HANDWASHING AND PERCEIVED FACTORS INFLUENCING THE PRACTICE AMONG NURSES IN STATE HOSPITALS IN IBADAN METROPOLIS, NIGERIA

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DEDICATION

This dissertation is dedicated to the Almighty God who has brought me this far. May His Name be continually praised.

ABSTRACT

Hand Washing (HW) helps to prevent or control Nosocomial Infections (NI) among health workers. Compliance to HW guidelines among health workers is low. The perceived factors which influence its practice among nurses in Secondary Healthcare Facilities (SHF) are yet to be well investigated. This study was, therefore, designed to determine the practice of HW and the factors perceived to influence HW practice among nurses in public SHF in Ibadan metropolis.

The study was a cross-sectional survey. A cluster sampling technique was used to select 320 consenting nurses proportionately allocated to wards/clinics in all the five state-owned hospitals. A semi-structured questionnaire which included questions on 21-point knowledge, 17-point perception and 53-point HW practice scales, as well as perceived HW facilitating and barrier factors were used for data collection. Knowledge scores ≤7, >7-15 and >15 were categorised as poor, fair and good, respectively. Hand washing-related perception scores < 9 and ≥ 9, were respectively, classified as unfavourable and favourable. Hand washing practice scores ≤26 and >26, were grouped as poor and good, respectively. Data were analysed using descriptive statistics, student's t-test, Chi-square test and logistic regression at p= 0.05

Respondents' age was 36.8±9.0 years, 85.0% were females and 63.8% possessed nursing diploma. Knowledge score was 13.3±2.1 and respondents with poor, fair and good knowledge were 2.5%, 64.4% and 33.1%, respectively. The correctly mentioned HW practices for controlling NI included the following: HW before and after touching a patient (95.9%); HW after dressing a bed (85.9%); and after contact with blood or body fluid (97.5%). Respondents' perception score was 13.7±2.1 and 98.8% had favourable perceptions. Respondents' practice score was 29.7±6.8 and 68.8% had good practice scores. The good HW methods practised included use of anti-septic soap and warm water (68.1%) and washing of both front and back of hands (80.0%). Poor HW methods practised included use of running water alone (23.4%), HW in a basin (27.8%) and use of soapy water in a basin (26.3%). The HW facilitating factors included availability of the following: a bucket of water with bowl (72.5%); a sink (59.1%); and soap racks (46.9%) while barriers to appropriate HW included irregular water supply (64.7%); lack of

water (47.5%) and lack of soap (46.3%). Respondents in wards were more likely to have good HW practices compared to respondents in the clinics (OR= 2.53, C.I=1.45-4.46).

Nurses in state hospitals in Ibadan favoured hand washing but knowledge of the practices was low among them. In addition several of them practiced poor hand washing. Availability of sinks facilitates the adoption of hand washing among respondents in the wards compared to those in clinic. Continuing education and provision of hand washing-related resources in wards/ clinics are needed to address the situation.

Keywords: Handwashing, Nurses in Secondary healthcare facilities, Nosocomial infection,
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CERTIFICATION

I certify that this project was carried out by Oluwafisayo Bolanle, AJALA in the Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria.

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GLOSSARY OF ABBREVIATION

CDC:	Center for Disease Control
CFU:	Colony Forming Units
FDA:	Food and Drug Administration
GHP	Global Handwashing Partnership
HAIs	Hospital Acquired Infections
HH:	Hand Hygiene
HW:	Hand Washing
MRSA	Methicillin-Resistant Staphylococcus Aureus
NI:	Nosocomial infection.
RSV:	Respiratory Syncytial Virus
SPSS:	Statistical Package for Social Sciences
SHF:	Secondary Healthcare Facilities
UK:	United Kingdom
WHO:	World Health Organisation

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Handwashing is a health – related habit which plays a vital role in the prevention and /or control of many infectious diseases. These are often diseases spread from person to person and /or from a source of contamination to others through the hands (Scott, 2013). Hands can play a major role in the transmission of infections in healthcare institutions, in industrial settings, such as the food industry; in communities and domestic settings (CDC, 2010; Scott, 2013). Handwashing is a recommended practice for combating hospital-associated or nosocomial infections (Boyce and Pittet, 2002). Nosocomial infections are a source of concern in healthcare settings because they are a threat to the health of patients (Pourakbari, Rezaizadeh, Mahmoudi and Mamishi, 2012). Nosocomial infectious constitute a public health burden worldwide (Defez, Fabbro-Peray, Cazaban, Boudemaghe, Sotto and Daurès, 2007; WHO, 2011).

The most common cause of healthcare-associated infections is person-to-person transmission of pathogens via the hands of health care professionals including nurses (Sickbert, Weber, Gergen, and Rutala, 2004; Al-Abdli and Baiu, (2014). Health care workers' hands can get contaminated by touching patients' body secretions, wounds, intact skin and environmental surfaces in the immediate vicinity of patients (Carvalho, Melo, Melo, Gontijo-Filho, 2007). Nursing practices which involves direct touching, contact with bodily fluids, and wound care can result in high levels of microbial contamination (Pittet, Simon, Hugonnet, Lucia, Sauvan and Pmeger, 2004; Bennett, Jarvis and Brachman, 2007). It has been noted, for instance that nurses' hands can become contaminated anywhere with about 100–1000 Colony Forming Units (CFU) of *Klebsiella spp* (Pittet, Allegranzi, Sax, Drahan, Lucia Pessoa-Silva, and Donaldson, 2006; Derya, Kadriye, Sabahat, Alife 2014). Infections can also be spread even during relatively clean procedures, such as taking the temperature, respiration and pulse of patients, measurement of arterial blood pressure.

Regular and proper handwashing, therefore, helps prevent infections in clinic settings. It has been noted that hand hygiene is not only an effective measure for preventing

healthcare associated infections but also a strategy for reducing infections in many cases; for instance an estimated 50% risk was found (Martin-Madrazo, Canada-Dorado, Salinero-Fort, 2009). The value of hand hygiene extends beyond health care settings as it helps in preventing chemically related occupational hazards and up to 80% of infections, including influenza, in the community setting (Cowling, Chan, Fang, 2009). Compliance with handwashing practice is low among health workers despite the fact that hand hygiene is one of the simplest and most effective ways to prevent nosocomial infections (Martin-Madrazo et al 2009; George, 2015). The reasons for low compliance with hand hygiene have not been thoroughly identified in developing countries including Nigeria. This is probably due to limited studies on hand hygiene among health workers in the developing world (Karaby, Sencan, Sahin, Alpteker, Ozcan, and Oktus, 2005).

In a study conducted by Perez-Perez, Herrero-Usagre, Bueno-Cavanillas, Alonso-Humada, Buiza-Camacho, and Vazquez-Vazquez (2015) on health professional's knowledge using the hand hygiene knowledge assessment questionnaire in Spain and demonstrated that health workers with lower knowledge on hand hygiene practices tended to be younger, male and non-clinical staff. However, Tobin, Asogun, Odia, and Ehidiamhen (2013) assessed knowledge and infection control practices among health workers in a rural tertiary state hospital in Nigeria and reported that 93.2% of the respondents were aware of the existence of hand hygiene guidelines, with 50.3% of these demonstrating good hand hygiene knowledge, 44.0% fair knowledge and 5.7% poor hand hygiene knowledge respectively. Doctors were reported as having the highest knowledge while nurses were the most compliant with standard infection prevention precautions. Of all the respondents surveyed in this study, 3.9% had poor compliance with standard precautions, 49.8% fair compliance and 46.8% good compliance. The study concluded that having received previous training did not necessarily ensure excellent knowledge on hand hygiene guidelines and practices.

It has been established that factors that contribute to non-compliance among health care workers include the following: lack of awareness and knowledge among health care workers as relating to the importance of the practice, techniques, methods and quality of hand hygiene (Barrett and Randle, 2008; Anargh, Singh, Maj, Kulkarni, Kotwal, Col and Malkin, 2013). The lack of surveillance systems and hand washing infrastructure such as soap available near sink, hand glove impeded the ability of practice of hand washing

among health workers in developing countries to effectively prevent the spread of nosocomial infection in health care setting. The recent outbreak of Ebola virus in Nigeria could be associated to the lack of knowledge of handwashingand the threat of the spread of the virus. As the outbreak spread to urban areas and expanded into an epidemic, the number of cases quickly overwhelmed the limited isolation and treatment capacity, leading to promoting the important habit of handwashing with soap. For handwashing to be effective it must be practiced consistently at key times, such as after using the toilet or before contact with food. While habits must be developed over time, this theme "Make Handwashing a Habit!" by The Global Handwashing Partnership (GHP) during the 2016 Global Handwashing Day emphasizes the importance of handwashing as a ritual behavior for long-term sustainability (Global Handwashing Partnership (GHP), 2017).

The importance of hand hygiene in disease prevention and control has contributed to the renewed interest in research relating to handwashing in healthcare settings within the last few years (Deyneko, Cordeiro, Berlin, Ben-David, Perna and Longtin, 2016). Over the past two decades, improving patient safety has received a growing attention in the United Kingdom and one of the first goals of the World Health Organization's World Alliance for Patient Safety is the substantial reduction of hospital-acquired infections. In order to reach the goal, improvement in compliance with hand hygiene guidelines is needed. Observed compliance rates among nurses in the United Kingdom have been regarded by public health authorities as unacceptably poor (Day, 2007; Georgios, Evridiki, Vasilios and Anastasios, 2011). The hand washing habits of nurses are thought to be poor for many reasons; these include the complicated structure of health care settings, the characteristics of the patients in hospitals, the heavy workload in some units, and an insufficient number of nurses (Creedon, 2005; Çelik and Koças, 2008; Karabey, Ay, Derbentli, Nakipoglu and Esen, 2002; Sax, Allegranzi, Uckay, Larson, Boyce, Pittet, 2007). The need to study the level of knowledge and pattern of handwashing among Nigerian nurses cannot be more auspicious than now in Nigeria taking into consideration the emergence of highly infectious diseases in Nigeria such as Lassa fever, Bird flu and Ebola Virus Fever.

1.2 Statement of the problem

It has been noted that many infections result from the transmission of microorganisms from the hands of healthcare workers especially nurses (Sepehri, Talebizadeh, Mirzadeh, Shekari and Sepehri, 2009; Masadeh and Jaran, 2009). Healthcare-associated infections (HAIs) affect 15 out of every 100 patients during a hospital stay; the rate is even higher in intensive care units, in low-resource settings, and for newborns (WHO, 2015). HAIs impact hundreds of millions of patients every year. They can cause short-term illness, long-term disability, and death. They also contribute to longer hospital stays, antibiotic resistance, and a massive financial impact for patients, families, and entire health care systems.

Studies continue to report unacceptably low hand washing compliance rates amongst health workers (Erasmus, Daha, Brug, Richardus, Behrend, Bceck, 2010). In one study, non- compliance was higher among physicians, nursing assistants and other health care workers than among nurses (Pittet, Mourouga, and Perneger, 1999; Andersson, Bergh, Karlsson and Nilsson, 2010). In another study to determine the role of hand washing in the prevention of endemic intensive care unit infections, the overall hand washing rate was noted to be 22%. After six months of interventions to increase the rate of hand washing, it increased to 29.9% (Simmons, Bryant, Neiman, Spencer and Arheart, 1990; Mahfouz, El Gamal and Al-Azraqi, 2013).

Although many countries have guidelines regarding hand hygiene for healthcare settings, overall compliance among HCWs remains poor (Suchitra, Lakshmidevi, 2006; WHO, 2009 b), despite hand hygiene being regarded as one of the most important elements of infection control activities (Mathur, 2011). According to the WHO guidelines for hand hygiene in health care settings belonging to a certain professional category (i.e. doctor, nurse or nursing assistant, physiotherapist, technician, ancillary staff) is an important predictor of compliance with hand hygiene guidelines (WHO, 2009a). Studies revealed that nurses were more likely to understand and put into practice the five moments for hand hygiene than doctors who often avoid these opportunities by citing more pressing and important commitments (Gilbert, 2014). Jang, Wu and Kirzner (2010) observes that doctors hold influential positions in hospitals thus their attitudes and practices towards hand hygiene disproportionately influence practices of other health workers. Although the Centers for Disease Control and Prevention (CDC, 2002) stated that handwashing is the

most important approach in preventing HAIs, handwashing compliance rates among healthcare professionals are very low (Boyce, 2008; Scheithauer, Kamerseder, Petersen, Brokmann, Lopez-Gonzalez and Mach, 2013). Lack of knowledge of hand hygiene guidelines, recognition of hand hygiene opportunities during patient care and awareness of the risk of cross-transmission of microbial pathogens constitute barriers to hand hygiene compliance (Saloojee and Steehoff, 2001). Guidelines delineating indications for hand hygiene exist, but do not rely on evidence-based studies of contamination of hands (Larson 1988). It is of utmost importance for health workers to identify patient care activities associated with colonization of germs on hands for effective practice towards handwashing. However, hand hygiene guidelines need to be revisited, so as to help health workers recognize at least those opportunities that carry the highest risk of cross-contamination when performing vital signs during patient care.

There are numerous researches which describe why hospital workers fail to wash their hands as thoroughly and as frequently as they should (Boyce 2008, Pittet et al, 2004, O'Malley, Varadharajan and Lok, 2005). Lack of awareness on correct HH actions towards the prevention of transmission of NI and HH determinant translates to whether health workers believes that they are at risk of acquiring a HAIs or not. Health workers that do not identify themselves as being at risk of infection might be less responsive to HH educational intervention. Take for instance the belief that one's hands are less compromising towards infection spread than another health workers. This would be blamed on external factors that is, personal noncompliance to HH whereas noncompliance of other health workers would be blamed on those individuals personal shortcomings. Subsequently, a health worker might experience their own hands to be cleaner than their colleagues and therefore less dangerous towards patient care. Furthermore, a study comparing self perception of HH against perception towards others showed that nurses as well as doctors believed their own hand hygiene to be cleaner than their co-workers (McLaughlin, 2011). There should be no opportunity for personal interpretation of HH performance in order for health workers to understand the severity of poor HH compliance.

Such studies focused mainly on nurses (O'Boyle, Henly and Duckett, 2001), doctors and nursing students (Çelik, et al, 2008). Most handwashing studies among health workers have, so far, been done in foreign countries. In Nigeria, handwashing knowledge and

pattern of practice of handwashing among nurses have not been well investigated. In addition, the factors which influence nurses' adoption of sustained or reported hand washing practices in clinic settings have not been adequately explored. This study was, therefore, designed to determine the level of knowledge and pattern of practice of hand washing among nurses in state hospitals in Ibadan metropolis.

1.3 Justification for the study

The Association for Professionals in Infection Control and Epidemiology (APIC), the Guidelines for Handwashing and Hospital Environmental Control (GHWHEC) from the Centers for Disease Control and Prevention (CDC), and the Hospital Infection Control Practices Advisory Committee each highlighted specific indications for handwashing compliance (CDC, 2010). Research interest in handwashing for prevention and control of communicable diseases is yet to be fully developed and promoted in Nigeria in spite of the fact that the majority of the diseases presented in Nigerian health care facilities can be transmitted through the hands.

The results of this study are useful as baseline information for the design of hand washing interventions aimed at promoting the practice of hand washing among nurses in secondary healthcare settings in the study area – Ibadan metropolis. In addition the study has potential in yielding results needed for formulating evidence based policies relating to hand wash in healthcare settings. Lastly, the results of the study will contribute to the body of literature on hand washing among healthcare professionals in Nigeria.

1.4 Research questions

The study was designed to answer the following questions :

1. What is the level of knowledge of nurses on handwashing?
2. What are nurses' perceptions of hand washing as a preventive action in health care settings?
3. What is the pattern of hand washing practices among nurses?
4. What are the factors which promote or hinder the practice of handwashing among nurses?

1.5.1 Broad objectives

The broad objective of this study was to investigate the prevalence of hand washing, pattern of practice of handwashing and handwashing antecedent factors among nurses in State Hospitals, Ibadan, Oyo State.

1.5.2 Specific objectives.

The specific objectives were to:

1. Assess the level of knowledge of nurses relating to handwashing.
2. Determine the perception of nurses relating to hand washing in clinic settings.
3. Determine the pattern ofhand washing practiced among the nurses.
4. Identify the factors which facilitate or inhibit the practice of hand washing among nurses.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual clarification

The practice of hand washing as an effective means to prevent disease spread is universally accepted among infection control leaders today (Aziz, 2013). Past research studies have substantiated the need to teach and encourage hand washing practices among health care workers, but little has been documented to support the importance of patient hand washing (Rigbe, Almedoin, Hagos, Albin and Mutungi, 2005) because patient practices have been excluded from previously documented handwashing studies. This investigator agrees with other researchers who states that handwashing is only partially developed and requires further research (Lawrence, 2003, Ward 2003.). The hands of health care providers are common vehicle for the transmission of microorganisms from client/patient/resident to client/patient/resident, from client / patient / resident to equipment and the environment, and from equipment and the environment to the client/patient/resident (PIDAC, 2009).

