ASSESSMENT OF NURSES' HAND HYGIENE PRACTICES IN PRIMARY HEALTH CARE CLINICS OF ETHEKWINI MUNICIPALITY

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Declaration

This is to certify that the work is entirely my own and not of any other person, unless explicitly acknowledged (including citation of published and unpublished sources). The work has not previously been submitted in any form to the Durban University of Technology or to any other institution for assessment or for any other purpose.

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Signature of student Date

Approved for final submission

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Abstract

Background

Hands of heath care workers are known to be the main vehicle in the transmission of infectious agents in the health care setting. Hand hygiene is an essential, cheap, simple, effective and the corner stone in infection and control strategies, and it plays a major role in reduction of health care associated infections. The focus on hand hygiene has been hospital based because of the health care associated infections within those settings. The high utilization of the primary health care (PHC) clinics, the complexity and comprehensiveness of the services rendered in PHC clinics, the more invasive procedures that are being performed in PHC clinics and the studies on hand hygiene that were focused mainly in hospitals setting motivated the study on the assessment of hand hygiene practices in PHC clinics.

Aim of the study

The aim of the study was to assess hand hygiene practices of nurses in the PHC facilities of eThekwini municipality.

Methodology

This study was a descriptive, observational and survey study design in a quantitative paradigm, conducted in three PHC clinics with high caseload. The non-probability, purposive sampling method was used to select PHC clinics. The study population were the nurses from the three selected PHC clinics. An adapted Infection Control Self-Assessment Tools for PHC Facilities was used to collect data. An adapted self-reported World Health Organisation Hand Hygiene Knowledge Questionnaire for Health Care Workers Assessment Tool was used to assess knowledge and training in hand hygiene. Data was analysed using SPSS version 22.0. Inferential statistics were used to determine the relationship between the variables.

Results

The results showed that in all the three PHC clinics, hand hygiene was performed more frequently after contact with patients than before contact with patients in both invasive and non-invasive procedures. The commonly used method of hand hygiene was hand rubbing with alcohol hand rub than hand washing. In observing whether the hand rubbing steps were followed, this was done significantly less than half the time (p=<.0005). The average knowledge score across all questions was 73.64% and there was no significant correlation between knowledge and percentage of time using HH.

Key words: hand hygiene, hand hygiene practices, nurses, primary health care clinic.

Dedication

The study is dedicated to:

- The field of infection prevention and control, and communities that are reliant on the health system for safe care.
- The nursing profession as the back bone of the health care system.

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Glossary of terms

Alcohol-based (hand) rub

An alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to inactivate microorganisms and/or temporarily suppress their growth. Such preparations may contain one or more types of alcohol, other active ingredients with excipients, and humectants (WHO 2009b: 4).

Antiseptic hand rubbing (or hand rubbing)

Applying an antiseptic hand rub to reduce or inhibit the growth of microorganisms without the need for an exogenous source of water and requiring no rinsing or drying with towels or other (WHO 2009b: 4).

Colonisation

A microbe that establishes itself in a particular environment such as a body surface without producing disease is said to “colonize” the site (Wilson 2006: 316).

Hand hygiene

A general term referring to any action of hand cleansing. Hand rubbing with an alcohol-based hand rub or hand washing with soap and water aimed at reducing or inhibiting the growth of micro-organisms on hands (WHO 2009b: 4).

Hand washing

The physical removal of microorganisms from the hands washing with soap (plain or antimicrobial) and running water (WHO 2009b: 4).

Health care associated infection (nosocomial or hospital-associated infection)

An infection acquired in a health care facility by a health care user, health care worker, or a visitor to a health care facility, who was in the facility for a reason other than that infection (Department of Health 2007: 8).

Infection prevention and control

Infection prevention and control refers to measures, practices, protocols and procedures aimed at preventing and controlling infections and transmission of infections in health care settings (Department of Health 2007: 8).

WHO Five Moments of Hand Hygiene

The point(s) in an activity at which hand hygiene is performed. Reminder of when hand hygiene should be performed by the health care worker (Dramowski 2014: 80).

List of acronyms

Acronym	Full word/sentence
ABHR	Alcohol hand-based hand rub
AHR	Alcohol hand rub
BR	Blood room
CDC	Centres for Disease Control and Prevention
CR	Consultation room
DHS	District Health System
EN	Enrolled nurse
ENA	Enrolled nurse auxiliary
HCAIs	Health Care Associated Infections
HCW	Health care worker
HH	Hand hygiene
HW	Hand washing
IA	Invasive after contact
IB	Invasive before contact
ICAT	Infection control assessment tool
IPC	Infection Prevention and Control
IMM	Immunization room
MRSA	Methicillin resistant staphylococcus aureus
NIA	Non-invasive after contact
NIB	Non-invasive before contact
KZNPA	KwaZulu-Natal Provincial Administration
OR	Observation room
PHC	Primary health care
PN	Professional nurse
WHO	World Health Organization

CHAPTER 1: OVERVIEW OF THE STUDY

1.1 INTRODUCTION AND BACKGOUND OF THE STUDY

Hands of health care workers (HCWs) are known to be a vehicle for transmission of micro-organism to patients leading to the Health Care Associated Infections (HCAIs) (Dramowski 2014: 78), and hand hygiene (HH), which is a simple and cost-effective action remains a primary prevention measure and important in infection control (Centres for Disease Control and Prevention [CDC] (2002: 2). According to the World Health Organisation (WHO), thousands of individuals die daily due to infections acquired whilst receiving health care, mainly from the hands of the HCWs (WHO 2009a: 1-12). Such infections can be prevented not only from infected and draining wounds but from frequently colonized areas of the normal and intact skin, and therefore HH is applied at all times during patient care. With constant and proper HH only, there is a significant reduction in HCAIs, which according to Damani (2003: 55), the reduction can be up to 30%. This indicates the importance of consistency of good HH practices in the health care settings.

HCAIs are a major problem in patient safety and in both hospital and ambulatory setting they appear to be hidden as a result of the complexity in their diagnosis. It is estimated that more than 1.4 million patients globally in both developing and developed countries are affected at any time. Their impact causes prolonged hospital stay, financial burden on both patient and family, increased micro bacterial resistance, mortality, and therefore are a contributing factor to the disease outbreak. Their prevention and surveillance has to be a priority for making healthcare safe. The challenge faced with their surveillance in developing countries remains a high unattainable goal as a result of poor hygiene, sanitation, lack and unavailability of equipment, overcrowding and limited financial resources (WHO 2009a: 124; WHO 2012: 6).

The importance for consistent HH is due to the fact that the main causes of the HCAIs are bacteria and viruses residing in the nose, skin and intestine. These agents do not cause any infections in their native environments until transported from patient to patient through the contaminated hands of the HCWs or instruments, examples are *Klebsiella* bacterium which is problematic in developing countries and Methicillin Resistant *Staphylococcus aureus* an organism resistant to antibiotics and *Clostridiumdifficile, which* remain common causes of HCAIs in developed countries. Compliance to good HH practices remain the most important measure in preventing their spread (Dennil 2009: 16). Irrespective of an improved awareness of the problem, there is global low compliance of the HCWs to HH practices (WHO 2009a: 66).

Bencko and Schejbalova (2006: 3) agree that in all the infection prevention and control measures in HCAIs, HH interventions remain the most important, attainable, accessible, simplest, and least expensive means to prevent them and the spread of microbial resistance. Furthermore, the WHO emphasizes that HH practices has to be observed by all the HCWs, caregivers or any individuals who are in direct or indirect contact with patients, and the practice must be done correctly and consistency for any impact (WHO 2009a: 9).

Ziady (2010b: 34-36) agrees that unless the right procedure for good HH is implemented, and the right supplies as recommended are made available and used, the strategy will not be effective. Hence, authorities need to ensure compliance of the HCWs to this strategy in order to witness the reduction of HCAIs.

The effect of HH in reducing the spread of infection is also critical in outpatient departments which includes PHC clinics but has poor compliance in most health care facilities; furthermore, in outpatient department the culture of infection prevention and control and HH has not been established and prioritized (WHO 2012: 11). According to Dramowski (2014: 47-50), the overcrowding of clinical areas increases the risk of spread of infection due to high load of pathogens and

the proximity of users, and the hands of the HCWs play an important role in the transportation of pathogens causing HCAIs. Furthermore, the author states that, accompanied staff shortages lead to shortcuts in clinical care compromising infection prevention and control strategies. The study by Daviaud and Chopra (2008: 48) confirms that shortage of health personnel has a negative impact on quality and efficiency. According to the Joint Commission (2009: 12), many countries have taken great strides implementing strategies in an effort to improve the occurrence of HCAIs in their health care facilities/ environments resulting in the development of guidelines and policies. However, the issuing of guidelines does not guarantee behaviour change amongst the HCWs. A comprehensive multidisciplinary approach of management support, education and training needs to be employed for effect change. While there are guidelines on hygiene practices in PHC facilities, it is also important to assess whether they are being implemented or not.

The WHO has implemented a campaign known as Clean Care Is Safer Care which was launched in October 2005, as a Patient Safety Challenge urging all countries to undergo their own HH initiative (WHO 2009c: 1). It aimed at reducing HCAIs worldwide, which are known to be the main causes of mortality and morbidity in hospital patients. A key action within 'Clean Care Is Safer Care' is to promote HH globally and at all levels of health care, because HH is a very simple implemented action and well accepted to be one of the primary modes of reducing HCAIs and of enhancing patient safety.

South Africa like other countries has developed a National Infection Prevention and Control Guidelines and Policies to assist the HCWs in the prevention and control of infection (Department of Health 2007:6-7). In addressing the issues of quality, in April 2008, the National Department of Health launched the National Core Standards for Health Establishment in South Africa (Department of Health 2011: 2-11). The National Core Standards has identified six priority areas namely:

- Values and attitudes;
- Waiting times;
- Cleanliness;
- Safety and security;
- Availability of medicines and
- Infection prevention and control, which includes HH as one of the areas monitored for compliance (Department of Health 2011: 2-11).

The KwaZulu-Natal (KZN) Department of Health Infection Control Committee also developed an Infection Prevention and Control Practical Guidelines Based on the National Policy and adapted from the WHO Practical Guidelines for Infection Control in Health Care Facilities for the Management, Prevention and Control of Infections and Hand Hygiene is included (WHO 2003: 1-74).

HH is essential in infection prevention and control strategies but this has not been well researched within the PHC setting (Smith 2009: 15). The field of HH focused in hospitals due to prevalence of HCAIs which lead to prolonged stay in hospital (National Institute for Health and Clinical Excellence 2003: 62). According to the WHO (2012: 7-10), there is limited data or out dated on the occurrence, transmission and infections in outpatients which includes PHC due to the difficulty in measuring HCAIs in these setting as a result of short stay of patients and difficulty in distinguishing them from community-acquired infections. There is a shift of down referral of patients from hospital to outpatient departments and communities with more invasive procedures being performed in these settings creating a greater risk of patients acquiring infections outside the hospital setting.

EThekwini Municipality Health Department through their Quality Assurance Unit has ensured that all their PHC clinics have copies of the Practical Guidelines for Infection Control and Hand Hygiene is included in the guidelines. On monthly basis, these PHC clinics conduct their HH self-reported audits which indicate compliance to HH practices, but according to Gould (2010: 50), self-reporting is an

unreliable method of collecting information about HH behaviour. According to Aziz (2013: 458), audits on hand washing are important as they give knowledge to the available material for hand washing, in his study the interventions as a result of the audit led to 95% improvement in HH practices and availability of alcohol-based hand rub. Inamulhaq, Aziz and Haq (2012: 196) are of the view that hand washing knowledge and practices be assessed in clinic settings as most studies are conducted in tertiary hospitals. The results of their study showed that lack of motivation and basic hand washing supplies were the major factor accompanying in hand washing.

In eThekwini Municipality's PHC clinics, there is no evidence of studies conducted to assess HH practices of nurses in those services. This is most important because of the high utilization of the services, the limited human resources and complexity and comprehensiveness of the services with more invasive procedures being performed in these facilities.

1.2 PROBLEM STATEMENT

HH is at the very core of the standard precautions and remains the corner stone and feasible method in infection prevention and control in all health care settings (WHO 2009b: 6). The WHO further argues that nurses do not practice HH during contact with patients either because of lack of hand washing supplies or the procedure is not seen as important in an ambulatory nature of the PHC clinics. The global economy has an impact on availability of resources whereby the state of the economy has caused countries to apply strict budgetary measures in an effort to save money. Institutional managers are under pressure to preserve finances and this is done at the expense of strategies like infection prevention and control. In an effort to save money there is procurement of poor quality and quantity of hand washing liquids/ soaps, cheap hand rub, and lighter paper towels. The availability of these HH supplies and the organizational culture play a major role in compliance to HH practices (Ziady 2010a: 2). Lack of these resources in low-and middle-income countries has made implementation of prevention and control

unsuccessful. On the contrary, the study by Mathai, Allegranzi, Seto, Chraiti, Sax, Larson, and Pittet (2010: 349) showed low compliance to HH practices regardless of the available resources.

Developing countries are more affected with high prevalence of HCAIs than developed countries (WHO 2009a: 7). This is due to the fact that the burden of these infections is determined by availability of the infection control measures. On the other hand, the infection control measures depend on financial resources to ensure adequate staffing, appropriate equipment for HH and adequate structures. Since developing countries are faced with financial constraints, they are affected hardest by these infections.

The South African Health System has adopted District Health System (DHS) as a vehicle for delivery of PHC approach. The PHC provides a comprehensive range of services to meet all health care needs of the population which include communicable and non-communicable diseases. The delivery of these services is through a supermarket approach and one-stop-shop approaches where in the same facility, at one visit different services can be offered (Dennil 2009: 16). The study, a model for the integration of PHC services in KZN, South Africa, confirmed the concept of supermarket approach and one-stop shop. In the study it was observed that all services were offered under one-roof, with larger facilities offering the services in different consultation rooms. This led to some of the facilities having to operate for extended hours and the compromised quality of care (Sibiya and Gwele 2009: 34). Furthermore, amongst other things the challenge with the system is lack of resources and overcrowding which was one of the concerns raised at the South African National Nursing Summit held in April 2011. The summit further raised the issues of the declining status of nursing; most nurses are employed by the public sector where there are high shortages of staff, abnormal staff patient ratios, lack of equipment and shortage of drugs and supplies. All these factors have a negative impact on the quality of service delivery and that includes practicing HH in routine patient care (Department of Health 2012: 24).

1.3 AIM OF THE STUDY

The aim of this study is to assess HH practices of nurses within PHC clinics of eThekwini municipality.

1.4 OBJECTIVES OF THE STUDY

The objectives of the study were to:

- Determine and document nurse's HH practices before and after patient contact through observation.
- Assess the availability of supplies for HH.
- Determine knowledge of nurses on HH practices.
- Determine if there is any association between HH practices, the availability of supplies for HH and the knowledge of nurses on HH practices.

1.5 SIGNIFICANCE OF THE STUDY

The findings will inform authorities on the organizational culture with regard to HH, which is a very important measure in infection prevention and control. Secondly the findings will assist in the development of appropriate and sustainable strategies to create awareness of HH and that will result in the reduction of infections within PHC facilities and communities. The findings will also help in the development of surveillance, monitoring and evaluation systems for infection, prevention and control. Interestingly a study in Mongolia revealed that hospital officials were reluctant to support infection control with both human and financial resources due to lack of data to prove the existence of HCAI. The lack of evidence to show the burden of infections was not a true reflection as there was dishonesty in reporting infections because of the punitive stance that authorities took on staff for non-compliance (Ider, Adams, Morton, Whitby and Clements 2012: 170).

The findings and recommendations will influence nursing education curriculum planners to include the field of infection prevention and control as key to patient safety and quality care. Kelcikova, Skodova and Straka (2011: 152) are of the view that lack of impertinence and attention on HH in basic nursing education programme has a negative impact on knowledge and compliance in HH practices of students. Subsequent to that there is non-compliance to HH practice of health care professionals. The study indicated more attention on HH to be paid in basic training to continue during practical training of students. The results of the study will influence employers to include infection prevention and control in the workplace skills development plan.

1.6 THEORETICAL FRAMEWORK

A theoretical framework is a set of ideas that directs, explains, guides and predicts the nature of the phenomenon under study (Brink 2006: 24; De Vos *et al*. 2009: 40). It helps to organize the study and, provides a context to examine the problem and gather and analyse data. The theoretical framework within which the study was undertaken is that of the Logic Framework for Programme Evaluation. The logic framework approach originated as a response to the analysis of the project evaluation of the US agency in 1969 and its now adopted worldwide and even taught in government and academic institutions. (Practical Concepts Incorporated 1979:1-2). According to the CDC (1999: 5), programme evaluation is a systemic way of improving and accounting for public health action. The Framework for Programme Evaluation is a practical and a non-prescriptive tool that assist to organise the important essentials of programme evaluation. It comprises the following six steps:

Step 1: Engage stakeholders.

Step 2: Describe the programme.

Step 3: Focus the evaluation design.

Step 4: Gather credible evidence.

Step 5: Justify conclusions.

Step 6: Ensure use and share lessons learned.

The logic framework model is a tool used in describing the programme (step 2) in programme evaluation and the study used that model. The logic model describes linkages among programme resources, activities, outputs, and short, intermediate and long-term outcomes related to specific problem or situation it is used to depict the programme components. The logic model describes the sequence of events for bringing about change. The model uses flow charts, map or a table to portray the sequence of steps leading to programme results. The model has the ability to display the infrastructure needed to support the operations of the programme. The logic model has two components process and outcome. The process describes the programmes inputs (resources), activities (actual events or actions that takes place) and outputs (direct products or direct tangible outputs of programme activities). The outcome describes the intended effects of the programme; it's the impact of the programme, which can be short term, intermediate, and or long term. Arrows depict the logical links between inputs, activities, and outcomes.

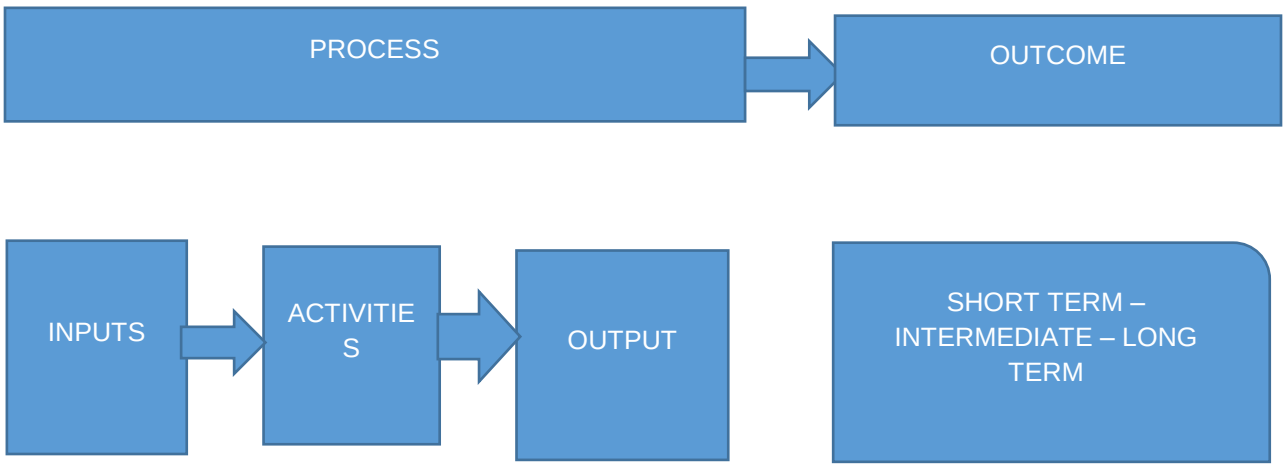

Figure 1.1: Components of a logic model

In the logic framework approach the assumption is that if resources(inputs) are available to the programme, then the programme activities can be implemented, if programme activities are implemented successfully then certain outputs and outcomes can be expected. The relationship of IF and THEN as shown in Figure 1.2 connects the components of the logic model.

IF------

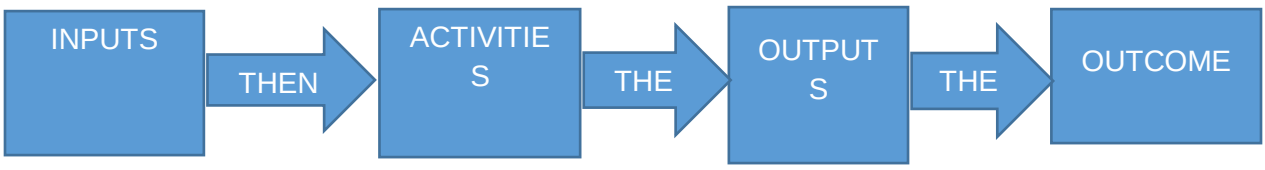

Figure 1.2: Components of logic framework connected by if---then relationship

The logic framework of programme evaluation was used in the study and focused on assessing the availability of HH supplies like running water, sinks, hand soap, pedal bins, hand paper towel, alcohol based hand rub, HH guidelines and HH posters as reminders (inputs), to assess the HH practices before contact, after contact, after using gloves and steps in hand washing and steps in hand rubbing (activities) and finally it assessed the desired results of compliance to HH practices by nurses according to HH guidelines (outputs). According to the Department of Health (2016: 117), for provision of good quality of clinical care, it is essential that the inputs, processes and outcomes of care conform to desired standards and they have to be continually monitored and improved.

In results-based management the logic framework approach is the important management tool for systematic planning, implementing as well as monitoring and evaluation of projects and programmes (Ile, Eresia-Eke and Allen-Ile 2012: 98).

1.7 STRUCTURE OF THE DISSERTATION

Chapter 1: Introduction and background.

Chapter 2: Literature review.

Chapter 3: Research methodology.

Chapter 4: Presentation of the results.

Chapter 5: Discussion of results.

Chapter 6: Conclusion, limitations of the study and recommendations.

1.8 SUMMARY OF THE CHAPTER

This chapter introduced the study and provided the background for the research. The purpose and the objectives were highlighted, the significance of the study is clarified and the theoretical framework within which the study will be based on. The problem statement is elaborated and operational terms are defined. Chapter two will focus on the relevant reviewed literature relating to this study for insight and support its relevance.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

Literature under review will discuss historical perspective of HH, normal bacterial skin flora, evidence of transmission of pathogens on hands and indication for HH, practices of the HCWs and education and training both globally and locally. Relevant research articles and sources were reviewed to support the need for the study and to develop an understanding of the literature in the field of study. Sources like the WHO Guidelines were used since the WHO has developed evidence-based guidelines on HH to support healthcare facilities to improve HH and thus reduce HCAIs, various journals, books, research articles, national government policies and guidelines were also used. A number of library resources of Durban University of Technology (DUT) were optimally utilised for local and international input through the inter-library loan system. Various electronic library databases were consulted.

2.2 HISTORICAL PERSPECTIVE OF HAND HYGIENE

The HCAIs and HH was first established in 1847 by Ignaz Semmelweis who is considered to be the father of HH; who concluded that HCAIs were transmitted via the hands of the HCWs upon observing higher mortality in one clinic than the other (Best and Neuhauser 2004: 233). He observed that medical students went to delivery room after performing autopsies and their hands had bad odours even after washing with soap and water. As a result, Semmelweis recommended that hand scrubbing with chlorinated lime solution before every patient contact after leaving the autopsy room, with this intervention the mortality rate dropped to 3%. It was concluded that the high maternal mortality rate due to puerperal fever was spread through the contaminated hands of health personnel by infectious particles. As a result of Semmelweis discovery, hand washing became the most important measure for the prevention of transmission of infections in health care setting (WHO 2009b: 9).

2.3 NORMAL BACTERIA OF THE SKIN FLORA

The two micro-organisms of the skin are transient and resident. Transient are on the surface layer of the skin, the epidermis. They are easily transmitted by physical contact between patients, HCWs and health care environment. They are carried on the skin for the short period and are easily removed with proper HH by the action of rubbing. Resident flora are in deep layers of the skin, the dermis, and is difficult to remove (Dramowski 2014: 79). Micro-organisms like *Staphylococcus aureus* are found on the skin and are the main cause for wound infections. Their entry into the blood stream leads to serious infections like septicaemia, pneumonia and endocarditis. Therefore, the effective measure to prevent their transmission is through appropriate HH (Schultz 2010:12-14).

2.4 EVIDENCE OF TRANSMISSION OF PATHOGENS ON HANDS

Transmission of health care-associated pathogens takes place through direct and indirect contact, droplets, air and the most common vehicle is the hands of the HCWs in most settings. For transmission of pathogens from one patient through the hands of the health care worker the following sequence of events is required:

i. Organisms are present on the patient's skin, or been shed onto inanimate objects immediately surrounding the patient.
ii. The organism from the patient has to be shed from the patient to the surfaces close to him.
iii. The organism must be transferred to the hands of the health care worker from the patient or the patient's surrounding.
iv. The organism must be able to survive on the hands of the health care worker for a few minutes.
v. There has to be inadequate or no hand washing or no practice of HH or the HH agent must be ineffective.
vi. Finally, the contaminated hands of the health care worker must have direct contact with the surface that will touch the patient or be in direct contact with another patient (CDC 2002: 4).

2.5 INDICATIONS FOR HAND HYGIENE

According to Nazarko (2013: 422), patient safety is at the heart of health care and the most important aspect of HH is to wash hands with soap and water and to dry them thoroughly. The WHO recommends the washing of hands when visibly dirty, visibly soaked with blood or body fluid, and after using the toilet (WHO 2009a:152). All other clinical situations where hands are not visibly soiled or dirty an alcohol based hand rub is the preferred method for routine antiseptic, and its faster, more effective and better tolerated by the skin. Wilson (2006: 157-158) concurs that washing with soap and water suffices in removing transient microorganisms. The resident flora is harmless if only skin contact is done. However, invasive procedures cause contamination. This could then enable resident flora to cause serious infections. Hand washing is not enough to get rid of them. Therefore, antiseptic soap and use of micro-biocides is recommended for an invasive procedure.

According to the WHO, it is evidenced that wearing of jewellery and artificial nails during routine care is associated with high colonization of micro-organism and may contribute to the transmission of certain health-care associated pathogens, and interferes with effective HH (WHO 2009a: 132). The recommendations are to discourage HCWs from wearing of jewellery, artificial fingernails or extenders when in direct contact with patients. A simple wedding band can be acceptable except in high risk settings like operating theatre. Natural nails are to be kept short less than 0.5cm long. Furthermore, the WHO (2009a: 62) recommends the use of additional hand lotions to increase hydration and prevent skin irritation as repeated hand washing has a potential to cause skin irritation. However, hand lotions have risks of contamination and refilling the containers has to be discouraged.

The WHO has identified five times when HH should be performed by the HCWs namely the ‘WHO Five Moments for Hand Hygiene’ and forms part of a global HH initiative for HCW (WHO 2009a: 101-102). The five moments include:

Moment 1: Before patient contact

To prevent germ transmission from the health care area to the patient through HCWs hands. Ultimately, to protect the patient from colonization and against exogenous infection by harmful germs in some cases.

Moment 2: Before an antiseptic task/ procedure

To prevent germ transmission to the patient and from one body site to another in the same patient, and from the health care area to the patient through inoculation.

Moment 3: After exposure to body fluids

To protect the HCW from colonization or infection with the patient's germs and to protect the health-care environment from germ contamination and potential subsequent spread.

Moment 4: After patient contact

To protect the HCW from colonization and potential infection by patient germs and to protect the environment in the health-care area from germ contamination and potential spread.

Moment 5: After contact with patient surroundings

To protect the HCW against colonization by patient germs that may be present on surfaces/ objects in patient surroundings and to protect the healthcare environment against germ contamination and potential spread.

