard precautions while age had a contribution of 24% on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state.

Hypothesis 3: Intrapersonal factors (knowledge and attitude) had a significant joint contribution on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state. In addition 75% of the total variation is accounted for by intrapersonal factors (knowledge and attitude).

Hypothesis 4: The two variables of intrapersonal factors' (knowledge and attitude) contributions were independently significant on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state. Knowledge had the highest contribution of 66.9% on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state while attitude had 22.1% contribution on standard precautions among nurses in tertiary teaching hospitals in Oyo state.

Hypothesis 5: The independent variables of institutional factors (availability of personal protective equipments, training and workload) jointly had a significant contribution on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state. In addition 76% of the variation is accounted for by the institutional factors.

Hypothesis 6: The three variables (availability of personal protective equipments, training and workload) independently had significant contributions on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state. . Availability of PPE has the highest contribution of 55.5% on compliance with standard precautions among nurses in tertiary

teaching hospitals in Oyo state followed by training by hospital with a contribution of 30.8% while workload contributed least 19.9%.

Hypothesis 7: Demographic factors, Intrapersonal factors and Institutional factors jointly had significant contribution on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state. 76% of the variation is accounted for by the independent variables.

Hypothesis 8: Based on years of experience there was a significant difference in compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state. Nurses with short years of nursing experience comply better with a mean of 65.093 than nurses with long years of nursing experience with a mean of 59.955.

Hypothesis 9: Based on hospital types there was a significant difference in compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state. There was a significant variation in compliance with standard precautions. Scheffe post hoc test further revealed a significant difference in compliance with standard precautions between federal teaching hospital and state tertiary teaching hospital, state tertiary teaching hospitals and faith based teaching hospitals. Likewise there was a significance difference in compliance with standard precautions among nurses in federal tertiary teaching hospitals and faith based tertiary teaching hospitals.

QUALITATIVE PRESENTATION OF THEMATIC CONTENT ANALYSIS ON DEMOGRAPHIC, INTRAPERSONAL AND INSTITUTIONAL FACTORS AS PREDICTORS OF COMPLIANCE WITH STANDARD PRECAUTIONS AMONG NURSES IN TERTIARY TEACHING HOSPITALS IN OYO STATE, NIGERIA

This section presents the thematic content analysis on demographic, intrapersonal and institutional factors in relation to standard precautions compliance. The guide prepared for the focus group discussion was used in probing the discussants (nurses). Consequently, the findings of the study on qualitative data are explained under the following sub-headings:

Question 1: What do participants understand by the term health care associated infections?

The finding of the qualitative analysis on health care associated infections established that, virtually all the discussants understood the concepts of health care associated infections. It was revealed through the discussion that such infections are those that are acquired within the hospital premises. It was also established that, the infection could be referred to as hospital acquired infections or nosocomial infections. As such, the infections could be transferred from the nurses to the patients and from the patients to the nurses.

Here are a few excerpts from the discussion sessions:

''As is usually called, hospital acquired infections or nosocomial infections are infections that can be transferred from an individual to the other particularly in hospital setting. An instance is a situation whereby a nosocomial infection is transferred from a nurse to the patients or from the patients to the nurse"

Another discussant noted:

''*In my own understanding*, *hospital acquired infections are usually transferred from medical personnel like nurses to the patients and from the patients to the nurse*"

In the same vein, most discussants affirmed that, the relatives of the patients can contact nosocomial infections and subsequently spread such infections at home. The discussants stressed

that, hospital acquired infections can make some patients to spend extra days on hospital bed which will result in additional cost on drugs and bed fees.

A discussant noted:

''The infections abound in the hospital environment, patients' relatives can even contact them and spread them at home".

Another discussant noted:

"*Health care associated infection will make patient to spend extra days on hospital bed which will result in additional cost on drugs and bed fees. The stress on the family member will increase due to extra stay of their patient in the hospital." "Patients' children may not even be able to attend school because extra funds is been spent in the hospital".*

Question 2: What do participants understand by standard precautions compliance?

The outcome of the qualitative analysis on standard precautions compliance revealed that, most of the discussants understood the concepts of standard precautions compliance. In addition, most of the discussants were of the opinion that universal precautions and standard precautions were the same.

Here are a few excerpts from the discussion sessions:

'' Yes! *Both universal precautions and standard precautions are the same.*

On the other hand, the clear cut differences on both were expressed by the discussants that, standard precautions focused on both patient and workers' safety while universal precautions focused on workers' safety mainly.

A discussant noted:

"The basic fact is that the standard precautions protects both patients and workers, while universal precautions protects the health worker"

Another discussant expressed:

"Not really the same, but universal precaution is a step further".

Question 3: What are participants' views about nurses' compliance with standard precautions?

The finding of the qualitative analysis on compliance revealed that, most of the nurses are not effectively compliant with standard precautions. In their rating, most of the discussants expressed that nurses compliance was just average.

The below are a few excerpts from the discussion sessions:

"Based on my own opinion, the nurses are trying to comply with standard precautions, but there are situations that prevent them from complying. Also, the nurses we (nurses) are trying our best but, since facilities are not available what can we do".