During the delivery of health care, the health care provider's hands continuously touch surfaces and substances including inanimate objects, client/patient/resident's intact or non-intact skin, mucous membranes, food, waste, body fluids and the health care provider's own body (Pittet et al, 2006). The total number of hand exposures in a health care facility might reach as many as several tens of thousands per day. With each hand-to-surface exposure a bidirectional exchange of microorganisms between hands and the touched object occurs and the transient hand-carried flora is thus continuously changing. In this way, microorganisms can spread throughout a health care environment within a few hours (WHO, 2009b).

Health care providers move from client/patient/resident-to-client/patient/resident carrying out a number of tasks and procedures, there are many more indications for hand hygiene during the delivery of health care than there are in the activities of daily living outside of the health care setting. Even though we know that the most common way infections are spread is by staff members touching a patient or contaminated piece of equipment with their hands, then touching another patient without washing their hands (Van Enk, 2006).

Handwashing is widely accepted as being key to the prevention of hospital-acquired infection but the frequency of handwashing by healthcare workers has been found to be low (Naikoba and Hayward, 2000; Joshi, Joshi, Park and Aryal, 2013). In a study conducted by Hugonnet and Pittet, 2000; Rumbaua, Yu. and Pena. (2001) it was observed that the rate of handwashing was below 50%. Compliance of healthcare workers with recommended hand washing practices remains unacceptably low, often in the range of 30% to 50% (Boyce, 1999; Lankford, Zeinbower, Trick, Hacek, Noskin, Peterson, 2003). The Centers for Disease Control and Prevention clearly mandates that all healthcare personnel decontaminate their hands as they enter a patient's room and as they leave the room (CDC, 2003).

Hand hygiene is one of the five key initiatives set out by the World Alliance for Patient Safety's Global Patient Safety Challenge (WHO, 2009). According to the World Health Organization (WHO) "The goal of Clean Care is Safer care is to ensure that infection control is acknowledged universally as a solid and essential basis towards patient safety and supports the reduction of health care-associated infections and their consequences". Hand hygiene is considered the most important and effective infection prevention and control measure to prevent the spread of HAIs (WHO, 2010). Hand hygiene is a general term referring to any action of hand cleaning (WHO, 2009). Hand hygiene relates to the removal of visible soil and removal or killing of transient microorganisms from the hands while maintaining the good skin integrity resulting from a hand care program (PIDAC, 2009).

Hand hygiene includes use of surgical hand antisepsis (Boyce, 2002). All humans carry microorganisms on their skin (Jef, 2014). These microbes can be divided into two groups – transient and resident bacteria (Boyce et al. 2002). Transient (or contaminating) bacteria colonize the upper layers of the skin and are acquired during direct contact with clients/patients/residents, health care providers, contaminated equipment or the environment. Transient bacteria may also be easily passed on to others or to objects in the environment and are a frequent cause of HAIs. Resident bacteria are found in deeper layers of skin and are more resistant to removal. These bacteria do not generally cause HAIs and can be beneficial to the good health of the skin (WHO, 2010). Effective hand hygiene kills or removes transient bacteria on the skin and maintains good hand health (Hugonnet, Perneger, and Pittet, 2002).

There are two primary actions of killing/removing microorganisms on hands. The first is hand sanitizing with a 70 to 90% Alcohol-Based Hand Rub (ABHR). This is a preferred method for cleaning hands. Using easily-accessible ABHR in health care settings takes less time than traditional hand washing (Pichcansathian, 2004; Mathur, 2011) and has been shown to be more effective than washing with soap (even using an antimicrobial soap) and water when hands are not visibly soiled (Pichcansathian, 2004; Boyce et al. 2002). The second is hand washing with soap and running water. This must be performed when hands are visibly soiled (Pichcansathian 2004).

The main problem found in the practice of hand hygiene is connected with the lack of available sinks and time-consuming performance of hand washing. An easy way to solve this problem could be the use of alcohol-based hand rubs, because of faster application compared to correct hand-washing (Hugonnet, et al. 2002). Despite this, compliance with hand hygiene protocols by health care providers has been, and continues to be, unacceptably low at 20% to 50% (Vernon, Trick, Welbel, Peterson and Weinstein, 2003).The hands of some caregivers may become persistently colonized with resident pathogenic flora such as yeast and *Staphylococcus aureus*, a gram-negative bacillus.

2.2 Role of the hand in hospital acquired infections

Many pathogens can be transmitted from patient to patient by way of the caregivers'. This is so because pathogenic organisms are present on patients' skin and objects in the environment. Some of these organisms are transferred to healthcare workers' hands which may become resident flora on some caregivers' hands. Cross-transmission of organisms occurs by contaminated hands and inadequate hand cleansing allows organisms to contaminate workers' hands (WHO, 2009). Healthcare-associated pathogens can be spread not only from infected or draining wounds but also from frequently colonized areas of normal intact skin (Riggs, Sethi, Zabarsky, Eckstein and Jump, 2007). The number of organisms present on intact areas of the skin varies from individual to individual (Ziakas, Zacharioudakis, Zervou, Grigoras, Pliakos and Mylonakis, 2015). For instance, those with chronic dermatitis, diabetes, and chronic renal failure are more likely to have intact skin areas colonized by Staphylococcus aureus (Zimakoff, Pedersen and Bergen, 1996). Commonly, the perineal or inguinal areas of the body are the most heavily

colonized, but the axillae, trunk, upper extremities, hands, and fingernails also may be contaminated (Jain, Persaud and Perl, 2005).

Many studies have documented that HCWs can contaminate their hands or gloves with pathogens such as Gram-negative bacilli, *S. aureus, enterococci or C. difficile* by performing "clean procedures" or touching intact areas of skin of hospitalized patients (Bhalla, Aron and Donskey, 2007). Studies have documented that the area under the fingernails or in chipped nail polish often harbor high concentrations of bacteria, most frequently coagulase-negative Staphylococci, gram-negative rods (including *Pseudomonas spp.*), Corynebacteria, and yeasts (Wynd, Samstag and Lapp, 1994). Whether artificial nails contribute to transmission of pathogens is unknown (McNeil, Foster, Hedderwick and Kaulfman, 2001).

Caregivers may contaminate their hands or gloves merely by touching inanimate objects. Patient gowns, bed linen, bedside furniture, and other objects in the patient's immediate environment can easily become contaminated with pathogenic organisms (Verman, et al. 2006). Other objects in patient rooms—such as the siderails of beds, handles of bedside table drawers, and intact areas of patients' skin—can also be contaminated. Pathogens are often found at handwashing stations, on the handles of faucets, and on other fixtures (Hayden, Blom, Lyle, Moore and Weinstein (2008). Patients themselves may be a source of infection. Caregivers of infants infected with Respiratory Syncytial Virus (RSV) have been known to acquire the virus simply by touching an infant and then touching their own nose or mouth (Sartor, Duvivier, Tissot-Dupont, Sambuc, and Drancourt, 2000). Obviously, when HCWs fail to clean their hands during the sequence of care of a single patient and/or between patients' contact, microbial transfer is likely to occur. Contaminated HCWs' hands have been associated with endemic HCAIs and also with several HCAI outbreaks (Foca, Jakob ,Whittier, Della ,Factor , Rubenstein and Salman 2000).

In UK, an outbreak of Pseudomonas aeruginosa in a neonatal intensive care unit was attributed to two nurses, one with long natural nails and one with long artificial nails. They both carried the strains of Pseudomonas on their hands and were believed to be the likely source of the pathogens (Moolenaar, Crutcher, San Joaquin, Sewell, Hutwagner and Carson, 2000). Personnel wearing artificial nails also have been epidemiologically implicated in several other outbreaks of infection caused by gram-negative bacilli and

yeast (Passaro, Waring and Armstrong, 1997). Although these studies provide evidence that wearing artificial nails poses an infection hazard, additional studies are needed to confirm the concern. While the WHO Guidelines urge each healthcare facility to create policies regarding artificial nails and nail polish, the consensus is that "healthcare workers should not wear artificial fingernails or extenders when having direct contact with patients and that natural nails should be kept short (≤ 0.5 cm long)" (WHO, 2012).

Several studies have demonstrated that skin underneath rings is more heavily colonized with pathogens than comparable areas of skin on fingers without rings (Lowbury, 1968; Jacobson, Thiele, McCune and Farrell, 1985). One study found that 40% of the caregivers tested harbored gram-negative bacilli on skin under rings and some carried the organism for several months. (Hoffman, Cooke, McCarville and Emmerson, 1985). Other studies showed that bacterial colony counts on hands after handwashing was similar for persons who wore rings and those who did not (Salisbury, Hutfilz, Treen, Bollin and Gautam, 1997). While acknowledging the need for more studies, the WHO Guidelines state: "The consensus recommendation is to discourage the wearing of rings or other jewelry during healthcare; the use of a wedding ring for routine care may be acceptable, but in high-risk settings, such as the operating theatre, all rings or other jewelry should be removed" (WHO, 2009). Several investigators have studied transmission of infectious agents by using different experimental models (Larson, McGeer and Quraishi, 1991).

In one study, nurses were asked to touch the groins of patients heavily colonized with gram-negative bacilli for 15 seconds-as though they were taking a femoral pulse (Ehrenkranz and Alfonso, 1991). Nurses then cleaned their hands by washing with plain soap and water or by using an alcohol hand rinse. After cleaning their hands, they touched a piece of urinary catheter material with their fingers, and the catheter segment was cultured.

The study revealed that touching intact areas of moist skin of the patient transferred enough organisms to the nurses' hands to allow subsequent transmission to catheter material despite handwashing with plain soap and water; by contrast, alcohol-based hand rub was effective and prevented cross-transmission to the device. Organisms are transferred to various types of surfaces in much larger numbers ($>10^4$) from wet hands than from hands that had been dried carefully (Patrick, Findon and Miller, 1997). The

transmission of organisms from artificially contaminated "donor" fabrics to clean "recipient" fabrics via hand contact also has been studied (Maples and Towers, 1979). Results indicated that the number of organisms transmitted was greater if the donor fabric or the hands were wet upon contact. Overall, only 0.06% of the organisms obtained from the contaminated donor fabric were transferred to recipient fabric via hand contact. *Staphylococcus saprophyticus, Pseudomonas aeruginosa and Serratia spp* were also transferred in greater numbers than was *Escherichia coli* from contaminated fabric to clean fabric after hand contact (Mackintosh and Hoffman, 1984).

Hand antisepsis reduces the incidence of healthcare associated infections (Larson, 1999). An intervention trial using historical controls demonstrated in 1847 that the mortality rate among mothers who delivered in the First Obstetrics Clinic at the General Hospital of Vienna was substantially lower when hospital staff cleaned their hands with an antiseptic agent than when they washed their hands with plain soap and water (Semmelweis, 1983). Trials have studied the effects of handwashing with plain soap and water versus some form of hand antisepsis on health-care-associated infections rates (Maki, 1989) Health-care–associated infection HAIs rates were lower when antiseptic handwashing was performed by personnel (Maki, 1989). In another study, antiseptic handwashing was associated with lower health-care-associated infection rates in certain intensive-care units, but not in others (Massanari and Hierholzer, 1984). A number of studies have demonstrated the effect of hand cleansing on HCAI rates or the reduction in cross-transmission of antimicrobial resistant pathogens. Investigators have determined also that health-care–associated acquisition of MRSA was reduced when the antimicrobial soap used for hygienic handwashing was changed (Webster, Faoagali, and Cartwright, 1994; Zafar, Butler, Reese, Gaydos and Mennonna, 1995).

Increased handwashing frequency among hospital staff has been associated with decreased transmission of Klebsiella spp. among patients (Casewell and Phillips, 1977) these studies, however, did not quantitate the level of handwashing among personnel. Health-care–associated infection rates were lower after antiseptic handwashing using a chlorhexidine-containing detergent compared with handwashing with plain soap or use of an alcohol-based hand rinse (Doebbeling, Stanley and Sheetz, 1992). The acquisition of various HAIs was reduced when hand antisepsis was performed more frequently by hospital personnel, both this study and another (Larson, Early, Cloonan, Sugrue and

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Pandey, 2000) documented that the prevalence of health-care-associated infections decreased as adherence to recommended hand-hygiene measures improved.

2.2.1 Method of handwashing

The CDC Guideline for Hand Hygiene recommends that when cleaning hands with soap and water, these methods should be performed appropriately;

- Remove the jewelry and rinse hands under running water (preferably warm).
- Lather with soap and using friction, cover all surfaces of hands and fingers.
- Wash thoroughly under running water for at least 15 seconds. Turn off faucet with wrist/elbow (Friberg , ghlenschlaeger, Ramsing and Agner, 1996).
- Dry hands with a single use towel. If disposable towels are used, throw in trash immediately (WHO, 2010).

Skin excoriation may lead to bacteria colonizing the skin and the possible spread of blood borne viruses as well as other microorganisms. Sore hands may also lead to decreased compliance with hand washing protocols (LCDC and BID, 1998). If using antiseptic rub, take an adequate amount and rub on all surfaces for the recommended time. Allow hands to dry on its own (Taylor, 1978)

2.3 Hand hygiene products

There are various hand hygiene antiseptis which reduces the incidence of HAIs. Hand washing using these products is better than handwashing using water with plain soap. Studies have compared the rates of infection of handwashing with plain soap and water versus some form of chemical antiseptic hand-cleansing products (Burton, Cobb, Donachie, Judah, Val Curtis, and Schmidt, 2011; Perus and Leslie, 2014). When hand cleansing is performed correctly, the infection rates were lower with chemical antiseptic products than with plain soap and water (FDA, 2013; Burton et al, 2014). However, it should be noted that many factors increase infections rates. These include handwashing technique, wearing of artificial nails or rings, use of contaminated soaps or cleansers, and out-of-hospital sources of pathogens (WHO, 2013).

The hand hygiene will now be briefly reviewed one by one, starting with plain soap. Soaps are detergent-based products that possess a cleansing action. Their cleansing activity is due to their detergent properties, which remove dirt, soil, and various organic

substances from the hand (Nicola, 2006). Plain soaps have minimal, if any, antimicrobial activity that will destroy or inhibit the growth of microorganisms. Handwashing with plain soap remove doose transient flora even though it does not remove pathogens from the hands of healthcare workers (Hugonett et al. 2001).

The next group of hand hygiene products worth reviewing are antiseptic agents. A great many antiseptic agents have been introduced to the healthcare market, the most common of which are alcohols (McDonnell and Russell, 2001). However, in choosing an agent, decision-makers must consider two primary issues: effectiveness of the agent against pathogens and potential damage to human skin by the agent (Rutala, David and Weber, 2008). Caregivers are instructed to read labels on antiseptic carefully and diligently follow recommended hand hygiene procedures (Pollard and Rice, 2006).

Common antiseptic agents are alcohols. The majority of alcohol-based hand antiseptics contain isopropanol, ethanol, n-propanol, or a combination of these products (Ayliffe, Babb, Davies and Lilly, 1988). Alcohol solutions containing 60% to 95% alcohol are most effective (Larson and Morton, 1991); higher concentrations are less potent (Larson et al, 1991). Alcohols have excellent germicidal activity in the laboratory against gram-positive and gram-negative vegetative bacteria, including fungi and multi-drug resistant pathogens such as methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococci* (Kampf, Jarosch and Rüden 1998; Kampf et al, 1999). Certain viruses such as herpes simplex virus, human immunodeficiency virus, influenza virus, respiratory syncytial virus, and vaccinia virus are susceptible to alcohols when tested in vitro (Krilov and Harkness 1993; Roberts and Antonoplos, 1998). Hepatitis B virus is somewhat less susceptible but is killed by 60% to 70% alcohol; hepatitis C virus could also be killed by this percentage of alcohol (Sattar, Tetro, Springthorpe and Giulivi, 2001). Despite their effectiveness against these organisms, alcohols have very poor activity against bacterial spores, protozoan oocysts, and certain nonenveloped (nonlipophilic) viruses (Woolwine and Gerberding, 1995).

Alcohols are rapidly germicidal when applied to the skin, but they have no appreciable persistent or residual activity that will prolong antimicrobial activity or inhibit the survival of microorganisms after application. Regrowth of bacteria on the skin occurs slowly after use of alcohol-based hand antiseptics (Lilly, Lowbury, Wilkins and Zaggy, 1979). Alcohol-based rinses are not appropriate for use when hands are visibly dirty or

contaminated with proteinaceous materials such as blood. In these situations, the hands of the caregiver first should be cleansed with soap and water. Then, an antiseptic hand rub using an alcohol-based rinse, can be applied to prevent pathogen transmission (Larson and Bobo, 1992).