In PHC settings, where five indications become unfeasible, it is accepted that one or two moments can be included when assessing HH practices (WHO 2012: 20). According to the WHO, knowledge of good HH practices and techniques is of paramount importance (WHO 2009a: 89-92). If the equipment is available but the technique applied inappropriate HH will not be effective. Techniques include

application of soap and water which is effective in removing debris and micro-organisms and vigorous rubbing of hands under running water. Unless the right soap dispenser, single user paper towel, alcohol based hand rub with 60-90% alcohol and emollient, washing of hands after removal of gloves amongst other things are in place compliance to HH practices will not be realized. HH with alcohol-based hand rubbing include the following steps, applying a palm-full of the product in a cupped hand, covering all surfaces, rubbing hands palm to palm; right palm over left dorsum with interlaced fingers and vice versa; palm to palm with fingers interlaced; backs of fingers to opposing palms with fingers interlocked; rotational rubbing of left thumb clasped in right palm and vice versa; rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa; once dry hands are safe. Hand washing steps include the following, wet hands with water; apply enough soap to cover all hand surfaces; rub hands palm to palm; right palm over left dorsum with interlaced fingers and vice versa; palm to palm with fingers interlaced; backs of fingers to opposing palms with fingers interlocked; rotational rubbing of left thumb clasped in right palm and vice versa; rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa; rinse hands with water; dry hands thoroughly with a single use towel; use towel to turn off tap; the hands are now safe (WHO 2009a: 154-156).

2.6 HAND HYGIENE PRACTICES IN INTERNATIONAL COUNTRIES

Non-compliance to HH is a global problem irrespective of its known benefit to the prevention and control of HCAIs. The findings of the study that was conducted by Baylina and Moreira (2012: 79) revealed that the contributory factors to non-compliance include multiple factors like workloads, accessibility of HH resources, knowledge, training, perceived risk and individual attitude. Developing countries in particular, infection prevention and control is poor which, is a threat to quality of patient care. The study by Ider et al. (2012:170) showed poor compliance to HH practice that was cited by lack of training in infection prevention and control thus staff having no technical skills in this field. Other reasons for non-compliance were

as a result of lack of infection, prevention and control committee, lack of accountability, poor human and financial resources for infection control, and lack of focus of the infection control nurse on infection control as a result of general administrative work making focus on infection control impossible.

The study on assessing role of hand washing in prevention of communicable diseases by Inamulhaq, Aziz and Haq (2012: 196-200) shows that staff had knowledge regarding benefits of hand washing practices however compliance was low due to lack of motivation and hand washing facilities. Of the total participants 55% indicated lack of time, 34.7% heavy rush patients and 15.7% non-conducive environment.

Similar findings were reported in Italy where compliance was based on the perception of the HCWs, which was determined by whether the procedure or area was seen as risky or not, and the other factors were workload and attitudes. Tai, Mok, Ching, Seto and Pittet (2009: 320) argue that 60% nurses and 46% doctors in agreement that HCAI can be prevented by HH, the study further showed 36% nurses and 23% doctors indicated that 6 to10 times hand cleaning per hour was enough. In addition, the adequacy of HH by the study participants was not informed by the number of opportunities to perform the HH. Mathai *et al*. (2010: 349-352) showed the same factors that influenced compliance like varying attitude, and behaviour of different professionals, low adherence to protocols, lack of knowledge and awareness and poor HH agents.

The study findings by Omogbai, Azodo, Ehizele and Umoh (2011: 9) reveal that there is low HH practices especially after contact with patients and removal of gloves, as a result of lack of adequate HH supplies, forgetfulness and busyness of the clinic. The poor compliance to HH was also shown in a baseline interventional study in two outpatient clinics at 11% and 21% and an improvement of 34% and 54% post intervention.

The study by KuKanich, Kaur, Freeman and Powell (2013: 36-37) also showed poor HH compliance prior to patient contact than post patient contact.

In a self-reported study in Hong Kong, compliance to HH practices was low before touching the patient, before aseptic technique, and lowest after touching patient environment. The non-compliance was cited to forgetting, dryness and skin irritation due to agents, and too busy, unpleasant smell of HH agent (Lau, Tang and Malc 2014: 159-164).

The study by Al-Naggar and Al-Jashany (2013: 11) revealed poor compliance of HH practices among medical science students regardless of high knowledge of the role of hand washing in the prevention of the transmission of infection. In the same study the self-reported evaluation showed compliance contrary to the observation, some students were observed washing hands with soap and water whilst some students only used water. Factors for noncompliance ranged from lack of time, forgetfulness, lack of hand washing facilities.

The study in India by Mathai, George and Abraham (2011: 6-15) indicated overall HH compliance rate of only 26% in ICU and a disjuncture between perceived rates of HH and actual observed rates. The researchers observed recontamination where HH practices would be adhered to but nurses would touch themselves or surfaces before contact with patients. Compliance improved significantly with the multimodal interventions of educational session based on the Five Moments of Hand Hygiene, displaying posters, providing verbal reminders, ensuring adequate supply of HH products. This is in agreement with recommendations by the WHO (2009a: 99-110) to employ multifaceted, multimodal HH strategy and an approach that promotes a patient safely culture.

In Brazil, a study by Borges, Rocha, Nunes and Filho (2012: 1-5) shows that over 25% overall compliance to HH practices, and with recommended intervention of poster campaigns and feedback, it improved by 40%-76%. The compliance had shown to be high amongst nurses due to having more opportunities to HH. The

study showed no improvement with HCAIs which remained high and stable even after the intervention. Lack of infrastructure, like sinks and empty alcohol gel dispensers were observed as factors contributing to low compliance. The other observation was nurse's recontamination of other hands by touching other objects. The study by Pittet (2000: 385) reveals that a revolution in compliance to HH from 48%-66% and a decrease in HCAIs from 29%-17% as a result of change from hand washing practices to hand rubs with an alcohol based preparation which is now considered as the standard of health care. The success included the use of wall poster promotion, and bedside hand rub and regular performance feedback. The same improvement was reported in most baseline studies which showed compliance rate below 50% with hand washing and a remarkable improvement with the introduction of hand rub with alcohol based preparation (WHO 2009a: 93). Similarly, a study by Gerrard, Amazian and Fabry (2001: 13-37) shows that there was improvement in HH compliance with the hand rub.

Scandinavian study by Hussen, Khakoo and Hobbs (2007: 566-570) indicates compliance in paediatric intensive care unit (ICU) higher that in adult ICU, the perception being that children are more vulnerable to infection than adults. The traditional hand washing with soap and water was more than the use of alcohol-hand rub (AHR) prior to the intervention among nurses and doctors used both methods equally. Prior to interventions the belief was that AHR cannot be used in known methicillin resistance staphylococcus aureus. Post intervention there was a significant increase HH compliance with the use of AHR and significantly higher among doctors than nurses.

Contrary to Mortel (2012: 1011), there was non-compliance to HH with the increased mortality and morbidity rates which raised hospitals costs. Non-compliance was regardless of IPC programmes which included ongoing education and training, easy access to hand washing facilities, convenient user-friendly alcohol-based hand rubs. The author is of the belief that HH should be as simple as alphabets to nursing as a caring profession and medicines with its hypocritical oath of 'first do no harm'. His recommendation emphasis should be on moral and

ethical obligation since there is no explanation to why education and training is failing to change behaviour in HH practices irrespective of the evidence based recommendations and infection control programme. In the Taiwan national survey, HH practices increased with the perception of H1N1 to be more transmissible than avian influenza, perceived likelihood of contracting H1N1, and the perceived effectiveness of hand washing in preventing H1N1 (Miao and Huang 2012: 604).

2.7 HAND HYGIENE EDUCATION AND TRAINING IN INTERNATIONAL COUNTIRES

Educating of all HCWs is the cornerstone for the improvement of HH practices. It is recommended that it be included in basic nursing and medical training and other critical infection control concepts. It has to be continuous training and to include importance of HH, the 'My Five Moments for Hand Hygiene' and the correct technique of hand washing and hand rubbing. The trainer has to possess basic knowledge of infection control and experience of educational techniques and health-care delivery (WHO 2012: 18).

The lack of knowledge of HH guidelines, unawareness of HH indicator during patient care, and the potential risk of transmission of microorganisms to patients are the barriers to HH compliance and training remains the corner stone in improving these barriers (Pittet 2000: 381-386). Education and training is an integral part in implementation strategies to promote HH practices (Mathai *et al*. 2010: 350). The authors highlight that the HCWs acknowledge and accept that their hands contribute to the spread of infection. They further explain that non-compliance remains a challenge regardless of availability or lack of financial resources. Hence training and education to create awareness is imperative since knowledge influence behaviour. There is limited data to show the impact of training as a successful intervention but what is known is that when people are informed, this information influences the way they behave and more awareness.

An interventional study by Salamati, Poursharifi, Rahbarimanesh and Emadi Koochak (2013: 441) on nursing personnel in Bahrani Paediatric hospital showed improvement in HH performance with lecture method and more improvement when lecture method was combined with motivational interviewing. This is an indication that for even better results mixed strategies should be applied in improving HH practices. Similarly, the systematic literature review by Schweizer, Reisinger, Ohl, Formanek, Blevins, Ward and Perencevich (2014: 248-249) interventions that included education, feedback, reminders like posters, access to alcohol-based hand rub, administrative support had shown to more effective in improving HH compliance.

Kelcikova, Skodova, and Straka (2011: 152-159) are of the view that lack of attention on HH in basic nursing education programme has a negative impact on knowledge and compliance in HH practices of students. Subsequent to that there is noncompliance to HH practice of health care professionals. The study indicated more attention on HH to be paid in basic training to continue during practical training of students.

2.8 HAND HYGIENE PRACTICES IN AFRICA AND SOUTH AFRICA

According to the study by Omogbai *et al*. (2011: 13), among dental professionals in tertiary dental clinic in Benin City, there was inadequate hand washing practices and monitoring despite knowledge of the role of hand washing in prevention of infection, which was cited by lack of hand washing facilities, time and forgetfulness. Respondents indicated a need for training that will cover the indications and the steps for HH. Alex-Hart and Opara (2011: 8) showed low hand washing amongst nurses and even lower before contact with the patient, and higher after contact with patients, which is indicative that HH improves when the HCWs perceive risk for their own health. In the same study noncompliance to hand washing was high where the clinic was busy and where there were inadequate hand washing supplies.

The observational study by Jelly and Tlale (2003: 72) indicated poor compliance of health professional with HH practices. HH compliance before contact with patients was 16.6% with an improvement of 63.6% after patient contact and after removal of gloves. The same study showed that 47% participants washed their hands and adhered to correct HH practices at the time when leaving the ward. Furthermore, the same study indicated that incomplete availability of hand washing facilities contributed to poor compliance to HH practices.

According to the WHO (2012: 18), alcohol-based hand rubs (ABHRs) at the point of care overcome barriers to noncompliance to HH like lack of time, lack of facilities, poor tolerability of HH products agents, and inconvenient location of sinks and dispensers. ABHRs should be made available in wall dispensers or spray bottles at the point of care or attached to trolleys, or in HCWs pockets, they should be made available at entrance of the health care facility for patients to spray their hands to reduce transmission from communities to the health care facility. This has to be done with patient information. Their availability should be assessed for the appropriateness and easy access, and monitoring of their actual use and acceptance by HCWs.

2.9 HAND HYGIENE EDUCATION AND TRAINING IN AFRICA AND SOUTH AFRICA

A study in South Africa public hospital in KZN showed nurses to be having higher level of awareness and knowledge of infection prevention and control policies and procedures than doctors as a result of their regular infection and control training and in that the responsibility of infection control is their function (Arbee, Maher, Mankahla, Naroth, Suleman and Essak, 2012: 32). According to Dramowski (2014: 88), the challenge in training on HH is that the HCWs believe they already know about the topic and new innovative ways to share the information are important. Another study by Dramowski, Marais, Goliath and Mehtar (2015: 73-75) showed that nurses in the rural district received infrequently IPC training either annually or none, in the same district 51% reported in service training in IPC. Furthermore, the

study showed that training improves health care worker's knowledge on IPC and HH compliance, but no change on other IPC practices.

According to Jelly and Tjale (2003: 72-75), continuous training and in-service education on HH practices with the emphasis of its role in reducing nosocomial infection has to be undertaken. The authors put further emphasis on the placing of reminders to reinforce good HH practices and the importance of making available HH supplies, like hand towels, hand soap, water, at all times. The study showed that some health professionals wanted to wash their hands but health supplies were incomplete.

The WHO (2012: 18) concurs with Jelly and Tjale that reminders in the workplace are key tools to prompt and remind HCWs about the importance of HH and the appropriate indications and techniques for HH. For patients, reminders are a means of informing them of the standard of care that they should expect from their HCWs with respect to HH, and educating them to perform HH when entering and leaving the outpatient facility. About 97% of participants in a self-assessment study by Alemangno *et al*. (2010: 469-471) reported the online training to have increased their knowledge of HH practices and the guidelines, and the promotion of behavioural change in clinical practices.

2.10 SUMMARY OF THE CHAPTER

The preceding discussion emphasizes HH, techniques, practices and reasons in noncompliance with practices, knowledge of HH and the role of education and training in promoting compliance. The studies and research reviewed above show low compliance of HH worldwide. The next chapter will discuss the research methodology, approaches that will be utilized in data collection, sampling and analysis.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

The preceding chapter focused on a review of literature with the purpose of discussing available literature in order to substantiate the relevance for the study to be under taken. This chapter describes the research methodology that was utilized in the study.

3.2 RESEARCH DESIGN

Grove, Burns and Gray (2013: 195) define research design as a detailed plan according to which the research is conducted. Mouton (1996: 107) describes the research design as a set of guidelines and instructions which are followed in addressing a problem. This study was a descriptive, observational and survey study design in a quantitative paradigm. The quantitative study allowed the researcher to gather information through structured observation and questionnaire.

3.2.1 Descriptive design

Descriptive designs may be used for the purpose of identifying current practices, making judgment or determine what others in the similar situations are doing (Burns and Grove 2009: 237). The design was chosen to identify patterns of variables and to compare and contrast groups on selected variables (Polit and Beck 2012: 87). This study used descriptive research design to study and provide evidence, and verify the phenomena and its frequency. Self-administered questionnaire was used for data collection.

3.2.2 Observation

Observation is considered the ‘gold standard’ in assessing HH (WHO 2009a: 159). It can be used to assess the products used, whether the proper amount of product is used, the thoroughness of cleansing, whether all surfaces of the hands and fingers are covered, whether hand rubbing occurs for the proper

amount of time, the use of gloves, and whether staffs are performing HH whenever there is an opportunity to do so (The Joint Commission 2006: 20). In this study structured observation was used to collect quantitative data with the aid of observation checklists. This allowed exploration of observable facts without manipulation of variables.

3.3 SETTING

The research setting is the physical location in which data collection takes place (Polit and Beck 2012: 743). The study was conducted at eThekwini Municipality, which comprises sub-districts namely South, North and West. The district health services are jointly provided by the Provincial Department of Health (KZNPA) and the Local Government (eThekwini Municipality) authority, with former contributing 40% of primary healthcare (PHC) clinics and later 60%. EThekwini District is divided into three sub-districts, the South, North and West sub-district (Figure 3.1). There are 45 PHC clinics in the South sub-district, 29 in the North and 28 in the West sub-district. In the South sub-district, 29 PHC clinics are controlled by the Municipality and 16 are controlled by KZNPA. In the North sub-district, 18 clinics are controlled by the municipality and 11 are controlled by KZNPA. In the West sub-district 13 are controlled by the Municipality and 15 are controlled by KZNPA.

The study was conducted in three PHC clinics in each sub-district, namely Clinic V in the North sub-district, clinic P in the West sub-district and clinic T in the South sub-district. These are facilities with high caseload, good infrastructure to allow an observation and high number of nurses.

3.4 STUDY POPULATION

A study population is a well-defined set of elements that have certain properties, like a set of people, in this study being nurses in eThekwini municipality PHC clinics (Burns and Grove 2005: 34; Wood and Haber 2002:240). The study population were the nurses who are involved in providing clinical care like administering injections, doing dressings, drawing bloods, consulting with patients for minor ailments in the three selected PHC clinics. These nurses

comprised of professional nurses, enrolled nurses and enrolled nursing auxiliary. According to the clinic records, clinic V had 23 nursing staff with a caseload of 11 275 patients on average per month. Clinic P had 16 nursing staff and seeing 8 873 patients on average per month, and clinic T with 12 nursing staff and seeing 6120 patients on average per month.

Figure 3.1: Map showing distribution of health care clinics in eThekwini district (EThekwini Municipality 2011)

3.5 SAMPLING PROCESS

The non-probability, purposive sampling method was used to select PHC Clinics. According to Polit and Beck (2008:763), purposive sampling is a non-probability sampling method where participants are selected based on which

ones will be most informative. Due to the small population size, all consenting nurses (43 out of 51 nurses) were targeted to participate in the study.

3.5.1 Inclusion criteria

- Nurses in the employment of eThekwini municipality.
- Nurses who were in direct consultation with patients at that point and time.

3.5.2 Exclusion criteria

- Nurses not employed by the eThekwini municipality.
- Nurses who were not in direct consultation with patients at that point and time.
- Nursing students who were at the PHC Clinics for their practical placements.

3.6 DATA COLLECTION PROCESS

Data was collected in two phases. The first phase included observation of HH practices, and the second phase included survey using a self-reported questionnaire to assess participants' knowledge of HH practices.

3.6.1 Phase 1: Observation of the participants

Phase 1 entailed direct observation of the participants. Observations are chosen as the method of gathering data because it is an ideal method for gathering data on non-verbal behaviour and it allows the researcher to achieve the most objective experience of the community. Data are gathered directly and are not of a retrospective nature (De Vos, Strydom, Fouche and Delport 2011:338). Structured (closed-ended) observation was used to collect data. Structured observation assisted the researcher to focus on specific predetermined areas and aspects (Tashakkori and Teddlie 2010: 221). An adapted Infection Control Self-Assessment Tool (ICAT tool) for PHC Facilities was used to collect data. The ICAT tool for PHC Facilities was originally based on hospital infection control. After being field tested and widely used a need was identified to develop a similar tool with a focus on PHC facilities. The tool

is designed to improve practices for the prevention and control of infections by using easy-to-apply instruments that highlight deficiencies in current practices and suggesting corrective methods. The tool can be applied by any PHC clinic. It uses multiple sets of questions and observation checklists. The following data collection tools were used to collect data:

- Appendix 4: Observation checklist for HH practices.
- Appendix 5: Observation checklist for hand washing practices.
- Appendix 6: Observation checklist for hand rubbing practices, adapted from the WHO poster for hand rubbing technique (WHO 2009a: 155).
- Appendix 7: Observation checklist for assessing hand washing station supplies.

Data was collected by the researcher using direct observation and recorded on the adapted ICAT checklists without the participants being aware that they are being observed for HH practices. According to the WHO, direct observation in HH remains the gold standard in providing detailed information on HH practices (WHO 2009a). The observation was on HH practices before and after contact with patients, on the available supplies for HH and posters illustrating HH practices.

De Vos, Strydom, Fouche and Delport (2011: 329) identify two types of observation, namely disguised (non-participant) and undisguised observation (participant observation). The researcher will use undisguised (participant observation). However, in order to minimise the Hawthorne effect, the researcher spent the first two days in the PHC clinics so that the nurses would get used to her presence (Polit and Beck 2012: 264). Being at the study sites for the first two days before commencing the observation provided an opportunity for the researcher to familiarize herself with the surroundings. During this period, the researcher provided information giving sessions, identifying focus points where to do observations. The researcher thereafter ensured that she remained in the observation sites for longer by spending a minimum of one week in each PHC clinic included in the sample. As nurses are expected to perform HH during clinical care. Thus, each participant was observed more than once per day at different times of the times of the day. The

patient volume of the day may influence the participation's HH practices. The clinic staff members were informed about the study during the information session.

3.6.2 Phase 2: Survey

In Phase 2, nurses were requested to fill a questionnaire in order to assess knowledge and training in HH. Adapted self-reported WHO Hand Hygiene Knowledge Questionnaire for Healthcare Workers Assessment Tool was used (Appendix 8). At the end of each session the nurses were asked to fill a questionnaire to assess knowledge and training in HH.

Data collection from consented participants through the self-administered structured questionnaire was done with clear instructions on how to complete the questionnaire. After completion the participant would then hand it back to the researcher without any disclosure of the name of the facility or the respondent. In consultation with a statistician (Appendix 9), a total of 43 consenting nurses were observed in all the three facilities. Each nurse was observed for a minimum of 10 patients making a total of 430 observations, with Observation Clinic V 160 patients, Observation Clinic P 150 and Observation Clinic T 120 over a period of 5 days in each clinic.

Although the researcher spent one week in each PHC clinic included in the study, the total period of doing the observations was one week per PHC clinic. The first one to two days was used by the researcher to familiarise herself with the PHC clinic as stated above. A total of three weeks was required to complete the observations in the three clinics included in the sample.

3.6.3 Data collection tools

Data collection tools in phase one of the study was used to achieve the first two objectives of the study which were to determine and document nurses' HH practices before and after patient contact through observation, and assess the availability of supplies for HH.

Phase two data collection tools assessed the third and fourth objectives which were to determine knowledge of nurses on HH practices and to determine any association between HH practices, available supplies for HH and knowledge of nurses on HH practices.

3.7 PRE-TESTING OF THE DATA COLLECTION TOOLS

Before conducting the main study, the questionnaire was pre-tested. A questionnaire should be pre-tested before it is actually used to collect data, so as to refine the questionnaire and ensure that respondents had no problems in answering the questions; ensure there are no problems in recording the data; assess the validity of questions; assess the reliability of data to be collected; check adequacy of research methods to be used; and to ensure the feasibility of the research methods to be used. A preliminary analysis of the pre-test data was conducted to ensure that the data collected will enable the investigative questions to be answered completely. For this survey, a pre- test was carried out with a sample of five nurses from the clinic which was not selected for the main study. Their feedback was utilized to refine the grammar of the final questionnaire prior to sending it out to the entire 43 respondents.

3.8 DATA ANALYSIS

Descriptive statistics, in the form of tables and graphs was used to describe the data graphically. In order to test for significant trends in the data, inferential statistics was applied. These included Pearson's correlation to ascertain whether good knowledge was significantly related to good hand hygiene practices, ANOVA to test the significance across variables, chi-square tests to ascertain if any of the frequency categories was selected significantly more often than the others, binomial test was applied to test the significant proportion of observations and Mann-Whitney Test used to determine percentage of time a HH practice used differed significantly with whether there were or no supplies available. Where the conditions were not met for the application of these tests, non-parametric equivalent tests or exact tests were used. A p-value of 0.05 was used to indicate significance.

The analysis was carried out using SPSS version 22.0. Further, the validity of results depended on the correct and appropriate use of statistical tests such that assumptions are not violated.

3.9 RESEARCH RIGOR

Burns and Grove (2009: 34) define research rigor as a search for excellence in research, involving discipline, adherence to details and strict accuracy. A rigorous researcher strives for more precise measurements, representative samples and tightly controlled study designs. In this study, the researcher was at a clinic daily for a week until the required sample was obtained. Validity and reliability were used to ensure the research rigour.

Validity is the ability of the instrument to measure what it's supposed to measure, it is the quality criterion referring to the degree to which inferences made in the study are accurate and well founded in measurement. (Polit and Beck 2012: 745) There was no observer bias as a structured observation was conducted on nurses using the checklist that only measured what it is supposed to measure. Content validity examines the extent to which the questionnaire includes all the major elements relevant to the construct being measured and faces validity of a data collection tool as measuring that the tool look like it is valid and give the appearance of measuring what it was supposed to measure (Burns & Grove 2009: 381). The data collection tools were for face and content validity by means of a pre-test of the data collection tool.

Reliability is defined as the ability of the accuracy and consistency of the information that is obtained in a study and is most often associated with methods that are used to measure the research variables (Polit and Beck 2012: 741). In this study, consistency of the measuring tool was measured using structured checklists to observe nurses' practices in HH and self-reported structured questionnaire which were administered at the end of observation.

Reliability was ensured by pre-testing the data collection tools with the nurses who were working in the PHC clinics and being in contact with patients. This ensured that the pilot respondents were homogenous with the main study respondents.

3.10 ETHICAL CONSIDERATIONS

Before the commencement of the study, the ethical clearance was granted by the Institutional Research Ethics Committee (Appendix 10, Ethics Number 134/15). Blanket approval to access the municipality sites was sought with eThekwini Municipality Health Department (Appendix 1). The study was discussed with the nursing staff without providing the details of the study procedure to avoid behaviour influence. Participants selected were those who were willing to participate without any coercion. Those who were not interested in the study or wanted to withdraw were allowed to opt out or withdraw.

Observation was conducted with minimum or without causing obstruction in the clinic. The participants knew what clinical practices were observed at the end of the observation session which were followed by the debriefing session. Information letters were discussed with the participants, thereafter written consent was sought from the participants (Appendices 2 and 3). Information on the anonymity of the participants during dissemination of the findings of the study was mentioned to the participants. Data collection tools were identified by numbers so that there would be no link between the participants' identity, PHC clinic and information collected. The researcher will keep data collection tools under lock and key for a minimum of 5 years, and thereafter they would be destroyed by shredding. Electronic data will be archived in raw format for five years from completion of the project.

3.11 SUMMARY OF THE CHAPTER

The chapter detailed the methodology used in the study. The study design, study setting, stages and sampling, data collection and data analysis were described. The next chapter will be presenting of the results.

CHAPTER 4: PRESENTATION OF THE RESULTS

4.1 INTRODUCTION

The previous chapter outlined the methodology that was used in conducting the study. As described in the previous chapter data was collected in two phases. Phase one data collection was done through structured (closed ended) observation and was intended to achieve the first two objectives of the study which were to:

- Determine and document nurses' HH practices before and after patient contact through observation, and
- Assess the availability of supplies for HH.

Phase two; participants filled a structured questionnaire to assess their knowledge and training. The questionnaire intended to achieve the study's third and fourth objectives which were to:

- Determine knowledge of nurses on HH practices and
- Determine if there is any association between HH practices, available supplies for HH and knowledge of nurses on HH practices.

4.2 RESEARCH INSTRUMENTS

The research instrument used for phase one data collection was observation checklists adapted from Infection Control Self-Assessment Tool (ICAT tool) for PHC Facilities. The items directly observed from the checklists included the following:

- HH practices before and after contact.
- Hand washing practices.
- Hand rubbing practices.
- Hand washing station supplies.

For Phase 2, a questionnaire adapted from the WHO Hand Hygiene Knowledge Questionnaire for the HCWs Assessment Tool was used.

4.3 SAMPLE REALISATION

4.3.1 Facility included in the study

Three eThekwini Municipality clinics one in the South Sub-district (Clinic T), one in the West sub-district (Clinic P) and one in the North sub-district (Clinic V) were included in the study.

4.3.2 Respondents included in the study

All nurse categories that met the inclusion criteria, and were involved in clinical care at the time of observations were included in the study. 26 were professional nurses, 14 enrolled nurses and 3 enrolled nursing assistants, making a total of 43 nurses that were observed.

4.3.3 Service areas included in the study

The service areas where HH was observed were the areas where clinical care took place and it allowed the nurse to have physical contact with the patient. The following service areas were this included:

- Immunization room (IMM), this was the service area where all the vaccination of babies, pregnant women or any other patient needing vaccines like rabies vaccine would be inoculated. In some instances, the same service area was used to offer family planning methods to women who needed them. The Enrolled nurse (EN) or the Professional nurse (PN) worked in the IMM room.
- Observation area (OR), this was the service area where all the vital signs like temperature, blood pressure, blood sugar, HIV screening are done. The Enrolled nursing assistant (ENA) or the EN worked in the OR.
- Blood room (BR), this was the service area where all patients needing bloods taken for investigation at the laboratory would be bled. On one or two occasion the patient came to show the nurse the needle site which was bruised but the client didn't necessarily come in to be bled. The PN or the EN worked in the BR.