A discussant noted:

"Compliance with standard precaution is not regular let us be truthful with ourselves. Although, I find it difficult to express it, but that is the usual practice"

Another discussant reacted:

"Honestly speaking, it is not easy to prevent health care associated infection because; the hospital is not even helping the matter. On the part of the personnel, I will score them 50% in terms of precaution, while the management will be scored below 50% based on the available facilities and equipment"

Question 4: Is your hospital / unit adequately equipped with consumables, facilities and equipment to practice standard precautions?

The outcome of the study on adequacy of consumables, facilities and equipment to practice standard precautions revealed that various units at the hospitals were not adequately equipped with necessary facilities for optimal compliance with standard precautions. This was evident through responses of most discussants; in which they reported that their respective units were not adequately equipped with necessary facilities for optimal compliance with standard precautions.

A discussant noted:

"*Facilities are not enough; resources are not readily available, while adequate policies are not in place". "Imagine in a hospital of this magnitude, there is no water to wash hands. Sometimes, we ask patient to give us pure water in order to wash our hands".*

A discussant reacted:

"It is obvious that facilities and resources are not readily available. For instance, there are no soaps to wash hands; while sterilizers are no longer working".

Another discussant noted:

"There are times that light will not even be available and nurses can have needle prick while carrying out procedures. "Even when you take instrument to Central Sterile Service Department (CSSD) it is half done, the instrument will still be wet which should not be the case"

Question 5: What are those barriers that cause non compliance with standard precautions?

The finding of the study on barriers revealed that, there was a shortage of manpower and limited material resources. It was further established by the discussants that shortage of manpower and limited material resources contributed greatly to non- compliance with standard precautions.

Here are a few excerpts from the discussion sessions:

"There is a shortage of manpower in hospitals. For instance, in a situation where there are 3 nurses to 28 patients; there is high tendency for the most senior to face administrative issues, while 2 nurses will be left for the treatment of 28 patients''

Another discussant noted:

Even, the little available resources are not always readily accessible when you put people that are not knowledgeable about nursing procedures in charge of store. For instance"

Here is another excerpt:

"In my hospital, there is shortage of gloves. On many occasions, we ration gloves on night duty. We hardly have gloves in the store. Also, most of the sinks in my ward are blocked" Even when you have enough materials you cannot access them easily and timely"

Apart from shortage of manpower and limited material resources, it was also established that attitude of healthcare providers is another barrier.

A discussant expressed:

"We don't really have the facilities that encourage the right attitude to comply with standard precautions"

Another discussant expressed:

"*The ratio of patient is high comparing with the available bed spaces" You may just have to discharge a patient or on the account of death before another is admitted. Once the doctors have another patient for admission they will be on the nurses' neck to admit the patient on the bed immediately; without giving adequate room for proper carbolyzation and adequate aeration of such bed".*

Question 6: What are those factors that can predict nurses' compliance?

The qualitative finding of the study on nurses' compliance established that, attitude of nurses towards standard precaution, in adequate supply of electricity, increase work load, in adequate hand on training or capacity building as well as in adequate facilities.

Here is an excerpt:

"*Our attitude as nurses towards standard precaution is not encouraging. Thus, as nurses, we should have it in mind that if a standard precaution is not properly practiced, it may lead to infection, which in turn can affect the nurses too"*

Another discussant reacted:

"*In my own opinion, irregular supply of 24 hours electricity and provision of clean water are serious factors that can affect nurses' compliance with standard precaution***.** *Consequently, I will implore the management to ensure that, there is adequate supply of water and electricity (24 hours).*

A discussant noted:

''*Shortage of personnel is a serious challenge affecting standard precaution. This has led to a serious workload among the nurses. It means that the management needs to employ more nurses so as to decrease work load***"**

A discussant expressed:

In adequate capacity building is another challenge that can predict nurses' compliance. Hence, I will advise the management on the need to organize for training and retraining of nurses. In addition, we (nurses) should update ourselves on current infection practices"

Discussants noted:

"*There are different factors affecting nurses' compliance, however, inadequate facilities are considered as the major factors. Hence, the hospital management should ensure that all facilities are provided in a way that will promote compliance with standard precautions"*

Discussion of Findings

The findings on relationship between all the independent variables and dependent variable revealed a strong relationship between age and compliance with standard precautions. This showed that as nurses advance in age, their compliance with standard precautions improves. This is line with the findings of Kirkland (2011) who opined that older nurses are consistently more likely to be strictly compliant with standard precautions guidelines. The finding also revealed strong positive relationship between work experience and compliance with standard precautions. This result is corroborated with the findings of Imad, Ahmad, Mahdiah and Safaa (2016) in their study on Midwives and Nurses compliance with standard precautions in Palestinian hospitals and reported that there is an association between work experience and standard precaution compliance.