Alcohols are effective for pre-operative cleansing of the hands of surgical personnel. The efficacy of alcohol-based hand hygiene products varies according to concentration, type, volume used, time of contact, and whether the hands are wet when the alcohol is applied (Mackintosh et al, 2002). When using alcohol-based hand rubs, the CDC recommends healthcare personnel rub their hands until the alcohol evaporates and the hands are dry (CDC, 2012). Alcohols are flammable. Flashpoints of alcohol-based hand rub range from 21° C to 24° C, depending on the type and concentration of alcohol (Widmer, 2000). For this reason, the National Fire Protection Agency of the United States of America recommends that alcohol-based hand rubs should be stored away from high temperatures or flames in accordance with local fire codes. In Europe, where alcohol-based hand rubs have been used for many years, the incidence of fires associated with such products has been low (Bryant, Pearce and Stover, 2002).

Another group of antiseptics agents are chlorhexidine. The immediate antimicrobial activity of chlorhexidine occurs more slowly than that of alcohols (Denton, Lea and Febiger, 1991) Chlorhexidine has good activity against gram-positive bacteria, somewhat less activity against gram-negative bacteria and fungi, and only minimal activity against tubercle bacilli.(Larson,1995) It does not kill spores (Kuo, 2014). Chlorhexidine has in vitro activity against enveloped viruses such as herpes simplex virus (HSV), human immunodeficiency virus (HIV), cytomegalovirus, and influenza, but substantially less activity against nonenveloped viruses (Rotter, 1999). It has substantial residual activity. Addition of low concentrations (0.5%–1.0%) of chlorhexidine to alcohol-based preparations results in greater residual activity than alcohol alone (Aly and Maibach 2000).

Iodine and iodophors constitute another group of antiseptic agents. Iodine has been recognized as an effective antiseptic since the 1800s (Gottardi, 1991). However, because iodine may cause irritation and discoloring of skin, iodophors have largely replaced iodine as the active ingredient in antiseptics (Goldenheim, 1993). Iodine and iodophors

have bactericidal activity against gram-positive, gram-negative, and certain spore-forming bacteria (e.g., clostridia, Bacillus spp.) and are active against mycobacteria, viruses, and fungi. Iodophors are not usually sporicidal (Davies, Babb, Bradley and Ayliffe 1993). The majority of iodophor preparations used for hand hygiene contain 7.5% to 10% povidone-iodine. Formulations with lower concentrations also have good antimicrobial activity because dilution can increase free iodine concentrations. However, as the amount of free iodine increases, the degree of skin irritation also may increase (Berkelman, Holland and Anderson, 1982). Iodophors cause less skin irritation and fewer allergic reactions than iodine but more irritant contact dermatitis than other antiseptics commonly used for hand hygiene (Larson et al. 1982).

Triclosan is an antiseptic agent. The product is a non-ionic, colorless substance that was developed in the 1960s (Jones, Jampani, Newman and Lee, 2000). It has been incorporated into detergents and other consumer products. Concentrations of 0.2% to 2% have antimicrobial activity as well as a broad range of antimicrobial activity (Jones, et al, 2000).The agent possesses reasonable activity against mycobacteria and Candida spp., but it has limited activity against filamentous fungi (Jones, et al, 2000). Like chlorhexidine, triclosan has persistent activity on the skin. Its antiseptic activity in hand-care products is affected by the acidity of the product; the presence of surfactants, emollients, or moisturizers; and the ionic nature of the particular formulation (Rotter, 1999). Some reports indicate that providing hospital personnel with a triclosan-containing preparation for hand antisepsis has led to decreased MRSA infections (Webster, et al 1994; Zafar, et al 1995). Triclosan's lack of potent activity against gram-negative bacilli has resulted in occasional reports of contamination (Barry, Craven, Goulate and Lichtenberg, 1984).

Quaternary ammonium compounds constitute a group of antiseptic agent. Of this large group of compounds, alkyl benzalkonium chlorides are the most widely used antiseptics. The group also includes cetrimide and acetyl pyridium chloride (Merianos, Lea and Febiger, 1991). Quaternary ammonium compounds are primarily bacteriostatic and fungistatic, although at high concentrations they are microbicidal against certain organisms; they are more active against gram-positive bacilli than gram-negative bacilli (Rotter, 1999). Quaternary ammonium compounds have relatively weak activity against mycobacteria and fungi and have greater activity against lipophilic viruses (Merianos et al 1991). It should be noted that a recent study of surgical intensive-care unit personnel

found that cleansing hands with quaternary ammonium compound wipes was about as effective as using plain soap and water for handwashing: both were less effective than alcohol-based hand rubs for decontaminating hands (WHO, 2009).

2.1 Measurement of adherence to hand hygiene guidelines

Guidelines for hand hygiene are intended to promote improved hand hygiene practices that help health care institutions reduce transmission of microorganisms and the associated infections (Gudnadottir, Fritz, Zerbel, Bernardo, Sethi and Safdar, 2013). Such guidelines consist of specific recommendations that are based on scientific evidence and the consensus of experts in the field (Boyce et al, 2002; WHO, 2006). Adhering to hand hygiene guidelines is the most effective way to prevent HAIs, particularly in hospital intensive care units and neonatal intensive care units, where adherence to hand hygiene guidelines tends to be lowest and patient vulnerability to infection tends to be highest (Lam et al, 2008).

Guidelines for hand hygiene have been issued by many organizations and countries, and they are revised periodically as new evidence becomes available. It is important, therefore, to always refer to the primary issuing source in order to access the most recent version of a guideline. Some examples of hand hygiene guidelines and related documents include those issued by the following centre or institutions: Health Canada (1998); The Centers for Disease Control and Prevention (CDC), United States (2002); The Department of Health and Aging, Australia (2004); National Health Service, England (2002); The World Health Organization (WHO), (2006).

The hand hygiene guidelines often address the core elements of hand hygiene behaviors, examples of such core elements includes; When to perform hand hygiene, agents to use in hand hygiene, techniques for hand hygiene (depending on the agents used), duration of hand hygiene and instruments for drying hands. The others are; use of disposable gloves, wearing of artificial nails and jewelry, how to choose hand hygiene agents and the necessary infrastructure for optimal hand hygiene. There is a great deal of similarity across existing hand hygiene guidelines, but there are some differences as well. For example, single-use disposable paper towels are recommended for drying hands in all the guidelines, but the Australian guidelines also state that a clean cloth towel, a fresh portion

of a roller towel, and use of retractable hand towels is acceptable (Australian Government, Department of Health and Ageing, 2004).

Glove use is another area in which there is some variation among guidelines. All the guidelines recommend against the reuse of gloves. The WHO guidelines state: "Avoid reuse of gloves. If gloves are reused implement reprocessing methods to ensure glove integrity and microbiological decontamination." Differences among guidelines are often appropriate because of differences in the intended users of the guidelines (WHO, 2006). Individual clinician adherence to safe hand hygiene practices is low worldwide, despite evidence that adhering to guidelines reduces infections (WHO, 2006). Lack of adherence has led to initiatives by the WHO and The Joint Commission's issuance of National Patient Safety Goal 7(JCAHO, 2004) which calls for health care organizations to adhere to the CDC hand hygiene guidelines; National Patient Safety Goal 7 was expanded in 2008 to also include the WHO hand hygiene guideline (The Joint Commission, 2007). According to Sax, et al. (2007) poor health care worker training on why, when, and how to perform hand hygiene during routine care is also a barrier to proper hand hygiene. The effective measurement of hand hygiene adherence requires an understanding of some basic terminology associated with the hand hygiene process. Three of the most important concepts are indications, opportunities and actions (Pratt, Pellowe, Liveday, Robinson, Smith and Barrett, 2001).

Indications are the principal rationale for performing hand hygiene. Developers of hand hygiene guidelines define indications and incorporate them into written guidelines (Boyce et al, 2002; WHO, 2006). Individual health care organizations can incorporate the guidelines so developed into their written policies governing hand hygiene (Pratt, et al, 2001). According to the WHO Manual for Observers, an indication "is the reason why hand hygiene is necessary at a given moment and also to protect patients, HCWs and the health-care environment against the spread of pathogens and thus reduce HAIs. It is formulated in terms of a temporal reference point: 'before' and 'after' the contact. The indications 'before' and 'after' do not necessarily correspond to the beginning and completion of a care sequence or activity (WHO, 2010). They occur during movements between geographical areas, during transitions between tasks near patients, or some distance from them." (WHO, 2006).

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The WHO (2006) has come up with a schema for investigating the five moments for hand hygiene. These are; before any contact with the patient and/or patient environment, before any aseptic procedure (e.g. before administering IV medication, before wound care, before accessing central venous devices or tube feeds) and after any exposure to body fluid, even when gloves are worn (e.g. following wound care or diaper changes, after emptying a urinary drainage bag, or following tracheal or oral suctioning). The others are: after any contact with the patient and after any contact with the patient environment.

Additional indications for hand hygiene are: when hands are visibly soiled or feel dirty, before preparation and administration of patient medication, before preparation, initiation, or discontinuation of patient enteral nutrition, after procedures/situations in which hands are likely to be contaminated such as cleaning spills, after cleaning equipment, instruments or toys and before preparing, handling, serving or eating food. When choosing a tool to measure hand hygiene adherence, it is important to be clear about which indications one wants to capture. The WHO guidelines recommend that five indications be measured (WHO, 2006). These five indications, which the WHO refers to as 'moments', are presented in figure 1.1

In hand hygiene the concept of "Opportunities" represents the points in time within the care process when hand hygiene should be performed, as specified by the indications. An opportunity exists whenever at least one of the indications for hand hygiene is present and observed. It should be noted, however that there can be more than one indication for a single opportunity. For example, assuming a nurse completes a dressing change, removes the gloves, and leaves the patient room, the indications are as follow: (1) after contact with wound dressings; (2) after removing gloves; and (3) after patient contact. All the three indications apply to one opportunity or expectation that hands should be cleaned (WHO, 2006).

The concept of actions comprises the performance of hand hygiene. Each opportunity should correspond to an action of performing hand hygiene. According to (WHO, 2006) "If properly carried out, the hand hygiene action implies recognition of the indications by healthcare workers during their activities and within the process they organize care."

2.5 Prevalence and risk factors for poor adherence to recommended hand hygiene practices.

There are number of factors which influence adherence to hand hygiene guidelines. In a large hospital-wide survey of hand hygiene practices, predictors of poor adherence to hand hygiene measures (that is risk factors for poor adherence) and these are presented in table I.a, I.b and table I.c: (CDC, 2002)

Table 2.1.a Predictors of poor adherence to hand hygiene measures

- Professional category (physicians, nurses, pharmacists, technicians, etc)
- Hospital unit (emergency department, pediatrics, maternity, adult medical, etc.)
- Time of day/week (day, evening, night shifts, and Monday through Sunday)
- Type and intensity of patient care (intensive, moderate, minimal care)
- Automated sink
- Physician status (rather than a nurse)
- Nursing assistant status (rather than a nurse)
- Male sex
- Working in an intensive care unit
- Activities with high risk of cross transmission
- High number of opportunities for hand hygiene per hour of patient care.

Source: CDC, 2002.

Table 2.1.b Self-reported factors for poor adherence with hand hygiene

- Hand washing agents cause irritation and dryness
- Sinks are inconveniently located/shortage of sinks
- Lack of soap and paper towels
- Often too busy/insufficient time
- Understaffing/overcrowding
- Patient needs take priority
- Hand hygiene interferes with health-care worker relationships with patients
- Low risk of acquiring infection from patients
- Wearing of gloves/beliefs that glove use obviates the need for hand hygiene
- Lack of knowledge of guidelines/protocols.

Source: CDC, 2002.

Table 2.1.c Additional perceived barriers to appropriate hand hygiene

Lack of active participation in hand hygiene promotion at individual or institution

- Lack of role model for hand hygiene
- Lack of institutional priority for hand hygiene
- Lack of administrative sanction of non compliers / rewarding compliers
- Lack of institutional safety climate. Source: CDC, 2002.

In one study involving 2,834 observed opportunities for hand hygiene, conducted in Switzerland, researchers found the average adherence rate was found to be low. Adherence was highest among nurses during weekends and in pediatric units. Non adherence was higher in intensive-care units, during procedures that carried a high risk of bacterial contamination, and when the intensity of patient care was high. In other words, the higher the need for hand hygiene, the lower the adherence. Chavali, Menon and Shukla, 2014; Vissher and Wicket, (2012) also noted that the lowest adherence rate (36%) was found in intensive care units, where indications for hand hygiene were typically more frequent. The highest adherence rate (59%) was observed in pediatrics wards, where the average intensity of patient care was lower than in other hospital areas. This study indicates that much needs to be done to improve adherence to hand hygiene practices (Pittet, 2001).

2.6 Strategies for Overcoming Barriers to Adherence

There are several reasons which account for the low adherence to hand hygiene practices among health care providers. According to Pittet (2001) these include, inaccessible hand hygiene supplies, skin irritation caused by hand hygiene agents, priority of care (the patient's need takes priority over hand hygiene), lack of knowledge of the guidelines, Insufficient time for hand hygiene and forgetfulness, High workload and understaffing and lack of scientific information about healthcare-related infection rates. To decrease nosocomial (HAIs) infections and increase adherence to hand hygiene protocols, barriers to their implementation must be addressed. Strategies that can be used include the following: placing dispensers of skin cleansing and emollient agents in accessible locations, minimize hand hygiene dermatitis by providing emollient agents; educating caregivers about infection rates and hand hygiene protocols; increasing nurse-patient ratios and creating an institutional culture of care that involves use of antiseptic hand hygiene (Persis, et al, 2014).

Education is the cornerstone of improved hand hygiene practices (WHO, 2009). Healthcare workers therefore need scientific information about hand hygiene, and healthcare-associated infections. They need to know how to cleanse their hands and use appropriate and efficacious antiseptic and protective agents. Written guidelines should be

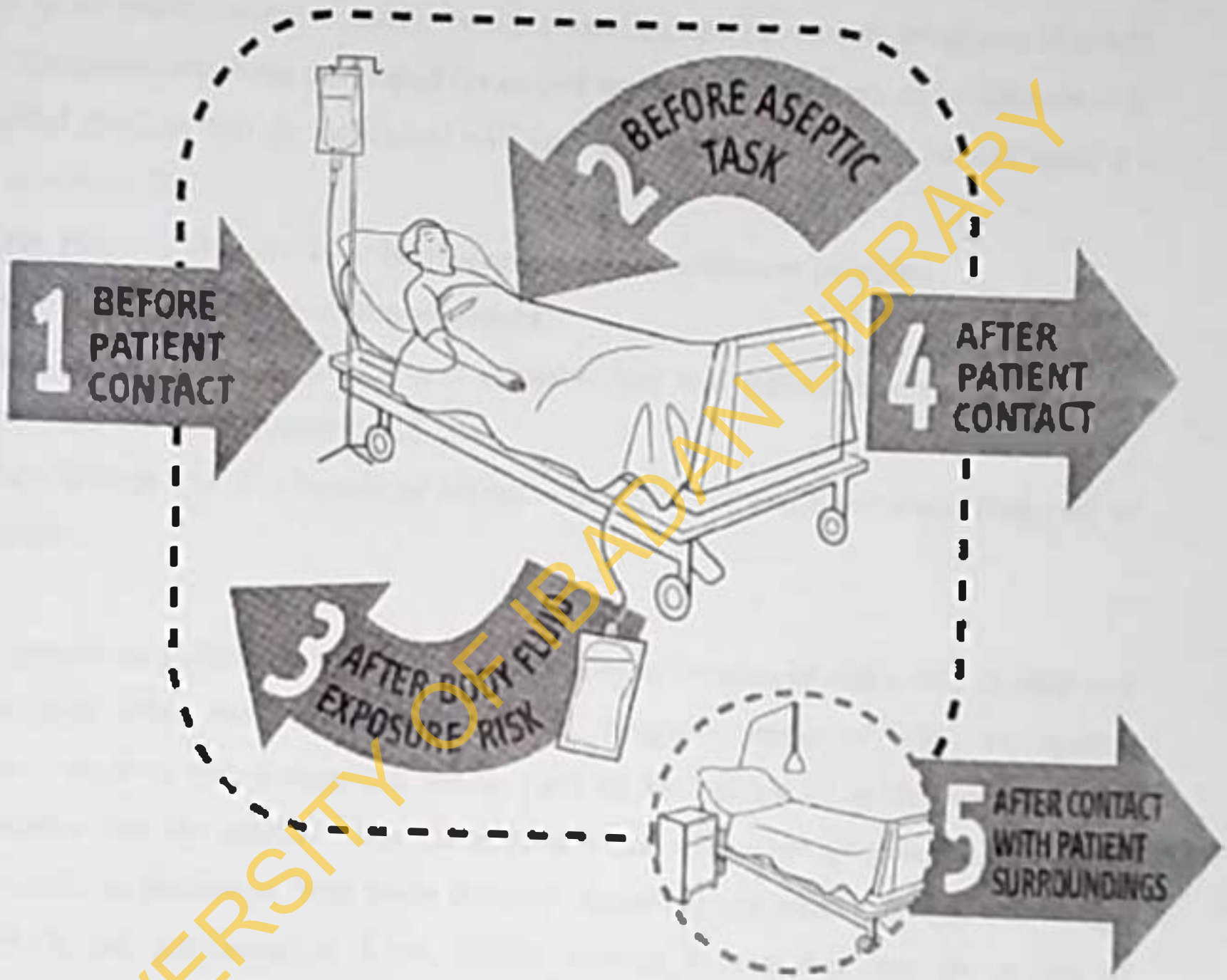
available to everyone, including visitors and new employees should receive these guidelines during their initial orientation. In addition, all caregivers should be monitored and given feedback about how consistently they are adhering to established hand hygiene protocols (Persis, et al. 2014). Traditionally, nurse-to-patient ratios have been decided by healthcare agencies, many of which are for-profit institutions seeking to cut costs. When patient-care units are understaffed and healthcare providers are overworked, they tend to cut corners with detrimental effects on hand hygiene. As a result, infection rates rise; death rates mount; and the health of caregivers, visitors, and patients also bear the burden (Shaloo, Goren, Phillips, and Stewart, 2012; Wallis, 2013).