- Consultation room (CR), this was the service area where any of the services like consultation for minor ailments, chronic care like Tuberculosis, Anti-retroviral or any other chronic diseases was rendered. Professional nurses mainly worked in the CR and in some cases enrolled nurses worked in CR when doing wound dressing or managing repeats chronic medication TB.

4.3.4 Number of observations done

- Ten observations were conducted for each nurse in each service area. In some cases, one service area was observed more than once on different days because the nurse using the area would be a different nurse.

4.4 PRESENTATION OF THE RESULTS

This chapter presents the finding that were gathered from the data analysis of both phases of the study. The results are presented according to the study objectives.

The statistical tests that were used to analyse the data include:

- Descriptive statistics including means and standard deviation, frequencies which are presented in tables and for selected elements presented in graphs.
- Non-parametric Kruska Wallis test (equivalent to ANOVA) to test the significance across variables.
- A binomial test was applied to test the significant proportion of observations.
- A chi-square goodness of fit test was applied to ascertain if any of the frequency categories was selected significantly more often than the others.
- Pearson's correlation to ascertain whether good knowledge is significantly related to good hygiene practices.
- Mann-Whitney Test was used to determine percentage of time a HH practice used differed significantly with whether there were or no supplies available.

4.5 ANALYSIS ACCORDING TO THE OBJECTIVES

4.5.1 Objective 1: Nurses' hand hygiene practices before and after patient contact through observation

HH practices before and after patient contact

Table 4.1 below is a summary of responses from the different nurses regarding their HH before and after contact. The analyses showed out the percentage of time that a particular nurse used each process before and after, broken down by invasive and non-invasive procedure.

Table 4.1: Hand hygiene practices

Nurse number	Nurse category	Facility	Service area		Number of observations	Percentage before patient contact			Percentage after patient contact		
						Hand washing	Alcohol rub	None	Hand washing	Alcohol rub	None
1	PN	T	CR	**Invasive**	3	33.3	66.7			100	
				Non-invasive	7	28.6	71.4			100	
2	PN	T	CR	**Invasive**	1			100	100		
				Non-invasive	9			100	11.1	77.8	11.1
3	PN	T	CR	**Invasive**	0						
				Non-invasive	10	60	40		30	70	
4	PN	T	CR	**Invasive**	3		100				100
				Non-invasive	7	42.9	57.1		42.9	42.9	14.3
5	PN	T	CR	**Invasive**	0						
				Non-invasive	10		20	80	20	80	
6	PN	T	CR	**Invasive**	3		33.3	66.7	100		
				Non-invasive	7			100		85.7	14.3
7	PN	T	CR	**Invasive**	2	100				100	
				Non-invasive	8		100			100	
8	EN	T	CR	**Invasive**	0						
				Non-invasive	10			100		60	40
9	EN	T	CR	**Invasive**	4			100			100

				Non-invasive	6			100		50	50
10	EN	T	BR	**Invasive**	10		10	90		50	50
				Non-invasive	0						
11	EN	T	CR	**Invasive**	10		30	70		100	
				Non-invasive	0						
12	ENA	T	CR	**Invasive**	0						
				Non-invasive	9		22.2	77.8		77.8	22.2
1	PN	P	CR	**Invasive**	0						
				Non-invasive	4		40	60		100	
2	PN	P	BR	**Invasive**	4			100			100
				Non-invasive	6			100			100
3	PN	P	CR	**Invasive**	0						
				Non-invasive	10			100		100	
4	PN	PN	CR	**Invasive**	0						
				Non-invasive	10	30	70		20	70	10
5	PN	P	CR	**Invasive**	0						
				Non-invasive	10	10	50	40		100	
6	PN	P	CR	**Invasive**	0						
				Non-invasive	9	22.2	77.8		10	90	
7	PN	P	CR	**Invasive**	1			100		100	

				Non-invasive	9		44.4	55.6		88.9	11.1
8	PN	P	CR	**Invasive**	2			100		100	
				Non-invasive	8		12.5	87.5		50	50
9	EN	P	IMM	**Invasive**	14	7.1	92.9		7.1	92.9	
				Non-invasive	1			100			100
10	EN	P	OR	**Invasive**	9	11.1	66.7	22.2			
				Non-invasive	1			100		90	10
11	EN	P	BR	**Invasive**	10		80	20		90	10
				Non-invasive	0						
12	EN	P	OR	**Invasive**	0						
				Non-invasive	10		80	20	10	80	10
13	EN	P	OR	**Invasive**	0						
				Non-invasive	10			100		100	
14	EN	P	IMM	**Invasive**	10		80	20	20	70	10
				Non-invasive	0						
15	ENA	P	OR	**Invasive**	0						
				Non-invasive	10		40	60		80	20
1	PN	V	CR	**Invasive**	0						
				Non-invasive	10			100			100
2	PN	V	CR	**Invasive**							

				Non-invasive	10		100	10	50	40
3	PN	V	CR	**Invasive**	0					
				Non-invasive	10	30	70	50	50	
4	PN	V	CR	**Invasive**	0					
				Non-invasive	10		100	30	20	50
5	PN	V	CR	**Invasive**	0					
				Non-invasive	10		100		60	40
6	PN	V	CR	**Invasive**	3		100		100	
				Non-invasive	7		100	57.1	42.9	
7	PN	V	CR	**Invasive**	0					
				Non-invasive	1		100		100	
8	PN	V	CR	**Invasive**	3		100	66.7	33.3	
				Non-invasive	7		100	28.6	71.4	
9	PN	V	CR	**Invasive**	2		100		100	
				Non-invasive	8		100			100
10	PN	V	CR	**Invasive**	3		100		100	
				Non-invasive	7	42.9	57.1		85.7	14.3
11	PN	V	CR	**Invasive**	0					
				Non-invasive	10	30	70	20	80	
12	EN	V	OR	**Invasive**						

				Non-invasive	10			100		100	
13	EN	V	OR	**Invasive**	3			100		100	
				Non-invasive	7		57.1	42.9		100	
14	EN	V	OR	**Invasive**	5		20	80		20	80
				Non-invasive	5			100			100
15	EN	V	IMM	**Invasive**	10		10	90	30	70	
				Non-invasive							
16	ENA	V	OR	**Invasive**	0						
				Non-invasive	10			100			100

It can be seen from **Table 4.1** that the majority of nurses did HH after contact with patients, in both invasive and non-invasive procedures. High percentage did not practice any HH before patient contact.

The commonly used method for HH shows to be hand rub more than hand washing.

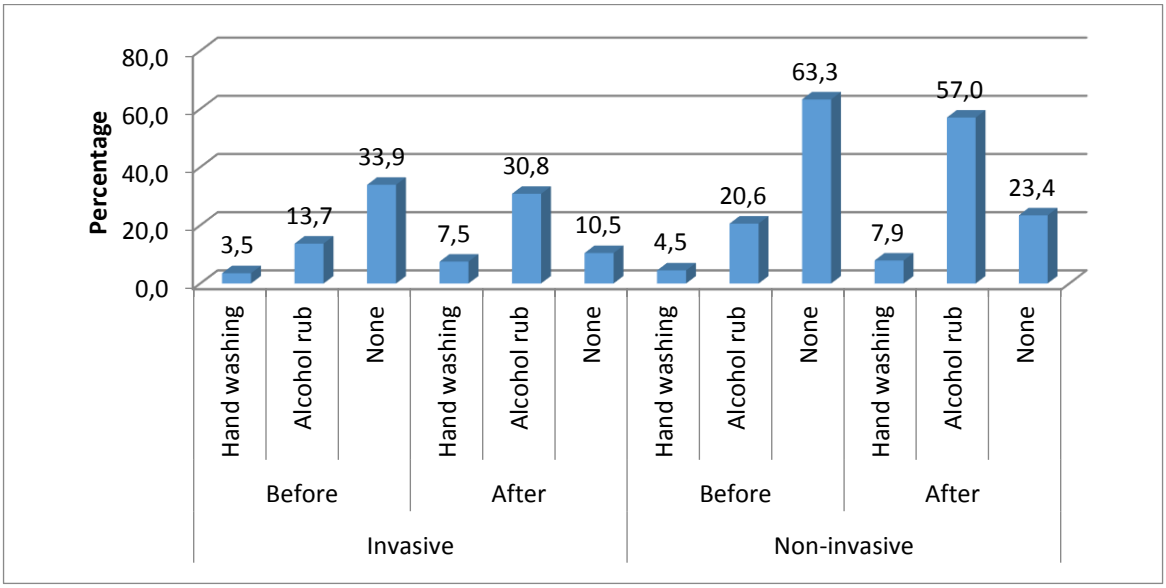

Figure 4.1: Average percentage of time each HH technique was used

As can be seen from **Figure 4.1**, for invasive procedure, before contact hand washing was carried out 3.5% (n=43) of the time (on average) versus 7.5% (n=43) after contact; alcohol-based hand rub was used 13.7% (n=43) of the time (on average) before contact versus 30.8% of the time after contact. 33.9% (n=43) of the time (on average) nothing was done before contact versus and 10.5% (n=43), while 33.9% (n=43) of the time (on average) nothing was done before contact and 10.5% (n=43) of the time (on average) after contact.

For non-invasive procedure, before contact hand washing was carried out 4.5% (n=43) of the time (on average) versus 7.9% (n=43) after contact; alcohol-based hand rub was used 20.6% (n=43) of the time (on average) versus 57% (n=43) of time (on average) after contact, while 63.3% (n=43) of the time (on average) nothing was done before contact and 23.4% (n=43) of the time (on average) after contact.

In order to see if there was a significant difference in HH practice for the professional categories, facilities and service areas, the non-parametric Kruskal Wallis test (equivalent to ANOVA) was applied across all variables one at a time.

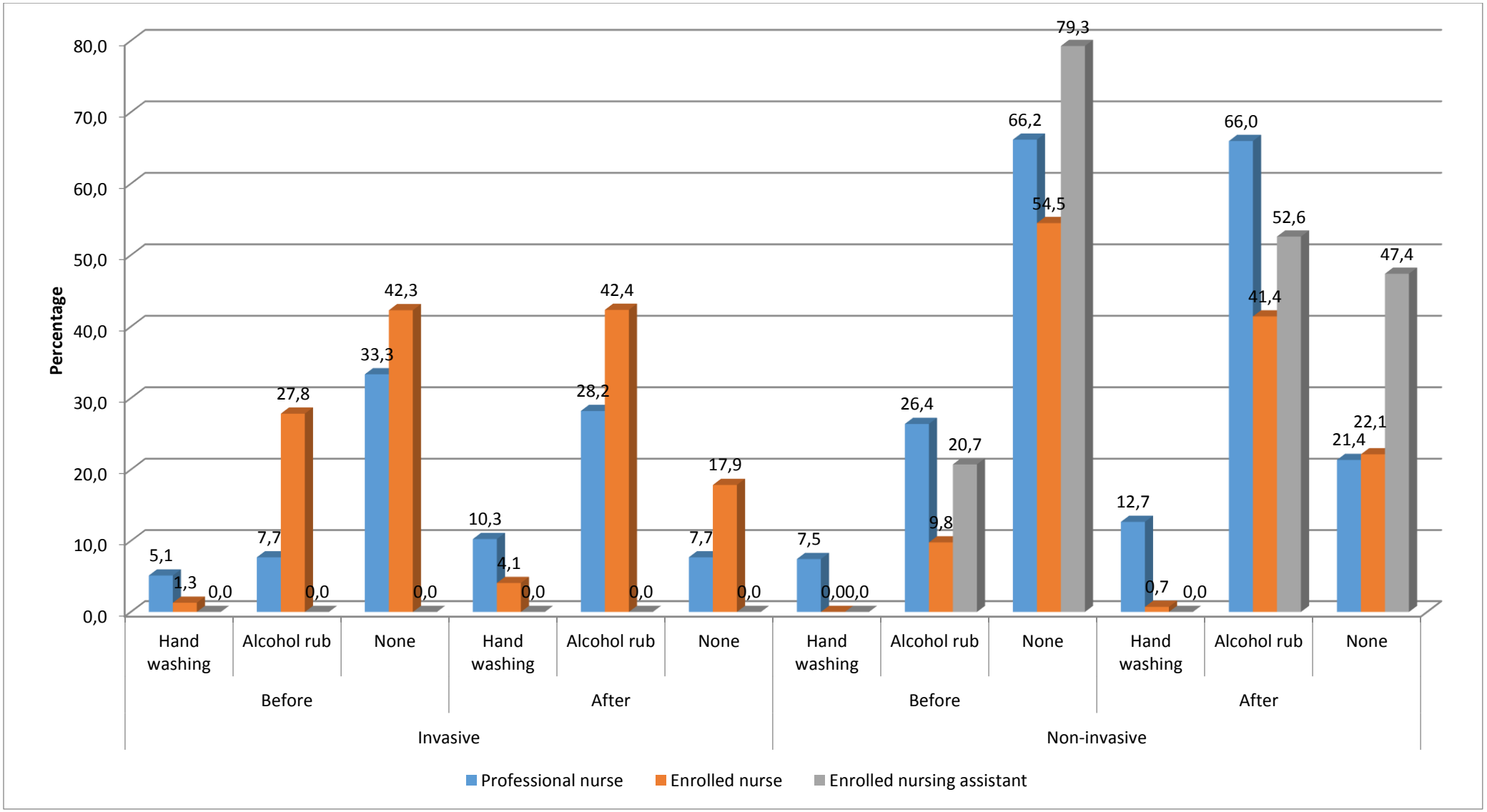

Figure 4.2: Average percentage of time difference each HH technique was used by professional category

Figure 4.2 shows that in invasive procedure hand washing by PN was done 5.1% (n=26) of time before contact and 10.3% (n=26) of time after contact, EN 1.3% (n=14) before and 4.1% (n=14) after contact, ENA 0% (n=3) before and after contact. Hand rub by PN was 7.7% (n=26) before contact and 28.2% (n=26) after contact, EN 27.8% (n=14) before and 42.4% (n=14) after contact. ENA was 0% (n=3) before and after contact.

In non-invasive procedure hand washing by PN was 7.5% (n=26) before contact and 12.7% (n=26) after contact, EN 0% (n=14) before and 0.7% (n=14) after, ENA 0% (n=3) before and after. Hand rub by PN 26.4% (n=26) before and 66.0% (n=26) after, EN 9.8% (n=14) before and 41.4% (n=14) after, ENA 20.7% (n=3) before and 52.7% (n=3) after contact.

It was observed that between 0% to 79.3% of nurses regardless of category in both invasive and non-invasive before and after contact, nurses didn't perform any HH.

Table 4.2 Test for significance difference in average of time each HH technique was used by professional category

Test Statistics[a,b]

	IB hand washing	IB alcohol rub	IB none	IA hand washing	IA alcohol rub	IA alcohol rub	NIB hand washing	NIB alcohol rub	NIB none	NIA hand washing	NIA alcohol rub	NIA none
Chi-Square	.648	9.564	2.971	.931	2.819	4.967	4.421	4.397	.280	8.295	2.302	3.362
df	2	2	2	2	2	2	2	2	2	2	2	2
Asymp. Sig.	.723	.008	.226	.628	.244	.083	.110	.111	.869	.016	.316	.186
a. Kruskal Wallis Test												
b. Grouping Variable: professional category												

The analysis in **Table 4.2** shows that there were significant differences on the use of alcohol rub before invasive contact (χ^2 (2) = 9.564, p=.008). Enrolled nurses used this process significantly more often than professional nurses. There were significant differences across nurse categories on the use of hand washing after non- invasive contact (χ^2 (2) = 8.295, p=.016). Enrolled nurses used this process significantly less often than professional nurses.

There were no significant differences by nurse category for invasive before (IB) hand washing, IB none, invasive after (IA) hand washing, IA alcohol rub, non-invasive before (NIB) hand washing, NIB alcohol rub NIB none, non-invasive after (NIA) alcohol rub and NIA none.

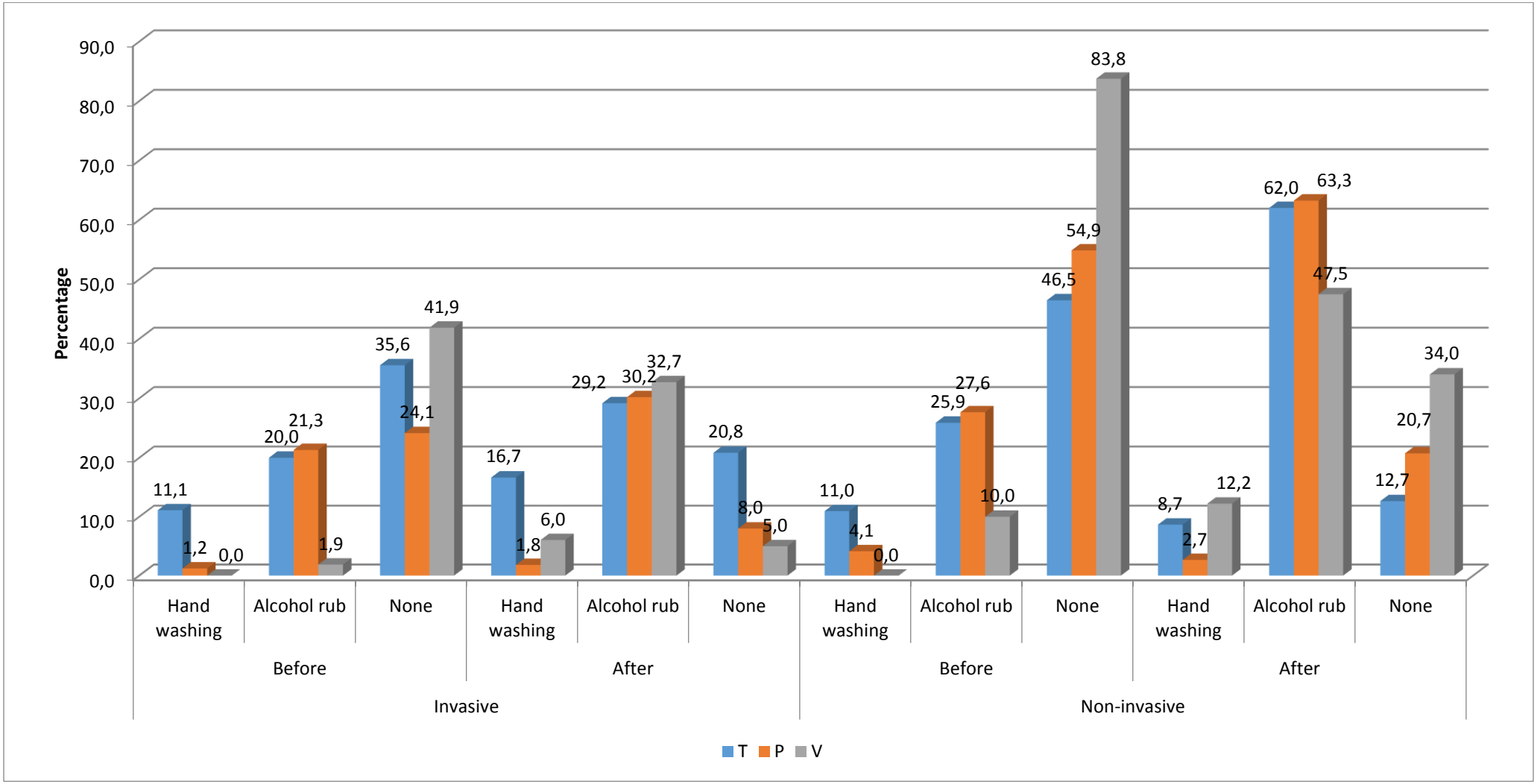

Figure 4.3: Average percentage of time difference each HH technique was used by facility

As it can be seen **Figure 4.3**, invasive procedure hand washing at clinic T was done 11.1% (n=12) of the time before contact versus 16.7% (n=12) after contact, clinic P 1.2% (n=15) before versus 1.8% (n=15) after contact, clinic V 0% (n=16) before versus 6.0% (n=16) after contact. Hand rub at clinic T was 20.0% (n=12) before contact versus 29.2% (n=12) after contact, clinic P 21.3% (n=15) before versus 30.2% (n=15) after contact. Clinic V was 1.9% (n=16) before versus 32.7% (n=16) after contact.

In non-invasive procedure hand washing in clinic T was done 11.0% (n=12) of the time before contact versus 8.7% (n=12) after contact, clinic P 4.1% (n=15) before versus 4.7% (n=15) after contact, clinic V 0% (n=16) before versus 12.2% (n=16) after contact. Hand rub at clinic T was 25.9% (n=12) before contact versus 62.0% (n=12) after contact, clinic P 27.6% (n=15) before versus 63.3% (n=15) after contact, while clinic V was 10% (n=16) before versus 47.5% (n=16) after contact.

It was observed that 24.1% to 83.3%of facilities didn't perform any HH in both invasive and non-invasive before and after contact.

Table 4.3: Test for significance difference in average percentage of time HH technique by facility

Test Statistics[a,b]

	IB hand washing	IB alcohol rub	IB none	IA hand washing	IA alcohol rub	IA none	NIB hand washing	NIB alcohol rub	NIB none	NIA hand washing	NIA alcohol rub	NIA none
Chi-Square	2.717	3.383	.380	.245	.304	2.058	4.305	3.441	6.102	2.003	1.638	.580
df	2	2	2	2	2	2	2	2	2	2	2	2
Asymp. Sig.	.257	.184	.827	.885	.859	.357	.116	.179	.047	.367	.441	.748
a. Kruskal Wallis Test												
b. Grouping Variable: Facility - coded by number												

Table 4.3 shows that there was significant differences of no practice of HH before contact in non- invasive procedures (χ^2 (2) = 6.102, p=.047). Nurses from clinic V reported this significantly (83.9%) more often than nurses from the other facilities, T (46.5%) and P (54.9%).

There were no significant differences across facilities on the use hand washing IB contact, alcohol rub IB contact, none IB contact, hand washing IA contact, alcohol rub IA contact, none IA contact, hand washing NIB, alcohol rub NIB contact, hand washing NIA contact, alcohol rub NIA contact and none NIA contact.

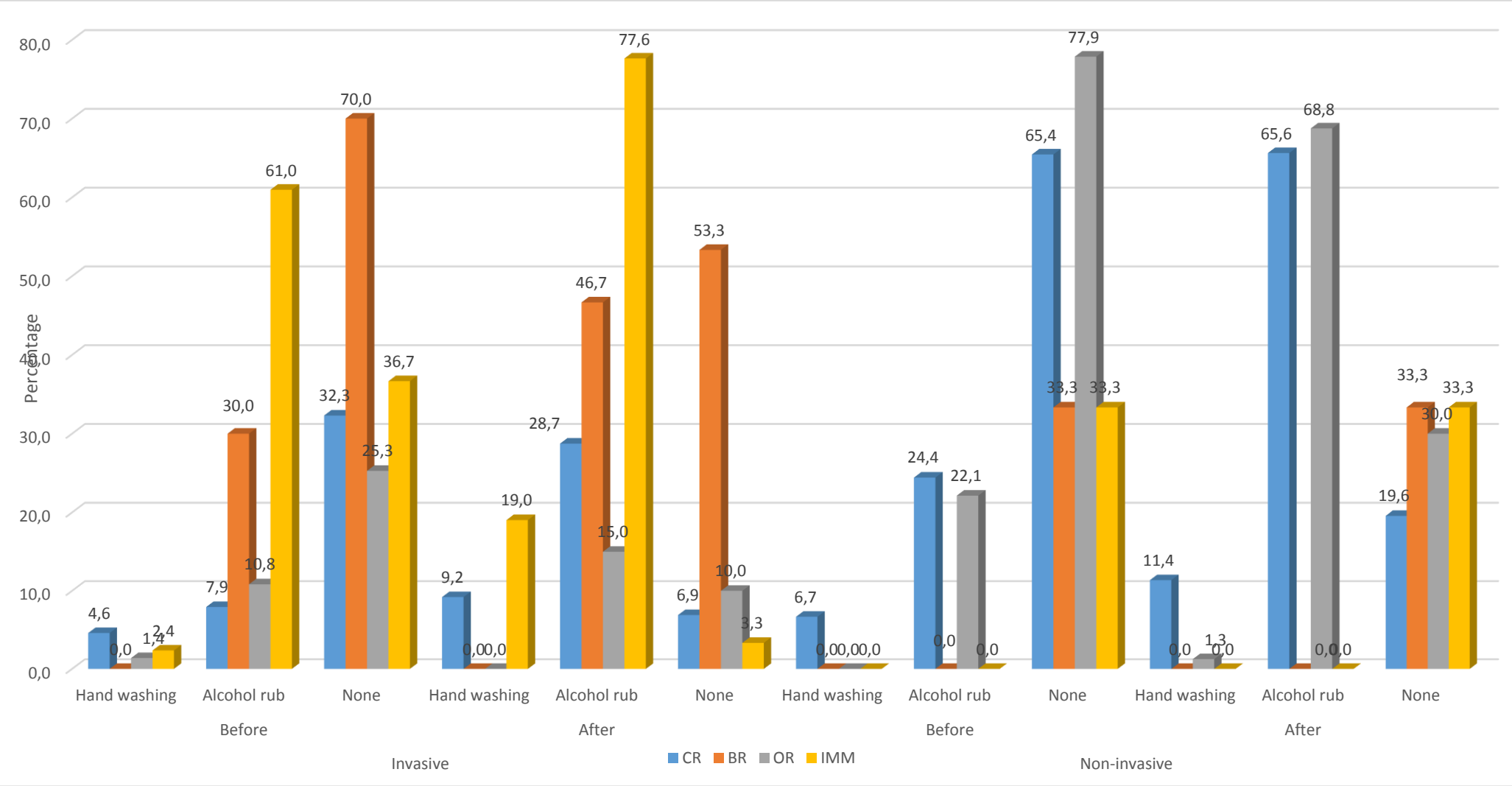

Figure 4.4: Average percentage of time difference each HH technique was used by service area

As it can be seen in **Figure 4.4**, invasive procedure hand washing at CR was done 4.6% (n=29) of the time before contact and 9.2% (n=29)of time after contact, BR 0% (n=3) before and 0% (n=3) after contact, OR 1.4% (n=8) before and 0% (n=8) after contact, IMM 2.4% (n=3) before and 19.0% (n=3) after contact Hand rub at CR was 7.9% (n=29) before contact and 28.7% (n=29) after contact, BR 30% (n=3) before and 46.7% (n=3) after contact. OR10.8% (n=8) before and 15% (n=8) after contact. IMM 61% (n=3) before and 77.6% (n=3) after contact.

In non-invasive procedure hand washing in CR was done 6.7% (n=29) of the time before contact and 11.4% (n=29) of time after contact, BR 0% (n=3) before and 0% (n=3) after contact, OR 0% (n=8) before and 1.3% (n=8) after contact, IMM 0% (n=3) before and 0% (n=3) after contact. Hand rub at CR was 24.4% (n=29) before contact and 65.6% (n=29) after contact, BR 0% (n=3) before and 0% (n=3) after contact. OR 22.1% (n=8) before and 68.8% (n=8) after contact. IMM 0% (n=3) before and 0% (n=3) after contact.

It was observed that 19.6% to 70% in both invasive and non-invasive before and after contact, service areas didn't perform any HH.