This result also revealed that there is high occurrence of health care associated infections (87.9%) ranging from upper respiratory tract infections to more life threatening infections among nurses in Oyo state. This is in line with the WHO (2008) report that the global prevalence of health care associated infections among health workers rise by 12% annually. This could be as a result of suboptimal compliance with standard precautions among the nurses. This was further corroborated from responses from the focus group discussants who opined that compliance with standard precautions is on the average among nurses due to varying reasons and which is not adequate for infection control. It could also be explained on the angle of shift pattern in which a nurse will be on afternoon duty today and be on morning duty the following day. This is the pattern practice in teaching hospitals in Oyo state. When this pattern of shift lingers on for a long time, it increases the stress level of the nurses and thereby lowers their immunity.

The study further investigated demographic, intrapersonal and institutional factors as predictors of compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state. The findings of this study showed that the two variables of demographic factors (age and work experience) jointly have significant contribution on standard precautions compliance. The findings on work experience as a predictor of compliance with standard precautions is in line with the result of Mcgovern, Vesley, Kochevar, Gershon, Rhame and Anderson (2000) who reported that longer job tenure was related to health care worker

compliance with standard precautions. The result is also in line with Nichol, Bigelow, O'Brien, McGeer, Manno and Holness (2008) who reported from their study that nurses with longer years of working experience comply better with standard precautions. Furthermore this also corrobates the findings of Kirkland (2011) who reported that nurses with more years of working experience were consistently more compliant with standard precautions guidelines. In addition the result is also in line with the findings of Imad, Ahmad, Mahdiah and Safaa (2016) in their study on Midwives and Nurses Compliance with standard precautions in Palestinian hospitals and reported that there is an association between work experience and standard precaution compliance.

The findings on work experience as a significant contributor to standard precautions compliance is contrary to the findings of Gershon (1999) who reported that in a study done on compliance with standard precautions there is less compliance with increased work experience. Najeera (2009) in her study also found out that work experience had no association with standard precautions compliance. However, based on the findings of this study, work experience as a demographic variable has the highest contribution of 76.0% on standard precautions compliance while age contributed 24.8%. This could be explained that irrespective of the age, the knowledge and skill an individual has gained through carrying out a particular task for a period of time will influence their behaviour. This could have accounted for the high contribution of work experience as a demographic variable as against age. The findings on age as a predictor of compliance with standard precautions showed that there is contribution of age on compliance with standard precautions. This is line with the findings of Gershon et al (2007) who reported that age is a predictor of standard precautions compliance. This further corroborated by Imad, Ahmad, Mahdiah and Safaa (2016) that there is an association between age and compliance with standard precautions.

Intrapersonal factor was found to have a significant contribution on compliance with standard precautions among nurses in Oyo state. Findings on knowledge as a predictor of compliance with standard precautions is line with the results of Chan, Ho and Day (2008) who found in their study that better knowledge of standard precautions was one of the predictors of better compliance among health workers. This was also affirmed by Luo, He Zhou and Lou

(2010) in their study who reported that knowledge is a predictor of compliance with standard precautions guidelines among nurses. Nelsing, Nielsen and Nelsing (1997) found out in their study that that lack of appropriate knowledge of standard precautions and infection control was the main reason for poor compliance. This was further corroborated by Ayranci and Kosgerolu in 2004. In another study conducted by Beghdadli, Belhadj, Chabane, Ghoman, Kandouci and Fanello (2008) it was also found that lack of knowledge on standard precaution resulted in lack of compliance with standard precautions guidelines. This showed that knowledge has a positive correlation with standard precaution compliance. The higher the level of knowledge the better the compliance rate and if the level of knowledge is low the compliance rate will equally be low. These results further showed that knowledge is a key factor in enhancing optimal compliance with standard precautions; since knowledge is usually the first step towards modification of a desirable behaviour.

The findings on intrapersonal factors in this study is against the findings of Akyol, Ulsoy and Ozen (2006) ; Tipple, Mendonca, Melo, Souza, Pereira et al (2007) who based on their findings postulated that knowledge although fundamental but not sufficient to foster behavioural change regarding standard precautions compliance especially hand hygiene. Labrague, Rosales and Tizon (2012) also reported that there was lack of significant association between knowledge and compliance with standard precautions. Furthermore, Abdulraheem et al (2012) revealed from their study that knowledge on standard precautions do not necessarily affect compliance and application. Attitude as an intrapersonal factor was revealed in this study to have a significant contribution on compliance with standard precautions among nurses in teaching hospitals in Oyo state. This is in agreement with findings of Nofal, Subih and Al- Kalaldeh (2017) who reported based on their findings that attitude was a significant predictor of compliance with standard precautions among nurses and physicians in Jordan. Also in line with this result is the findings of Quan et al. (2015) who submitted that attitude is an influential factor in compliance with standard precautions. This could be because, attitude is a key factor in any health behaviour, the stronger the attitude towards a health behaviour, the better the practice of such behaviour.