Some Nursing organizations have been pressing for laws to mandate minimum staffing ratios in patient-care units. In 2004, California, USA became the first state to pass legislation mandating nurse-patient ratios in health care settings (Miller, 2012). The California legislation mandated that there should be one nurse to 2 patients in intensive care units such as critical care, labor and delivery, neonatal intensive care, post-anesthesia recovery, and emergency room intensive care units. It was also stated in the legal guideline that there should be one nurse to 3 patients in intensive care step-down units. The other provisions of the legislation include the following; one nurse to 4 patients in specialty units such as antepartum, postpartum, pediatrics, emergency room, telemetry, and specialty care; one nurse to 5 patients in medical-surgical units and one nurse to 6 patients in psychiatric units (Serratt, Harrington, Spetz and Blegen, 2011).

As of March 2011, fifteen states and the District of Columbia enacted nurse staffing legislation and/or adopted regulations addressing nurse staffing while other states are considering similar legislation (Miller, 2012). In 2010, a study compared nurse-to-patient ratios in surgical units in New Jersey, USA and Pennsylvania hospitals. Using death rates in all three states, researchers found that if the average patient-to-nurse ratios in New Jersey and Pennsylvania hospitals had been what it is in California and New Jersey would have had 14% fewer patient deaths and PA would have had 11% fewer deaths. Over a 2-year period, 468 lives might have been saved (Aiken, Clark and Sloane, 2010).

Adherence to hand hygiene increases when its practice is expected of everyone in an institution and when the practice is assimilated as an indispensable cultural expectation (Phillips, 1999). In order to promote the adoption of the culture of hand hygiene among

health providers. health can: institutions need to: provide written guidelines for all healthcare providers; introduce and demonstrate hand hygiene protocols to all of them and encourage leaders to model and support antiseptic hand hygiene practice (Pittet. 2001) In addition. there should be monitoring and provision of feedback to all healthcare providers. including physicians. nursing care providers. food service personnel. laboratory technicians. pharmacists. and therapists (Kretzer. et al 1998).



Figu
re 2.1: When handwashing should be practiced by health workers.

Adapted from World health Organization (WHO, 2006)

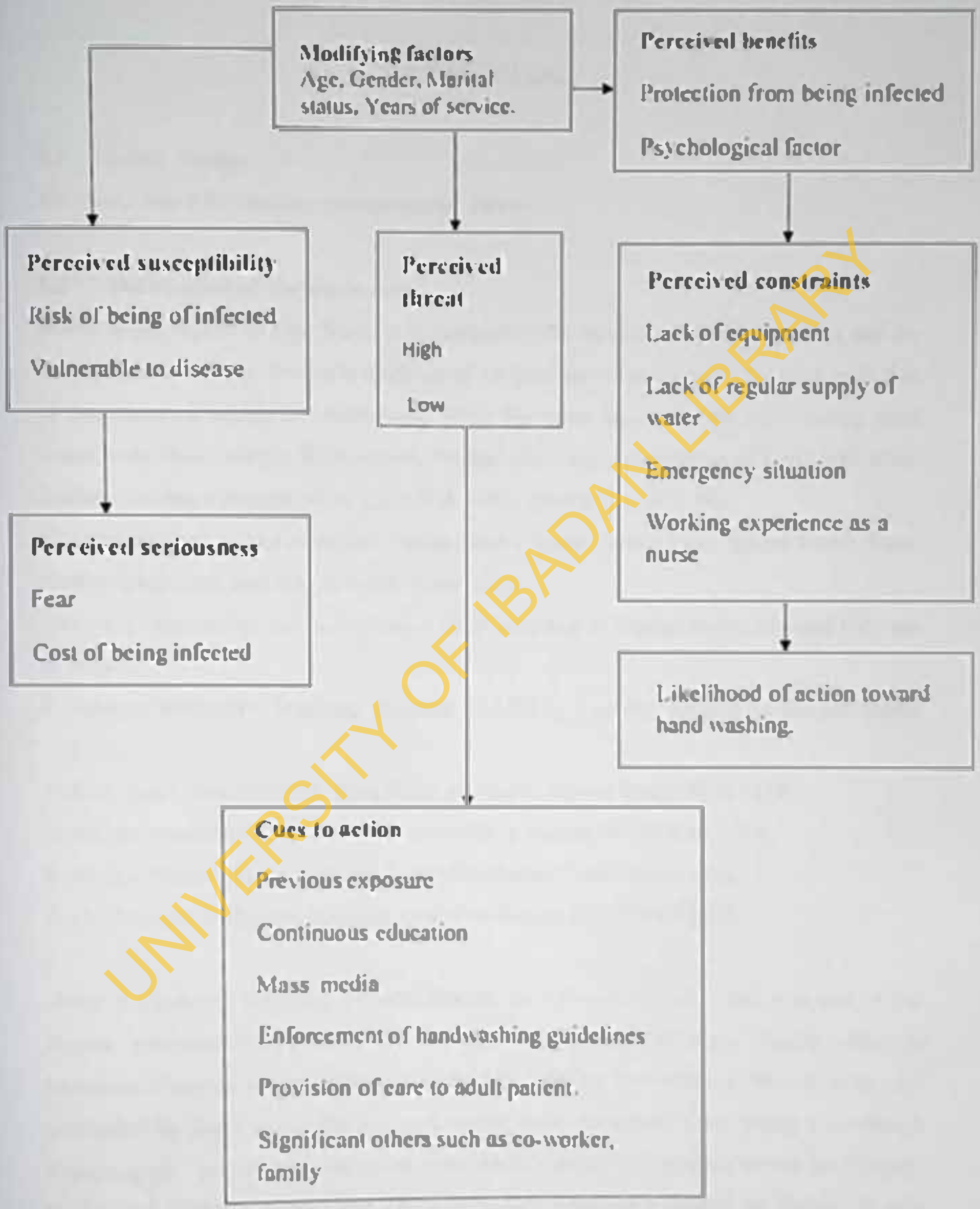
2.7 Conceptual framework

The conceptual framework adopted to facilitate the design of this study is the Health Belief Model (HBM). It was used to select some key or pertinent variables which are related to the research questions and objective. The model is designed to explain health behavior by understanding beliefs about health. This theory explains why individuals participate or fail to adhere to public health screening and preventive programs (Becker, 1977). The model has been developed for or and applied to other types of health behavior. The model predicts that an individual will take action to protect him / herself against a health condition if:

a) They perceive themselves to be susceptible to a condition or problem;
b) They believe it has serious consequences;
c) They believe a course of action is available that will reduce their susceptibility or minimize the consequences; and
d) They believe that the benefit of taking action will outweigh the associated cost or barriers.

Factors perceived as barriers to hand washing includes: location of sinks, lack of soap and paper towels, often too busy/insufficient time, irregular supply of water emergency situations, working experience as a nurse. Lack of knowledge of guidelines/protocols. They believe that the benefits of action to reduce risk will outweigh potential costs and barriers such as; protection from being infected, knowledge of hand washing, knowledge about HAIs and psychological factor. Health workers believe that they are at risk of infection when performing their duties. Such risk includes; Risk of being infected, vulnerable to diseases. Health worker Believe that the consequences of infection are serious. Fear of getting infected by a disease when practicing her nursing duties, cost of being infected. Supportive cues for action which may trigger a response to improve compliance to hand washing. Such as previous exposure or serious infection involving co-worker to HAIs, continuous education, mass media or information on consequences of lack of handwashing practice in clinic setting and enforcement of hand washing guidelines. Regular or routinely handwashing practices before or after patient's care would serves as an effective strategy to taking action to improve compliance among health worker.

The tenets of the HBM model were used to select some variables for assessments and for the design of the instruments for data collection. Questions relating to knowledge about handwashing include: Which of the following is the main route of cross transmission of potentially harmful germs among patient in a health care facility? What is the most frequent source of germs responsible for health care associated infection? Which of the following hand hygiene action prevent transmission of germs to the patients and health worker? "I landwashing before and after touching a patient".



Adapted from Rosenstoch, 1974

Figure 2.2. Application of health belief model to handwashing practices

CHAPTER THREE

METHODOLOGY

3.1 Study design

The study was a descriptive cross-sectional survey.

3.2 Description of the study area

Ibadan is the capital of Oyo State. It is unarguably the largest city in West Africa and the third largest in Africa. Ibadan is made up of 11 local government areas (LGAs), with five of them located within the metropolis, while the other six are in the surrounding rural hinterlands. Based on the 2006 census, Ibadan urban has a population of 1,338,659 while Ibadan rural has a population of 1,211,934 with a growth rate of 4.7%.

The metropolitan LGAs comprise Ibadan North, Ibadan North East, Ibadan North West, Ibadan South East, and Ibadan South West LGAs.

The study was carried out in five major State hospitals in Ibadan metropolis and they are as follow:

1. Adeoyo Maternity Teaching Hospital (AMTH), Yemetu, located in Ibadan North LGA;
2. Ring Road State Hospital, Ring Road, located in Ibadan South-West LGA;
3. Jericho Specialist Hospital, Jericho, located in Ibadan North-West LGA;
4. Jericho Nursing Home, Jericho, located in Ibadan North-West LGA;
5. Oni Memorial Children Hospital located in Ibadan South-West LGA.

Adeoyo Maternity Hospital, Yemetu, Ibadan, was founded in 1927 and it is one of the biggest maternity hospitals in Ibadan, Oyo State, South-Western Nigeria. Adeoyo Maternity Hospital serves Ibadan municipality with its five urban LGAs. It is mostly patronized by those within the low and middle socio-economic class. Being a combined secondary and tertiary hospital in the state, AMTH serves as a referral centre for Primary Health Care (PHC) centres and other secondary healthcare centers in Ibadan. It was upgraded to the status of a teaching hospital in 2004. The hospital is close to the University College Hospital (UCH), Ibadan, which is a completely tertiary institution. Where need be, referrals are sent from AMTH to the UCH. There are about 42 doctors, 203

nurses, 6 pharmacist plus other health staff working at AMH at the time of study. The hospital has seven main service departments: Obstetrics and Gynecology, Pediatrics, Casualty, Pharmacy, Medical Records, Transport and Administration.

Jericho Nursing Home was a private hospital before the Oyo State Government decided to take over the health unit. It is mainly an obstetric and gynecology hospital ad there are doctors, nurses and other categories of health care workers working at the facility.

The Oni Memorial Hospital is strictly a pediatrics center for children. It is located at Ring Road in Ibadan.

The Ring Road State Hospital is a secondary health care facility which provides a wide range of health services to health consumers in Ibadan metropolis. It also serves as a referral centre for Primary Health Care (PHC) centers and other secondary health centers in Ibadan. Therefore also a tertiary center. The hospital has departments, which include; Obstetric and Gynecology, Pediatrics, Casualty, Pharmacy, Medical Records, Transport and Administration

3.3 Population of the study

The study population comprises of registered male and female nurses, who meet the inclusion criteria, working in the four major State Hospitals in Ibadan urban area. Nurses are the largest group of health workers in these facilities. They play major roles in the care of patients in collaboration with doctors and other health care providers. Their professional practices put them at risk of infections. Their practices also have potential for putting their patients at risk of HAIs as well.

3.4 Study variables

The variables studied were categorized into two, namely the independent variables and dependent variables.

3.4.1 Independent Variables: The independent variables in the study include the socio- demographic characteristic of the respondents such as age, marital status, level of education and years of service.

3.4.2 Dependent Variables: The dependent variables on the other hand, include: knowledge of hand washing, perception of handwashing and practice of handwashing among nurses.

3.5 Inclusion criteria

a. Registered and practicing nurses who were in contact with patient

b. Nurses who voluntarily agreed to participate in the study.

3.6 Exclusion criteria

The exclusion criteria were:

a. Nurses who do not have direct or physical contact with patients.

b. Nurses on leave at the time of the study.

c. Student nurses.

3.7 Determination of sample size

The sample size determination for the study was calculated by using the following (Lelie Kish's, 1965) formula:

$$n = \frac{Z^2 pq}{d^2}$$

Where: n= sample size

Z^2 = a variable with a critical value of at 1% standard error (i.e. 95% confidence interval)

Z^2 = 1.96*1.96

P = the proportion of the target population estimated which have a particular characteristic of study interest (which is 25.1% of exposure rate to blood and body fluid, Olowu, Olusje, Kehinde, 2001)

p + q = 1 thus q = 1-p

d= precision limit (limit of standard error)

Therefore,

$Zu^2 = 1.96^2$

p= 0.251

q=1- 0.251 = 0.749

d=0.0025

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d= precision limit (limit of standard error)

Therefore,

$Za^2 = 1.96^2$

p= 0.251

q=1- 0.251 = 0.749

d=0.0025

$$n = \frac{1.96^2 \times 0.251 \times 0.749}{0.0025} = 288.8$$

10% of the calculated sample size was added to give a new sample size of 320

3.8 Sampling Technique

The number of nurses in each health facility was obtained from the administrative section of each hospital. The recorded number of nurses in each of the facilities were as follows;

1. Adeoyo Maternity Teaching Hospital - 203
2. Ring Road State Hospital -145
3. Jericho Nursing Home - 45
4. Jericho Specialist Hospital - 14
5. Oni memorial children Hospital – 59

Total number of nurses =466

A multi-stage sampling process was used to select the study participants.

Stage 1 - The five local government areas in Ibadan Metropolis was purposively selected for this study.

Stage 2- Proportionate sampling was used to facilitate the sample size of nurses from each hospital that were interviewed for this study using the following formula

- Sample size of nurses: $\frac{\text{Total number of nurses from each hospital} \times \text{sample size}}{\text{Total number of nurses in all the hospitals}}$
- For instance, in Adeoyo Maternity Teaching Hospital:

Number of nurses: $\frac{203 \times 320}{466} = 139$

This same procedure was used to determine the number of nurses selected from the remaining hospitals (see table 3.1 for details).

Stage 3- In each health facility, the following steps were used in selecting the respondents for the study:

a) Listing of all units/wards/departments in the hospital
b) Listing of the number of nurses from the units
c) Proportionate sampling was used to determine the number of nurses to be sampled from each of the units in the hospital using the following formula:

$$\frac{\text{Number of nurses in the selected unit}}{\text{Total number of nurses in the selected hospital}} \times \text{Total number of nurses to be selected from the hospital}$$

Stage 4- Convenient sampling technique was used to select the number of nurses that participated in the selected units of each hospital.

Table 3.1: Distribution of Nurses in each of the secondary health care facility

S/N	Name of Hospitals	Number of nurses in each hospital	Proportion of nurses selected from each hospital
1	Adeoyo Maternity Teaching Hospital	203	$\frac{203 \times 320}{466} = 139$
2	Jericho Nursing Home	45	$\frac{45 \times 320}{466} = 31$
3	Jericho Specialist Hospital	14	$\frac{14 \times 320}{466} = 10$
4	Ring Road State Hospital	145	$\frac{145 \times 320}{466} = 99$
5	Oni Memorial Children Hospital	59	$\frac{59 \times 320}{466} = 41$

3.9 Method for Data Collection

(i) Questionnaire

Data collection was carried out by means of semi-structured questionnaire (Appendix II) The semi - structured questionnaire was designed in English language. The questionnaire was developed with ideas teased out from relevant literature. It consists of five sections labeled Sections A. B. C. D and E. Section A focused on social demographic information while B constituted information on the knowledge about handwashing. section C was used to elicit information on perception of hand washing while Section D focused on pattern of practice of hand washing. Lastly, section E was used to elicit information on factors which promote or serve as barrier to the practice of hand washing.

3.10 Validity of the Instrument

In order to determine the validity of the questionnaire for data collection the following steps were under taken;

1. The draft of the questionnaire was developed by consulting relevant literature. The draft of the instrument underwent an independent review from peers and expert researchers in the Faculty of Public Health, College of Medicine University of Ibadan. The experienced researchers consisted of specialists in the fields of Health Promotion and Education, Population and Reproductive Health.
2. Pretest of the instrument was conducted between 2nd – 7th October 2014 using State Hospital, Ijaye, Ogun State which shared similar characteristic with the study population
3. My supervisor reviewed and helped to fine-tune the instrument.