Table 4.4: Test for significance difference in average percentage of time HH technique by service area

Test Statistics[a,b]

	IB hand washing	IB alcohol rub	IB none	IA hand washing	IA alcohol rub	IA none	NIB hand washing	NIB alcohol rub	NIB none	NIA hand washing	NIA alcohol rub	NIA none
Chi-Square	2.155	13.043	3.090	17.076	3.828	16.136	3.264	4.617	3.122	5.790	12.091	.248
Df	3	3	3	3	3	3	3	3	3	3	3	3
Asymp. Sig.	.541	.005	.378	.001	.281	.001	.353	.202	.373	.122	.007	.970

a. Kruskal Wallis Test

Table 4.4 shows that there were significant differences across service area on the use of alcohol rub IB contact (χ^2 (3) =13.043, p=.005). BR used this process significantly more than CR, IMM used this process significantly more than CR, IMM used this process significantly more than OR.

There were significant differences across service area on the use of hand washing IA contact (χ^2 (3) =17.076, p=.001). IMM used this process significantly more than CR, IMM practised HH significantly more than BR, IMM used this process significantly more than OR.

There were significant differences across service area on the use of alcohol none IA contact (χ^2 (3) =16.136, p=.001). BR used this process significantly more than CR, BR used this process significantly more than OR.

There were significant differences across service area on the use of alcohol rub after NIA contact (χ^2 (3) =12,091, p=.007). CR used this process significantly more than BR, CR used this process significantly more than IMM.

There were no significant differences by service area for the use of hand washing IB contact, none IB contact, alcohol rub IA contact, none IA contact, hand washing NIB contact, alcohol rub NIB, washing NIA and None NIA contact.

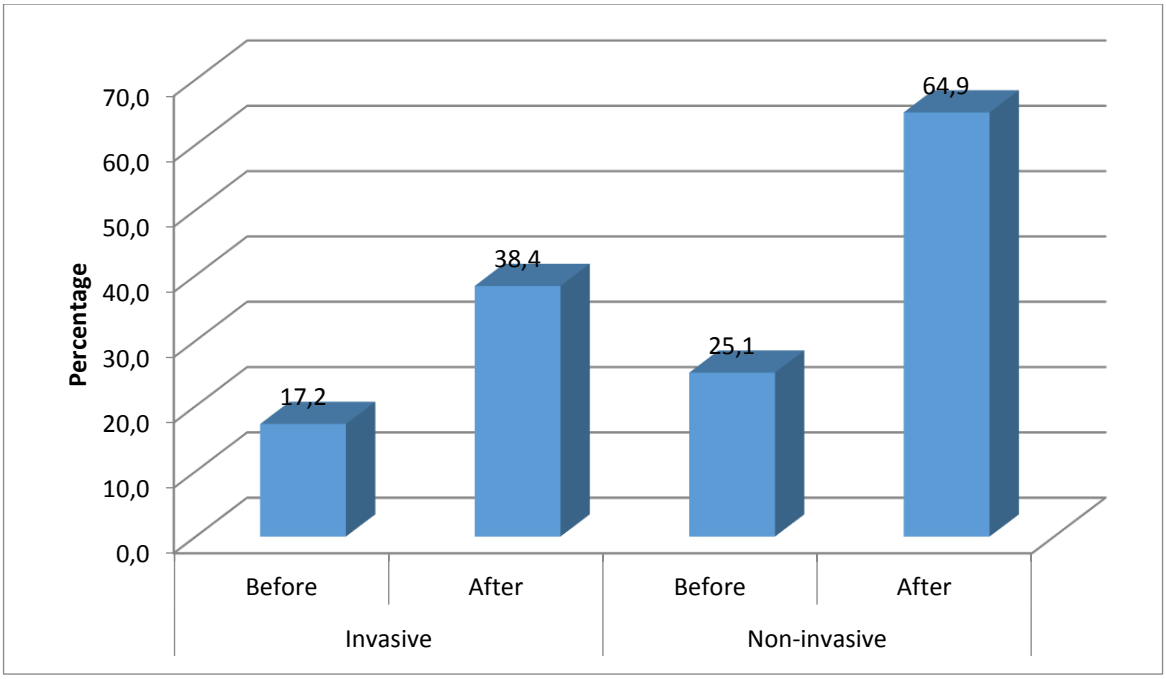

Figure 4.5: Average percentage of time difference both HH techniques were used

It can be observed from **Figure 4.5**, the time on average for HH was more after contact than before contact in both invasive and non-invasive. In invasive procedure HH before contact was 17.2% (n=43) and 38.4% (n=43) after contact. Non-invasive was 25.1% (n=43) before contact and 64.9% (n=43) after contact.

The average percentages are all significantly lower than 50% ($p<.0005$ in each case), which indicates that the HH practices were carried out significantly less often than 50% of the time.

Testing the averages for significant differences across all variables, by service area, by nurse category and by facility Kruskal Wallis was applied.

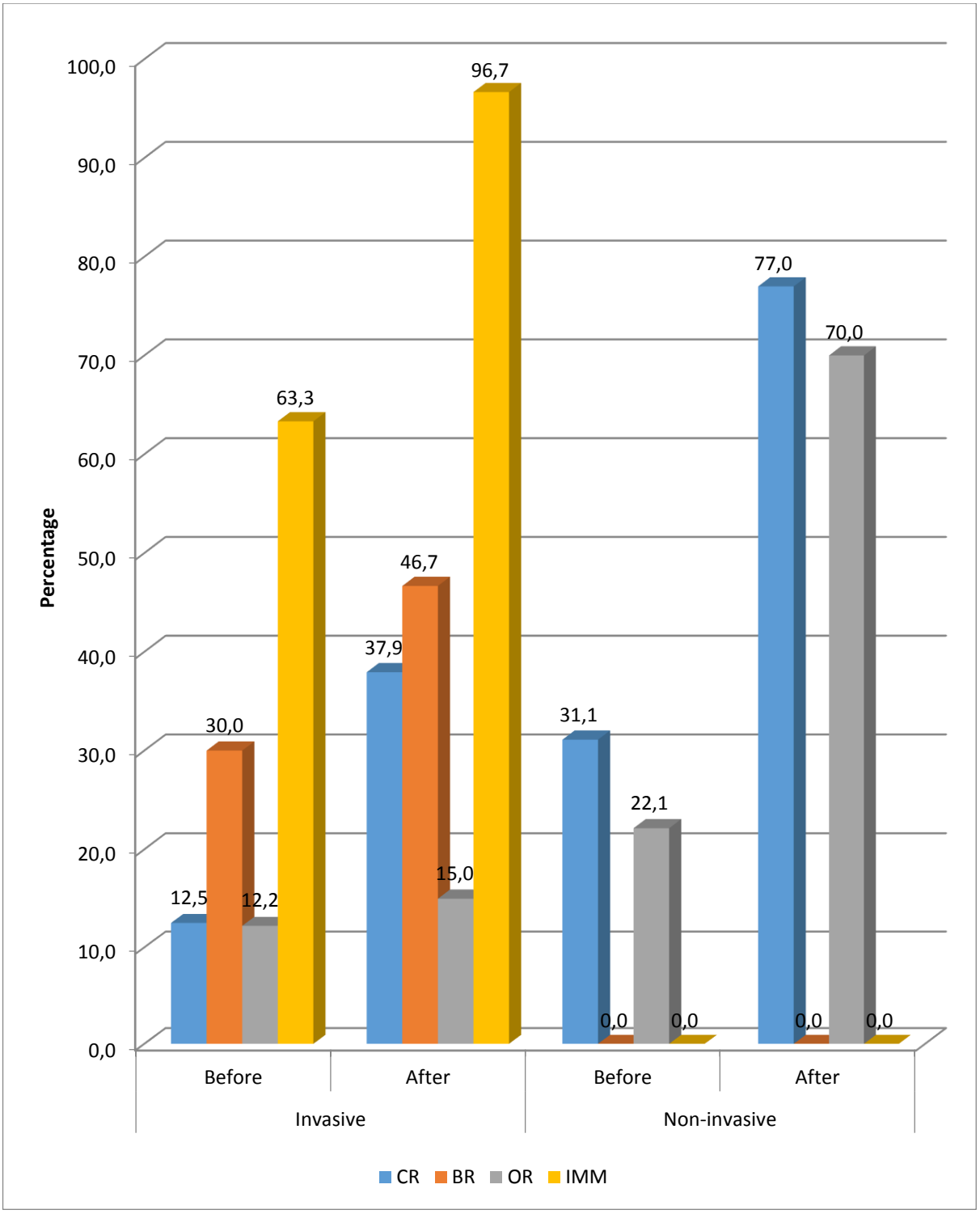

Figure 4.6: Average percentage of time difference both HH techniques were used by service area

As can be seen from **Figure 4.6**, the average time difference of HH before contact is lower than after contact in both invasive and non-invasive.

In invasive before contact CR reported 12.5% (n=29) and 37.9% (n=29) after contact, BR 30% (n=3) before and 46.7% (n=3) after contact, OR 12.2% (n=8) before and 15.0% (n=8) after and IMM 63.3% (n=3) before contact and 96.7% (n=3) after contact.

In non-invasive CR before contact reported 31.1% (n=29) and after 77% (n=29), BR and 0% (n=3) before and after and OR 22.1% (n=8) before and 70% (n=8) after contact and IMM 0% (n=3) before contact and 0% (n=3) after contact.

Table 4.5: Test for significance difference in average percentage of time both HH techniques were used by service area

Test Statistics[a,b]

	HH invasive before	HH Invasive after	HH non-invasive before	HH non-invasive after
Chi-Square	10.113	4.781	4.937	12.218
df	3	3	3	3
Asymp. Sig.	.018	.189	.176	.007

a. Kruskal Wallis Test
b. Grouping Variable: Service area - coded by number

Table 4.5 shows that there were significant differences across service area with HH invasive before contact (χ^2 (3) =10.113, p=.018). IMM used this process significantly more than CR, IMM used this process significantly more than OR.

There were significant differences across service area with HH non-invasive after contact (χ^2 (3) =12.218, p=.007). CR used this process significantly more than BR, CR used this process significantly more than IMM.

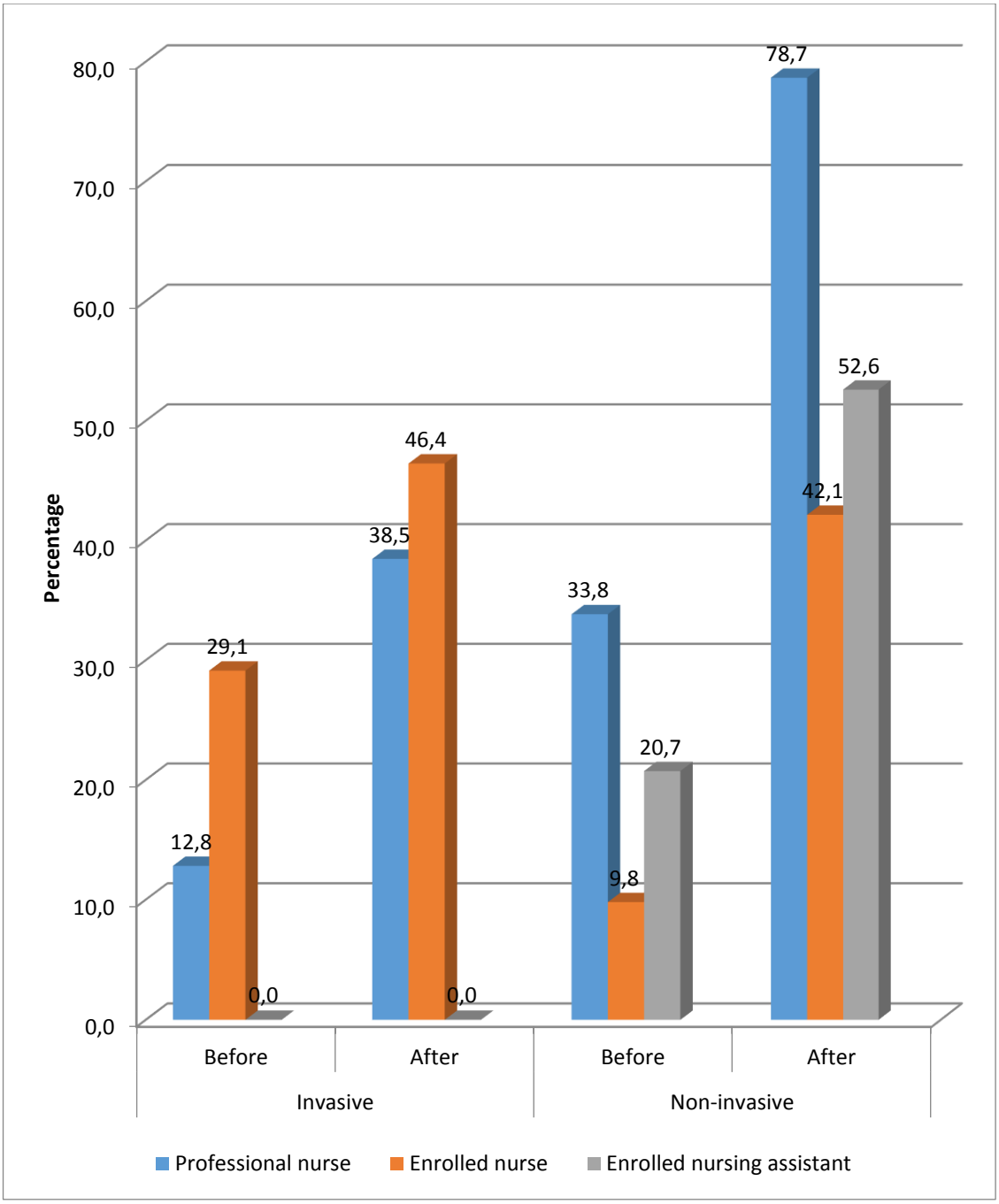

Figure 4.7: Average percentage of time difference both HH techniques were used by professional category

As can be seen in **Figure 4.7** with respect to nurse professional category, in invasive procedure PN reported 12.8% (n=26) before contact and 38.5% (n=26) after contact; EN 29.1% (n=14) before contact and 46.4% (n=14) after contact and ENA 0% (n=3) before contact and 0%(n=3) after contact.

In non-invasive PN reported 33.8% (n=26) before contact and 78.7% (n=26) after contact, EN 9.8% (n=14) before contact and 42.1% (n=14) after contact and ENA 20.7% (n=3) before contact and 52.6% (n=3) after contact.

Table 4.6: Test for significance difference in average percentage of time both HH techniques were used by professional category

Test Statistics[a,b]

	HH invasive before	HH Invasive after	HH non-invasive before	HH non-invasive after
Chi-Square	6.836	2.402	5.377	6.899
df	2	2	2	2
Asymp. Sig.	.033	.301	.068	.032
a. Kruskal Wallis Test				
b. Grouping Variable: professional category				

The analysis in **Table 4.6** showed significant differences across nurse categories on the use of HH invasive before contact (χ^2 (2) = 6.836, p=.033). EN showed significance difference more than PN.

There were significant differences across nurse categories on the use of HH non-invasive after contact (χ^2 (2) = 6.899, p=.032). PN used HH more than EN.

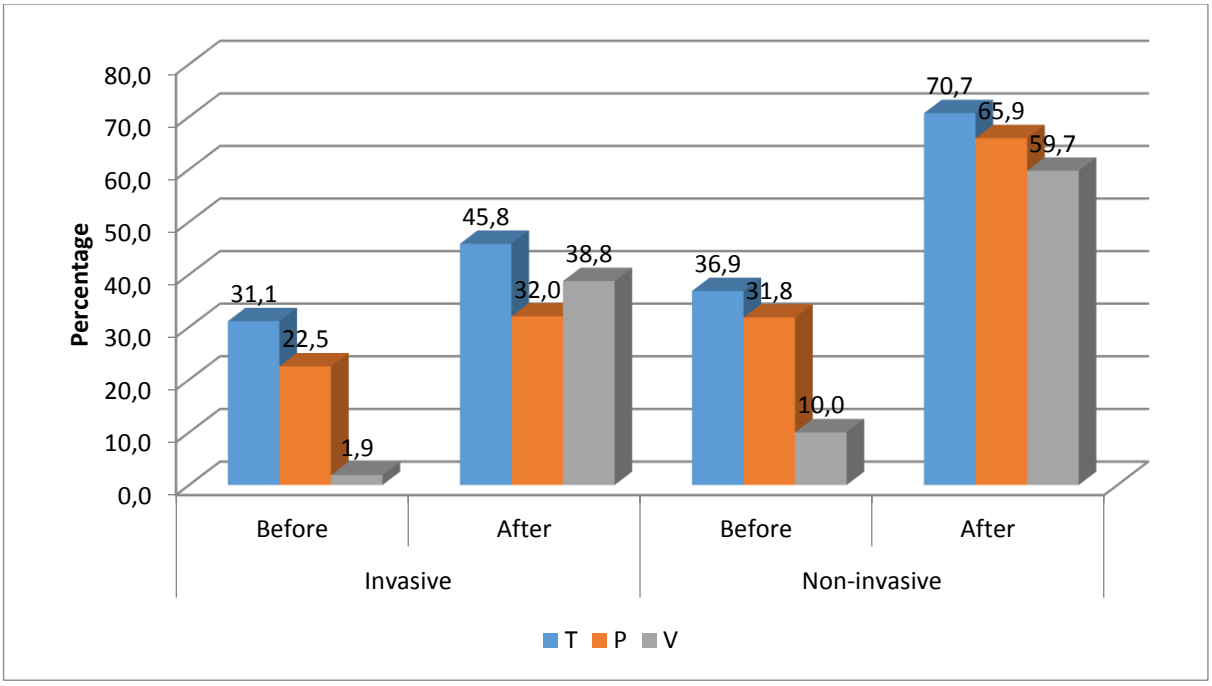

Figure 4.8: Average percentage of time difference both HH techniques were used by facility

As shown in **Figure 4.8** the overall average time difference of HH with respect to facility before contact is lower than after contact in both invasive and non-invasive.

In invasive before contact clinic T reports 31.1% (n=12) and 45.8% (n=12) after contact, clinic P 22.5% (n=15) before and 32% (n=15) after contact, clinic V 1.9% (n=16) before and 38.8% after.

In non-invasive clinic T before contact reported 36.9% (n=12) and after 70.7% (n=12), clinic P 31.8% (n=15) before contact and 65.9% (n=15) after contact, and clinic V 10% (n=16) before and 59.7% (n=16) after contact.

There were no significant differences found with respect to facilities, in both invasive and non-invasive before and after contact.

Table 4.7: Hand rubbing practices

Nurse number	Nurse category	Facility	Service area	Number of applicable observations	Hand rub solution applied fully	All hand rubbing steps followed	Allow hands to dry	Rubbing not less than 20 seconds
1	PN	T	CR	17	47.1	0	100	100
2	PN	T	CR	7	42.9	0	42.9	0
3	PN	T	CR	13	100	0	61.5	30.8
4	PN	T	CR	10	30	0	20	20
5	PN	T	CR	10	60	0	60	40
6	PN	T	CR	7	0	0	71.4	42.9
7	PN	T	CR	18	33.3	0	77.8	94.4
8	EN	T	CR	6	0	0	100	100
9	EN	T	CR	3	0	0	0	0
10	EN	T	BR	6	50	0	66.7	100
11	EN	T	CR	13	30.8	0	30.8	100
12	ENA	T	CR	9	100	0	100	100
1	PN	P	CR	14	64.3	0	100	100
2	PN	P	BR	0				
3	PN	P	CR	10	0	0	100	100
4	PN	P	CR	13	0	0	100	92.3
5	PN	P	CR	15	33.3	0	100	26.7
6	PN	P	CR	17	23.5	0	88.2	23.5
7	PN	P	CR	13	61.5	0	7.7	0
8	PN	P	CR	7	100	0	100	100

9	EN	P	IMM	26	100	0	53.8	42.3
10	EN	P	OR	15	20	0	0	20
11	EN	P	BR	17	0	0	100	0
12	EN	P	OR	14	84.6	0	21.4	7.1
13	EN	P	OR	10	0	0	0	0
14	EN	P	IMM	11	45.5	0	54.5	9.1
15	ENA	P	OR	12	33.3	33.3	33.3	33.3
1	PN	V	CR	0				
2	PN	V	CR	5	100	0	100	100
3	PN	V	CR	8	100	0	25	25
4	PN	V	CR	2	0	0	100	100
5	PN	V	CR	6	33.3	0	33.3	33.3
6	PN	V	CR	6	100	0	100	100
7	PN	V	CR	1	0	100	100	100
8	PN	V	CR	6	100	0	0	0
9	PN	V	CR	2	100	0	100	100
10	PN	V	CR	12	83.3	0	100	66.7
11	PN	V	CR	11	100	0	100	90.9
12	EN	V	OR	10	0	0	0	0
13	EN	V	OR	14	78.6	0	100	78.6
14	EN	V	OR	2	0	0	0	0
15	EN	V	IMM	8	62.5	0	0	37.5
16	ENA	V	OR	0				

As it can be seen in **Table 4.7** there are variations with the full application of the alcohol hand rub, the time for the alcohol hand rub to dry after application. The findings show a very far less number of all categories of nurse that followed the steps for hand rubbing.

Looking at all the nurses' together analysis in **Figure 4.9** showed what percentage of the time, on average, each hand rubbing item is done correctly.

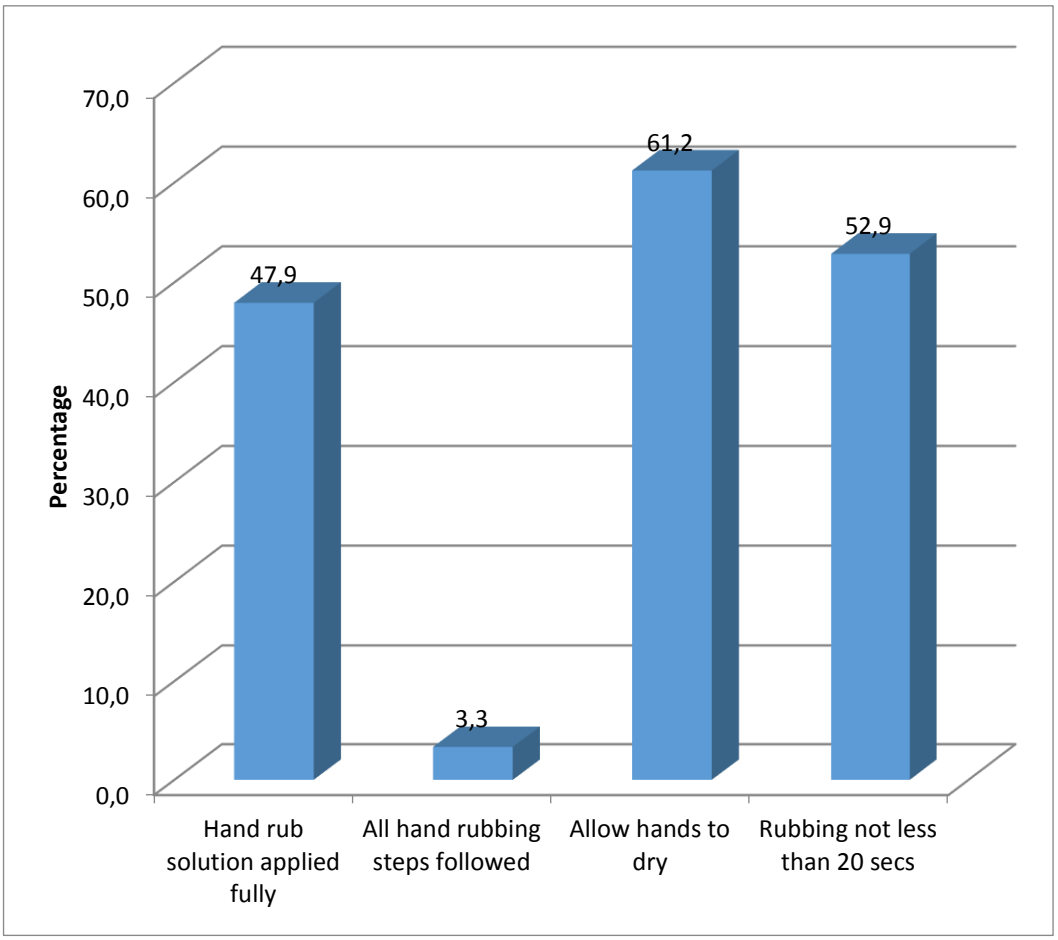

Figure 4.9: Average percentage of time hand rubbing item was done correctly

As it can be seen from **Figure 4.9**, hand rubbing solution was applied fully only 47.9 % (n=40) of the time; all hand rubbing steps were followed only 3.3% (n=0) of the time, hands were allowed to dry only 61% (n=40) of the time and rubbing for not for less than 20 seconds was observed 52, 9% (n=40) of the time.

The results show that all hand rubbing steps followed are done significantly less than half the time (t (39) = -17.849, p<.0005).

The other practices like hand rub solution applied fully, allow hands to dry and rubbing not less than 20 seconds are not done significantly different from 50% of the time.

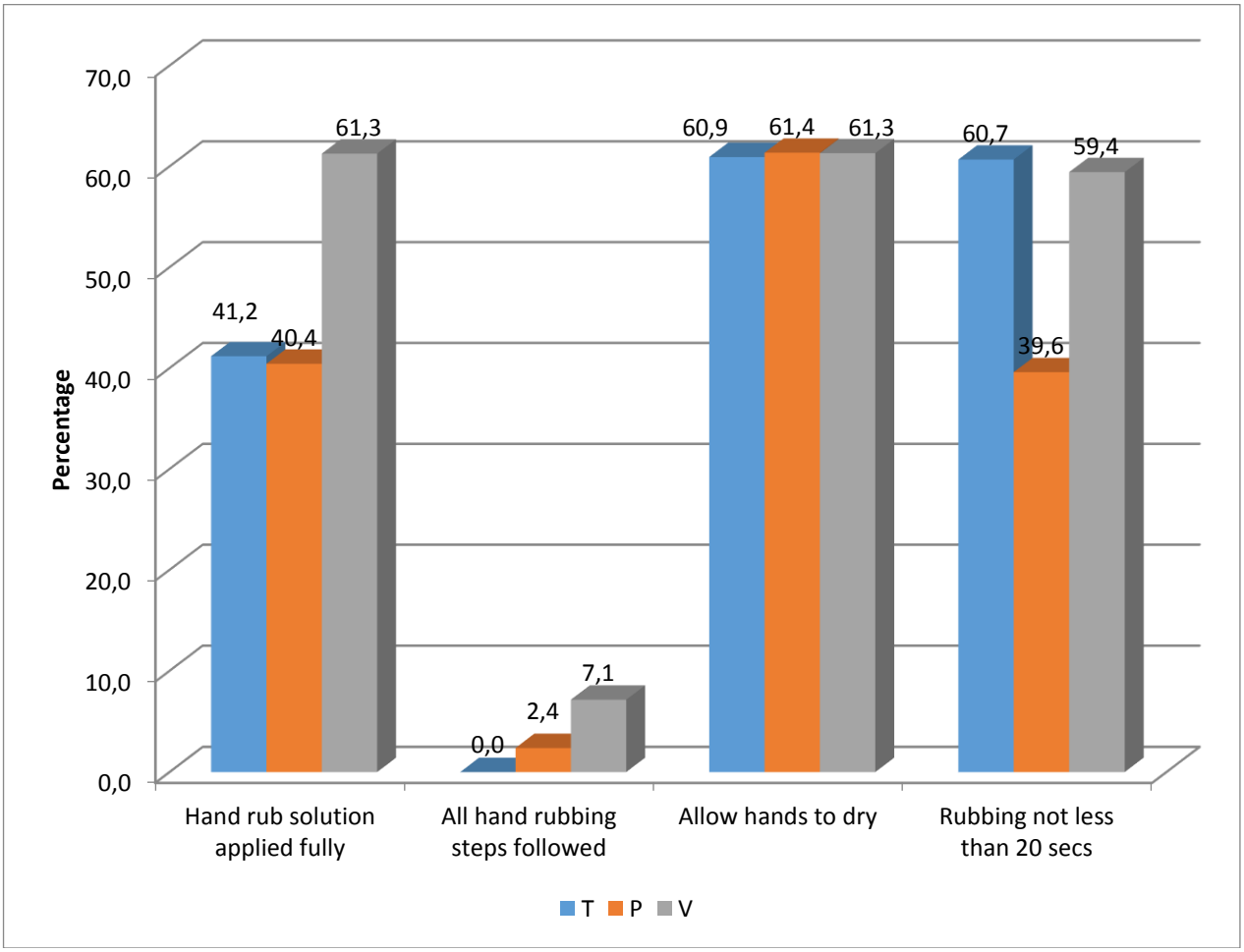

Figure 4.10: Average percentage of time difference hand rubbing item was done correctly by facility

As shown in **Figure 4.10**, all facilities performed hand rubbing poorly in all the items. For the item, hand rub solution applied fully, where clinic V reported 61.3% (n=14), clinic T 41.2% (n=12) and clinic P 40.4% (n=14). The worst performance was on the item, all rubbing steps followed, 0% (n=12) for clinic T,

2.4% (n=14) for clinic P and clinic V performed 7.1% (n=14). There were no significant differences in the hand rubbing practices across facilities.