The outcome of this study also revealed that institutional factors of availability of personal protective equipment, training by hospitals and workload jointly contributed on compliance with

standard precautions among nurses in teaching hospitals in Oyo state. However further investigations revealed that availability of personal protective equipment contributed most on compliance with standard precautions while workload is the least contributor. This may be as a result that personal protective equipment are the basics things that were needed in infection control practices which without them standard precautions cannot be carried out. Almost all standard precautions recommendations require some kind of personal protective equipment which are to be readily available and accessible at the point of use. This is in line with the outcome of findings of Kirkland (2011) who submitted that the major reasons given by her respondents for non compliance with the use of personal protective equipment was lack of availability. This implies that availability of personal protective equipment will increase compliance with standard precaution among her respondents.

This result also corroborated the findings of Okechukwu et al. (2011) who reported that the main constraint given for low compliance is lack of regular supplies of personal protective equipment. The findings of this result further supported Vaz et al. (2010) who posited that availability of personal protective equipment is among the main suggestion for compliance with standard precautions. One of the major reasons given for low compliance with standard precautions in these published studies has included non availability of personal protective equipment. This invariably means that if personal protective equipment is made available for use this will improve standard precaution compliance and thereby reduce infection transmission in hospital settings. On the other hand, if personal protective equipments are not available compliance with standard precautions will be low.

Training of employees by the hospital management was shown to independently contribute to compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state. This is in tandem with the findings of Cole (2007) who revealed that training on standard precautions has been shown to increase retention of knowledge and improve attitude, with an overall improvement on standard precautions compliance. It also corroborated the findings of Suchitra and Lakshmi (2007) who submitted that training on standard precaution improves compliance with standard precautions thereby decreasing the risk of exposure and transmission of infectious organisms. The findings on training of employees is also in line with the

submission of Felix, Victor, Malagutti and Gir (2013) that health workers who had training on standard precautions guidelines were more likely to always comply with standard precautions compared to non trained health workers. Furthermore Haile et al. (2017) also affirmed that improved compliance with standard precaution is associated with training on standard precautions guidelines. The finding on this study could be explained that training is one of the cornerstones of improved compliance with any desired activity. Hence, this could be the fact that training on standard precautions guidelines could improve knowledge and skills of nurses on basic principles of infection control and recommendations which will foster adequate compliance. In addition current knowledge and skills regarding standard precaution could increase the confidence and morale in complying with standard precautions. The finding of this study is against the findings of Imad et al. (2016) who reported that there was no association between training courses and standard precaution compliance.

The result of this study showed that workload load had significant contribution on compliance with standard precautions among nurses in teaching hospitals in Oyo state. Though, it is the least contributor on compliance with standard precautions out of the three institutional variables. This result means that workload of the nursing staffs will predict better compliance to standard precautions. This could be because majority of the nurses working in these hospitals which is the area of study were trained in the hospitals. These hospitals are teaching hospitals and referral centre with influx of patients and the nurses had been exposed to high workload during their training years and which they have imbibed as the norm. This is in line with the findings of Brevidelli and Cianciaarullo (2009) in which perception of work load had a positive influence on standard precautions. It was hence submitted from their findings that high perceived job demands were considered to be associated with great responsibility and concentration and which in turn favoured compliance with standard precautions. The widely believed opinion is that high workload tends to make professionals cut corners and not adhere strictly to laid down recommendations and guidelines in bid to save time and reduce stress. Cutter and Jordan (2004) reported that non compliance among health workers could be due to their belief that their work load is increased by adhering to universal precautions and therefore these procedures are difficult to accommodate due to day to day current clinical pressures. This is also in line with the

submission of Jawaid et al. (2009) that excessive patient workload affects standard precautions compliance to some extent.

The result on composite prediction of demographic, intrapersonal and institutional factors on compliance with standard precautions among nurses in teaching hospitals in Oyo state revealed that the three independent variables contributed significantly on compliance with standard precautions. This could be explained that since compliance with standard precaution involves a change in behaviour, so many factors are involved in behavioural change. This showed that all these predicting factors are interrelated and must be in play before optimal compliance with standard precautions can be achieved. Adequate knowledge on standard precautions and attitude towards it are intrapersonal factors that affect compliance with standard precautions. Improving these factors only among nurses is not sufficient to ensure optimal compliance.

The personal protective equipment needs to be available for it to be made use of even if there is adequate knowledge on its importance and nurses' favourable disposition to its usage. When personal protective equipment were available but no adequate training on their appropriate usage this will still make compliance to be suboptimal, and may increase infection transmission. There is an appropriate step to step application, usage and proper disposal of these equipments which if not adhere to will lead to infection transmission and jeopardize the essence of standard precautions. Nurses need adequate training on this so as to improve compliance with standard precautions. This is in line with findings of Quan et al. (2015) who opined that improving nurses' knowledge of standard precautions as well as attitude regarding standard precaution is not sufficient to ensure sufficient compliance is achieved because protective devices are of poor quality and inadequate.