3.11 Reliability

The questionnaire were Pre-tested among thirty-two registered nurses in State Hospital, Ijaye, Ogun State who were not involved in the study, they however share the same characteristics as the target population. The responses to the question were data were coded, entered into a computer and analyzed using SPSS software. The Cronbach alpha technique was used to analyse the data with a view to determining the reliability of the instrument. A co-efficient score of 0.5 above indicates that an instrument is reliable. The obtained Cronbach alpha co-efficient score nears 0.87 indicating that the instrument was reliable. The outcome of the pre-test was used to correct and modify questions which

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were not clear to the respondents and those that were found to be irrelevant were removed.

3.12 Recruitment and Training of Research Assistants

Considering the wide geographical spread of this study, involving visits to hospitals located in different parts of the metropolis and the shared number of respondents involved, it became necessary to recruit and train four Research Assistants (RAs) who would help in data collection. A five -man team of researchers comprising of the investigator and RAs was constituted. The following criteria were used to select the four RAs for training.

1. Holder of educational qualifications of least Ordinary National Diploma (OND) in a health and/or science related field.
2. Being fluent in English and Yoruba Languages.
3. Possession of good Interpersonal and good communication skills.
4. Possession of report writing skills.
5. Ability to devote all hours to the research works while it lasts.

The research assistants were trained for two days (28th - 29th October, 2014). Training manual, training plan and timetable were developed and approved by my supervisor for the training. The training took place from 9a.m-12 noon daily at the Department of Health Promotion and Education. The training commenced with introduction of the trainer and trainees. The trainees were given training materials. The training focused on the objectives of the study and study methodology. It was also used to upgrade their knowledge and skills relating to interviewing skills and how to seek for informed consent. The appropriate training methods and materials were used to conduct the training. The methods included a combination of active training methods such as participatory discussions, demonstration and return demonstrations, role-play and lectures to make the training participatory. Recapitulatory questions for monitoring and assessing trainees' comprehension were asked from time to time. Demonstrations were used to transfer skills relating to questionnaire administration.

Logistic plans for data collection were discussed. Each RA was assigned units and dates for data collection and was directly supervised by the researcher. Each RA received a copy of the field manual, copies of the questionnaire, one copy of the ethical approval

from the State Ministry of Health and writing materials, all contained in a clear water proof bag. All RAs who participated in the data collection for the pre-test of the questionnaire in State Hospital Ijaye, Ogun State were included. This was done to enable them acquire some experiences relating to the scope of the main study.

3.13 Data Collection Procedure

The study was carried out from November 2nd to December 8th 2014 with the assistance of four trained RAs. The questionnaire was self administered since all of the potential participants were able to read and write in English language. The sections in the questionnaire include the socio-demographic characteristics of the respondents while other section contains information on variables of the study.

The questionnaires given out were 350, but 330 valid questionnaires were retrieved due to attrition and incomplete responses.

The data collection process included the following steps:

A letter of introduction from the department and evidence of ethical approval were tendered to matron to obtain permission to conduct interviews and administer questionnaire on the respondents. The consent of the participants was sought before the administration of the questionnaire after explaining to them the purpose of the research and its benefits to the populace. Each of the questionnaires was collected after a respondent was through with it. After the collection of a questionnaire from respondents, the RA checked if the questionnaire was completed. The attention of respondents was drawn to cases of omission and incomplete responses.

Data collection took place in the morning, afternoon and night for a period of two weeks in each facility.

3.14 Data management and Analysis

All the administered questionnaires were checked one by one, assessed, edited for completeness and accuracy. Serial numbers were written on the questionnaires for easy identification and recall of any instrument with problems. Serial number was assigned to each questionnaire for identification and for correct data entry and analysis. A coding scheme guide was developed and edited by my supervisor after carefully reviewing the responses. The data were manually coded and entered into the computer for analysis.

The data were analyzed using IBM Statistic Package for Social Science (SPSS) (Version 16). Descriptive statistical tools used were mean and percentage, while Chi-square (X^2), t-test and logistic regression was used. The research hypotheses were tested to establish associations between the independent and dependent variables using the chi-square (X^2) test at 5% probability level for rejecting the null hypotheses. The results are summarized and presented in chapter four of this dissertation. The knowledge, perception and practice scales are presented in Appendix ii.

3.15 Ethical considerations:

The proposal was submitted for approval and review by the Oyo State Ethical Review Committee (see Appendix iii). Informed consent was obtained from the respondents by giving them an informed consent form to fill and explaining it to the best of their understanding (see Appendix iv). The inform consent form spelled out the title of the study, purpose of the study, justifications for doing the study as well as the benefit that will be derived at the end of the study.

Participation was voluntary and there was no criticism of respondents who refused to participate. Participants' identities like names or addresses were not written on the questionnaire so as to keep the information given by each respondent as confidential as possible. However, participants' were given opportunities to withdraw their consent freely during the study. Confidentiality of each participant's responses was maintained during and after the collection of his information. Information gathered from the respondents was stored in a computer system for analysis by the researcher. The completed copies of the questionnaire will be kept for a maximum of ten years after which it is believed that the purpose of the study would have been accomplished. It will be destroyed thereafter.

3.16 Limitation of the study

- Nurses were on duty at varying times; while some nurse would be on duty, others would be off duty depending on the prevailing work schedule which varied across the different hospitals. As a result of this the participants were given duration of 24 hours to properly complete copies of the questionnaire and returned.

- Consequently, it was not possible to keep track of /or monitor the completion of the questionnaire in the presence of either the investigator or the RAs. In order to ensure

that the respondents complete the copies of the questionnaires honestly. time was taken to explain the objectives of the study and the advantages, interest in its conduct to nurses and patients alike. It was assumed that those that consented to participate in the study might have completed the questionnaire given to them honestly.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic information

In this section, results of respondents' demographic characteristics are presented. The socio-demographic characteristics of the respondents are presented in Table 4.1a. Majority (85.0%) of the respondents were females, 67.5% of them were married while 67.2% were of the Christian faith. On the level of education, 63.8% of the respondents had basic nursing diploma, few (34.1%) had B.Sc Nursing degree. Over half of the respondents (57.5%) were Nursing Officers.

Table 4.1b on the other hand, shows the demographic characteristics of respondents relating to working experience, ethnicity, areas of services and age. Majority (77.5%) had worked for 1-10 years in their hospital. Respondents of the Yoruba ethnic group constitute 76.6% and 68.4% of them worked in the ward. More than half (58.1%) of the respondents had spent 1-10 years as a nurse. The respondents' age ranged from 25 to 60 years with a mean age of 36.8±8.7. Over a quarter (25.0%) of the respondents were aged ≤25 years.

Table 4.1a: Frequency distribution of respondents' socio-demographic characteristics relating to sex, marital status, level of education and official designation

Demographics	N= 320	
Sex	**N**	**%**
Male	48	15.0
Female	272	85.0
Marital Status		
Single	71	22.2
Married	216	67.5
Formerly married	33	10.3
Religion		
Christianity	215	67.2
Islam	103	32.2
Traditional	2	0.6
Education		
Basic Nursing	204	63.8
B.Sc Nursing	109	34.1
Others*	7	2.2
Official Designation		
SNO and above	136	42.5
NO and below	184	57.5

*This consists of 0.3%, 1.6% and 0.3% had PhD in Nursing, midwifery and post basic nursing respectively

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Table 4.1b: Frequency distribution of respondents' socio-demographic characteristics relating to age, working experience in the hospital, ethnicity, Areas of service in the hospital, years of experience as a nurse

N= 320

Demographics	N	%
Age group (In Years)		
≤29	80	25.0
30-34	71	22.2
35-39	42	13.1
40-44	60	18.8
≥45	67	20.9
Years working in this hospital		
1-10	248	77.5
11-20	57	17.8
21-30	15	4.7
Ethnicity		
Yoruba	245	76.6
Igbo	67	20.9
Hausa	8	2.5
Area of service in hospital		
Ward	219	68.4
Clinic	101	31.7
Years of nursing experience		
1-10	186	58.1
11-20	88	27.5
21-30	41	12.8
31-40	5	1.6

*Mean age of respondents=36.8±8.7

4.2 Respondents' knowledge on hand washing

Respondents' knowledge relating to the main routes of cross-transmission of potentially harmful germs is presented in Table 4.2. Many (39.4%) of respondents reported the unclean hands of health workers as the main route of transmission of potentially harmful germs among patients in a health care facility, 26.6% reported patients' exposure to colonised surfaces as the main route of cross-transmission, while 24.1% had knowledge that sharing noninvasive object between patients was a main route of transmission of harmful germs among patients in a health facility.

Table 4.3 shows the knowledge of respondents on the frequent sources of germs responsible for HAI. Slightly over half (53.8%) stated that germs present on or within the patients are the most frequent source of germs responsible for health care associated infection. Some (26.9%) reported that hospital environment was a frequent source of germs while 22.2% stated that hospital watersystem is the most frequent source of germs responsible for HAI.

The knowledge of respondents on the appropriate time for hand washing is presented in Table 4.4. Most (95.9%) of the respondents reported that hand washing is done before and after touching a patient. Majority (88.4%) of the respondents stated that hand washing is practiced immediately after exposure to the body fluid of patients, while 62.8% stated that hand washing is practiced immediately after exposure to patients surrounding. Majority, (81.6%) also stated that hand washing is practiced immediately before touching a clean site during patient care such as s taking pulse of patients, measurement of arterial blood pressure and the taking of patients' body temperature.

Table 4.5 presents the knowledge of respondents related to the use of alcohol base hand rub. Majority (70.6%) reported that Alcohol Based Hand Rub (ABHR) is required before palpitation of the abdomen. 63.4% stated that use of ABHR is required before giving an injection while 85.9% reported that the use of ABHR is required after making a patient's bed. Knowledge of respondents relating to the use of ABHR and hand washing with soap and water is presented in Table 4.6. More than half (58.8%) reported it is true that hand rubbing with alcohol is more rapid for and cleansing than hand washing, 50.9% also stated that it is true that ABHR causes skin dryness more than hand washing while majority (68.1%) reported it is true that ABHR is more effective against germs than hand washing.

Minimal time needed for ABHR to kill germs on the hand is showed in table 4.7. More than half (54.7%) of the respondents reported the time to be 20sec while few (22.8%) reported the time to be 1minute Table 4.8 shows the knowledge of respondents relating to hand washing with soap and water. Most (97.5%) stated that hand washing with soap and water is done after emptying a bed pan. Similar proportions of the respondents stated that hand washing with soap and water is done after removing examination gloves (97.5%) and after contact with blood or body fluid (97.5%).

Table 4.9 presents the knowledge of respondents relating to the colonisation of hands with harmful germs. Majority (72.1%) stated that wearing jewelries could result in the colonization of hands with harmful germs. Most of the respondents also reported that other items could result in the colonization of hands with harmful germs. The other items includes: damaged skin (95.9%), artificial fingernails (94.1%), long and unclean finger nails (97.5%) and damaged nail/chipped or peeling polish (92.5%).

Table 4.2: Knowledge of respondents on the main routes of cross-transmission of potentially harmful germs by health worker to patients

Main route of cross-transmission	N=320 N	%
Health workers hand when not clean*	126	39.4
Air circulation in the hospital setting	31	9.7
Patient exposure to colonised surface	85	26.6
Sharing non-invasive object between patient	78	24.4

* correct responses.

Table 4.3: Knowledge of respondents on the most frequent sources of germs responsible for health care associated infection

Most frequent sources of germs	N=320 N	%
Hospital water system	71	22.2
Hospital Air	23	17.2
Germs present on or within the patient*	172	53.8
Hospital environment	54	26.9

* correct response

Table 4.4: Knowledge of respondents on handwashing to prevent transmission of germs to patient and health worker

Variables	N=320	
	N	%
Handwashing before and after touching a patient		
Yes*	307	95.9
No	7	2.2
No Response	6	1.9
Immediately after body fluid exposure		
1.Yes*	283	88.4
2.No	9	2.8
3.No response	28	8.8
After exposure to immediate surroundings of a patient		
1.Yes*	201	62.8
2.No	73	22.8
3.No response	46	14.4
Before touching a clean site during patient care such as blood pressure taking.		
1.Yes	261	81.6
2.No*	24	7.5
3.No response	35	10.9

*Correct responses

Table 4.5: Knowledge of respondents related to the use of Alcohol Based Hand Rub.

Alcohol Based Hand Rub required in the following situation	N=320 N	%
Before palpation of the abdomen		
Yes*	226	70.6
No	80	25.0
No response	14	4.4
Before giving an injection		
Yes*	203	63.4
No	102	31.9
No response	15	4.7
After making a patient's bed		
Yes*	275	85.9
No	43	13.4
No response	2	0.6

*correct responses

Table 4.6: Knowledge of respondents relating to the use of ABHR and hand washing with soap and water

Use of ABHR and hand washing with soap and water	N=320	
	N	%
Hand rubbing with alcohol is more rapid for cleansing than handwashing		
True*	188	58.8
False	123	38.4
No response	9	2.8
Alcohol based hand rub causes skin dryness more than handwashing		
True*	163	50.9
False	126	39.4
No response	31	9.7
Hand rubbing with alcohol is more effective against germs than hand washing		
True*	218	68.1
False	83	25.9
No response	19	6.0

* correct responses

Table 4.7: Minimal time needed for alcohol based hand rub to kill germs on the hand

	N=320	
Time needed	**N**	**%**
20 Seconds*	175	54.7
3 Seconds	49	15.3
1 Minutes	73	22.8
10 Seconds	23	7.2

*correct responses

Table 4.8: Knowledge of respondents relating to hand washing with soap and Water

	N=320	
Hand washing with soap and water	**N**	**%**
After emptying a bed pan		
Yes*	312	97.5
No	0	0.0
No response	8	2.5
After removing examination gloves		
Yes *	312	97.5
No	5	1.6
No response	3	0.9
After contact with blood or body fluid		
Yes*	312	97.5
No	0	0.0
No response	8	2.5

*correct response

Table 4.9: Knowledge of respondents relating to the colonisation of hands with harmful germ

N= 320

Colonisation of hands with harmful germs	N	%
Wearing jewellery		
Yes*	231	72.2
No	80	25.0
No response	9	2.8
Damage skin		
Yes *	307	95.9
No	1	.3
No response	12	3.8
Artificial finger nails		
Yes*	301	94.1
No	2	0.6
No response	17	5.3
Long and unclean finger nails		
Yes*	312	97.5
No	1	0.3
No response	7	2.2
Damaged nail /chipped or peeling polish		
Yes*	296	92.5
No	3	0.9
No response	21	6.6

*correct response

Table 4.10 shows the level of knowledge of handwashing among respondents. Majority (87.8%) of the respondents had fair knowledge. The proportions of respondents who had good and poor knowledge were 9.7% and 2.5%. respectively. Overall, the mean knowledge score of the respondents was 13.3±2.1.The distribution of knowledge level by age is contained in Table 4.11. Majority of the respondents in each age hmekets had fair knowledge, for instance, among respondents aged 40–44, 96.5% with only 3.3% having good knowledge. Among respondents aged 30-34 years. 83.1% had fair knowledge while only 14.1% had good knowledge.

The distribution of knowledge respondents by sex is presented in Table 4.12. Significantly, more males (95.8%) than females (86.4%) had fair knowledge. Table 4.13 shows the distribution of respondents' levels of knowledge by education. Respondents with B.Sc Nursing (94.5%) had fair knowledge than holders of Basic Nursing (84.3%). By far more respondents with other qualifications such as PhD in Nursing, midwife and post basic nursing (96.7%) had fair knowledge compared with the other. The distribution of respondents' knowledge by the official designation is presented in Table 4.14. More Nursing Officers (88.0%) than the Senior Officers (87.5%) had fair knowledge of handwashing. The difference between these two groups was not however. statistically significant.

Table 4.15 shows the distribution of respondents' knowledge level of area of service. The table shows that significantly, more respondents who were working in the clinics (95.0%) than those working in the wards (84.3%) had fair knowledge of handwashing.