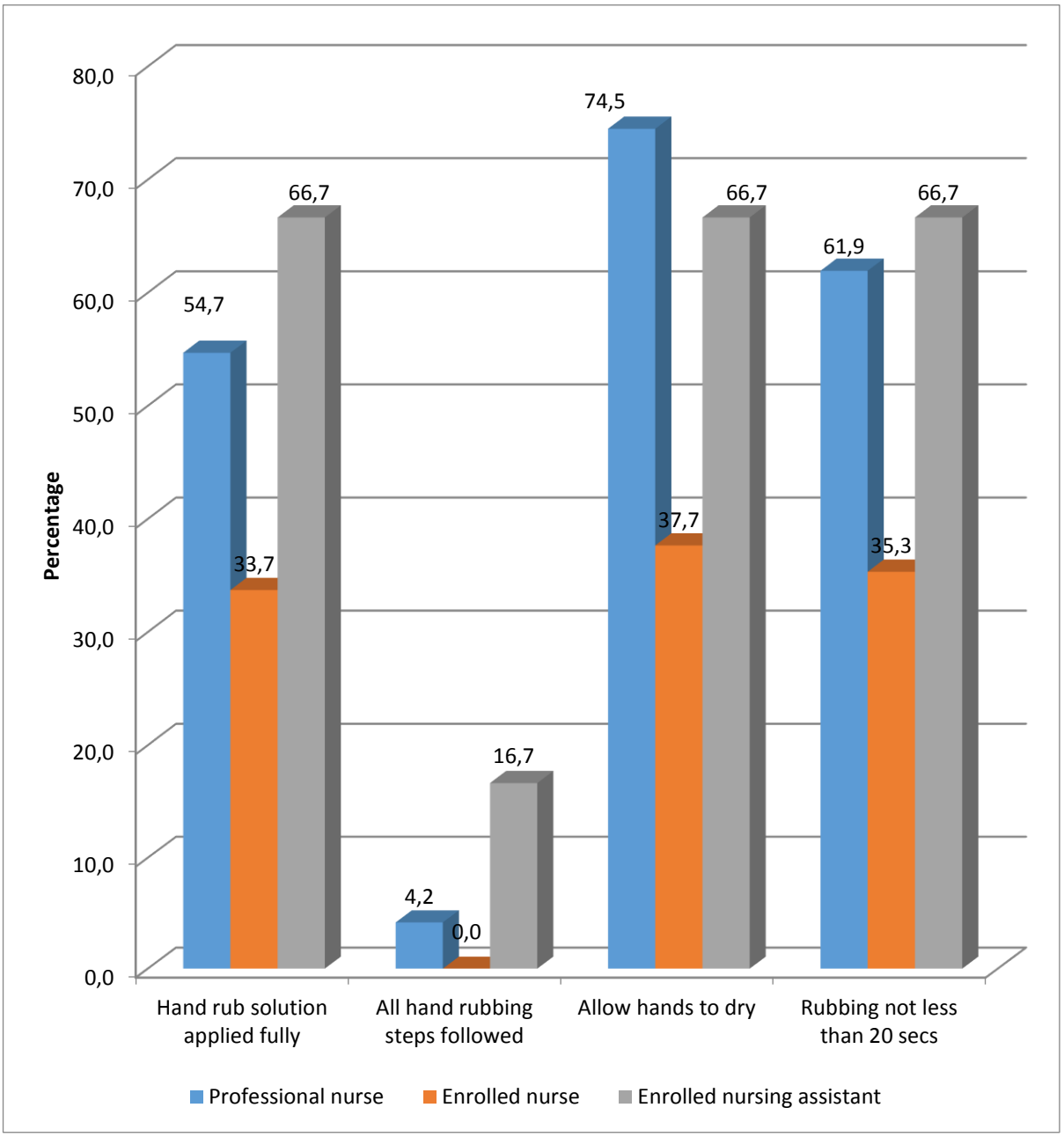

Figure 4.11: Average percentage of time difference hand rubbing item was done correctly by professional category

As seen in **Figure 4.11**, EN demonstrated poor hand rub performance than ENA and PN. Application of hand rub fully ENA reported 66.7% (n=2), PN 54.7% (n=24) and EN 33.7% (n=4), following of all hand rubbing steps ENA did it correctly 16, 7% (n=2) of the time, PN 4, 2% (n=24) and EN 0% (n=4), allowing

of hands to dry PN did correctly 74.5% (n=24) of the time higher than ENA 66.7% (n=2) and EN 37.7% (n=4) , rubbing not less than 20 seconds ENA 66.7% (n=2), PN 61.9% (n=24) and EN 35.3% (n=4).

Table 4.8: Test for significance difference in average percentage of time hand rubbing item was done correctly by professional category

Test Statistics[a,b]

	Hand rub solution applied fully	All hand rubbing steps followed	Allow hands to dry	Rubbing not less than 20 secs
Chi-Square	3.278	8.597	7.441	3.997
df	2	2	2	2
Asymp. Sig.	.194	.014	.024	.136
a. Kruskal Wallis Test				
b. Grouping Variable: professional category				

The analysis in **Table 4.8** showed that there were significant differences across professional categories on the item, all hand rubbing steps followed (χ^2 (2) = 8.597, p=.014). ENA showed significance difference more than PN and EN. There were also significant differences across professional categories on the item, allow hands to dry (χ^2 (2) = 7.441, p=.024). PN showed significance difference more than EN.

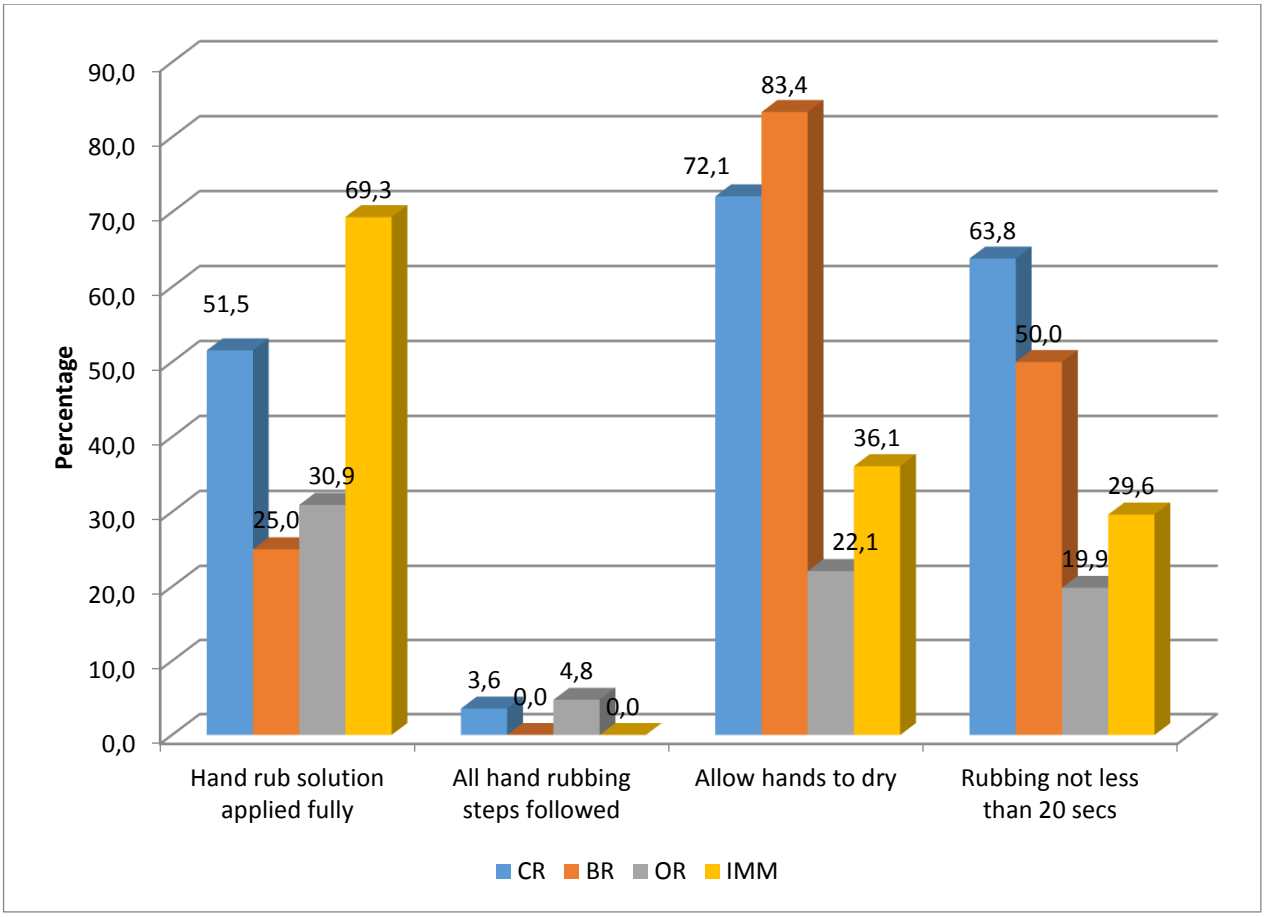

Figure 4.12: Average percentage of time difference hand rubbing item was done correctly by service area

The findings on **Figure 4.12** show that facilities did not do all the hand rubbing items. For the item, hand rubbing solution applied fully, IMM performed it 69.3% (n=3) more times than CR 51.5% (n=28), OR 30.9% (n=7) and BR 25% (n=2) of the time. The item on all the hand rubbing steps followed, was poorly done of all four service areas. OR reported 4.8% (n=7) of the time, CR reported 3.6% (n=28) and BR and IMM reported 0% of the time.

For the item allow hand to dry, BR performed it 83.4% (n=2), CR 72.1% (n=28), IMM 36.1% (n=3) and OR reported 22.1% (n=7) of the time. The item on rubbing not less than 20 seconds, CR performed 63.8% (n=28), BR 50% (n=2), IMM 29.6% (n=3) and OR 19.9% (n=7) of the time.

Table 4.9: Test for significance difference in average percentage of time hand rubbing item was done correctly by service area

Test Statistics[a,b]

	Hand rub solution applied fully	All hand rubbing steps followed	Allow hands to dry	Rubbing not less than 20 secs
Chi-Square	3.460	1.504	10.060	7.242
df	3	3	3	3
Asymp. Sig.	.326	.681	.018	.065

a. Kruskal Wallis Test

b. Grouping Variable: **Service area** - coded by number

As it can be seen the findings on **Table 4.9** showed that there is significant difference with the item, allow hands to dry (χ^2 (3) = 10.060, p=.018). CR allowed hands to dry significantly more than OR 72% (n=28) versus 22.1% (n=7).

Table 4.10: Hand washing practices

Nurse number	Nurse category	Facility	Service area	*Number of applicable observations	Hands are free of jewelry and other accessories	Sleeves are above the elbow	Soap is applied	Rubbing palms and backs of hands, fingers, between fingers and wrists	Hands are rinsed with sufficient running water	Dry hands with paper towel	Avoid recontam-ination of hands when switching off the tap	Wash hands for no less than 30 seconds
1	PN	T	CR	4	100	100	100	100	100	100	100	100
2	PN	T	CR	2	100	100	100	0	100	100	50	0
3	PN	T	CR	7	100	100	100	100	100	100	100	100
4	PN	T	CR	6	0	100	66.7	50	66.7	100	100	66.7
5	PN	T	CR	2	100	100	0	0	100	100	0	100
6	PN	T	CR	3	100	100	100	33.3	100	100	66.7	100
7	PN	T	CR	2	100	100	100	100	100	100	100	100
8	EN	T	CR	0								
9	EN	T	CR	0								
10	EN	T	BR	0								
11	EN	T	CR	0								
12	ENA	T	CR	0								
1	PN	P	CR	0								
2	PN	P	BR	0								
3	PN	P	CR	0								
4	PN	P	CR	5	100	100	100	100	100	100	80	100
5	PN	P	CR	1	100	100	100	100	100	100	100	100
6	PN	P	CR	4	100	100	100	100	100	100	100	100

7	PN	P	CR	0								
8	PN	P	CR	0								
9	EN	P	IMM	2	0	100	100	0	100	100	100	100
10	EN	P	OR	1	100	100	100	0	100	100	0	0
11	EN	P	BR	0								
12	EN	P	OR	1	100	100	100	0	100	100	100	100
13	EN	P	OR	0								
14	EN	P	IMM	2	0	100	100	0	100	100	0	0
15	ENA	P	OR	0								
1	PN	V	CR	0								
2	PN	V	CR	1	0	100	100	100	100	100	0	0
3	PN	V	CR	5	100	100	100	100	100	100	100	100
4	PN	V	CR	3	0	100	100	0	100	100	0	0
5	PN	V	CR	0								
6	PN	V	CR	4	100	100	100	50	100	100	75	0
7	PN	V	CR	0								
8	PN	V	CR	4	0	100	100	100	100	100	0	100
9	PN	V	CR	0								
10	PN	V	CR	0								
11	PN	V	CR	2	100	100	100	100	100	100	100	100
12	EN	V	OR	0								
13	EN	V	OR	0								
14	EN	V	OR	0								
15	EN	V	IMM	3	0	100	100	0	100	100	0	0
16	ENA	V	OR	0								

Table 4.10 indicates hand washing practices of individual nurse category, hand washing practices per facility and per service area. The analyses show the number of applicable observations and the percentage of time that each hand washing observation was performed, hands were free of jewellery and other accessories (HW1) sleeves were above the elbow (HW2), soap was applied (HW3), rubbing palms and backs of hands, fingers, between fingers and wrists (HW4), hands were rinsed with sufficient running water (HW5), dry hands with paper towel (HW6) avoid recontamination of hands when switching off the tap (HW7) and wash hands for no less than 30 seconds (HW8).

It can be seen from **Table 4.10**, there was poor performance with the steps of hand washing amongst nurses in all the facilities. All nurses dried their hands with the hand towel with some recontamination when switching off the taps.

Looking at all the nurses together the analysis on Figure 4.13 show what percentage of the time, on average, each hand washing (HW) activity was done correctly.

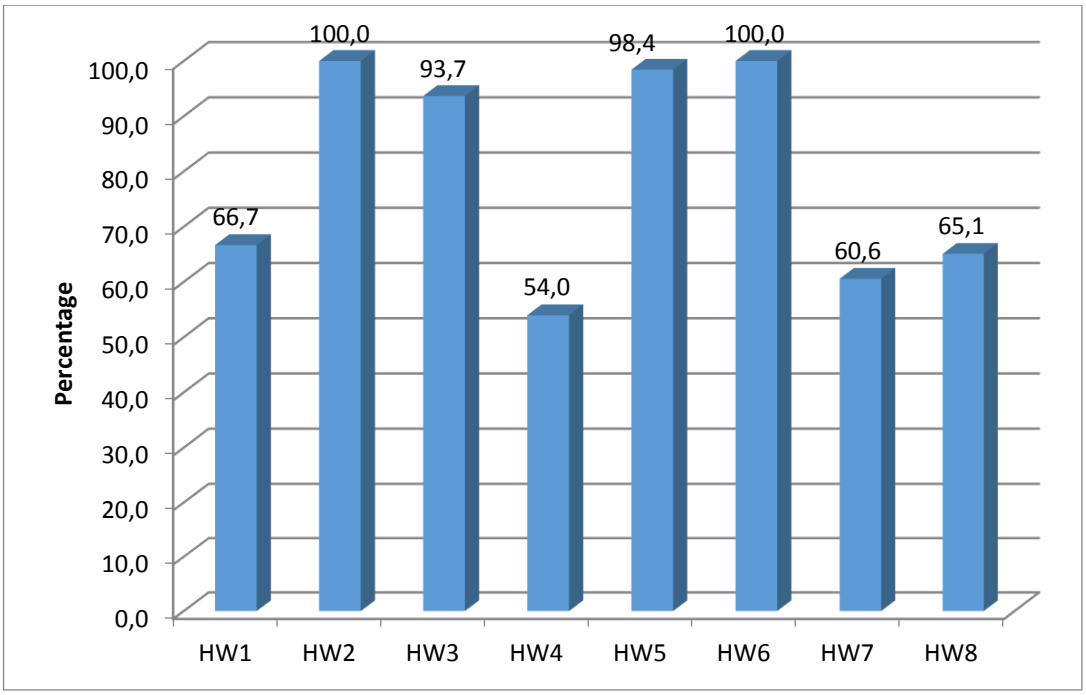

Figure 4.13: Average percentage of time each hand washing activity was done correctly

Analysis of the results as seen in **Figure 4.13** showed that nurses perform hand washing correctly with sleeves above elbow (HW2), soap applied (HW3), hands rinsed with sufficient running water (HW5) and dry hands with towel paper (HW6) between 93.7% - 100% of the times.

Between 60.6%-66.7% of times hand washing was done by nurses with hands free of jewellery and other accessories (HW1), avoiding recontamination when switching the taps(HW7) and washing hands for not less than 30seconds (HW8).

Overall only 54.0% (n=21) of the time nurses performed hand washing correctly with rubbing palms and backs of hands, fingers, between fingers and wrists was observed.

Using a binomial test to test whether a significant proportion of the sample do the hand washing activities (HW1 hands are free of jewellery and other accessories, HW2 sleeves are above the elbow, HW3 soap is applied, HW4 rubbing palms and backs of hands, fingers, between fingers and wrists, HW5 hands are rinsed with sufficient running water, HW6 dry hands with paper towel, HW7 avoid recontamination of hands when switching off the tap, HW8 wash hands for no less than 30 seconds) more than 75% of the time.

The results showed that HW2 (sleeves above the elbow), HW3 (soap applied), HW5 (hands are rinsed with sufficient water) HW6 (dry hands with towel) are the hand washing activities that were done more than 75% of the time.

Table 4.11. Average proportion of the time each hand washing activity was done correctly by facility

Descriptive statistics

		N	Mean	Std. Deviation
HW1	T	7	85.7143	37.79645
	P	7	71.4286	48.79500
	V	7	42.8571	53.45225
	Total	21	66.6667	48.30459
HW2	T	7	100.0000	.00000
	P	7	100.0000	.00000
	V	7	100.0000	.00000
	Total	21	100.0000	.00000
HW3	T	7	80.9571	37.79435
	P	7	100.0000	.00000
	V	7	100.0000	.00000
	Total	21	93.6524	22.65254
HW4	T	7	54.7571	45.86298
	P	7	42.8571	53.45225
	V	7	64.2857	47.55949
	Total	21	53.9667	47.40700
HW5	T	7	95.2429	12.58622
	P	7	100.0000	.00000
	V	7	100.0000	.00000
	Total	21	98.4143	7.26666
HW6	T	7	100.0000	.00000
	P	7	100.0000	.00000
	V	7	100.0000	.00000
	Total	21	100.0000	.00000
HW7	T	7	73.8143	38.31677
	P	7	68.5714	47.40906
	V	7	39.2857	49.70149
	Total	21	60.5571	45.80577
HW8	T	7	80.9571	37.79435
	P	7	71.4286	48.79500
	V	7	42.8571	53.45225
	Total	21	65.0810	47.69840

As shown in Table 4. 11, there is no significant differences across facilities. On average facilities performed hand washing activities poorly with 53.9% (n=21) hand washing step of rubbing palms and backs of hands, fingers, between fingers and wrists(HW4), 66.6% (n=21) hands free of jewellery(HW1) and 60.5% (n=21) avoided recontamination of hands when switching taps (HW7).

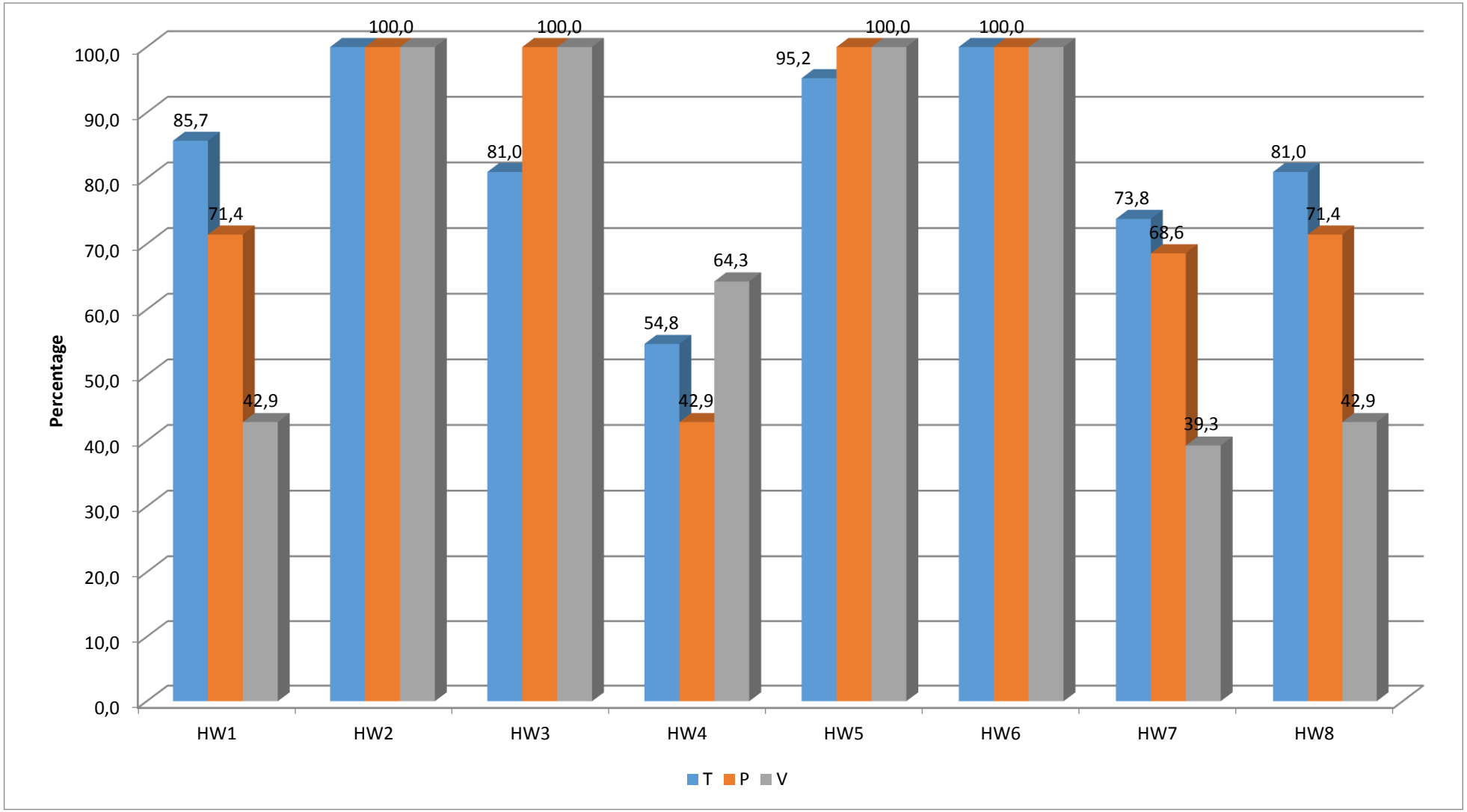

Figure 4.14: Average proportion of the time each hand washing activity was done correctly by facility

Figure 4.14 shows that there are no significance variations with facilities. Hand washing activities that are performed above 90% of the times at all three facilities are HW2, HW5 and HW6, with T having performed 81% compared to P and V at 100% in HW3.

Hand washing activities that were performed between 39.3% and 85.7% were HW1, HW7 and HW8 while V was the least performing as compared to T and P. HW4 was the worst performing hand washing activities, with V reporting 64.3%(n=7) of the times, T reported 54.8% (n=7) of the times, P reports 42.9% (n=7) of the times.

Table 4.12: Average proportion of the time each hand washing activity was done correctly by professional category

		N	Mean	Std. Deviation
HW 1	Professional nurse	16	75.0000	44.72136
	Enrolled nurse	5	40.0000	54.77226
	Total	21	66.6667	48.30459
HW 2	Professional nurse	16	100.0000	.00000
	Enrolled nurse	5	100.0000	.00000
	Total	21	100.0000	.00000
HW 3	Professional nurse	16	91.6688	25.81774
	Enrolled nurse	5	100.0000	.00000
	Total	21	93.6524	22.65254
HW 4	Professional nurse	16	70.8313	41.50167
	Enrolled nurse	5	.0000	.00000
	Total	21	53.9667	47.40700
HW 5	Professional nurse	16	97.9188	8.32500
	Enrolled nurse	5	100.0000	.00000
	Total	21	98.4143	7.26666
HW 6	Professional nurse	16	100.0000	.00000
	Enrolled nurse	5	100.0000	.00000
	Total	21	100.0000	.00000
HW 7	Professional nurse	16	66.9813	42.57549
	Enrolled nurse	5	40.0000	54.77226
	Total	21	60.5571	45.80577
HW 8	Professional nurse	16	72.9188	44.25275
	Enrolled nurse	5	40.0000	54.77226
	Total	21	65.0810	47.69840

As seen in **Table 4.12**, there's no significant variations with all nurses. On average nurses performed hand washing activities poorly with 53.9% (n=21) rubbing palms and backs of hands, fingers, between fingers and wrists (HW4), 66.6% (n=21) hand washing with hands free off jewellery (HW1), 60.5% (n=21) avoiding recontamination when closing the taps (HW7) and 65% (n=21) washing for not less than 30 seconds (HW8).