Findings on difference in compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state based on work experience revealed that nurses with short years of experience had a greater mean of 65.0934 while nurses with long years of working experience had a mean of 59.9552. This implies that nurses with short years of experience comply more with standard precautions than nurses with long years of experience. This is contrary to most of the widely reported findings on work experience and standard precautions compliance. This

could probably be because nurses with short years of experience are younger in age and in their prime of life. They may not want to expose themselves to occupational infections that will endanger their future and cut their life short. Hence they comply with standard precautions. It could also be that as nurses gain experience over the years, their confidence and capabilities increases which in turn makes them not to follow certain guidelines and recommendations. Another reason given by the focus group discussant of this study was that nurses with short years of experience are not usually ready to work and since there is usually shortage of personal protective equipment, it is an excuse for them not to work but capitalizing on adhering to standard precautions. The findings is in line with Gershon et al. (1999) who revealed that there is less compliance with universal precautions with increased age and experience. In contrary the findings of Amoran and Onwube (2013) revealed that there was no statistically difference in compliance with standard precautions based on years of work experience.

Finally, the study found out that there was variation in compliance with standard precautions based on types of hospital among nurses in teaching hospitals in Oyo state. This means there was a significant difference between the different types of hospital based on their level of compliance. This result was further subjected to statistical analysis of Scheffe post hoc multiple comparison which then revealed that nurses in federal tertiary teaching hospitals comply better with standard precautions than nurses in faith based tertiary teaching hospitals and state teaching hospitals. The result further revealed that faith based tertiary teaching hospital nurses comply better than state teaching hospital nurses, making the state teaching hospital nurses the least compliant out of the three tertiary teaching hospitals. This could be because there is better funding of the federal teaching hospitals and faith based teaching hospital than state teaching hospital. In addition federal teaching hospitals are frontier of knowledge in all areas of medical practice and which enable their nurses to be more exposed to various training programmes and implementation of such acquired training which in turn favours better clinical practice among them compared to both faith based and state teaching hospital nurses.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter presents the summary, conclusion and recommendations which were drawn based on the findings of the study. The contributions to knowledge as well suggestions for further studies were made on the identified limitations in this study.

Summary

The study examined demographic, intrapersonal and institutional factors as predictors of compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state. The independent variables for the study were demographic factors, which included age and work experience; intrapersonal factors which are knowledge and attitude and institutional factors of availability of personal protective equipment, workload and training. The study presented an introductory part of the background and the need for optimal compliance with standard precautions guidelines by nurses so as to reduce the risk of infection transmission in hospital settings. Standard precautions are the latest and most comprehensive infection control guidelines that has to be followed in preventing transmission of infections in healthcare facilities

The study raised three research questions and nine hypotheses. The first and second hypotheses tested the joint and relative contributions of demographic factors on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state. The third and fourth hypotheses tested the joint and relative contributions of the intrapersonal variables on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state. The fifth and sixth hypotheses tested the joint and relative contributions of institutional variables on compliance with standard precautions among nurses in teaching hospitals in Oyo state. The seventh hypothesis tested the composite prediction of the three independent variables (demographic, intrapersonal and institutional factors) on compliance with standard precautions among nurses in teaching hospitals in Oyo state. The eight hypothesis tested significant difference in compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state based on work experience. The ninth hypothesis tested the significant difference in

compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state based on hospital types.

A conceptual framework was developed for the study with theoretical and empirical review of relevant literature. They included infectious diseases in healthcare settings, safety of health workers in health facilities, health care associated infections in tertiary teaching hospitals, burden of health care associated infections in health care settings, overview of infection control practices, evolution of infection control guidelines and standard precautions. Empirical review included demographic, intrapersonal and institutional factors as predictors of standard precautions compliance among nurses.

The study employed the use of descriptive research design of correlational type. Total enumeration technique was used to select one thousand five hundred and eighteen (1518) respondents while one thousand four hundred and ninety- nine (1499) correctly filled questionnaires were analyzed. A self- developed questionnaire and focus group discussion guide were used as instruments for the study. The questionnaire was subjected to validation and reliability and had reliability of 0.78 for demographic factors as predictors of compliance with standard precautions scale (DFPCSPS), 0.90 for intrapersonal factors as predictors of compliance with standard precautions scale (IFPCSPS), 0.84 for institutional factors as predictors of standard precautions compliance scale (INFPCSPS) and 0.86 for compliance with standard precautions scale (CSPS).

The data collected were analyzed using descriptive statistics of frequency count and percentages for the demographic variables of the respondents while inferential statistics of regression, analysis of co-variance and student t-test were used to test the hypotheses at 0.05 level of significance. The qualitative information from the focus group discussion was analyzed using thematic-content analysis approach.

The study provided answers to three research questions and nine hypotheses

Conclusion

Findings from this study reveal that demographic, intrapersonal and institutional factors had significant relative contribution on compliance with standard precautions among nurses in teaching hospitals in Oyo state, Nigeria. Findings also revealed that independent variables of demographic, intrapersonal and institutional factors when taken together had significant composite contribution on compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo State, Nigeria. It can be concluded from this study that in order to achieve optimal compliance with standard precautions among nurses so as to reduce infection transmission in health care facilities; interventions to improve compliance should focus on demographic, intrapersonal and institutional factors that predict compliance with standard precautions.