Table 4.10: Distribution of respondents categorizes of knowledge scores relating to handwashing

Knowledge score (in points) *	Qualitative assessment**	N = 320 N	%
≤7	Poor	8	2.5
>7-15	Fair	281	87.8
>15	Good	31	9.7

*Mean Knowledge score 13.3 ± 2.1

**Operationally definition as poor, fair and good.

Table 4.11: Distribution of respondents' levels of knowledge on handwashing by age

N = 320

Age group	Levels of knowledge: Poor N (%)	Fair N (%)	Good N (%)	X^2	Df	P value
≤29	4(5.0)	70(87.5)	6(7.5)	9.885	4	0.273*
30-34	2(2.8)	59(83.1)	10(14.1)			
35-39	1(2.4)	35(83.3)	6(14.3)			
40-44	0(0.0)	58(96.7)	2(3.3)			
≥45	1(1.5)	59(88.1)	7(10.4)			

*Not significant (P>0.05)

Table 4.12: Distribution of respondents' levels of knowledge on handwashing by sex

N = 320

Sex	Levels of knowledge			X^2	df	P value
	Poor N (%)	Fair N (%)	Good N (%)			
Female	8(2.2)	235(86.4)	31(11.4)	6.512	1	0.039*
Male	2(2.4)	46(95.8)	0(0.0)			

*Significant (P<0.05)

Table 4.13: Distribution of respondents' knowledge scores on handwashing by Education

N = 320

Education	Levels of knowledge			X^2	Df	P value
	Poor N (%)	Fair N (%)	Good N (%)			
Basic Nursing	7(3.4)	172(84.3)	25(12.3)	7.285	2	0.122*
B.sc Nursing	1(0.9)	103(94.5)	5(4.6)			
Others **	0(0.0)	58(96.7)	2(3.3)			

*Not Significant (P>0.05)

** This consists of 0.3%, 1.6% and 0.3% had PhD in Nursing, midwifery and post basic nursing respectively.

Table 4.14: Distribution of respondents' level of knowledge score by official Designation

N = 320

Offical designation	Levels of knowledge			X^2	Df	P value
	Poor N (%)	Fair N (%)	Good N (%)			
SNO and above	2(1.5)	119(87.5)	15(11.0)	1.445	1	0.486*
NO and below	6(3.3)	162(88.0)	16(8.7)			

*Not Significant (P>0.05)

Table 4.15: Distribution of respondents' level of knowledge score by area of service

N = 320

Area of service	Levels of knowledge			X^2	df	P value
	Poor N (%)	Fair N (%)	Good N (%)			
Ward	6(2.7)	185(84.3)	28(12.8)	7.913	1	0.019*
Clinic	2(2.0)	96(95.0)	3(3.0)			

*Significant (P<0.05)

4.3 Comparison of mean knowledge scores by selected socio-demographic variables.

Table 4.16 shows the comparison of the mean knowledge scores of respondents by sex. The mean scores by the male and female respondents were 12.6±2.3 and 13.4±2.1 respectively. There was no significant difference between the mean knowledge scores among the two groups. The comparison of respondents of the mean knowledge scores of respondents by level of education is highlighted in Table 4.17. The mean knowledge scores among those with basic nursing. B.Sc nursing and other were 13.3±2.2. 13.3±2.0 and 14.0±2.3 respectively. There was no significant difference in the mean scores.

The comparison of respondents' mean hand knowledge scores by area of service is presented in Table 4.18. The respondents who worked in the ward had a mean knowledge score of 13.4±2.1 while those working in the clinic had a mean knowledge score of 13.0±2.1. There was no significant difference in the mean knowledge scores of the respondents by area of service. Table 4.19 presents the mean knowledge scores of respondents by official designation. The mean scores by respondents who were senior nursing officer and above and Nursing officer and below were 13.8±1.9 and 12.9±2.2 respectively. There was a significant difference in the mean knowledge score by official designation.

Table 4.16: Comparison of respondents' mean knowledge scores by sex

N = 320

Sex	N	Mean score	SD	t-value	df	p-value
Male	48	12.6	2.3	1.581	318	0.115*
Female	272	13.4	2.1			

*Not significant (p>0.05)

Table 4.17: Comparison of respondents' mean knowledge scores by level of Education

N = 320

Level of education	N	Mean score	SD	F-test	df	p-value
Basic nursing	204	13.30	2.21	0.395	319	0.674*
B.sc nursing	109	13.25	2.00			
Other**	7	14.00	2.31			

*Not significant (p>0.05)

This consists of 0.3%, 1.6% and 0.3% had PhD in Nursing, midwife and post basic nursing respectively.

Table 4.18: Comparison of respondents' mean knowledge scores by area of service

N = 320

Area of service	N	Mean score	SD	t-value	df	p-value
Ward	219	13.4	2.1	1.613	318	0.11*
Clinic	101	13.0	2.1			

*Not significant (p>0.05)

Table 4.19: Comparison of respondents' mean knowledge mean score by official designation

N = 320

Office designation	N	Mean score	SD	t-value	Df	p-value
SNO and above	130	13.8	1.9	3.597	318	0.00*
NO and below	184	12.9	2.2			

*Significant (p<0.05)

4.4 Respondents' perceptions relating to hand washing.

Respondents' perception relating to hand washing are presented in Table 4.20. Most (95.3%) of respondents were of the view that hand washing only reduces the spread of infection. Only 1.6% of the respondents opposed to the view that hand washing can reduce the spread of infection. Few (33.8%) respondents were of the opinion that transmission of harmful germ is mainly through inadequate hand washing by health worker, while 61.9% of the respondents were opposed the view.

Most (94.1%) of the respondents agreed with the notion that hand hygiene action must be performed before and after touching a patient while 4.4% were opposed to the view. Majority (73.1%) of the respondents were of the view that the use of ABHR makes hand hygiene easier to practice in one's daily work. Most (90.3%) respondents were of the view that hand hygiene must be performed each time one enters or exits. Majority (85.9%) of respondents were of the view that they should improve on their hand hygiene practice.

Table 4.21 reveals the perceived strategies that could improve hand hygiene. Majority agreed with the following strategies; performing hand hygiene as recommended (92.2%), provision of education on hand hygiene (92.2%), availability of ABHR (93.8%) and use of poster display (92.8%). More than half, (56.6%) were opposed to the notion that patients should be educated to remind health worker to wash their hands.

Table 4.20: Respondents' Perceptions relating to Hand washing

Variables	N = 320 Responses					
	Agree		Disagree		Undecided	
	Number	(%)	Number	(%)	Number	(%)
Hand washing reduces the spread of infection	305	95.3**	5	1.6	10	3.1
Transmission of harmful germs is mainly through inadequate hand washing by health workers	108	3.8**	198	61.9	14	4.4
Hand hygiene action must be perform before and after touching a patients	301	4.1**	14	4.4	5	1.6
The use of ABHR made had hygiene easier to practice in your daily work	234	3.1**	79	24.7	7	2.2
Perform hand hygiene each time you enter or exit a patients room	289	90.3	24	7.5**	7	2.2
Health workers often feel that they should improve their hand hygiene	275	85.9**	25	7.8	20	6.3

*ABHR means alcohol based hand rub

** Favourable perception

Table 4.21: Perceived strategies for improving handwashing

Perceived strategies for improving hand Washing	Yes		No		N = 320 No response	
	No	(%)	No	(%)	No	(%)
Performing hand hygiene as recommended	295	92.2	1	0.3	24	7.5
Education on handwashing	295	92.2	15	4.7	10	3.1
Making alcohol hand rub always available	300	93.8	2	0.6	1	85.6
Poster display	297	92.8	16	5.0	7	2.2
Patients should be educated to remind health worker to wash their hands.	119	37.2	181	56.6	20	6.3

Table 4.22 shows the combined qualitative and quantitative evaluation of the level of perception of hand washing among the respondents. The proportions of respondents with unfavourable and favourable perception scores were 1.3% and 98.8%. respectively. The mean perception score was 13.7±2.1.The distribution of perception levels by sex is presented on table 4.23. Most (95.5%) of the female respondents had favourable perception while all (100.0%) the male respondents had favourable perception. There was, however, no significant relationship between the perception of respondents and their sex.

Table 4.24 shows the distribution of respondents' perception level by age. Most of the respondents that were aged ≤29. 30-34. and 35-39 years and their proportions were (98.8%). (97.2%) and (97.6%) respectively had favourable perception. It was noted that there was no significant relationship between the perception of respondents and their age. The distribution of perception level by education is presented in table 4.25. Most of the respondent with basic nursing (98.5%) and B.Sc nursing (99.1%) had favourable perception. The Chi-square test showed that there was no significant relationship between the perception of respondents and level of education.

Table 4.26 shows the distribution of perception level by official designation. All (100.0%) the respondents who were SNO and above had favourable perception. Similarly, most (97.8%) respondents were NO and below had favourable perception. The Chi-square test showed that there was no significant relationship between the perception of respondents and their official designation. The distribution of perception level by area of service is presented in table 4.27. Most (98.2%) respondents had favourable perception. All (100.0%) respondents who work in the clinic had favourable perception. The Chi-square test showed that there was no significant relationship between the perception of respondents and area of service.

Table 4.22: Respondents' level of perception relating to hand washing.

N = 320

Perception scores (in points*)	Qualitative assessment	Proportion	
		No.	%
<9	Unfavourable	4	1.2
≥9	Favourable	316	98.8

*Mean perception score = 13.7±2.1

Table 4.23: Distribution of respondents' perception by sex

Sex	Level of Perception		X^2	Df	P value
	Unfavourable N (%)	Favourable N (%)			
Female	4(1.5)	268(95.5)	0.715	1	0.398*
Male	0(0.0)	48(100.0)			

N = 320

*Not significant (P>0.05)

Table 4.24: Distribution respondents' perception scores on handwashing by Age

Age	Level of Perception		X^2	Df	P-value
	Unfavourable N (%)	Favourable N (%)			
≤29	1(1.2)	79(98.8)	3.455	4	0.485*
30-34	2(2.8)	69(97.2)			
35-39	1(2.4)	41(97.6)			
40-44	0(0.0)	60(100.0)			
45 & above	0(0.0)	67(100.0)			

N = 320

*Not significant (P>0.05)

Table 4.25: Distribution of respondents' perception scores level washing by Education

Level of Education	Level of Perception		X^2	Df	N = 320 P-value
	Negative N (%)	Positive N (%)			
Basic nursing	3(1.5)	201(98.5)	0.267	2	0.875*
B.Sc nursing	1(0.9)	108(99.1)			
Others**	0(0.0)	7(100.0)			

*Not significant (P>0.05)

**This consists of 0.3%, 1.6% and 0.3% had PhD in Nursing, midwife and post basic nursing respectively.

Table 4.26: Distribution of respondents' perception scores on Handwashing by official designation

N = 320

Office designation	Level of perception		X^2	Df	P-value
	Unfavourable N (%)	Favourable N (%)			
SNO & above	0.(0.0)	136(100.0)	2.994	1	0.084*
NO & below	4(2.2)	180(97.8)			

*Not significant (P>0.05)

Table 4.27: Distribution of respondents' perception by area of service

N = 320

Area of service	Perception level		X^2	Df	P-value
	Unfavourable N (%)	Favourable N (%)			
Ward	4(1.8)	215(98.2)	1.868	1	0.172*
Clinic	0(0.0)	10(100.0)			

*Not significant (P>0.05)

4.5 Practice of handwashing among respondents

Table 4.28 shows the type of hand washing methods used by respondents. More respondents reported that they did not use the following hand washing methods: soapy water in a basin (47.5%), bar soap and cold running water (35.9%), bar soap and warm running water (44.4%), use of water in a basin (40.0%) and use of running water alone (41.3%) Majority of the respondents reported the use the following methods of hand washing, use of antiseptic soap and warm running water (68.1%) and washing front and back of hand including under the nails (80.0%). More than half (58.4%) of the respondents made use of alcohol hand base hand rub while 41.9% said they rub soap on wet hands for about 20seconds before rinsing.

The frequency of use of methods relating to hand washing is presented in table 4.29. Many respondents stated that they never made use of the following methods, wetting hand with water (40.3%), use of water in a basin (39.7%) and drying hand with paper towel (37.1%). Over half (54.7%) also reported that they had never used liquid soap and warm running water. Many (39.1%) respondents stated that they always removed hand and arm jewelry before hand washing. Similarly, 38.1% of the respondents reported that they always rub their hands for about 20seconds to lather the soap and cover all surfaces of hand before rinsing with water in a bowl or running water. Use of antiseptic soap and warm running water was used always by 63.8% of the respondents while most (92.2%) of them reported that they washed front and back of hand including under the nails. Less than half (40.3%) stated that they sometimes used liquid soap and cold running water while slightly over half (52.2%) of the respondents sometimes made use of alcohol hand base hand rub.

Table 4.30 shows hand hygiene methods used before providing care by respondent. Majority (75.0%) engaged in proper hand hygiene method before providing patients care, 62.8% of respondents practice hand hygiene before putting on gloves, while 67.8% washed hands before performing invasive procedures. Most (97.8%) engaged in hand hygiene before preparing, serving or feeding patients.

Handwashing methods performed by respondents after providing care to patient are presented in Table 4.31. Most (96.9%) of the respondents engaged in proper hand hygiene method after providing patient care, 100% of the respondents engaged in hand hygiene

after contact with body fluids (blood, mucus e.t.c.). 99.7% reported after contact with potentially contaminated objects. 99.4% reported after performing invasive procedures. and 100% engaged in hand hygiene after preparing. serving or feeding a patients.

Table 4.31 shows hand drying techniques among the respondents. Slighly less than half (49.7%) of the respondents reported that they sometimes make use of personal handkerchief for hand drying. 50.0% of the respondents always allow their hands to dry on their own while 48.1% of the respondents sometimes made use of towels for hand drying.

Table 4.28: Hand washing methods of respondents

Hand washing methods*	Yes		No		N=320 No response	
	No	(%)	No	(%)	No	(%)
Soapy water in a basin	84	26.3	152	47.5	84	26.2
Liquid soap and cold running water	114	35.6	76	23.8	130	40.6
Bar soap and cold running water	110	34.4	115	35.9	95	29.7
Liquid soap and warm running water	87	27.8	107	33.4	124	38.8
Use bar soap and warm running water	59	18.4	142	44.4	119	37.2
Use of water in a basin	89	27.8	128	40.0	103	32.2
Use of running water alone	75	23.4	132	41.3	113	35.3
Use of antiseptic soap and warm running water	218	68.1	18	5.6	84	26.3
Rubbing soap on wet hands for about 20seconds before rinsing	134	41.9	59	18.4	127	39.7
Washing front and back of hand including under the nails	256	80.0	3	0.9	61	19.1
Use of alcohol hand base hand rub	187	58.4	28	8.8	105	32.8

* Multiple responses

Table 4.29: Hand washing technique

Variables **	N = 320							
	Never		Always		Sometimes		No response	
	No	(%)	No	(%)	No	(%)	No	(%)
Removing hand and arm jewellery	74	23.1	125	39.1	91	28.4	30	9.4
Wetting hand with water	129	40.3	44	13.8	104	32.5	43	13.4
Applying liquid soap and warm running water	175	54.7	45	14.1	51	15.9	49	15.3
Liquid soap and cold running water	35	10.9	121	37.8	129	40.3	35	10.9
use of water in a basin	127	39.7	86	26.9	76	23.8	31	9.7
Rubbing hand for about 20secs to lather the soap and cover all surfaces of hand before rinsing with water in a bowl or running water	94	29.4	22	38.1	59	18.4	45	14.1
Use of antiseptic soap and warm running water	14	4.4	204	63.8	67	20.9	35	10.9
Washing front and back of hand including under the nails	6	1.9	295	92.2	14	4.4	5	1.6
Use of alcohol hand base hand rub	63	19.7	75	23.4	167	52.2	15	4.7
Drying hand with paper towel	119	37.1	68	21.3	93	29.1	40	12.5

** Multiple responses.

Table 4.30: Hand hygiene method before providing care

Variables	N =320			
	YES		NO	
	Number	(%)	Number	(%)
Before providing patient care	240	75.0	80	25.0
Before putting on gloves	201	62.8	119	37.2
Before contact with blood, body, fluid, mucus membrane, non-intact skin	297	92.8	23	7.2
Before contact with potentially contaminated object or in the environment	294	91.9	26	8.1
Performing invasive procedure	217	67.8	103	32.2
Before preparing, handling, serving or eating or feeding a patient	313	97.8	7	2.2

Table 4.31: Hand hygiene method after care procedure

Variables	N = 320			
	Yes		No	
	Number	%	Number	%
After providing patient care	310	96.9	10	3.1
After taking off hand glove	314	98.1	6	1.9
Contact with blood, body fluid, mucus membrane, non-intact skin	320	100	0	0.0
Contact with potentially contaminated object or in the environment	319	99.7	1	0.3
Performing invasive procedure	318	99.4	2	0.6
Preparing, handling, serving or eating or feeding a patient	320	100	0	0.0

Table 4.32: Hand drying techniques among respondents

N =320

Hand drying techniques	Never (%)	Always (%)	Sometime (%)	No response (%)
Use of personal handkerchief	27(8.4)	121(37.8)	158(49.7)	13(4.1)
Allowing hands to dry on their own	15(4.7)	160(50.0)	131(40.9)	14(4.4)
Use of towels	45(14.1)	103(32.2)	154(48.1)	18(5.6)

The combined qualitative and quantitative evaluation of the level of practice of hand washing among the respondents is presented in table 4.33. The proportion of respondents with poor and good practice scores were 31.3% and 68.8% respectively. The mean practice score was 29.7±6.8. Table 4.34 shows the distribution of respondents' level of practice of hand washing by selected socio-demographic characteristics. The proportion of male respondents with a good practice was (72.9%) while the proportion of the female respondents with good handwashing practice was 68.0% with no significant difference.