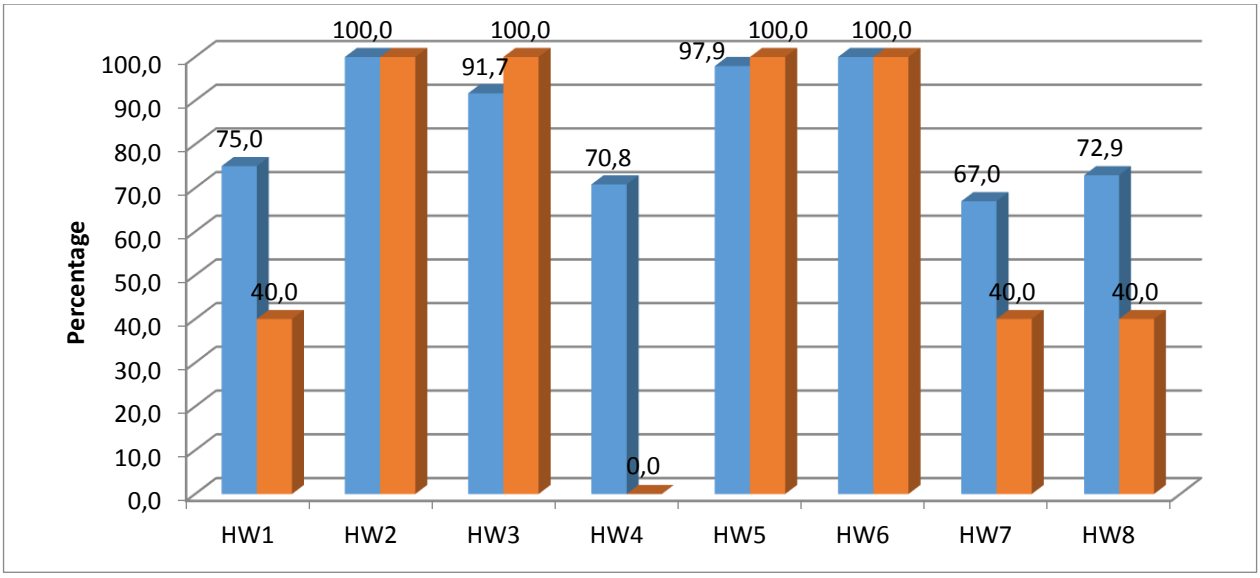

Figure 4.15: Average proportion of the time each hand washing activity was done correctly by professional category

In **Table 4.12** and **Figure 4.15,** it is observed that both PN and ENs performed HW2, HW3, HW5 and HW6 between 98% and 100% of the times. HW1, HW4, HW7 and HW8 were performed by PN and ENs between 0-75% of the times.

PN were observed to be doing more than EN in HW1, PN reported 75% (n=16) and EN 40% (n=5), HW2 PN performed 70.8% (n=16) and EN 0% (n=5), HW7 PN reported 67% (n=16) and EN 40% (n=5), and HW8 PN reported 72.9% (n=16) and EN 40.0% (n=5).

Table 4.13: Test for significance difference in average proportion of the time each hand washing activity was done correctly by professional category

	HW1	HW2	HW3	HW4	HW5	HW6	HW7	HW8
Chi-Square	2.000	.000	.656	8.597	.313	.000	.796	1.584
Df	1	1	1	1	1	1	1	1
Asymp. Sig.	.157	1.000	.418	.003	.576	1.000	.372	.208

a. Kruskal Wallis Test

b. Grouping Variable: professional category

Table 4.13 show a significant difference in average proportion with HW4 (p=.003). PN rubbed palms and backs of hands, fingers, between fingers and wrists 70.8% (n=16) significantly more than EN 0% (n=5).

Table 4.14. Average proportion of the time each hand washing procedure done correctly by service area

		N	Mean	Std. Deviation
HW1	CR	16	75.0000	44.72136
	OR	2	100.0000	.00000
	IMM	3	.0000	.00000
	Total	21	66.6667	48.30459
HW2	CR	16	100.0000	.00000
	OR	2	100.0000	.00000
	IMM	3	100.0000	.00000
	Total	21	100.0000	.00000
HW3	CR	16	91.6688	25.81774
	OR	2	100.0000	.00000
	IMM	3	100.0000	.00000
	Total	21	93.6524	22.65254
HW4	CR	16	70.8313	41.50167
	OR	2	.0000	.00000
	IMM	3	.0000	.00000
	Total	21	53.9667	47.40700
HW5	CR	16	97.9188	8.32500
	OR	2	100.0000	.00000
	IMM	3	100.0000	.00000
	Total	21	98.4143	7.26666
HW6	CR	16	100.0000	.00000
	OR	2	100.0000	.00000
	IMM	3	100.0000	.00000
	Total	21	100.0000	.00000
HW7	CR	16	66.9813	42.57549
	OR	2	50.0000	70.71068
	IMM	3	33.3333	57.73503
	Total	21	60.5571	45.80577
HW8	CR	16	72.9188	44.25275
	OR	2	50.0000	70.71068
	IMM	3	33.3333	57.73503
	Total	21	65.0810	47.69840

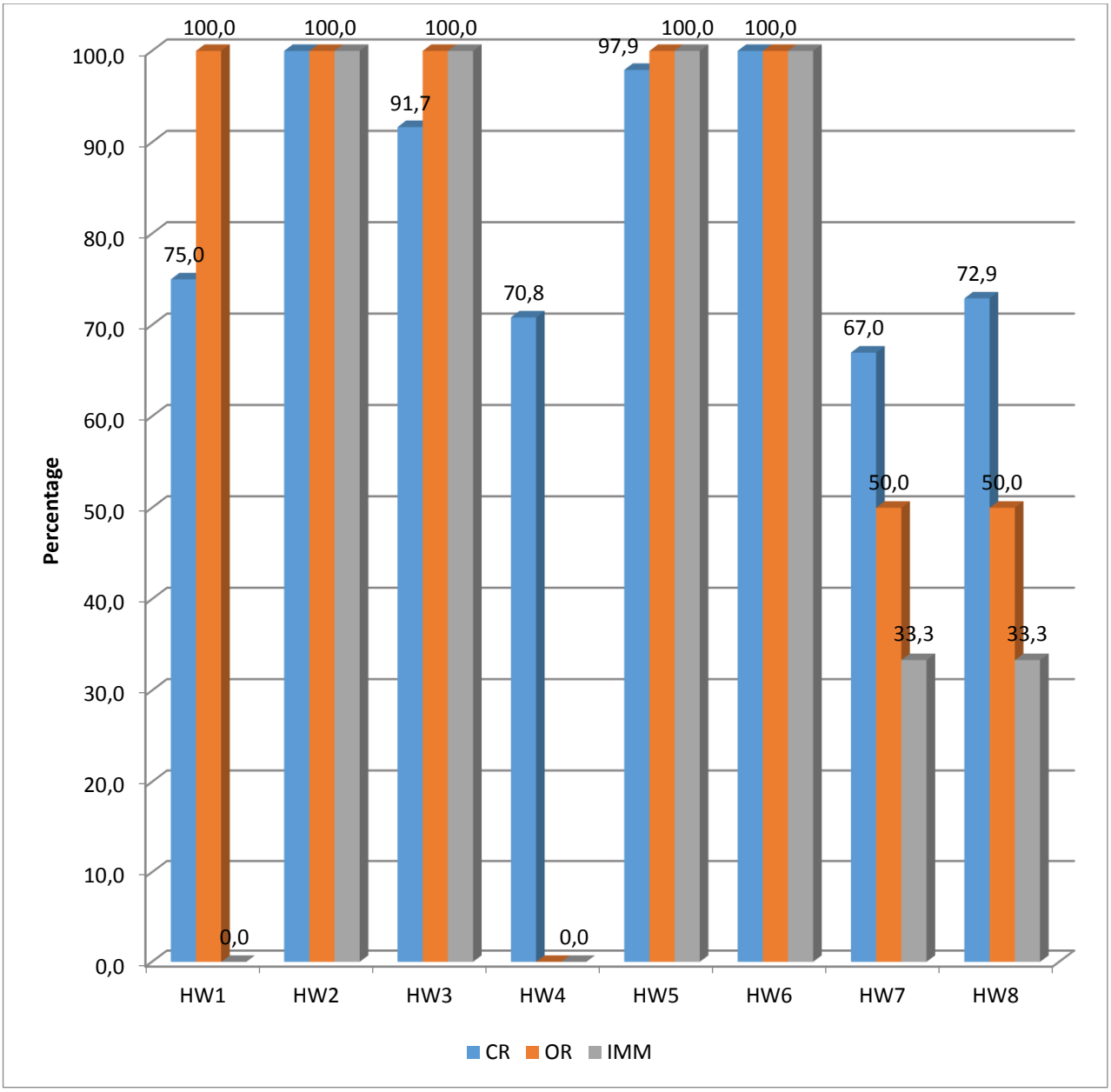

Figure 4.16: Average proportion of the time each hand washing procedure was done correctly by service area

As it can be seen in **Table 4.14** and **Figure 4.16**, service areas showed good hand washing practices between 91.7% to 100% of the time in HW2, HW3, HW5 and HW6. HW7 and HW8 were performed less than 75% of the times in CR, OR and IMM with IMM less reported at 33.3% of the time. CR observed HW4 70.8% of the times more than OR and IMM who did not practice the activity.

Table 4.15: Test for significance difference in average proportion of the time each hand washing procedure was done correctly by service area

Test Statistics[a,b]

	HW1	HW2	HW3	HW4	HW5	HW6	HW7	HW8
Chi-Square	7.143	.000	.656	8.597	.313	.000	.954	1.728
Df	2	2	2	2	2	2	2	2
Asymp. Sig.	.028	1.000	.720	.014	.855	1.000	.621	.421

a. Kruskal Wallis Test

b. Grouping Variable: Service area - coded by number

Table 4.15 show a significant difference in HW1 (p=.028), CR significantly more than IMM (100% versus 0%) while OR significantly more than IMM (75% versus 0%).

There was a significant difference in HW4 (p=.014) where CR was 70.8% significantly more than OR and IMM 0%.

4.5.2 Objective 2: Assess the availability of supplies for hand hygiene

Table 4:16: Hand hygiene supplies

	YES	NO	Missing response
S4.1 Is running water available?	97.7	2.3	
S4.2 Is the tap elbow operated?	90.7	9.3	
S4.3 Is liquid soap available?	95.3	4.7	
S4.4 Is the soap dispenser in a clean condition?	88.4	11.6	
S4.5 Are disposable towels available?	90.7	9.3	
S4.6 Is there a pedal bin in the service area?	11.6	88.4	
S4.7 Are posters illustrating hand wash technique displayed beside each sink?	95.3	4.7	
S4.8 Is alcohol hand rub available?	93.0	7.0	
S4.9 Is alcohol hand rub at the point of care?	86.0	14.0	
S4.10 Are posters illustrating hand rub technique close to the dispensers?	16.3	81.4	2.3
S4.11 Are posters illustrating indications for HH displayed in multiple areas of the facility?	48.8	46.5	4.7
S4.12 Is any other type of hand hygiene displayed/available on this facility?	55.8	37.2	7.0
S4.13 Is there a copy of HH guideline available in the facility?	90.7	2.3	7.0
S4.14 Is the sink clean?	79.1	20.9	
S4.15 Are the taps leaking?		100.0	
S4.16 Are the drainage pipes leaking?		100.0	

According to **Table 4.16**, the supplies that were poorly available were pedal bins (11.6%), posters illustrating hand rub technique close to the dispensers (16.3%), posters illustrating indications for HH displayed at multiple areas of the facility (48.8%), and any other type of HH displayed or available in this facility (55.8%).

A significant proportion of observations indicate that, there was available running water; the elbow tap is operated; liquid soap, soap dispenser in a clean condition, disposable hand towel, hand washing posters displayed beside each sink, alcohol hand rub at the point of care, Is the sink clean, a copy of HH guideline available in the facility. However a significant proportion of observations indicate that, there is not a pedal bin in the service area; posters illustrating hand rub technique are not close to the dispensers; the taps and drainage pipes are not leaking.

4.5.3 Objective 3: Determine knowledge of nurses on hand hygiene practices

Demographics and knowledge

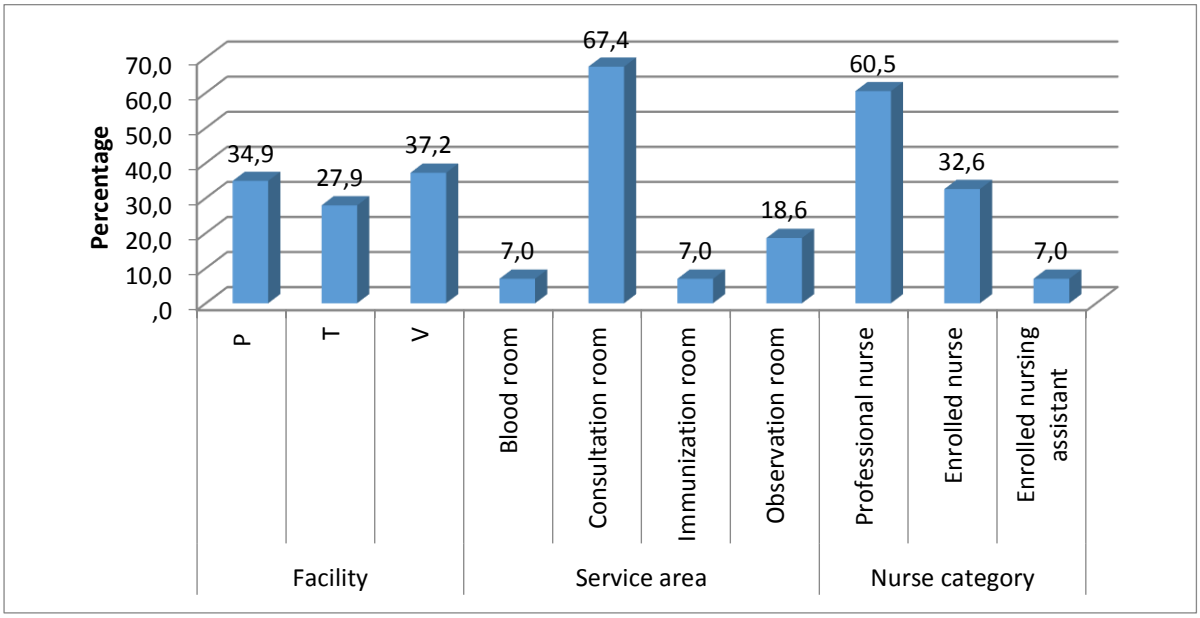

Figure 4.17: Demographics by facility, service area and professional category

Figure 4.17 illustrated the demographics of the sample size by facility, service area and nurse category. Sample size by facility clinic P was 34.9 %(n=15), clinic T 27.9% (n=12) and clinic V 37.2 %(n=16). Sample size by service area: Blood room was 7 %(n=3), Immunization room was 7% (n=3), Observation room was 18.6% (n=8) with the highest sample size being the consultation room at 67.4 % (n=29). Sample size by professional category: Professional nurse had the highest sample size of 60.5% (n=26), Enrolled nurse 32.6% (n=14) and Enrolled nursing assistant 7% (n=3).

Training questions of nurses on HH

Table 4.17: Training received on hand hygiene

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	32	74.4	78.0	78.0
	No	9	20.9	22.0	100.0
	Total	41	95.3	100.0	
Missing	System	2	4.7		
Total		43	100.0		

In **Table 4.17**, 74.4% (n=32) nurses reported to have received training on HH, 20.9% (n=9) had no training and 4.7% (n=2) did not specify whether training on HH was received or not.

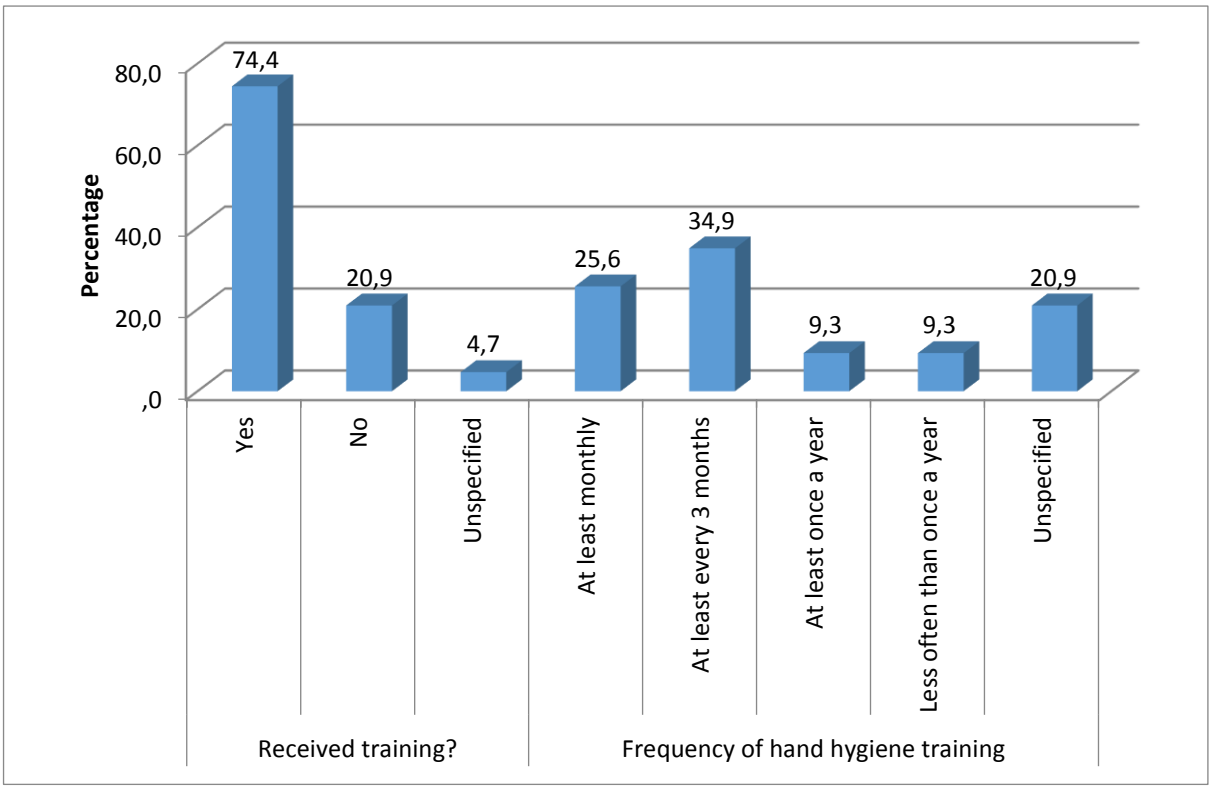

Figure 4.18: The frequency of hand hygiene training

As shown in **Figure 4.18**, 34.9% (n=15) indicated the frequency of HH training to be at least every three months, 9.3% (n=4) indicated the frequency at least once a year and less often than once a year, while 20.9% (n=9) were unspecified.

Significantly more than expected indicated that they received training monthly or 3-monthly (χ^2 (3) = 10.471, p=.015).

Table 4.18: Test for significant proportion of HH training received

		Category	N	Observed Prop.	Test Prop.	Asymp. Sig. (2-tailed)
5 Have you received any training on HH?	Group 1	Yes	32	.78	.50	.000[a]
	Group 2	No	9	.22		
	Total		41	1.00		
a. Based on Z Approximation.						

Table 4.18 shows a significant proportion of respondents 78% (n=32) who answered this question indicated that they did receive training (p<.0005). In order to ascertain if any of the frequency categories was selected significantly more often than the others. It was found that the frequency of HH training was at least every three months significantly more often than others.

Knowledge questions on prevention of transmission to the patient

Table 4.19 were knowledge questions to establish whether HH before touching the patient, immediately after a risk of body fluid, after exposure to the immediate surroundings of a patient, immediately before a clean/aseptic technique prevents transmission to the patient.

Table 4.19: Knowledge questions on prevention of transmission to the patient

Knowledge questions on prevention of transmission to the patient	**Frequency**	**Percent**	**Valid percent**	**Cumulative percent**
HH before touching patient				
Yes	43	100	100	100
No	0	0	0	0
HH immediately after risk of body fluid exposure				
Yes	36	83.7	83.7	83.7
No	7	16.3	16.3	100
HH after exposure to the immediate surrounding of patient				
Yes	40	93.0	93.0	93.0
No	3	7.0	7.0	100.0
HH immediately before a clean/aseptic technique				
Yes	42	97.7	97.7	97.7
No	1	2.3	2.3	100.0

Table 4.19 shows that all 100% (n=43) answered yes for HH before touching a patient prevents transmission to the patient, while 83.7% (n=36) answered yes for HH immediately after a risk of body fluid exposure prevents transmission to the patient.

Analysis further shows that 93% (n=40) of the respondents answered yes for HH after exposure to the immediate surroundings of a patient prevents transmission to the patient, while 97.7% (n=42) answered yes for HH immediately before a clean/aseptic technique prevents transmission to the patient.

Knowledge questions on prevention of transmission to the nurse

Table 4.20 were knowledge questions to establish whether HH before touching the patient, immediately after a risk of body fluid, after exposure to the immediate surroundings of a patient, immediately before a clean/aseptic technique prevents transmission to the nurse.

Table 4.20: Knowledge questions on prevention of transmission to the nurse

Knowledge question on prevention of transmission to the nurse	**Frequency**	**Percent**	**Valid percent**	**Cumulative percent**
HH after touching patient				
Yes	43	100	100	100
No	0	0	0	0
HH immediately after risk of body fluid exposure				
Yes	43	100	100	100
No	0	0	0	0
HH immediately before a clean/aseptic technique				
Yes	27	62.8	62.8	62.8
No	16	37.2	37.2	100
HH after exposure to the immediate surroundings of a patient				
Yes	42	97.7	97.7	97.7
No	1	2.3	2.3	100.0

Table 4.20 shows that all nurses, 100% (n=43) answered yes for HH after touching a patient and immediately after a risk of body fluid exposure prevent transmission to the nurse, and 62.8% (n=27) answered yes for HH immediately before a clean/aseptic technique prevents transmission to the nurse. While 97.7% (n=42) answered yes for HH after exposure to the immediate surroundings of a patient prevents transmission to the nurse.

Knowledge questions on what to avoid

Table 4.21: Knowledge questions on what to avoid

Knowledge question what to avoid	**Frequency**	**Percent**	**Valid percent**	**Cumulative percent**
Wearing jewelry				
Yes	42	97.7	97.7	97.7
No	1	2.3	2.3	100
Damaged skin				
Yes	43	100	100	100
No	43	0	0	0
Artificial fingernails				
Yes	43	100	100	100
No	43	0	0	0
Regular use of hand cream				
Yes	30	69.8	69.8	69.8
No	13	30.2	30.2	100

Table 4.21 shows that 97.7% (n=42) answered yes for wearing of jewellery has to be avoided, while 100% (n=43) answered yes for damaged skin and fingernails has to be avoided. Only 69.8% (n=30) answered yes for regular use of hand cream has to be avoided.

Table 4.22: Average score percentage for all the questions

	N	Minimum	Maximum	Mean	Std. Deviation
Knowledge percentage	43	58.33	91.67	73.6444	8.31814
Valid N (listwise)	43				

Analysis on **Table 4.22** indicates average knowledge score across all question was 73.64% (n=43).

There was a significant proportion of nurses who answered incorrectly with regard to HH immediately after a risk of body fluid exposure, 84%(n=36) answered incorrectly and only 16% (n=7) answered correctly, after exposure to the immediate surroundings of a patient 93% (n=40) answered incorrectly and 7%(n=3) answered correctly, immediately before a clean/aseptic procedure 63% (n=27) answered correctly and 16% (n=16) answered incorrectly and regular use of a hand cream only 30% (n=13) answered correctly and 70% (n=30) answered incorrectly.

4.5.4 Objective 4: Association between hand hygiene practices, available supplies for hand hygiene and knowledge of nurses on hand hygiene practices

In **Table 4.23**, Pearson's correlation was used to ascertain whether good knowledge was significantly related to good hygiene practices.

Table 4.23: Correlations of knowledge by hand hygiene

		HH invasive before	HH Invasive after	HH non-invasive before	HH non-invasive after
Knowledge percentage	Pearson Correlation	.177	.169	.105	.120
	Sig. (2-tailed)	.256	.278	.502	.445
	N	43	43	43	43
*. Correlation is significant at the 0.05 level (2-tailed).					
**. Correlation is significant at the 0.01 level (2-tailed).					

Analysis on **Table 4.23** showed no significant correlation between knowledge and HH practices.

Table 4.24: Correlations knowledge by hand rubbing

		Hand rub solution applied fully	All hand rubbing steps followed	Allow hands to dry	Rubbing not less than 20 secs
Knowledge percentage	Pearson Correlation	.171	-.124	.204	.249
	Sig. (2-tailed)	.291	.446	.206	.121
	N	40	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

As can be seen in **Table 4.24**, there are no significant correlations between knowledge and percentage of time using hand rubbing practices.

Table 4.25: Correlations knowledge by hand washing practices									
		HW1	**HW2**	**HW3**	**HW4**	**HW5**	**HW6**	**HW7**	**HW8**
Knowledge percentage	Pearson Correlation	-.337	.[a]	-.229	.004	-.011	.[a]	-.367	-.036
	Sig. (2-tailed)	.135	.	.317	.986	.964	.	.101	.878
	N	21	20	21	21	21	21	21	21
	Sig. (2-tailed)	.019	.	.319	.032	.391	.		.001
	N	21	20	21	21	21	21	21	21
a. Cannot be computed because at least one of the variables is constant.									
*. Correlation is significant at the 0.05 level (2-tailed).									
**. Correlation is significant at the 0.01 level (2-tailed).									

Table 4.25 show no significant correlations between knowledge and percentage of time using hand washing practices.

Mann Whitney Test was used to analyse the percentage of time a practice was used differed significantly with whether supplies were available or not.

Table 4.26: Hand washing practices by various supply questions

		N	Mean rank	Sum of ranks
Is running water available by sufficient water available (HW5)?	Yes	21	11.00	231.00
	No	0	0.00	0.00
Is the tap elbow operated by avoid recontamination of hand when switching off the tap (HW7)?	Yes	21	11.00	231.00
	No	0	0.00	0.00
Is liquid soap available by soap is applied (HW3)?	Yes	21	11.00	231.00
	No	0	0.00	0.00
Are disposable towels available by dry hands with paper towel (HW6)?	Yes	21	11.00	231.00
	No	0	0.00	0.00
Is there a pedal bin in the service area by avoid recontamination of hand when switching off the tap (HW7)?	Yes	3	10.17	30.50
	No	18	11.14	200.50
Are posters illustrating hand wash technique displayed beside each sink by avoid recontamination of hand when switching off the tap (HW7)?	Yes	21	11.00	231.00
	No	0	0.00	0.00
Are posters illustrating indications for HH displayed in multiple areas of the facility by wash hands for no less than 30 seconds (HW8)?	Yes	11	11.64	128.00
	No	9	9.11	82.00

Table 4.26 shows that there was running water, elbow operated taps, soap was always available, disposable towels were always available, there was always availability of posters, and there was no significant relationship of pedal bin in the service area by recontamination when switching off the tap nor with poster illustrating HH in multiple areas by wash hands for not less than 30 seconds.

Table 4.27: Hand rubbing practice by various supplies

		N	Mean rank	Sum of ranks
Hand rub solution applied fully alcohol hand rub available?	Yes	38	19.96	758.50
	No	2	30.75	61.50
All hand rubbing steps followed by are posters illustrating hand rub technique close to the dispensers?	Yes	7	21.71	152.00
	No	32	19.63	628.00
Rubbing not less than 20 secs by Is there a copy of HH guideline available in the facility?	Yes	36	18.65	671.50
	No	1	31.50	31.50

Table4.27 shows that the majority of respondents (n=38) applied hand rub fully and that the alcohol hand rub was available.

The majority of respondents (n=32) did not follow all hand rubbing steps and posters illustrating hand rub technique close to the dispensers were not available.

There were 36 respondents who had a copy of HH guideline available but 1 respondent undertook rubbing of hands for not less than 20 seconds.

4.6 SUMMARY OF THE CHAPTER

The chapter presented the findings and analysis from the data collected. There were variabilities between facilities, professional category and service areas. Variations were also seen with hand washing and hand rubbing. Chapter five will explore and discuss the findings of the study.

CHAPTER 5: DISCUSSION OF RESULTS

5.1 INTRODUCTION

This chapter discusses the results of the study findings presented in the previous chapter. The discussion is based on the study objectives and the theoretical framework that guided the study. The literature used in the previous chapters and the new relevant literature was utilised in the discussion of the results to either support or argue the findings.