Recommendations

Based on the findings and conclusion of this study, the following recommendations were made;

1. There should be periodic in-service training for all nurses so as to update their knowledge on emerging infectious diseases and on standard precautions
2. The study revealed that there is contribution of availability of equipment on compliance with standard precautions; hence necessary personal protective equipment should be made readily available.
3. Available personal protective equipment should not be kept in store over the weekend when ward managers who have easy access to them will not be around.
4. A senior nurse on duty on weekends should be made responsible for upkeep of personal protective equipment so that they will be readily accessible at the point of need.
5. Personnel who are knowledgeable on infection control should be put in charge of stores where personal protective equipment and other consumables are being supplied to nurses.

6. State government should endeavour to fund state teaching hospitals so that adequate personal protective equipment will be procured; so as to aid better compliance among the nurses.

7. Hospital management should conduct regular monitoring and evaluation of implementation of standard precautions guidelines among nurses so as to ensure adequate compliance.

8. Hospital management should ensure that standard precautions policy in accordance with CDC guidelines are made readily available so that nurses can make quick reference to it when in doubt. This should be made available on every ward.

9. Regular water and electricity supply should be made available by the hospital management so as to facilitate compliance with standard precautions among nurses.

10. Blocked sinks should be repaired so as to facilitate better hand hygiene practise.

Contributions to knowledge

Based on the outcome of this study, the researcher believed the following are the contributions of the thesis to knowledge;

1. The findings of this study established that demographic, intrapersonal and institutional factors had a cumulative influence on compliance with standard precautions among nurses in teaching hospitals in Oyo state.

2. The combinations of demographic, intrapersonal and institutional factors were established to be imperative in the prediction of compliance with standard precautions among nurses in teaching hospitals in Oyo state.

3. The findings of this study provided empirical contributions for the improvement of compliance with standard precautions among nurses in tertiary teaching hospitals in Oyo state.

4. The findings established that nurses from federal hospital complied better with standard precautions than nurses from state and faith based hospitals; while nurses from faith based hospital complied better than nurses from state hospitals.

5. This study identified that nurses with short years of work experience complied better with standard precautions than nurses with long years work experience.

Suggestions for further studies

Based on the findings of this study, the following suggestions were made;

1. The study should be replicated among nurses in private hospitals and primary health care centres since these are usually the first port of call when people are assessing health care services.

2. The study should also be replicated in other teaching hospitals in south west and other geopolitical zones in Nigeria to establish a valid generalization of the findings.

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APPENDIX 1

DEPARTMENT OF HUMAN KINETICS AND HEALTH EDUCATION, UNIVERSITY OF IBADAN, NIGERIA

QUESTIONNAIRE ON

DEMOGRAPHIC INTRAPERSONAL AND INSTITUTIONAL FACTORS AS PREDICTORS OF COMPLIANCE WITH STANDARD PRECAUTIONS AMONG NURSES IN TERTIARY TEACHING HOSPITALS IN OYO STATE

Dear Respondent,

I am a doctoral student in Health Education at the Department of Human Kinetics and Health Education. I am carrying out a study on "**Demographic Intrapersonal and Institutional Factors as Predictors of Compliance with Standard Precautions among Nurses in Tertiary Teaching Hospitals in Oyo State".** Your response to the questions below shall be highly appreciated and your participation shall be treated confidentially. Kindly fill them as appropriate. The outcome of this study hopefully will help your hospital management to intervene appropriately.

Thanks for your anticipated cooperation.

Yours sincerely,

Olaoluwa O.A.

SECTION A: Demographic information

Instruction: please tick (√) in the column as it applies to you in each of the following items

1. Place of work: 1. UCH ( ) 2. LAUTECH ( ) 3. BOWEN ( )

2. Designation: **1.** Nursing Officer II ( ) **2**. Nursing Officer I ( ) **3**. Senior Nursing Officer ( ) 4. Principal Nursing Officer ( ) 5. Assistant Chief Nursing Officer ( ) 6. Chief Nursing Officer ( )

3. Section Where you work: 1. Medical unit ( ) 2. Surgical unit ( ) 3. Obstetrics & Gynecology ( ) 4. Paediatrics ( ) 5. Accident and Emergency Unit ( ) 6. Theatre/Intensive Care Unit ( ) 7. Others specify……

4. Age: 1. Less than 25yrs ( ) 2. 25-29 ( ) 3. 30-34 ( ) 4. 35-39 ( )

   5. 40- 44 ( ) 6. 45- 49 ( ) 7. 50- 54 ( ) 8. 55years and above ( )

5. Sex: 1. Male ( ) 2. Female ( )

6. Marital status: 1. 2. Single ( ) 3. Married ( ) 4. Divorced ( ) 5. Widowed ( ) 6. Separated ( )

7. Years of work experience: 1. Less than 5years ( ) 2. 5-9 years ( ) 3.10 – 14 years ( ) 4. 15-19 years ( ) 5. 20 years and above ( )

SECTION B

Demographic Factors as Predictors of Compliance with Standard Precautions Scale.