The distribution of handwashing practice by age showed that respondents who fall into the different age groups had a good practice. Majority (70.0%) of respondents who were ≤29 years had good practice. Majority of respondents in other age groups namely, 30-34 (80.3%), 35-39 (69.0%), 40-44 (55.0%) and ≥45 (67.2%) all had good practice as well. The Chi-square test showed that there was a significant relationship between practice of handwashing and sex. The distribution of handwashing practice by educational status as presented in the table indicates that 73.5% of the respondents who had Basic Nursing had good practice of hand washing. Similarly, 61.5% of respondents who had B.Sc Nursing had good practice of hand washing. The Chi-square test showed that there was a significant relationship between handwashing practice and educational status.

The distribution of handwashing practice by area of service delivery revealed that respondents 75.8% of the respondents who work in the wards had good practice of hand washing. More than half (53.5%) of respondents who work in the clinic also had good practice of hand washing. The Chi-square test showed that there was a significant relationship between HW practice and area of service. The distribution of HW practice by official designation showed that 72.8% of the respondents who were SNO and above had good practice of hand washing. Similarly, 65.8% of respondents who were NO and below had good practice of hand washing. The Chi-square test showed that there was no significant relationship between HW practice and official designation of respondents.

Table 4.33: Respondents' level of practice of handwashing

Practice score in points*	Qualitative assessment	N=320 Proportion	
		N	%
≤26	Poor	100	31.3
≥26	Good	220	68.8

*Mean practice score= 29.7 ± 6.8
** operationally defined as poor and good

Table 4.3.1. Relationship between socio-demographic characteristics of respondents' and practice of hand washing.

Socio-demographic characteristics	Levels of practice				N = 320
	Poor (≤26) (%)	Good (>26) (%)	X^2	Df	P value
Sex					
Female	32.0	68.0	0.456	1	0.499•
Male	27.1	72.9			
Age					
<= 29	30.0	70.0			
30- 34	19.7	80.3			
35-39	31.0	69.0			
40-44	45.0	55.0	9.813	4	0.044••
45 & above	32.8	67.2			
Educational status					
Basic nursing	26.5	73.5			
B sc nursing	38.5	61.5			
Other	57.1	42.9	7.044	2	0.030••
Area of service					
Ward	24.2	75.8			
Clinic	46.5	53.5			
Office designation					
SNO and above	27.2	72.8	16.048	1	0.000••
NO and below	34.2	65.8	1.801	1	0.180•

•Not significant (p>0.05)
••Significant (p<0.05)

Table 4.35 shows the comparison of respondents' mean hand washing practice scores by sex. The mean scores among the male and female respondents were 12.6±2.3 and 13.4±2.1 respectively. The student t-test showed that was no significant difference between the mean practice scores of the two genders. The comparison of respondents mean practice scores by level of education is highlighted in table 4.36. The mean practice scores among those with Basic Nursing, B.sc nursing and other qualifications were 13.3±2.2, 13.3±2.0 and 14.0±2.3, respectively. The student t-test showed that there was no significant difference between the mean practice scores and level of educational.

Table 4.37 presents the mean practice scores of respondents by area of service. The respondents working in the wards had a mean practice of 13.4±2.1 while those working in the clinics had 13.0±2.1. The student t-test revealed that there was no significant difference in the mean practice score of the respondents working in the wards and those working in the clinics. The comparison of respondents' means hand practice scores by official designation are shown in table 4.38. The mean scores by respondents who are Senior Nursing Officer and above and Nursing Officer and below were 13.8±1.9 and 12.9±2.2, respectively. The student t-test revealed that there was a significant difference in the mean practice scores among the two groups.

Table 4.35: Comparison of respondents' mean Hand washing practice scores by sex

N = 320

Sex	N	Mean score	SD	t-value	df	P-value
Male	48	12.6	2.3	1.581	318	0.115
Female	272	13.4	2.1			

*Not significant (P>0.05)

Table 4.36: Comparison of respondents' mean Handwashing practice scores by level of education

N = 320

Educational status	N	Mean score	SD	F-test	Df	p-value
Basic nursing	204	13.30	2.21	0.395	319	0.674*
B.Sc nursing	109	13.25	2.00			
Other**	7	14.00	2.31			

*Not significant (p>0.05)

**This consists of 0.3%, 1.6% and 0.3% had PhD in nursing, midwife and post basic nursing respectively.

Table 4.37: Comparison of respondents' mean hand washing practice scores by area of service

N = 320

Area of service	N	Mean score	SD	t-value	Df	p-value
Ward	219	13.43	2.14	1.613	318	0.11*
Clinic	101	13.02	2.11			

*Not significant (P>0.05)

Table 4.38: Comparison of respondents' mean hand washing practice mean score by official designation

N = 320

Official designation	N	Mean score	SD	t-value	Df	p-value
SNO and above	130	13.8	1.9	3.597	318	0.00**
NO and below	184	12.9	2.2			

**Significant (p<0.05)

4.6 Factors Influencing the Practice of Hand Washing.

Table 4.39 presents the pattern of availability of facilities that promotes hand washing. More than half (56.3%) reported that running water was always available while 30.6% of the respondents stated that running water was only available occasionally. More of the respondents (59.1%) stated that sinks were always available while 19.4% reported that sinks were not available. Less than half (46.9%) of the respondents reported that soap racks were always available while 40.3% stated that soap racks were only available occasionally.

Majority (72.5%) of the respondents reported that water in a basin is always available while only 21.3% of the respondents stated that water in a basin is available only occasionally. Less than half (44.4%) reported that pipe-borne water was available always while 34.1% of the respondents reported the non-availability of pipe-borne water. More (40.3%) respondents stated that borehole water was available always. 32.5% reported that borehole is available only occasionally. On the availability of napkins, 41.6% of the respondents stated that it was available only occasionally while 36.3% reported that it was not available it all. More than half (57.5%) reported the occasional availability of towels while 20.3% reported that towels were available always.

Table 4.40 shows respondents' perceived barriers to hand washing. Less than half (47.5%) of the respondents identified lack of water as barrier. 47.2% reported inaccessibility of sinks as barriers while majority also identified non availability of ABHR (80.9%) and irregular running water (64.7%) as barriers to hand washing.

Table 4.41 shows the regression results relating to determinants of practice of hand washing among the respondents. Area of service is therefore a determinant of hand washing practices. Respondents within the wards were three times more likely to have good practices compared to those in the clinics. (OR: 2.5; 95% CI: 1.446-4.455).

Table 4.39: Pattern of availability of facilities that promotes hand washing

N = 320

Facilities *	Not Available (%)	Available occasionally (%)	Available always (%)	No response (%)
Running water	32(10.0)	98(30.6)	180(56.3)	10(3.1)
Sinks	62(19.4)	51(15.9)	189(59.1)	18(5.6)
Soap rack	30(9.4)	129(40.3)	150(46.9)	11(3.4)
Bucket of water in a basin	5(1.6)	68(21.3)	232(72.5)	15(4.7)
Pipe-borne water	109(34.1)	52(16.3)	142(44.4)	17(5.3)
Bore hole ripped within the facilities	64(20.0)	104(32.5)	129(40.3)	99(7.2)
Napkins	116(36.3)	133(41.6)	58(18.1)	13(4.1)
Towels	60(18.8)	184(57.5)	65(20.3)	11(3.4)

* Multiple responses

Table 4.40: Perceived barriers to hand washing among the respondents

Variables*	N= 320					
	Response					
	Yes		No		No response	
	Number	(%)	Number	(%)	Number	(%)
Lack of water	152	47.5	150	46.9	18	5.6
Irregular running water	207	64.7	96	30.0	17	5.3
Forgetfulness	33	10.3	264	82.5	23	7.2
Lack of motivation	104	32.5	191	59.7	25	7.8
Non availability of ABHR	259	80.9	39	12.2	32	6.9
Inaccessibility of sinks	151	47.2	147	45.9	22	6.9
Lack of time	16	5.0	284	88.8	20	6.3
Busy work schedule	39	12.2	256	80.0	25	7.8
Non availability of soap	148	46.3	152	47.5	20	6.3
Skin irritation	18	5.6	271	84.7	31	9.7

** Multiple responses

Table 4.41: Regression results relating to determinants of the respondents' practice on handwashing.

N = 320

Selected covariates	S.E.	df	Level of Sig.	OR	95.0% C.I. for OR	
					Lower	Upper
Age						
<= 29						
30- 34	0.365	1	0.870	1.062	0.519	2.169
35-39	0.401	1	0.119	1.868	0.868	4.102
40-44	0.431	1	0.935	0.646	0.415	2.248
45 & above	0.373	1	0.164	0.609	0.284	1.237
Educational level						
Basic Nursing	0.851	1	0.052	5.214	0.983	27.644
B.Sc Nursing	0.865	1	0.139	3.596	0.659	19.613
Area of service						
Wards	0.287	1	0.01*	2.538	1.446	4.455
Clinics	.	1	.	.	.	.
Years of service as a nurse						
1-10	0.687		0.672	1.337	0.348	5.137
11-20	0.680		0.325	0.512	0.135	1.942
21-30	.		.	.	.	
31-40						

*significant

CHAPTER FIVE

5.1 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

This chapter is organized into the following sections: socio-demographic characteristics; participants' knowledge relating to hand washing; perceptions relating to handwashing, pattern of practice of hand washing; perceived factors which facilitate or inhibit the practice of hand washing and implication of the findings to health education. The chapter ends with the conclusion and recommendations including suggestions for further studies.

5.1.1 Socio- demographic characteristics of respondents

The respondents' ages ranged from 25 to 60 years; it is an age structure which reveals an adult population and a workforce which falls below the official 65 years retirement age in the public service in Nigeria. The population revealed a higher proportion of females compared to males. It is to be noted that the profession is dominated by females (Sullivan, 2001). Most of the respondents were of the Yoruba ethnic group; it is also because the study was conducted in Ibadan, a city predominantly inhabited by the Yoruba from different parts of the South Western region.

5.1.2 Participants' knowledge relating to hand washing

In this study, respondents' knowledge about handwashing was found to be fairly knowledgeable about hand washing which was a positive finding. This finding is similar to a study conducted among nurses (Ariyaratne, Gunasekara, Weerasekara, Kottahachchi and Kudavidanage, 2013). On the other hand, in a study from South West Nigeria majority of respondents (83.0%) had good knowledge of hand hygiene, which could have been due to greater number of training activities been provided to the students in Nigeria than in our study (Timothy and Ifeoma, 2013). The findings from this study indicates that thirty nine percent of participants knew that unhygienic hands of HCWs were the main route of transmission of potentially harmful germs between patients in a health care facility (HCF). In contrast, a study done by Angel, (2015) in India revealed a higher proportion of respondents' knowledge on the main routes of transmission of germs. But surprisingly, 53.8% of respondents had correct knowledge of the most frequent source of germs responsible for HAIs.

In this study. only 7.5% knew specifically that washing hands immediately before a clean/aseptic procedure doesn't have much role in preventing transmission of infections to health care workers. Inadequate availability of hand rub in most of the hospitals in developing countries is a common problem (WHO. 2009) which may be the cause of inadequate knowledge in this study.

Consistent with the findings of this study. a study conducted among health workers in India. which revealed that more than half (64.6%) of the respondents knew that ABHR are more rapid for hand cleansing than hand washing (Tabassum. Saira. Ali. Sadia. Najam. Athar and Zulfia. 2015). In this study. only few of the respondents knew that alcohol based hand rub is more rapid and more effective against germs than hand washing. This finding is contrary to the higher proportion reported by Ariyaratne et al.. (2013). Alcohol-based hand rubs are also effective for proper hand hygiene and are more rapid for hand cleansing than hand washing (WHO. 2009).

However. more than half of the respondents in this study were aware about the minimum time needed for effective hand hygiene. This finding is contrary to a study conducted in India where 25% of the respondents were aware of the minimum time required for effective hand hygiene as documented in WHO guidelines. Also. similar finding to this study carried out by AbdElaziz in Cairo reported only 23.2% of participants showed inappropriate hand washing due to short contact time (less than 30 sec). WHO recommends alcohol based hand rubs for hand antiseptis based on its intrinsic advantages of fast acting. broad spectrum microbicidal activity and to improve compliance by making the process faster, but due to its non-availability in some of the hospitals in developing country making adherence doubtful.

5.1.3 Perception towards hand washing

In this study, majority strongly agreed that hand washing helps to prevent transmission of infection to patients. health worker and health workers family members (Omogbai. Azodo. Ehizele and Umoh. 2011). Majority of respondents were of the perception that improving on their hand hygiene would make them non-vulnerable to transmitting harmful germs during their daily work and to the patients. Messages and video display about hand hygiene practices on computer screen savers on the wards to show patients the significance of hand hygiene in preventing cross infection and to remind or motivate

HCWs to practice hand hygiene before healthcare delivery (Maxfield and Dull, 2011) and placing proper hand hygiene technique illustrations above sinks or near to alcohol hand-rub dispensers could be helpful as well (Smith and Lokhorst, 2009).

Contrary to the findings, the study by Feather, Stone, Wessier, Boursicot, and Pratt (2000), in UK, reported that only 8.5% perceived that hand hygiene must be performed before and after patient contact, although the figure rose to 18.3% when hand hygiene signs were displayed. Also, contrary to the finding, the study reported by Smith et al., (2009) suggest that promotional material, such as posters placed in noticeable areas of the hospital would help remind HCWs and patients as perceived strategy towards improving hand hygiene.

5.1.4 Respondents' practice to hand washing.

In this study, only 38.1% reported that rubbing soap on wet hands for about 20 seconds before rinsing and washing front and back of hands including under the nail, is the most appropriate techniques of good hand washing, which were similar to those reported by Opara and Alex-Hart (2009) in their study.

In this study, only 23.4% reported washing their hands with water alone as hand washing methods. Similar finding to this study was reported among 17.1% of the respondents who practice an unacceptable method of handwashing. The belief that washing with water alone to remove visible dirt is sufficient to make hand clean is common place in most countries (Samuel et al, 2005). In this study, only 34.4% of the respondents wash their hands with soap and water and more than half of respondent reportedly practice the use of antiseptic soap and running water of soap. Respondents handwashing methods before and after patients care was found to be high in this study, which is consistent with the 58.7% and 64.3% reported by Stein, Makarawo, and Ahmad (2003) in UK.

This study shows the proportion of respondents who either use personal handkerchiefs (37.8%), allowed their hands to dry on their own (50.0%) or use common cloth towels (32.2%) to dry their hands. Contrary to this findings, as reported by Tibballs, (1996) and Daniel, Ollila and Ernestina (2014) that the use of paper towels are the most appropriate hand drying method. Hand drying is as important as hand washing in maintaining hand hygiene (Gustafson, Vetter and Larson, 2000). Drying the hands is an essential step in

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hand cleansing and should be adequately done so that hands are not re-contaminated (Omogbai et al. 2011).Common cloth towels and handkerchiefs which become damp and contaminated can act as reservoirs for bacteria and therefore have the potential to become significant sources of infection (Tibballs. 1996; Gould, 1994; WHO, 2008).

5.1.5 Perceived factor to hand washing.

The facilities available for facilitating hand washing in this study were bucket of water with a basin or cup, bore hole within the health facilities and sinks. Others were soap rack, pipe borne water, napkins and towels. In this study, revealed that availability of sinks, soap racks and bucket of water in a basin was high, though the non-availability of napkins and pipe bore water also high. Availability of sink was 59.1% while bucket of waterin a basin was 72.5%. This was similar to the findings by Devnani, Kumar, Sharma and Gupta (2011) with report of 99.5% ofsink available.

Generally, non-availability of soap, irregular running water and non availability of ABHR with a proportion of 46.3%, 64.7%, and 80.9% respectively are the commonest constraints perceived among respondents to hand washing in this study. Others were forgetfulness, lack of time, inconveniently located sinks and lack of motivation. These factors and many others have been reported in other studies as barriers to hand washing among health workers (Kretzer and Larson, 1998; Sharma *et al*., 2005; Gould, 1996; Harris et al, 2000; Larson, 1995). This finding implies facilities such as soap and running water were not readily available at the point of care, thus perceived as barriers to handwashing among health workers. Busy schedule will not only reduce frequency of hand washing but in addition proper handwashing technique may be inadequate.

In our study, factors associated with non-compliance with hand hygiene recommendations are related not only to the health care workers but also the health care settings. These findings support suggestions by other authors. Such factors include lack of appropriate hand hygiene agents and lack of hand hygiene facilities e.g. disposable paper towels as observed in this study.

5.1 Implication for Health Promotion and Education.

Findings from this study revealed that many respondents have fair knowledge of issues relating to handwashing. Specifically their knowledge was low relating to the following hand hygiene issues: on the most frequent source of germs responsible for HAIs and ABHR effectiveness against HAIs than handwashing and performing hand washing during patients care. The identified gap in knowledge can be addressed through in-service training programmes. Thus, emphasizing on the important role that contaminated hands play in transmission of health-care-associated pathogens, including multidrug-resistant pathogens and viruses. Educational health programs for personnel that include instructions for proper technique when washing hands with soap and water, or when using an alcohol-based hand rub should be developed and implemented.