5.2 DISCUSSION OF THE RESULTS ACCORDING TO THE OBJECTIVES

5.2.1 Objective 1: Nurses' hand hygiene practices before and after patient contact through observations

HH practices before and after contact

The first objective of the study was to determine and document nurses' HH practices before and after patient contact. The results showed that nurses practiced HH more after contact with patients than before contact, this was observed in both invasive and non-invasive procedures across all nurse category, all the three facilities and in all the service areas. Invasive before contact was 17.2% and after contact 38.4%. Non-invasive before contact is 25.1% and after contact 64.9%.

The study by Alex-Hart and Opara (2011: 8-15) showed similar results, with low hand washing amongst nurses and even lower before contact with the patient, and higher after contact with patients, the authors believed HH improves when the HCWs perceive risk for their own health. The scope of this study did not look at the reasons for nurses to perform HH more after contact than before contact.

Jelly and Tjale (2003: 72-75) show the same results of poor compliance of health professional with HH practices, and where compliance before contact with patients was low 16.6% with an improvement of 63.6% after patient contact and after removal of gloves. Kukanich *et al*. (2013: 36-37) had similar findings of poor HH prior to patient contact than post patient contact.

On the contrary the study by Omogbai *et al*. (2011: 9-13) shows low HH practices and poor monitoring amongst the HCWs especially after contact with patients, and after removal of gloves.

HH before contact with patients had been recommended by the father of HH, Ignaz Semmelweis who through the implementation of hand washing strategy saw a reduction in mortality rate that dropped to 3% (Best and Neuhauser 2004: 233). According to the WHO (2009a: 101-102), in the Five Moments of Hand Hygiene, the first moment is to practice HH before contact with the patient, as it prevents transmission of microorganisms to the patient. Failure to practice HH before contact puts the patient at a higher risk of transmission from the hands of the health care worker.

In the logic framework for programme evaluation which was the theoretical framework used to guide the study, the assumption is that if resources(inputs) are available to the programme, then the programme activities can be implemented, if programme activities are implemented successfully then certain outputs and outcomes can be expected CDC (1999: 5-7). The lack of reminders on the Five Moments of Hand Hygiene and infrequent training (inputs) could have contributed in failure to perform HH before contact with the patient.

The results of this study further showed that hand rub with alcohol based solution was the preferred method of HH than hand washing. It was observed that hand rub solution at the point of care made access easy and it was less

time consuming and a convenient method. Hand washing facilities though in the service area it took time and effort to utilise them.

The preferred method of hand rubbing with alcohol based solution, in the study by Pittet (2000: 385) showed a remarkable increase in compliance to HH from 48%-66% and a decrease in HCAIs from 29%-17% as a result of change from hand washing practices to hand rubs with an alcohol based preparation. This method is now considered as the standard of health care. The success in Pittet study was as a result of the usage of wall poster promotion, bedside hand rub and regular performance feedback. The same improvement was reported in most baseline studies which showed compliance rate below 50% with hand washing and a remarkable improvement with the introduction of hand rub with alcohol based preparation (WHO 2009a: 93). Similarly, a study by Gerrard, Amazian and Fabry (2001: 13-37) showed that there was improvement in HH compliance with the hand rub.

The interventional study by Hussen, Khakoo and Hobbs (2007:566-570) revealed that the traditional hand washing with soap and water was more than the use of alcohol-hand rub solution prior to the study intervention, amongst nurses. Doctors used both hand washing and hand rubbing with alcohol based solution methods equally. Post intervention there was a significant increase in HH compliance with the use of alcohol hand rub and significantly higher among doctors than nurses.

According to the WHO (2012:18), alcohol-based hand rubs at the point of care overcome barriers of noncompliance to HH like lack of time, lack of facilities, poor tolerability of HH products agents, and inconvenient location of sinks and dispensers.

Results of the current study also showed that HH hygiene before and after contact were carried out significantly less often than 50% of the time with p value of <.0005 in each case. These findings concur with the WHO (2009a: 66),

which reveal that irrespective of an improved awareness of the HCAIs problem, there is global low compliance to HH practices. The WHO further states that HH is at the very core of the standard precautions and remains the corner stone and feasible method in infection prevention and control in all health care settings (WHO 2009a: 6). However, the of the HCWs do not practice HH during contact with patients either because of lack of hand washing supplies or the procedure is not seen as important in an ambulatory nature of the PHC clinics. The WHO indicates that in ambulatory services the culture of infection control hasn't been inculcated (WHO 2012: 11). The researcher in this study observed that lack of HH was a habitual thing. This was indicated by the change in HH behaviour of nurses in the presence of the observer with the first 2 patients. However, they would revert back to their used habits with the rest of the observation as they get used to the presence of the observer in the service area. The practice took place irrespective of the availability of the resources.

HH practices by professional category

Results showed significant differences across nurse categories on the use of HH invasive before contact (χ^2 (2) = 6.836, p=.033). EN results show significant difference more than PN. The researcher observed that invasive procedure done by EN was mainly immunisation and giving of injectable family planning method, in some cases drawing of bloods for laboratory investigation and pricking of fingers for screening tests. In those cases, HH would be performed before putting on gloves. On the contrary PN would put gloves without performing HH. According to WHO (2009a: 142), where wearing of gloves is indicated before contact with the patient, HH using alcohol hand rub or hand washing with soap and water has to be performed before putting on gloves. HH has to be performed before the aseptic procedure. Gloves are to be changed between patients and between sites in the same patient followed by HH after removal. Facilities were in possession of the WHO Hand Hygiene Guidelines (inputs); however, majority did not perform HH practices (activities) as stipulated in the guidelines.

The results of the current study further showed significant differences across nurse categories on the use of HH in non-invasive procedure after contact (χ^2 (2) = 6.899, p=.032). PNs demonstrated more significant difference more than EN. Mathai *et al*. (2010: 349-352) revealed the same factors that influenced compliance like varying attitude, and behaviour of different professionals, low adherence to protocols, lack of knowledge and awareness and poor HH agents.

The researcher observed that PN were attending to patients with minor ailments and doing more physical examinations which is a non-invasive activity, and they would be observed doing HH practice immediately after contact with patients during physical examination. This could have been the perception of the risk of contamination with patients' which the EN did not have. The practice of HH after contact in non-invasive is supported as good practice. According to the WHO (2009a: 101-102), HH after contact with patients is one of the indications to protect the HCWs from colonization, and potential infection by patient germs, and to protect the environment in the health-care area from germ contamination and potential spread.

HH by facility

Findings by facility showed that performance of HH before contact was lower than after contact in both invasive and non-invasive and there was no significant differences in all the facilities. Findings further showed that facilities did not perform any HH by 24.1% to 83.3% in both invasive and non-invasive before and after contact. This was a cause for concern where it is well documented that hands of the HCWs are known to be a vehicle for transmission of micro-organism to patients, leading to HCAIs, and HH which is a simple and cost-effective action remains a primary preventable measure and important in infection control (Dramowski 2014: 78).

The study by Mathai *et al*. (2010: 350) showed that knowledge and acknowledgement of HCWs to their hands contributing to the spread of infection did not improve compliance to HH regardless of the availability or lack of financial resources. The findings of the study that was conducted by Mortel (2012: 1011) indicated that non-compliance regardless of IPC programmes which included ongoing education and training, easy access to hand washing facilities, convenient user-friendly alcohol-based hand rubs. The author's recommendation was that HH should be based on moral and ethical obligation since there is no explanation to why education and training is failing to change behaviour in HH practices irrespective of the evidence based recommendations and infection control programme.

There was significant difference across facilities in non-performance of HH before contact with patients in non- invasive procedure (χ^2 (2) = 6.102, p=.047). Nurses from Clinic V reported this significantly more often than nurses from the other facilities.

The researcher observed that Clinic V was overcrowded, with staff shortages during the study period and nurses worked to push the crowds. The Department of Health (2012: 19) is supported by the studies that were conducted by Sibiya and Gwele (2009: 34); Daviaud and Chopra (2008: 48) which confirm that the comprehensive PHC services with the one stop shop approach has increased the utilisation of PHC services. Increase in patient caseloads compromises the quality of care, and shortage of health personnel adds to the negative impact on quality and efficiency in health care.

HH by service area

Different service areas were observed for the practice of HH and showed that HH before contact was lower than after contact in both invasive and non-invasive.

There were significant differences across service area with HH invasive before contact (χ^2 (3) =10.113, p=.018). IMM used this process significantly more than CR and OR.

The observation was that the IMM service area performed invasive procedures more than any service area. The practice was the performance of HH before wearing gloves, and after contact with patients HH would be performed directly on the gloves if gloves were not changed or HH would be performed after changing of the gloves. The practice of HH directly on the gloves is contrary to WHO HH guidelines instead the recommendation is to change gloves in between patients and the performance of HH immediately after removal (WHO 2009a: 12). According to Fitzpatrick, Everett-Thomas, Nevo, Shekhter, Rosen, Scheinman, Arheart, and Birnbach (2011: 273) gloves do not prevent transmission as a result HH is important before and after the removal of gloves.

In non-invasive procedures, CR reported 31.1% before contact and 77% after contact, BR reported 0% before contact and 0% after contact. OR reported 22.1% before and 70% after contact. IMM reported 0% before contact and 0% after contact.

There were significant differences across service area with HH non-invasive after contact (χ^2 (3) =12.218, p=.007). CR used this process significantly more than BR and IMM.

It was observed that consultation of patients with minor ailments took place in CR and that was where mainly non-invasive procedures were carried out and HH was performed after contact. It can be argued that HH after contact was done as a result of nurses' perception to protect themselves from patients' germs. This is supported by Baylina and Moreira (2012:79) where the contributory factors to non-compliance included multiple factors like workloads, accessibility of HH resources, knowledge, training plus perceived risk and individual attitude. Similarly, HH practice that is influenced by perception was

demonstrated in a study by Hussen, Khakoo and Hobbs (2007: 566-570) which indicated compliance in paediatric intensive care unit (ICU) higher that in adult ICU, the perception being that children are more vulnerable to infection than adults.

This study assessed the average percentage of time difference each HH technique (hand rub and hand washing) was used by service area.

The results showed significant differences across service area on the use of alcohol rub IB contact (χ^2 (3) =13.043, p=.005). BR used this process significantly more than CR. IMM more than CR and OR.

The observation was that the procedures performed in both BR and IMM service areas were invasive (injection giving), and that's where nurses used gloves with the practice of hand rubbing before putting on those gloves. The practice of HH before putting on gloves is supported by the WHO (2009a: 102-105) as stipulated in the WHO HH guidelines.

There were significant differences across service area on the use of hand washing IA contact (χ^2 (3) =17.076, p=.001). IMM used this process significantly more than CR, BR, and OR. The researcher observed that IMM was the busiest in all the services with immunization plus administration of family planning injections. Performance of handwashing after contact in invasive procedures it's also a recommended practice according to the WHO HH Guidelines. HH can either be hand washing or hand rubbing (WHO 2009a: 102-105).

There were significant differences across service area on the use of alcohol none IA contact (χ^2 (3) =16.136, p=.001). BR used this process significantly more than CR and OR. It can be argued that the usage of gloves in the BR gave a sense of false protection. According to the WHO (2009a: 129), HH is indicated even if gloves are worn, however their usage does influence the practice of HH.

The preferred HH method was the use of alcohol hand rub more than hand washing.

There were significant differences across service area on the use of alcohol rub after NIA contact (χ^2 (3) =12,091, p=.007). CR used this process significantly more than BR and IMM. In practice it was observed that CR were mainly used by professional nurses and procedures were non-invasive, and PNs were exposed to training in infection control more than other category of nurses. The practice was in line with the WHO moments of HH, which included HH after contact with the patient, to protect the HCW from colonization and potential infection by patient germs and to protect the environment in the health-care area from germ contamination and potential spread (WHO 2009a: 101-102). Though PNs in non-invasive after (NIA) used alcohol rub significantly more than others the technique was wrong rendering HH ineffective. The WHO further recommends usage of alcohol hand rub as standard for routine antiseptic, as it is faster, more effective and better tolerated by the skin. Hand washing is indicated when hands are visibly soiled, visibly soaked in blood or body fluids and after using the toilet (WHO 2009a: 10).

Hand rubbing practices

Hand rubbing practices of each individual nurse category, each facility and each service area were observed. The observation analysed the average percentage of time the hand rub solution was applied fully, hand rubbing steps were followed, hands allowed to dry and hands rubbed for not less than 20 seconds.

The results showed hand rubbing solution was applied fully only 47.9 % of the time; all had rubbing steps were followed only 3.3% of the time, hands were allowed to dry only 61% of the time and rubbing for not for less than 20 seconds was observed 52.9% of the time. Hand rubbing steps were done significantly less than half the time (t (39) =17.849, p<.0005), whilst other practices are not done significantly different from 50% of the time.

Such results indicate fewer efficacies in the destruction of microorganisms, for efficacy the procedure has to be done correctly. Ziady (2010b: 34-36) agrees that unless the right procedure is implemented, and the right supplies as recommended are made available and used, the strategy will not be effective. This view by Ziady concurs with the logic framework model, the right procedure implemented, in the logic framework model means (activities), right supplies as recommended available means (inputs), the strategy (HH) will not be effective means (outputs in the logic framework model). Hence, authorities need to ensure compliance the HCWs to this strategy in order to witness the reduction of HCAIs.

The WHO emphasizes that HH practices have to be observed by all HCWs, caregivers or any individuals who are in direct or indirect contact with patients, and the practice must be done correctly and consistently for any impact (WHO 2009a: 9). The WHO further recommends the use of alcohol hand rub solution for its routine antiseptic, it is faster, it is more effective and it is better tolerated by the skin. The knowledge of good HH practices and techniques is of paramount importance. If the equipment is available but the technique is applied inappropriately, HH will not be effective (WHO 2008: 210).

The WHO (2012:18), recommends that the appropriate ABHRs should be made available in wall dispensers or spray bottles at the point of care or attached to trolleys, or in HCWs pockets. They should be made available at entrances of the health care facility for patients to spray their hands to reduce transmission from communities to the health care facility. He further argues that monitoring, of their actual use, acceptance by the HCWs, their appropriateness and easy access has to be done for compliance.

This is supported by the logic framework for programme evaluation CDC (1999:5-7. The Department of Health (2016: 117) agrees that for provision of good quality of clinical care, it is essential that the inputs, processes (activities) and outcomes of care conform to desired standards and they have to be

continually monitored and improved. According to Ile, Eresia-Eke and Allen-Ile (2012: 98-100), in results based management the logic framework approach is the important management tool for systematic planning, implementing as well as monitoring and evaluation of projects and programmes.

Hand rubbing practices by facility

In order to see if there was a significant difference in hand rubbing practices for the nurse category, the facilities, and the service areas, the non-parametric Kruskal Wallis Test was applied and results showed that all facilities performed hand rubbing poorly in all the items.

For the item, hand rub solution applied fully, clinic V reported 61.3% more than the other two facilities; clinic T reported 41.2% and clinic P 40.4%.

The worst performance was on the item, all rubbing steps followed, clinic T was 0%, clinic P 2.4% and clinic V 7.1% of the time more than the two facilities. There were no significant differences in the hand rubbing practices across facilities.

The findings of the studies conducted by (Ziady 2010a: 19; Omogbai *et al*. (2011:9-13) report poor compliance to HH as a lack of adequate HH supplies like antimicrobial soap, forgetfulness and lack of time due to busyness of the clinic. In this study the availability of alcohol hand rub (inputs) was adequate, however this were facilities with high headcounts. The study by (Mathai *et al*. 2010: 349) shows a different view of low compliance to HH practices regardless of the available resources, similar to this study which showed poor compliance with adequate availability of alcohol hand rub solution.

According to Jelly and Tjale (2003: 72), placing of reminders to reinforce good HH practices and the importance of making available HH supplies, like hand towels, hand soap, water, at all times. Their study showed that some health

professionals wanted to wash their hands but health supplies were incomplete. In this study the researcher observed that there were no hand rubbing posters as reminders for steps to be followed in alcohol hand rubbing procedure. The WHO concurs with Jelly and Tjale that reminders in the workplace are key tools to prompt and remind HCWs about the importance of HH and the appropriate indications and techniques for HH (WHO 2012: 18).

Hand rubbing practices by professional category

The study further observed whether hand rubbing item was done correctly by professional category. EN showed poor had rub performance than ENA and PN. EN in the study performed all the invasive procedures in the IMM and BR and it could be argued that the usage of gloves gave the false security of safety. There were significant differences across professional categories on the item, all hand rubbing steps followed (χ^2 (2) = 8.597, p=.014). ENA showed significance difference more than PN and showed significant difference more than EN.

The observation was that ENA mainly performed non-invasive procedures like taking of temperature, blood pressure, urine testing and on few occasions, do invasive ones like finger prick for sugar testing and HIV test. This category of staff received no or little in-service training on infection control.

There were also significant differences across professional categories on the item, allow hands to dry (χ^2 (2) = 7.441, p=.024). PN showed significance difference more than EN. This could have been the differences in insight on infection control.

Hand rubbing practices by service area

The study looked at the average percentage of time difference hand rubbing item was done correctly by service area. The findings showed that service areas did not do all the hand rubbing items. For the item, hand rubbing solution applied fully, IMM performed 69.3% more times than CR 51.5%, OR 30.9% and BR 25% times less than all the service areas. The item on all the hand rubbing steps followed, was the poorly done of all the four items. OR reported 4.8% of the times, CR reported 3.6% and BR and IMM did not perform the item reported 0% of the time. The results in different service areas showed that hand rubbing techniques were done poorly, and more poorly on the item observing if all rubbing steps were followed. Studies Pittet (2000: 385); Gerrard Amazian and Fabry (2001: 13-37) had shown increased compliance to HH practices and a reduction of HCAIs with the introduction of alcohol hand rub. Results of non-compliance to the correct technique means the effectiveness of alcohol hand rub was not be realised.

There was significant difference with the item, allow hands to dry (χ^2 (3) = 10.060, p=.018). CR allow hands dry 72% significantly more than OR 22.1%. The findings are in line with the observation where in CR worked PN who were more qualified and exposed to infection control training. This was supported by the study in South African public hospital in KZN which showed nurses to be having higher level of awareness and knowledge of infection control policies and procedures than doctors as a result of their regular infection and control training, and in that the responsibility of infection control is their function (Arbee *et al*. 2012: 32).

This study showed OR performing less than CR. During the study it was observed that nurse category in the OR were ENA and in CR was PN. This observation on the contrary to Arbee *et al*. (2012: 32) showed that even though nurses received training more than doctors not all category of nurses are equally exposed to the infection control training.

Hand washing practices

The study observed the hand washing practices of individual nurse category, hand washing practices per facility and per service area. The analyses showed the number of applicable observations and the percentage of time that each hand washing observation performed, hands were free of jewellery and other accessories, sleeves were above the elbow, soap was applied, rubbing palms and backs of hands, fingers, between fingers and wrists, hands were rinsed with sufficient running water, avoid recontamination of hands when switching off the tap, Wash hands for no less than 30 seconds. The results showed poor performance with the steps of hand washing amongst nurses in all the facilities.

According to Nazarko (2013: 422-427), patient safety is at the heart of health care and the most important aspect of HH is to wash hands with soap and water and to dry them thoroughly. The observation in the study showed that nurses dried their hands with the hand towel with some recontamination when switching off the taps. Similarly, in the study by Mathai, George and Abraham (2011: 6-15) the researchers observed recontamination where HH practices would be adhered to but nurses would touch themselves or surfaces before contact with patients.

Analysis in this study showed that nurses performed hand washing correctly 93.7% to100% with sleeves above elbow (HW2), soap applied (HW3), hands rinsed with sufficient running water (HW5) and dry hands with towel paper (HW6). The results revealed that 60.6% to 66.7% hand washing was done with hands free of jewellery and other accessories (HW1), avoiding recontamination when switching the taps (HW7) and washing hands for not less than 30 seconds (HW8).

The results showed that only 54.0% of the time was hand washing done correctly with rubbing palms and backs of hands, fingers, between fingers and wrists (HW4). The researcher observed that every hand washing sink had a

hand washing poster showing all the steps (HW4) and nurses particularly PNs were reading from those posters. Interestingly the rest could not refer to those posters.

The binomial test was applied to test whether a significant proportion of the sample do the hand washing activities (HW1) hands are free of jewellery and other accessories, (HW2) sleeves are above the elbow, (HW3) soap is applied, (HW4) rubbing palms and backs of hands, fingers, between fingers and wrists, (HW5) hands are rinsed with sufficient running water, HW6 dry hands with paper towel, (HW7) avoid recontamination of hands when switching off the tap, (HW8) wash hands for no less than 30 seconds, were done more than 75% of the time.

Results indicated that HW2 (sleeves above the elbow), HW3 (soap applied), HW5 (hands are rinsed with sufficient water) HW6 (dry hands with towel) are the hand washing activities that were done more than 75% of the time. There were poor HH practices with nurses having jewellery on, religious and cultural strings (HW1), not rubbing palms and back hands, fingers, between fingers and wrist (HW4), hands not rinsed with sufficient water (HW5), hand re-contaminated when switching off the tap (HW87) and hands washed for less than 30 seconds(HW8). Since 1847 as a result of Semmelweis discovery, hand washing became the most important measure for the prevention of transmission of infections in health care setting (WHO 2009a: 9). There is poor compliance to HH, which is also critical in outpatient department, and the culture of infection prevention and control and HH has not been established and prioritized in those settings (WHO 2012: 11). This study which was conducted in PHC clinics showed poor compliance to hand washing.

According to the CDC (2002: 4), there are sequence of events for transmission of pathogens from one patient to the other through the hands of the HCWs. The fifth event in the sequence describe that there has to be inadequate or no hand washing or no practice of HH or the HH agent must be ineffective for

transmission to take place. In the study, poor compliance to hand washing violated this event thus rendering hands of nurses' unsafe and perpetuated transmission of pathogens, which is a violation to patients' safety.

This study showed that hand washing was performed with jewellery (HW1) a contradiction with the WHO Hand Hygiene Guidelines and Infection Prevention and Control Guidelines. According to the WHO (2009a: 132), it is evidenced that wearing of jewellery and artificial nails during routine care is associated with high colonization of micro-organism and may contribute to the transmission of certain health-care associated pathogens, and interferes with effective HH. The recommendations are to wear a simple wedding band except in high risk settings like operating theatre. Dramowski (2014: 79) agrees that long nails, nail polish, artificial fingernails, and wearing of jewellery prevents the healthcare worker from performing proper HH.

The results also showed recontamination of hands when switching off the tap after hand washing. Similar observation was seen in a study by Mathai, George and Abraham (2011: 6) which showed overall HH compliance rate of only 26% and recontamination where nurses would touch themselves or surfaces. According to the WHO (2009a: 154-156), in hand washing, after rinsing hands with water; they are to be dried thoroughly with a single use towel and that towel to be used to turn off the faucet and in that case the hands are now safe from recontamination.

According to Aziz (2013: 458), audits on hand washing are important as they give knowledge to the available material for hand washing, and in his study the interventions as a result of the audit led to 95% improvement in HH practices and improvement in the availability of alcohol-based hand rub. Inamulhaq *et.al*. (2012: 196) agree that hand washing knowledge and practices be assessed in clinic settings as most studies are conducted in tertiary hospital.

The clinics in this study were the clinics known to be compliant with HH practices; however, those results of compliance to HH were self-reported HH audits conducted every month. Gould (2010: 50) agrees with regular monitoring of HH through audits, however argues that self-reporting is an unreliable method of collecting information about HH behaviour. This could have been the case with the clinics under study.

Hand washing practices by facility

Analyses showed on average that facilities performed hand washing activities poorly with 53.9% hand washing step of rubbing palms and backs of hands, fingers, between fingers and wrists (HW4), 66.6% hands free of jewellery (HW1) and 60.7% avoided of recontamination of hands when switching taps (HW7).

There were no significance variations with facilities regarding hand washing practices. Hand washing step of rubbing palms and backs of hands, fingers, between fingers and wrists (HW4) was reported to be the less performed of all the hand washing activities. Clinic V reported 64.3% of the times, Clinic T reported 54.8% of the times, and Clinic P reported 42.9% of the times less than clinics T and V. The researcher observed that nurses in the facility were more concerned about seeing the patient faster. The hanging hand washing posters next to the sinks were hardly looked at.

Hand washing practices by professional category

Results showed no significant variations with all nurses regarding hand washing practices. On average nurses performed hand washing activities poorly with 53.9% rubbing palms and backs of hands, fingers, between fingers and wrists (HW4), 66.6% hand washing with hands free off jewellery (HW1), 60.5% avoiding recontamination when closing the taps (HW7) and 65% washing for not less than 30 seconds (HW8).

PN performed better than EN in HW1 75% and EN 40%, HW2 PN 70% and EN 0%, HW7 PN 67% and EN 40%. There was a significant difference in average proportion with HW4 (p=.003). PN rubbed palms and backs of hands, fingers, between fingers and wrists 70.8% significantly more than EN 0%. The results could have been as a result of PN having more insight due to more exposure to infection control and training than EN. It could have also been as a result of the awareness of the presence of the observer by the PNs, and the knowledge that the observation was on HH practices, thus HH behaviour was changed (Hawthorne effect), and thus the usage of HH posters next to the sinks for the correct HH technique.

Hand washing practices by service area

The study looked at the average proportion of the time each hand washing procedure was done correctly in each service area.

Results showed no variations with good hand washing practices in all the service areas. The avoidance of recontamination (HW7) and washing hands for not less than 30 seconds (HW8) was less than 75% of the times in all service area with IMM the lowest 33.3% of the time. The results further showed CR 70.8% of the times more than OR and IMM, in removing of jewellery (HW1) and in the performance of the hand washing steps of rubbing palms and back of the hands, fingers between fingers and wrist (HW4) with the significant difference of p=.028 and p=.014 respectively. The researcher observed that nurses who worked in the OR and IMM service areas were mainly lower category of nurses than professional nurses that worked in CR service area. OR and IMM nurses had less exposure to training on infection control measures and HH. The argument is supported by Mathai *et al*. (2010: 350) who indicated that training and education to create awareness is imperative since knowledge influence behaviour. The authors further highlighted that there is limited data to show the impact of training as a successful intervention but what is known is that when people are informed, this information influences the way they behave and

create more awareness. They emphasize that education and training is an integral part in implementation strategies to promote HH practices.

A study by Dramowski *et al*. (2015:73-75) shows improvement in IPC knowledge and HH compliance as a result of training. The study concluded that the frequency of the training was important. As it was shown in their study 75% nurses reported to have received training. What the authors highlighted was the quality of training and the attitude of nurse towards the training. In another study by Dramowski (2014: 88), HCWs believed that they already know about HH and therefore according to them new and better ways were needed than training.

Ider *et al*. (2012: 170) further supports training as their study showed poor compliance to HH practice that was cited by lack of training in infection prevention and control thus staff having no technical skills in this field. The WHO (2009a: 89-92) agrees that knowledge of good HH practices and techniques is of paramount importance for effective HH. It can be argued that nurses in the IMM service area lacked awareness of the WHO recommendations on HH and needed training to avoid recontamination which include, drying hands thoroughly with a single use towel; use towel to turn off the tap which makes the hands safe.

5.2.2 Objective 2: Assess the availability of hand hygiene supplies

The study showed that there was availability of HH supplies. The supplies that were poorly available were pedal bins with availability of 11.6%, posters illustrating hand rub technique close to the dispensers reported 16.3%, posters illustrating indications of for HH displayed at multiple areas of the facility reported 48.8%, and any other type of HH displayed or available in this facility reported 55.8%.

The poor supply of some of the HH resources has a negative impact in achieving recommended HH standards. According to the WHO (2009a: 133), HH is made possible with enough infrastructure and adequate HH supplies at the right location for easy reach and use and in line with the concept of Five Moments of Hand Hygiene.