Please tick (√) as appropriate in the column provided

	Work Experience	**SA**	**A**	**D**	**SD**
1	I wash my hands immediately after removal of gloves due to my long working experience				
2	My compliance with washing of hands in between patients contact has improved with my experience on the job.				
3	I do not recap needles after use based on the experience I have gathered over the years.				
4	My long years of working experience have enhanced my compliance with protection of face and eyes when blood splash or spray is anticipated.				

	AGE				
5	Older nurses comply better with standard precautions than younger nurses				
6	As an old nurse I know I have become an expert and can work without complying with standard precautions.				
7	Older nurses comply better with standard precautions in emergency situation than younger nurses.				
8	Younger nurses are always inexperience and so they comply less with standard precautions				

SECTION C

Intrapersonal Factors as Predictors of Compliance with Standard Precautions Scale.

Please tick (√) as appropriate in the column provided.

S/N	ITEMS	TRUE	FALSE	I DON'T KNOW
	Knowledge			
1.	Standard precautions is an infections control measures that should be used when caring for all patients			
2.	Standard Precautions include recommendations to protect health workers, patients and visitors to the hospital			
3.	Health care associated infections are infections that occurs 48hrs after hospital admission			
4.	Health care associated infections (HCAI) can be transmitted from a patient to health worker and vice versa			
5.	The cheapest and an effective method of preventing health care associated infection is hand washing			
6.	Hand should be washed before contact with a patient, after contact with a patient and between			

	patients contact			
7.	Respiratory protection requires respirator with N95			
8.	Gown should be removed and hand washed before leaving patients environment			
9.	Sharp boxes should be discarded when 1/3 filled			
10.	Segregation of waste is a component of infection prevention.			
11.	After accidental puncturing of hand with sharp instruments blood should be squeezed out from the injured hand.			
12.	Hospital administration does not have a role in ensuring adequate sterilisation			

S/N	**Attitude**	**SA**	**A**	**D**	**SD**
13.	Health care associated infections prevention can be achieved if I follow standard precaution guidelines.				
14.	Wearing personal protective equipment during emergency situation does not mean I am irresponsive to patient urgent needs.				
15.	Changing of my gloves when heavily soiled is not a waste				

	of resources				
16.	Thorough disinfection of medical equipments should be the responsibility of all health care providers				
17.	I am always careful where I put my other materials while at work				
18.	Telling patients to cover their mouth when coughing is not insultive				
19.	Patient with infectious diseases can be treated without being infected if standard precautions guideline is followed.				

SECTION D

Institutional Factors as Predictors of Compliance with Standard Precautions Scale.

Please tick (√) as appropriate in the column provided

	Availability of PPE in your place of work	**Always Available**	**Sometimes Available**	**Not Available**
1	Latex gloves are available for use for patient care .			
2	Sterile glove are available for use for sterile procedures			
3	Eye goggles are available for use to guide against accidental body fluid splash			

	or spray			
4	Face mask is available for use on my ward.			
5	A respirator with N95 is available for use on all medical wards			
6	Disposable aprons/gowns are available for use			
7	Sharp boxes are available for use			

S/N	ITEMS **Training provided by your teaching hospital**	SA	A	D	SD
8.	Newly employed nurses are trained on Standard Precaution				
9.	In- service training on standard precaution are provided for nurses				
10.	Standard Precaution guidelines booklet are available for use when a nurse is in doubt				
11.	Experienced nurses always guide newly employed nurses on standard precautions				

S/N	ITEMS **Workload**	SA	A	D	SD
12.	Most nursing activities that I do require extensive mental effort and concentration that will not enhance standard precautions compliance				
13.	Most often I am exhausted while on duty and this affects my standard precautions compliance				
14.	My daily nursing activities entail lot of emergency activities and these do not give room for adequate compliance				
15.	With the level of work intensity in my section compliance with standard precautions is impracticable				

SECTION E:

COMPLIANCE WITH STANDARD PRECAUTIONS SCALE

Please tick (√) as appropriate in the column provided

	ITEMS	**Always**	**Sometimes**	**Rarely**	**Never**
1.	I wash my hands before and after any procedure				
2.	I wash my hands immediately after removal of gloves				
3.	I wash my hands in between contact with patients				
4.	I wash my hands with water and soap				
5.	I change gloves during patient care if I move hand from contaminated body site to clean body site				
6.	I wear gloves when caring for all patients				
7.	I wear mask during suctioning.				
8.	I wear gown when contact precaution is required.				
9.	I protect my face and eyes when blood splash or spray is anticipated.				
10.	I do not recap needles after use.				
11.	I discard used needles and other sharps in a sharp box				
12.	I report incidents in case of needle stick injury				

13.	I teach patients and visitors how to practice respiratory hygiene.				
14.	I physically separate coughing/sneezing patients more than one meter away from other patients.				
15.	I wear mask when caring for patients with respiratory symptoms.				
16.	I ensure thorough cleaning and disinfection of nursing and medical equipments, tables, door knobs and telephones during my shift.				
17.	I ensure all waste contaminated with blood, body fluids, secretions and excretions during my shift are labeled biohazard.				
18.	I ensure proper placement of patients when admitting them.				
19.	Prophylaxis treatment is available in my hospital in case of accidental injury				
20.	My hospital ensures pre-employment immunization of all staffs.				