Respondents perceived unfavourable strategies that patients should be educated to remind health workers to improve hand washing. This can be achieved through; provision of promotional material, such as hand bills, posters placed in noticeable areas of the hospital to remind HCWs, patients, and visitors about the importance of hand hygiene practice. Findings from this study revealed that reasons such as lack of water/irregular running water, non-availability of ABHR and inaccessibility of sinks were the barriers to handwashing practice. Strategies such as training and advocacy could be used to address these challenges. Thus, handwashing related challenges can be tackled through policy intervention and which promotes deliberates investment in the provision of quality health services and basic facilities for handwashing such as running water and availability of sinks.

5.3 Conclusion

The research explored the knowledge, perception and practices relating to handwashing by HCWs in secondary health facilities in Ibadan metropolis. From the results, it shows that majority of the respondents had fair knowledge about handwashing, a favourable perception relating to handwashing and practices towards handwashing were good.

Majority of respondents perceived favourable strategies for improving handwashing. However, hospital administration should play a more active role to improve and motivate HCW's to perform handwashing as recommended through in-service education and training, posters, leaflets, workshops, lectures, hospital guidelines and availability of hand hygiene products.

The study indicates that respondents' tend to practice good handwashing methods. Surprisingly, some of them practice inappropriate handwashing technique. The reason adduced for this could be the use of ABHR as an effective hand hygiene practice during patients' care compared to hand washing. Perceived barriers to handwashing as identified by respondents were; lack of hand hygiene products and facilities, such as running water, sinks, antiseptic or non-antiseptic soaps, alcohol hand-rubs and hand paper towels, which can play a major role in poor handwashing practice.

5.4 Recommendations

1. Continuous education, campaign and seminar on hand hygiene should be organized to improve their knowledge regarding the importance of correct practices on handwashing.
2. Health workers should perform regularly hand hygiene as recommended in the CDC Guideline for Hand Hygiene in Health-Care Settings in order to upgrade their knowledge and practice on handwashing.
3. Health workers with good hand hygiene practice could gain recognition, for example, announcement in the hospital newsletter, an accolade which may encourage others to do likewise which would serves as a means of motivation amongst them.
4. Compliance to hand hygiene practices is low among health care worker. This can be addressed through education, training, and continuous motivation geared towards change among health workers.
5. A multiple interventions approach to sustain hand hygiene practices within healthcare should be encouraged. Such intervention approach includes; effective hospital administration and infection control administration. These should play a vital role in hand hygiene compliance by encouraging patients' monitoring of hand hygiene by observation of health workers within the health care settings.
6. Aspects of infection prevention and control in healthcare settings should be incorporated into health care worker performance contract so as to help improve overall compliance rates in the country.

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APPENDIX I

INFORMED CONSENT FORM

My name is AJALA. OLUWAFISAYO BOLANLE, I am a student of the Department of Health Promotion and Education, Faculty of Public Health, University of Ibadan, Ibadan. I am conducting a study on the prevalence and determinants of handwashing practices among Nurses in State Hospitals Ibadan metropolis in order to find out about your knowledge, perception, pattern of practice and factors influencing hand washing. I will need to ask you some questions.

Please note that your answers will be kept confidential. You will be given a number and your name will not be written on the form so that your name will not be used in connection with any information you give. The information you give will be used only for the purpose of this study. Findings will be used to make interventions or policy. During this exercise, medical examination will not be carried out on you, but your knowledge about handwashing practices will be required in answering the questions. This process will not cause you any harm or injury. Your honest answers to the questions will help to better understand what nurses think, say or do with respect to their knowledge on handwashing. You are free to take part in this programme. You have a right to withdraw at any given time if you choose to. We will greatly appreciate your help in responding to the survey and taking part in this study

Consent: Now that the study has been well explained to me and I fully understand the content of the process, I will be willing to take part in the programme.

_____ _____

Signature/thumbprint of participant Interview date

APPENDIX II

QUESTIONNAIRE

HANDWASHING AND PERCEIVED FACTORS INFLUENCING THE PRACTICE AMONG NURSES IN STATE HOSPITAL, IBADAN METROPOLIS, NIGERIA

Dear respondent,

I am a postgraduate student of the department of Health Promotion and Education, Faculty of Public Health University of Ibadan. The purpose of the study is to investigate the **Handwashing and Perceived Factors Influencing The Practice Among Nurses In State Hospital, Ibadan Metropolis, Nigeria.** Your identity, responses and opinion will be kept strictly confidential and will be use for the purpose of research only. Please do not write your name on the questionnaire. I kindly seek your assistance to answer the below questions as accurate as possible to make the research a success. Kindly show by ticking (√) any of the following boxes provided to indicate that your participation in this study is voluntary.

_____

Signature of participant

Thank you for your cooperation.

SECTION A: Socio-demographic characteristics of respondents

Please mark /x / in boxes provided where appropriate.

1) Sex: 1) Female ☐ 2) Male ☐

2) Actual age as at last birthday ☐☐ years

3) Religion: 1) Christianity ☐ 2) Islam ☐ 3)Traditional ☐ 4) Others

4) Marital status: 1) Single ☐ 2) Married ☐ 3) Separated ☐ 4) Widow ☐

5) Divorced ☐ 6) Others (specify) _____

5) Official Designation CNO ☐ ACNO ☐ PNO ☐ SNO ☐

NO ☐ Staff midwife others (specify) _____

6) Highest educational qualification (1) Basic Nursing ☐ (2) B Sc Nursing ☐

(3) Others (specify) ____

7) Ethnic group: 1) Yoruba ☐ 2) Igbo ☐ 3) Hausa ☐ 4) Others ____

8) Total number of years of service as a Nurse : _____

9) Area of service in this hospital : Ward _____
Clinic _____
Others (specify) _____

10) No of years spent working in this hospital _____

SECTION B: Knowledge of Nurses on Handwashing.

Please tick (√) or underline the right answer in each of the following question.

11) Which of the following is the main route of cross-transmission of potentially harmful germs among patients in a health-care facility? (tick one answer only)

a. Health-care workers' hands when not clean

b. Air circulating in the hospital setting

c. Patients' exposure to colonised surfaces (i.e., beds, chairs, tables, floors)

d. Sharing non-invasive objects (i.e., stethoscopes, pressure cuffs, etc.) between patients

12) What is the most frequent source of germs responsible for health care-associated infections? (tick one answer only)

a. The hospital's water system

b. The hospital air

c. Germs already present on or within the patient

d. The hospital environment (surfaces)

13) Which of the following hand hygiene actions prevents transmission of germs to the patients and health worker?

	Handwashing	YES	NO
a	Before and after touching a patient		
b	Immediately after body fluid exposure		
c	After exposure to the immediate surroundings of a patient		
d	Immediately before touching a clean site during patient care (e.g opening an IV catheter hub)		

14) Which of the following statements on alcohol-based handrub or hand sanitizer and handwashing with soap and water are true?

	Statements	True	False
A	Hand sanitizer is more rapid for hand cleansing than handwashing		
B	Hand sanitizer causes skin dryness more than handwashing		
C	Hand sanitizer is more effective against germs than handwashing		

15) What is the minimal time needed for alcohol-based handrub to kill most germs on your hands? (tick one answer only)

a. ☐ 20 seconds
b. ☐ 3 seconds
c. ☐ 1 minute
d. ☐ 10 seconds

16) Alcohol based hand rub or hand sanitizer is required in the following situation?

	Clinical situation	Yes	No
A	Before palpation of the abdomen		
B	Before giving an injection		
C	After making a patient's bed		

17) Handwashing with soap and water is required in the following situation?

	Clinical situation	Yes	No
A	After emptying n bedpan		
B	After removing examination gloves		
E	After contact with blood or body fluids		

18) Which of the following should be avoided when carrying out hand hygiene action to prevent hands with harmful germs?

	Hand hygiene care	Yes	No
A	Wearing jewellery		
B	Damaged skin		
C	Artificial fingernails		
D	Long and unclean finger nails		
E	Damaged nails, chipped or peeling polish		

SECTION C: Perception of Handwashing

Instruction: Here are some statements relating to perception towards handwashing. For each statement, kindly tick (√) to indicate whether you strongly Agree [SA], Agree [A], Disagree [D] or strongly Disagree [S]

	Statements	Agree	Disagree	Undecided
19	Handwashing only reduce the spread of infection			
20	Transmission of harmful germs is mainly through inadequate handwashing of health workers			
21	Hand hygiene action must be perform before and after touching a patient.			
22	The use of an alcohol-based hand rubs or hand sanitizer made hand hygiene easier to practice in your daily work?			

23	Perform hand hygiene each time you enter or exit a patients room			
24	Health workers often feel that they should improve their hand hygiene			

25) In your opinion, which of the following strategies do you think would improve hand hygiene in your clinics / wards?

	Strategies	Yes	No
a	Performing hand hygiene as recommended		
b	Education on hand hygiene		
c	Making Alcohol based hand rub or hand sanitizer always available		
d	Posters displayed		
e	Patients should be educated to remind health worker to wash their hands		

SECTION D: Practice of Handwashing among Nurses

26) Is there an Infection Control Committee in your hospital? 1) Yes ☐ 2) No ☐
3) Do not know ☐

27) Do/did you participate/participated in the activities of the Committee?
a) Yes ☐ b) No ☐

28) Did you receive formal training in hand hygiene in the last three years? 1) Yes ☐
2) No ☐

29) How often do you practice the following hand washing techniques in your clinic or wards
(please tick the right answers as appropriate)

	Handwashing techniques	Never	Always	Sometimes
A	Removing hand and arm jewellery			
B	Wetting hand with water			
C	Applying liquid soap and warm running water			
D	Use of liquid soap and cold running water			
E	Use of water in a basin alone			
F	Rubbing hand for about 20 sec to lather the soap and cover all surfaces of hand before rinsing with water in a bowl or running water			
G	Use of antiseptic soap and water			
H	Washing front and back of hands including under the nails			
I	Use of alcohol based hand rub or hand sanitizer			
J	Drying hand with paper towels			

Frequency of Hand drying Techniques in the wards /clinic

30) How often do you practice the following hand drying techniques in your clinic or wards

	Hand drying techniques	Never	Always	Sometimes	No response
A	Use of personal handkerchief				
B	Allow hands dry on their own				
C	Use of towels				

31) Which type of hand washing methods do you use? *(please tick the right answers as appropriate)*

	Handwashing methods	Yes	No	No response
A	Use of soapy water in a basin			
B	Use of liquid soap and cold running water			
C	Use of bar soap and cold running water			
D	Use of liquid soap and cold running water			
E	Use of bar soap and warm running water			
F	Use of water in a basin			
G	Use of running water alone			
H	Use of antiseptic soap and running water			
I	Rubbing soap on wet hands for about 20 seconds before rinsing			
J	Washing front and back of hands including under the nails			
K	Use of alcohol based hand rub or hand sanitizer			

Frequency of self reported handwashing procedures practices among Nurses

32) How often do you perform hand hygiene methods during the following care procedures?

	Care Procedures	BEFORE Procedures		AFTER Procedures	
		Yes	No	Yes	No
A	When providing patient care				
B	When putting on and taking off gloves				
C	Contact with blood, body fluids (e.g., urine), mucous membranes, non intact skin (e.g., wounds or a rash),				
D	Contact with potentially contaminated objects (e.g., bed pans or dressings), or in the environment (e.g., door handles or bed rails)				
E	Performing invasive procedures				
F	Before preparing, handling, serving or eating food or feeding a patient				

Section E: Factors Influencing the Practice of Handwashing among Nurses.

33) Facilities available for facilitating handwashing (*please tick the right answers as appropriate*)

	Facilities	Not available	Available occasionally	Available always
a	Running water			
b	Sinks			
c	Soap rack			
d	Basin of water with basin or cup			
e	Bucket of water with basin or cup			
f	Pipe-bore water			
g	Borehole ripped within health facilities			
h	Napkins			
i	Towels			

Barriers to hand washing

34) Which of the following do you perceived as BARRIERS to following handwashing? (*please tick the right answers as appropriate*)

	Barriers	Yes	No	No response
A	Lack of water			
B	Irregular running water			
C	Forgetfulness			
D	Lack of motivation			
E	Non availability of alcohol based hand rub			
F	Inaccessibility of sinks			
G	Lack of time			
H	Busy work schedule			
I	Non availability of soap			
J	Skin irritation			

Thank You.

Appendix IV

Knowledge Scale

Question	Variable	Score
B	General Knowledge Statements on hand washing practices among nurses	
11	Which of the following is the main route of cross transmission of potentially harmful germs among patient in a health care facility?	1
	health wokers hand when not clean (1)	
	air circulation in the hospital setting (0)	
	patient exposure to colonised surface (0)	
	sharing non-invasive object between patient(0)	
12	What is the most frequent source of germs responsible for health care associated infection	1
	hospital water system (0)	
	hospital air (0)	
	germs present on or within the patient (1)	
	hospital environment (0)	
13	13.1 Which of the following hand hygiene actioo prevent transmission of germs to the patients and health worker? handwashing before and after touching a patient	1
	YES (1)	
	NO (0)	
	no response (0)	
	13.2 Immediately after body fluid exposure	1
	1.Yes (1)	
	2.No (0)	
	3.No response (0)	
	13.3 After exposure to immediate surrounding of a patient	1
	1.Yes(1)	
	2.No(0)	
	3.No response (0)	
	13.4 Immediately before touching a clean site during patient care e.g opening of an IV catheter hub	1
	1.Yes (1)	
	2.No(0)	
	3.No response (0)	
14	14.1 Which of the following statement on alcohol based hand rub and hand washing with soap and water are true? 'hand rubbing with alcohol is more rapid for and cleansing than hand washing	1
	TRUE (1)	
	FALSE (0)	
	No response (0)	

	14.2 Alcohol based hand rub causes skin dryness more than handwashing	
	TRUE (1)	
	FALSE (0)	
	No response (0)	
	3 Hand rubbing with alcohol is more effective against germs than handwashing	1
	TRUE (0)	
	FALSE (1)	
	No response (0)	
15	What is the minimal time needed for alcohol based hand rub to kill germs on the hand?	1
	20 SEC (1)	
	3 SEC (0)	
	1 MINS (0)	
	10 SEC (0)	
16	16.1 Alcohol based hand rub is required in the following situation before palpation of the abdomen	1
	YES (0)	
	NO(1)	
	no response (0)	
	16.2 Before giving an injection	1
	YES (0)	
	NO (1)	
	no response (0)	
	16.3 After making a patient's bed	1
	YES (0)	
	NO (1)	
	no response (0)	
17	17.1 Hand washing with soap and water is required in the following situation? 'After emptying a bed pan	1
	YES (1)	
	NO (0)	
	no response (0)	
	17.2 'After removing examination gloves	1
	YES (1)	
	NO (0)	
	no response (0)	
	17.3 After contact with blood or body fluid	1
	YES (1)	
	NO (0)	
	no response (0)	

18	18.1 which of the following should be avoided ,as associated with increased likelihood of colonisation of hands with harmful germs 'wearing jewellery'	1
	YES (1)	
	NO (0)	
	no response (0)	
	18.2 which of the following should be avoided as associated with increased likelihood of colonisation of hands with harmful germs 'damage skin	1
	YES (1)	
	NO (0)	
	no response (0)	
	18.3 'Artificial finger nails'	
	YES (1)	1
	NO (0)	
	no response (0)	
	18.4 'long and unclean finger nails'	
	YES (1)	1
	NO (0)	
	no response (0)	
	18.5 'damaged nail, chipped or peeling polish'	1
	YES (1)	
	NO (0)	
	no response (0)	
	SUBTOTAL	21
	GRAND TOTAL	21

TELEGRAMS.............. TELEPHONE..............

MINISTRY OF HEALTH

DEPARTMENT OF PLANNING, RESEARCH & STATISTICS DIVISION

PRIVATE MAIL BAG NO. 5027, OYO STATE OF NIGERIA

Your Ref. No. ....

All communications should be addressed to

the Honorable Commissioner quoting

Our Ref. No. AD 13/479/618 14th October, 2014

The Principal Investigator,
Department of Health Promotion and Education,
Faculty of Public Health,
College of Medicine,
University of Ibadan,
Ibadan.

<u>Attention: Ajala Oluwafisayo</u>

<u>Ethical Approval for the Implementation of your Research Proposal in Oyo State</u>

In response of your letter requesting for Renewal of your Research Proposal titled: "Prevalence and Determinants of Handwashing Practices Among Nurses in State Hospital, Ibadan Metropolis, Oyo State."

2. The committee has noted your compliance with all the ethical concerns raised in the initial review of the proposal. In the light of this, I am pleased to convey to you the approval of committee for the implementation of the Research Proposal in Oyo State, Nigeria.

3. Please note that the committee will monitor closely and follow up the implementation of the research study. However, the Ministry of Health would like to have a copy of the results and conclusions of the findings as this will help in policy making in the health sector.

4. Wishing you all the best.

[illegible] (Dr)
Director, Planning, Research & Statistics
Secretary, Oyo State, Research Ethical Review Committee