Lack of pedal bins would mean recontamination of hands as they had to open the bins by hand which is not a good infection prevention practice. The WHO further recommends posters as they are reminders on what needs to be done and they give step by step information on HH technique (WHO 2009a: 154-156). It could be argued that lack of posters to illustrate hand rub technique contributed to the hand rub steps not done accurately as this study showed poor performance with steps in applying hand rub solution.

The logic framework was used for the study to describe the programme's inputs (resources), activities (actual events or actions that takes place) and outputs (direct products or direct tangible outputs of programme activities). In the logic framework approach the assumption is that if resources(inputs) are available to the programme, then the programme activities can be implemented, if programme activities are implemented successfully then certain outputs and outcomes can be expected. It can therefore, be argued that the results of poor compliance to hand rubbing techniques was as the result of lack of hand rub posters near dispensers (CDC 2002a: 4).

The findings are supported by Inamulhaq *et al*. (2012: 196) which showed that lack of motivation and basic hand washing supplies were the major factor accompanying hand washing. Ziady (2010a: 2) also alludes that poor HH practices by nurses during contact with patients is either as a result of lack of hand washing supplies or the procedure is not seen as important in an ambulatory nature of the PHC clinics. She further states that the global economy has an impact on availability of resources and resulting in budget cuts or procurement of poor quality resources in an effort to save, furthermore

programmes like infection control become less prioritized. She agrees that the availability of these HH supplies and the organizational culture play a major role in compliance to HH practices. This is further supported by the WHO (2009b: 9) stating that burden of HCAIs is determined by availability of infection control measures which are determined by availability of financial resources which in turn determine the availability of staffing, appropriate equipment and HH supplies. And developing countries are the most affected.

Most studies cited poor compliance amongst other things to be lack of HH supplies (Ider *et al*. (2012: 170); Al-Naggar and Al-Jashany (2013: 11); Jelly and Tlale (2003: 72). The study by Mathai, George and Abraham (2011: 6) compliance improved significantly with the multimodal interventions of educational session based on the five moments of HH, displaying posters, providing verbal reminders, ensuring adequate supply of HH products.

The South African National Nursing Summit held in April 2011 raised concerns about overcrowding, high shortages of staff, abnormal staff patient ratios, lack of equipment and shortage of drugs and supplies which have a negative impact on the quality of service delivery, and that includes practicing HH in routine patient care (Department of Health 2012: 19). While most studies showed poor compliance as a result of poor HH supplies Mathai *et al*. (2010: 349) did not find this to be the case. Their study showed low compliance to HH practices regardless of the available resources. This study showed similar results. The resources that were lacking were pedal bins, hand rub posters, but most essential supplies for HH were available, and yet the findings showed poor HH across nurse category, facilities and service areas within the facility. It can be argued and agreed with the WHO (2009a: 99) that to improve HH a multifaceted, multimodal HH strategy, and an approach that promotes patient safety culture has to be used for better results. Such approach will result in the desired results.

5.2.3 Objective 3: Determine the knowledge of nurses on hand hygiene practices

Demographics and knowledge

The study findings showed poor knowledge of HH in all the facilities, in all the service areas and in all the nurse category. However, PNs still showed more knowledge than other categories 60.5%. Clinic V had more knowledge 37.2% than the other two clinics and CR had 67.4% knowledge more than the other service area. It was observed that where there was better knowledge there was more PNs in that facility than others and the CR service area PNs worked there.

The findings are supported by Arbee *et al*. (2012: 32), in their study nurses had higher level of awareness and knowledge of infection control policies and procedures than doctors as a result of their regular infection and control training and in that the responsibility of infection control was their function. In this study it can be argued that the training was not given equally to all categories of nurses. PN were exposed to infection prevention training more than other categories of staff and that is shown by their better knowledge than other nurse categories. According to the study by Dramowski *et al*. (2015: 73), training improved health care worker's knowledge on IPC and HH compliance, but no change on other IPC practices. Similarly, the study by Mortel (2012: 1011) showed non-compliance regardless of IPC programmes which included ongoing education and training, easy access to hand washing facilities, convenient user-friendly alcohol-based hand rubs.

Training of nurses on HH

The study wanted to know whether any training on HH was received, and the frequency of that training. The results showed inadequate training, with only 78% having been trained and 34.9% indicated having received it every three months

The study by Dramowski *et al*. (2015: 73-75) shows that nurses in the rural district received infrequently IPC training either annually or none, in the same district, only 51% reported in service training in IPC. The study showed improvement as a result of training in IPC knowledge and HH compliance but not on other IPC practices. Finding in another study by Dramowski (2014: 88), showed that the challenge in training on HH is that the HCWs believe that they already know about the topic and new innovative ways to share the information are important. From Dramowski *et al*. (2015: 73-75; Dramowski 2014: 88), it can be concluded that the frequency of the training, the quality and the attitude of the nurses to the training contributes to the level of compliance to HH, and to create a culture of HH more and frequent training needs to be done.

The WHO (2012: 18) recommends training on HH practices and other critical infection prevention and control should form part of the basic nursing and medical training. Training has to be continuous training and has to cover the importance of HH, the 'My Five Moments for Hand Hygiene' and the correct technique of hand washing and hand rubbing. For quality training the trainer has to possess basic knowledge of infection control, and experience of educational techniques and health-care delivery. The WHO cited this as critical because education and training is the cornerstone in infection control. The findings of the study by Omogbai *et al*. (2011: 13) concur with the WHO in that respondents indicated a need for training that will cover the indications and the steps for HH.

The study by Schweizer *et al*. (2014: 248-249) reveals that interventions that included education, feedback, reminders like posters, access to alcohol-based hand rub, administrative support had shown to be more effective in improving HH compliance.

Knowledge of nurses with HH practices

Table 4.19 include knowledge questions to establish whether HH before touching the patient, immediately after a risk of body fluid, after exposure to the immediate surroundings of a patient, immediately before a clean/aseptic technique, immediately before a clean/aseptic technique prevents transmission to the patient.

All nurses (100%) responded that they did HH before touching a patient prevents transmission to the patient. This supported by the WHO (2009a:101-102). Moment one of the Five Moments of Hand Hygiene, which states that HH before contact with the patient is to prevent germ transmission from the health care area to the patient through HCWs hands. Ultimately, to protect the patient from colonization and against exogenous infection by harmful germs in some cases. The nurses' correct knowledge that HH before contact with patient prevented transmission of germs to the patients contradicted what was observed in this study where HH was performed more after contact with patient than before contact. An indication of knowledge that didn't translate to practice.

The results of the current study showed that 83.7% answered that HH immediately after a risk of body fluid exposure prevents transmission to the patient and 93% answered that HH after exposure to the immediate surroundings of a patient prevents transmission to the patient. These findings showed lack of knowledge since according to the WHO 'Five Moments of Hand Hygiene', the reason for HH after contact with patient and after the patient's surrounding is to prevent contamination of the nurse and the surrounding (WHO 2009a: 101). Though the study showed nurses performing HH more after contact than before contact the results on their knowledge showed lack of knowledge on the rationale behind the HH indication. Contrary to the study by Alex-Hart and Opara (2011: 8) which showed low hand washing amongst nurses and even lower before contact with the patient, and higher after contact

with patients, which indicated that HH improved after contact with patients when the HCWs perceive risk for their own health.

The results of the study that was conducted by Aziz and Haq (2012: 196-200) revealed that staff had knowledge regarding the benefits of HH however compliance was low due to lack of motivation and lack of hand washing facilities.

Almost all nurses (97.7%) responded that HH was done immediately before a clean/aseptic technique prevents transmission to the patient. The findings are supported the WHO (2009a: 101) in the moment two of the five moments of HH that states that HH immediately before a clean/aseptic technique is to prevent germ transmission to the patient and from one body site to another in the same patient, and from the health care area to the patient through inoculation.

It is worth noting that the knowledge and the observations of the respondents were not consistent, as the study showed HH after contact was done more than before contact. According Schultz (2010:12-14), knowledge of HH before a clean or aseptic technique is important according to as micro-organisms like *Staphylococcus aureus* are found on the skin and are the main cause for wound infections. Their entry into the blood stream leads to serious infections like septicaemia, pneumonia and endocarditis. Therefore, the effective measure to prevent their transmission is through appropriate HH.

The study also assessed the knowledge of what to avoid for effective HH and 97.7% had knowledge that wearing of jewellery had to be avoided, and all nurses 100% had knowledge that artificial finger nails and broken skin had to be avoided. Nurses knowledge didn't translate into action, it was observed that only 66.6% had no jewellery during hand washing and <75% of the time. The researcher observed nurses with nail polish on. According to the WHO (2009a:132), the wearing of jewellery and artificial and painted nails during routine care carry the risk of high colonization of micro-organism and may

contribute to the transmission of certain health-care associated pathogens, and interferes with effective HH. The recommendations are to discourage the HCWs from wearing of jewellery, a simple wedding band can be acceptable except in high risk settings like operating theatre, and to have natural nails that are to be kept short less than 0.5cm long.

Nurses knew that broken skin should be avoided and that could have been to protect themselves more than the understanding of high colonisation by pathogens. The researcher didn't observe any nurses with a broken skin. The response about whether the regular use of hand cream has to be avoided 69.8% of nurses answered yes, which was incorrect as according to WHO (2009a: 62), it is recommended that additional hand lotions are to be used to increase hydration and prevent skin irritation as repeated hand washing has a potential to cause skin irritation. The concern is that hand lotions have risks of contamination and refilling the containers has to be discouraged.

The study showed the average knowledge score across all questions was 73.64% and what was observed showed no translation of that knowledge into practice. The knowledge was a self-reported, the study by Al-Naggar and Al-Jashany (2013: 11) a self-reported evaluation on knowledge showed compliance contrary to the observation, some respondents were observed washing hands with soap and water whilst some only used water. According to the WHO, knowledge of good HH practices and techniques is of paramount importance (WHO 2009a: 89-92).

5.2.4 Objective 4: Association between hand hygiene practices, available supplies for hand hygiene and knowledge of nurses on hand hygiene practices

Pearson's correlation was used to ascertain whether good knowledge was significantly related to good HH practices, hand washing and hand rubbing. Results showed no significant correlations between knowledge with HH practices, hand washing and hand rubbing. The findings are supported by an interventional study by Fitzpatrick *et al*. (2011: 272) where an educational programme to improve knowledge regarding HCAI and HH was done and showed very low compliance 48% for physicians and 42% for nurses post intervention. Nurses showed no significant improvement which implied that their non-compliance was as a result of attitude and learned behaviour more than knowledge. The authors concluded that educational programme on HH add value and improve compliance.

The findings of the study that was conducted by Van De Mortel, Kermode, Progano and Sanson (2012: 576) showed poor knowledge in both nursing and medical students in the use of alcohol hand rub solution and recommended that education and training is required to improve knowledge and compliance in HH compliance.

According to the Joint Commission (2009:12), countries took efforts to improve the occurrence of HCAIs in their health care facilities and environments through development of guidelines and policies, but the issuing of guidelines does not guarantee behaviour change amongst the HCWs, what is important is the assessment of their implementation. South Africa as a country has developed National Infection Prevention and Control Guidelines and Policies to assist HCWs in the prevention and control of infection and it uses the WHO guidelines (DOH 2007:6-7; WHO 2003: 1-74), and all facilities had copies of the guidelines, but as stated by the Joint Commission (2009:12) issuing guidelines without training does not guarantee usage or compliance. Fitzpatrick *et al.*

(2011: 270) agree that poor HH compliance can be improved through education and training and introduction and enforcement of the HH policies.

Pittet (2000: 381-386) study concluded that training remains the corner stone in improving HH practices and the lack of knowledge of HH guidelines, unawareness of HH indicator during patient care, and the potential risk of transmission of micro-organisms to patients are the barriers to HH compliance.

To ascertain the percentage of time HH practice, hand washing and hand rubbing used differed significantly with whether there were or were no supplies Mann Whitney Test was used. The results showed that Mann Whitney Test could not be performed on empty groups as resources were available.

The findings refute the WHO in stating that IPC measures are depended on financial resources that determine staffing, supplies and adequate structures and developing countries with their financial constraints are hid hard (WHO 2009a: 7). In the study supplies were available. Instead the findings are congruent to the study by (Mathai *et al*. 2010: 349) which showed low compliance to HH practices regardless of the available resources.

Contrary, the study findings by Omogbai *et al*. (2011: 9) shows that the barriers to HH were reported to be lack of adequate HH supplies like antimicrobial soap and in addition to that forgetfulness and lack of time due to busyness of the clinic. Similarly, Aziz and Haq (2012: 196-200) showed that staff had knowledge regarding benefits of hand washing practices however compliance was low due to lack of motivation and hand washing facilities. It can be argued that studies showed lack of supplies with other factors as barriers to HH. The study by Ider *et.al*. (2012:170) showed poor compliance to HH practice that was cited by lack of training in infection prevention and control thus staff having no technical skills in this field. Other reasons for non-compliance were as a result of lack of infection, prevention and control committee, lack of accountability, poor human and financial resources for infection control, and lack of focus of the infection

control nurse on infection control as a result of general administrative work making focus on infection control impossible.

5.3 SUMMARY OF THE CHAPTER

This chapter discussed the findings of the study. Logic model framework facilitated the research by providing information on the availability of resources (inputs) for HH and practices (activities) in HH in selected PHC clinics of eThekwini municipality. The next chapter will discuss the limitations and recommendations of the study.

CHAPTER 6: LIMITATIONS, RECOMMENDATIONS AND CONCLUDING REMARKS OF THE STUDY

6.1 INTRODUCTION

The chapter will discuss the limitation and recommendation of the study.

6.2 LIMITATIONS OF THE STUDY

The study excluded doctors who visited clinics once a week for half a day or the entire day. The sample size was small. The small number of ENAs to ENs and PNs was not a true reflection as it allowed bias. The study excluded students placed at this facilities for their experiential learning. Findings could have helped to establish how much does basic nurse training emphasize IPC and HH practices. Observation allowed the generation of most accurate data on compliance of the nurses to the HH guidelines. The limitation was the possibility of nurses altering their HH performance in the presence of direct observer (Hawthorne effect), video cameras or disguised observation would have minimised this possible source of bias. Feedback could not be given immediately before leaving the facility as a result of the busyness of the facilities and since it was a research project and data had to be analysed first and interpreted. The study was closed ended structured question and not allowing further exploration on the knowledge and understanding of phenomena.

6.3 RECOMMENDATIONS OF THE STUDY

The recommendations were made with special reference to organisational structure, training of nurses on HH, monitoring and evaluation of the HH and entire IPC programme, management support of HH programme and further research.

6.3.1 Organisational structure

To create the culture of IPC in the PHC setting and in view of the emergence of HCAIs which are the health care system cost drivers due to prolong hospital stay, possible litigation, the IPC programme should have dedicated staff without any other responsibilities but IPC and that staff has to be trained or specialists in the field. They will guide the programme, ensure that guidelines and policies are known and staff is trained on, and they are being implemented and monitored through audits or research, and will give regular feedback for improvement.

6.3.2 Training of nurses on HH

Training alone doesn't change behaviour, it needs to be monitored and needs trained trainers with subject expertise and who are passionate about the field. Training can be formal or in-service training of all staff categories. The formal training has to be included in basic nursing and be registered with the South African Nursing Council for infection prevention and control to be taken seriously.

6.3.3 Monitoring and evaluation of HH practices

Monitoring and evaluation in the form of audits with feedback has to be carried out on regular basis to ensure sustainable implementation. It must not rely on self- assessments only, but to be in the form of internal, peer and external reviews. Assessments should not rely on checklists but to include observations of the HH techniques as this is the "gold standard" and as recommended by other studies.

6.3.4 Management support

Managers in the health services play a major role in influencing behaviour. They are role models in the health systems. Their support should also include their

adherence to HH guidelines with regard to wearing of jewellery, nails and HH practices when entering clinical services. This include supervisors and programme managers.

6.3.5 Further research

Further research to explore reasons for poor HH when resources were available. More observational studies with the sample size that could produce a large-scale data on compliance with HH to the five moments for HH approach. Interventional studies to allow monitoring of improvement in HH practices.

6.4 CONCLUSION OF THE STUDY

The study has shown that HH which is known to be cheap, easy, simple standard precaution to reduce the HCAIs and as a result reduce disease outbreaks, morbidity, mortality, cost of long hospital stay and possible litigation, remains a practice that is not complied even in the PHC setting. The challenge is that it is not practiced even when resources are available and if it is practiced the technique is wrong thus not effective in removal of pathogens. The study has further shown that inputs in the logic framework were available but their availability didn't yield to the desired activities and that needs to be explored. Nurse preferred the usage of ABHR more than hand washing however the technique was very poor. Usage of ABHR is recommended by WHO for its antiseptic effect, however the poor technique in applying it renders it ineffective in the destruction of pathogen. Regular training on HH practices is indicated since the results showed that not to be the case particularly with lower category of the nursing staff. This was shown by the poor knowledge of nurses in HH practices. Resources in the study did show any correlations with the practice of HH. Further research is needed in PHC setting to explore further HH practices amongst all HCW in this setting.

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APPENDICES

Appendix 1: DUT Ethics clearance

Institutional Research Ethics Committee
Faculty of Health Sciences
Room MS 49, Mansfield School Site
Gate 8, Ritson Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2900
Fax: 031 373 2407
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

26 November 2015

IREC Reference Number: **REC 136/15**

Ms N G Mufamadi
P O Box 14083
Austerville
4052

Dear Ms Mufamadi

Assessment of nurses' hand hygiene practices in primary health care clinics of eThekwini municipality

The Institutional Research Ethics Committee acknowledges receipt of your final data collection tool for review.

We are pleased to inform you that the questionnaire has been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the IREC acknowledges receipt of your gatekeeper permission letter.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Yours Sincerely,

[redacted]

Professor J K Adam
Chairperson: IREC

DUT DURBAN UNIVERSITY OF TECHNOLOGY
2015 -11- 26
INSITUTUTIONAL RESEARCH ETHICS COMMITTEE
P O BOX 1334 DURBAN 4000 SOUTH AFRICA

Appendix 2a: Letter of permission to the Head of Health Unit

65 Hillhead Road
Bluff
4052

Head of Health Unit
EThekwini Municipality
9 Archie Gumede Road
Durban
4000

Dear Sir/Madam

REQUEST FOR PERMISSION TO CONDUCT A STUDY IN THE MUNICIPALITY PHC CLINICS

I hereby request to conduct a research project at your institution. The research project is for my studies towards Masters of technology Degree. I am currently registered with Durban University of Technology in faculty of health Science, Nursing Department. The title of my research project is: *Assessment of nurse' hand hygiene practices in primary health care clinics of eThekwini municipality*. I am attaching the research proposal for your perusal.

The aim of the study is to assess the current prevailing practices of the nurses with regard to hand hygiene during clinical care. Data will be collected in two phases. Phase 1 will entail direct observation with the aid of an adapted Infection Control Self-Assessment Tool (ICAT tool) for Primary Health Care Facilities. In Phase 2, nurses will be asked to fill a questionnaire in order to assess knowledge and training in hand hygiene using World Health Organisation (WHO) Hand Hygiene Knowledge Questionnaire for Health Care Workers Assessment Tool.

The researcher will ensure confidentiality and will not disrupt the flow of the clinic.

Your support and permission to conduct the study in your facilities will be appreciated.

Yours sincerely

Ms. N. G, Mufamadi (Masters student)

Signature: _____

Prof. M.N. Sibiya (Supervisor)

Signature: _____

Appendix 2b: Approval letter from the Head of Health Unit

Dear NG Mufamadi

17 November 2015

Subject: Approval of a research proposal.

The research proposal titled: **Assessment of nurses hand hygiene practices in primary health care clinics of eThekwini Municipality** was reviewed by the eThekwini Municipal Health Department research Committee. The study is hereby **approved.**

The following conditions need to be noted:

- Submission of the indemnity form obtainable from the EThekwini Municipality Health Unit before commencement of the study.
- Prior arrangements to be made with the facility and an assurance that all services will not be disrupted.
- No staff member should be used for collecting data for the researchers.
- Progress reports to be provided and the final report of the study to the eThekwini Municipality Health Unit or emailed to:**ntombifuthi.mangeni@durban.gov.za and Cc: grace.mufamadi@durban.gov.za**
- Obtain permission from the eThekwini municipality health department for press releases and release of results to communities/stakeholders.
- The department has to receive recognition for the assistance given.
- Any amended to the study to be communicated with the eThekwini Municipality Health Unit and the relevant amendment form obtainable from the unit to be submitted.
- Withdrawal of permission to conduct research will be left to the discretion of the eThekwini Municipality Health Unit.

Yours faithfully

[redacted]

Deputy Head of Health

Signature: [redacted]

Date: 2015-11-20

Appendix 3a: Letter of information to the participants

Dear Participant

Thank you for agreeing to participate in this study.

Title of the Research Study: Assessment of nurses' hand hygiene practices in primary health care facilities of eThekwini municipal area.

Principal Investigator/s/researcher: Ms NG Mufamadi (B Tech: Nursing)

Co-Investigator/s/supervisor/s: Prof MN Sibiya (D Tech: Nursing)

Brief Introduction and Purpose of the Study: Infection control is one of the priority areas of the national core standard and hand hygiene is one of the standard precautions in infection control. Therefore, the purpose of the study is to assess hand hygiene practices of nurses within PHC clinics of eThekwini municipality.

so as to come up with recommendation for quality improvement.

Outline of the Procedures: The researcher will sit in the consultation room during patient care observing clinical activities and the surrounding. If there's little activity in the room or if clinical situation makes it difficult or inconvenient to conduct the observations, the researcher will go to the next room. At the end of the observation session you'll be requested to complete the questionnaire by signing the informed consent**.** Completion of this questionnaire will take you about 15 minutes.

Risks or Discomforts to the Participant: There will be no risk or discomfort that will happen when you take part in the study.

Benefits: The study will assess your hand hygiene practices and will identify if there are the knowledge gaps and ultimately recommendations will be made to address these gaps.

Reason/s why the Participant May Be Withdrawn from the Study: You are allowed not to be part of the study or withdraw if you no longer want to proceed with the study and there will be no penalty for withdrawal.

Remuneration: There will be no money paid to you for being part of the study.

Costs of the Study: You will not be expected to pay money to be involved in the study

Confidentiality: There will be no mention of your name on the data collection tools that will be used for the study. The consent form with your name will be kept separately from the questionnaire by the researcher.

Research-related Injury: The nature of the study does not have the risk of you being injured.

Persons to Contact in the Event of Any Problems or Queries: Please contact the researcher (031-311 3697.), my supervisor (031-373 2606.) or the Institutional Research Ethics administrator on 031-373 2900. Complaints can be reported to the DVC: TIP, Prof F. Otieno on 031-373 2382 or dvctip@dut.ac.za.

Appendix 3b: Consent

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Ms NG Mufamadi about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	**Date**	**Time**	**Signature / Right Thumbprint**

I, _____ (name of researcher) herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____	_____	_____
Full Name of Researcher	**Date**	**Signature**
_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**
_____	_____	_____
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**

Appendix 4: Observation checklist for hand hygiene practices

Date

1. Facility

2. Service area:

3. Professional category:

4.

Professional Nurse	
Enrolled nurse	
Enrolled nursing auxiliary	

5. Observations

Patient Contact	Type of patient contact		Type of HH before patient contact			Type of HH after patient contact		
	Invasive	Non-invasive	Hand washing	Alcohol rub	None	Hand washing	Alcohol rub	None
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								

17								
18								
19								
20								
TOTAL								

Appendix 5: Observation checklist for hand washing practices

6. Date
7. Facility

8. Service area:

9. Professional category:

Professional Nurse	
Enrolled nurse	
Enrolled nursing auxiliary	

10. Observations

No	1		2		3		4		5		6		7		8	
Observations	**Are hands free of jewelry and other accessories?**		**Are sleeves above the elbow?**		**Is soap applied?**		**Rubbing palms and backs of hands, fingers, spaces between fingers, and wrists?**		**Are hands rinsed with sufficient running water?**		**Dry hands with paper towel?**		**Avoid recontam-ination of hands when switching off the tap?**		**Wash hands for no less than 30 seconds?**	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																

18																
19																
20																
Total																

Appendix 6: Observation checklist for hand rubbing practices

Date

Facility

Service area:

Professional category:

Professional Nurse	
Enrolled nurse	
Enrolled nursing auxiliary	

Observations

No	1			2			3			4		
	Is the hand rub solution applied fully on the palm			Follow all the steps of hand rubbing technique which involves rubbing hands palm to palm, palm over dorsum with interlaced fingers, palm to palm with interlaced fingers, fingers opposing palms with fingers interlocked, rotational rubbing of thumb, and rotational rubbing of palms.			Allowing hands to dry			Hand rubbing for not less than 20 seconds.		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
1												
2												
3												
4												

5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
total												

Appendix 7: Observation checklist for assessing hand washing station supplies

1. **Date:**

2. **Facility:**

Service area:

4. HAND HYGIENE SUPPLIES	**YES**	**NO**
4.1. Is running water available?		
4.2. Is the tap elbow operated?		
4.3. Is liquid soap available?		
4.4. Is the soap dispenser in a clean condition?		
4.5. Are disposable towels available?		
4.6. Is there a pedal bin in the service area?		
4.7. Are posters illustrating hand wash technique displayed beside each sink?		
4.8. Is alcohol hand rub available?		
4.7. Is alcohol hand rub at the point of care?		
4.8. Are posters illustrating hand rub technique close to the dispensers?		
4.9. Are posters illustrating indications for hand hygiene displayed in multiple areas of the facility?		
4.10. Is any other type of hand hygiene displayed/available on this facility?		
4.11. Is there a copy of hand hygiene guideline available in the facility?		
4.12. Is the sink clean?		
4.13. Are the taps leaking?		
4.14. Are the drainage pipes leaking?		
TOTAL		

Appendix 8: Questionnaire

1. Date:

Facility:

2. Service area:

3. Professional category:

Professional nurse	
Enrolled nurse	
Enrolled nursing auxiliary	

4. Have you received any training on hand hygiene?

Yes	
No	

5. If yes to question 5, indicate the frequency of hand hygiene training in this facility:

At least monthly	
At least every 3 months	
At least once a year	
Less often than once a year	

7. Which of the following hand hygiene actions prevents transmission of germs to the patient?

	Yes	No
7.1 Before touching a patient		
7.2 Immediately after a risk of body fluid exposure		
7.3 After exposure to the immediate surroundings of a patient		
7.4 Immediately before a clean/aseptic technique		

8. Which of the following hand hygiene actions prevents transmission of germs to the nurses?

	Yes	No
8.1 After touching a patient		
8.2 Immediately after a risk of body fluid exposure		
8.3Immediately before a clean/aseptic procedure		
8.4 After exposure to the immediate surroundings of a patient		

9. Which of the following should be avoided, as associated with increased likelihood of colonisation of hands with harmful germs?

	Yes	No
9.1 Wearing of jewellery		
9.2 Damaged skin		
9.3 Artificial fingernails		
9.4 Regular use of a hand cream		

THANK YOU FOR YOUR TIME.

Appendix 9: Letter from the statistician confirming consultation

Gill Hendry B.Sc. (Hons), M.Sc. (Wits)

Mathematical and Statistical Services

Cell: 083 300 9896

email: hendryfam@telkomsa.net

9 March 2015

To whom it may concern

Please be advised that Ms Grace Mufamadi (Student Number 19700825) who is presently studying for a Master of Technology: Nursing has consulted me regarding the sampling strategy she will use for her study. I have also advised her on the development of the checklists and questionnaire.

Yours sincerely

Gill Hendry (Mrs)