APPENDIX II

FOCUS GROUP DISCUSSION GUIDE FOR NURSES IN TERTIARY TEACHING HOSPITALS IN OYO STATE.

Research Title:

DEMOGRAPHIC INTRAPERSONAL AND INSTITUTIONAL FACTORS AS PREDICTORS OF COMPLIANCE WITH STANDARD PRECAUTIONS AMONG NURSES IN TEACHING HOSPITALS IN OYO STATE, NIGERIA.

Principal Investigator: Oyindamola Abosede OLAOLUWA

Estimated Time for Discussion- 1- 1.5 hours

Instruction to Interviewer:

(a) Introduce self.

(b) Let the participant know why he/she was selected for the discussion.

(c) Stress and verify comfort level with the discussion, noting that for practical reasons such as the need to reduce fatigue, more than one meeting for the discussion will be necessary.

(d) Assure respondents of confidentiality.

(e) Obtain informed consent for the discussion.

Introduction

Good day. I am Mrs …….. and my colleagues names are ……. We are from University of Ibadan, Department of Human Kinetics and Health Education. We thank you all for agreeing to participate in this discussion on demographic intrapersonal and institutional factors as predictors of standard precautions compliance among nurses in tertiary institutions in Oyo state. This discussion is part of a research project and its' outcome will be useful in future for planning strategies that will help in increasing nurses' standard precautions compliance. We have specially invited you to come and share your views with us because of

your wealth of experience. In this discussion, no views expresses by any discussants will be judged right or wrong. Kindly permit us to use a tape recorder because there is limit to what the brain can remember and we do not want to forget the useful experiences we are here to share. We assure you that what is discussed here will not be used in any way against any one. All that will be discussed will be kept confidential.

Thank you.

S/N	MAIN QUESTION	FOLLOW UP QUESTIONS
1	What do you understand by the term health care associated infection (HCAI)?	• Are you aware of those who are susceptible to it? • In what ways is it been transmitted? • In what ways do you feel it affects individual, family and health care system?
2	What do you understand by standard precautions	• Is it the same as universal precaution? • Can you mention its components? • Why was it formulated? • What are its advantages
3.	What is your view about nurses compliance with standard precautions	• How will you rate nurses' compliance with standard precautions? • Is their compliance low or high? • Why do you think nurses compliant are low/high? • Is it adequate to prevent infection transmission?

4	Is your hospital/unit adequately equipped with consumables, facilities and equipment to practice standard precaution	• What facilities are needed in your unit? • Are they readily available? • Are they easily accessible during emergency?
5.	What are those barriers that causes non compliance	• Probe for the barriers
6.	What are those factors that can predict nurses compliance	• Probe for the factors

SOCIAL SCIENCES AND HUMANITIES RESEARCH ETHICS COMMITTEE (SSHEC)
UNIVERSITY OF IBADAN
Chairman: Prof. A. S. Jegede, B.Sc, M.Sc (Ife), MHSc (Toronto), Ph.d (Ibadan)
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NOTICE OF FULL APPROVAL AFTER FULL COMMITTEE REVIEW

Re: Demographic, Intrapersonal and Institutional factors as Predictors of Standard Precautions Compliance among Nurses in Teaching Hospitals in Oyo State.

UI/Social Sciences Ethics Committee assigned number: **UI/SSHEC/2016/0038**

Name of Principal Investigator: **Oyindamola Abosede OLAOLUWA**
Address of Principal Investigator: Dept of Human Kinetics & Health Education,
Faculty of Education,
University of Ibadan.

Date of receipt of valid application: **28/10/2016**
Date of meeting when final determination on ethical approval was made: **1st March, 2017.**

This is to inform you that the research described in the submitted protocol, the consent forms, and other participant information materials have been reviewed and given full approval by the SSHE Committee.

This approval dates from **01/03/2017 to 28/02/2018**. If there is delay in starting the research, please inform the SSHE Committee so that the dates of approval can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside of these dates. All informed consent forms used in this study must carry the SSHE Committee assigned number and duration of SSHE Committee approval of the study. It is expected that you submit your annual report as well as an annual request for the project renewal to the SSHE Committee early in order to obtain renewal of your approval to avoid disruption of your research.

Note: the National code for health research ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse events are reported promptly to the SSHEC. No changes are permitted in the research without prior approval by the SSHEC except in circumstances outlined in the Code. The SSHE reserves the right to conduct compliance visit to your research site without previous notification.

Prof. A.S. Jegede

APPENDIX V

(A) Focus group discussion session

(B) Focus group discussion session

(C) Focus group discussion session

(D) Researcher with focus group discussion participants