

**KNOWLEDGE, ATTITUDES AND PRACTICES OF NURSES IN  
INFECTION PREVENTION AND CONTROL WITHIN A TERTIARY  
HOSPITAL IN ZAMBIA**

**CHITIMWANGO PRISCILLA CHISANGA**

Thesis presented in partial fulfilment of the requirements

for the degree of



**Masters of Nursing Science**

In the Faculty of Medicine and Health Sciences

**Stellenbosch University**

**Supervisor: Mrs. Dawn Hector.**

**Co- supervisor: Mrs. Anneleen Damons**

**March 2017**

## **DECLARATION**

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own work and that I am the sole author thereof, that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and I have not previously in its entirety, or in part, submitted it for any qualification.

Signature:

Date: March 2017

Copyright © 2017 Stellenbosch University

All rights reserved

## ABSTRACT

**Background:** Nurses are health care professionals whose duty it is to protect patients from acquiring infections while hospitalised or while in a health care set up. By maintaining an infection free environment, the patient's recovery will be promoted and high-quality nursing care will be delivered. Nurses spend most of their time with patients. Therefore, they should have a good level of understanding of the knowledge, attitudes and practices in infection prevention and control in health care setups.

The aim of the study was to determine the knowledge, attitudes and practices of nurses regarding infection prevention and control.

The objectives were to determine:

- The knowledge of nurses in infection prevention and control within a tertiary hospital within Zambia.
- The attitude of nurses in infection prevention and control within a tertiary hospital in Zambia.
- The practices of nurses in infection prevention and control within a tertiary hospital in Zambia and
- To make recommendations to the risk programme and policies of the tertiary hospital within Zambia.

**Method:** A quantitative descriptive study was conducted at a government tertiary hospital in Zambia. Sample: a Stratified random sampling was performed. A total of n= 196 nurses of all categories (70% from each category) were recruited in the study. Tools of data collection: a self-developed validated close-ended questionnaire guided by hospital policies, procedure standards, World Health Organisation and Zambian Centres for infection prevention and control, was used to collect data.

**Results:** During the main study, n= 196 questionnaires were distributed, n= 196 participants completed the questionnaires, a response rate of 100%. Most of the participants were female; 84.7% (n= 166) while 15.3 % (n= 30) were male. The majority of participants had good knowledge in infection prevention and control with the mean score of 83.21. The attitude towards infection prevention and control was good with the mean score of 81.37. The practice in infection prevention and control was poor with the mean score of 48.88.

**Conclusion:** Based on the findings of the current study, it can be concluded that, despite performing well in knowledge and showing a positive attitude towards infection prevention and control, nurses had unsatisfactory practice levels regarding infection prevention and control, exposing the patients to infection-related diseases.

**Recommendations:** Strengthening infection prevention and control practice through regular in-service training/workshop; ensure that members of staff receive appropriate vaccinations regarding infection prevention and control; ensure that resources, e.g. personal protective equipment are available all the time; observing nurses' practices (hand hygiene auditing and during invasive procedures) and provide feedback. Furthermore, research about the barriers in infection prevention and control practices.

**Keywords:** Knowledge, Attitudes, Practices, infection prevention and control.

## OPSOMMING

**Agtergrond:** Verpleegsters is gesondheidswerkers wie se plig dit is om pasiënte te beskerm teen die opdoening van infeksies tydens hospitalisasie of terwyl die patient in 'n gesondheidsorg instelling is. Deur die handhawing van 'n infeksie vrye omgewing, word die pasiënt se herstel bevorder en 'n hoë gehalte verplegingsorg gelewer. Verpleegsters spandeer die meeste van hul tyd saam met pasiënte, dus moet hulle 'n goeie vlak van begrip van die kennis, houdings en praktyke hê met betrekking tot die voorkoming en beheer van infeksie in gesondheidsorg instellings. Die doel van die studie was om die kennis, houdings en praktyke van verpleegsters met betrekking tot infeksie voorkoming en beheer te bepaal.

Die doelwitte was om vas te stel:

- die kennis van verpleegsters in infeksie voorkoming en beheer binne 'n tersiêre hospitaal in Zambië
- die houding van verpleegkundiges in infeksie voorkoming en beheer binne 'n tersiêre hospitaal in Zambië.
- die praktyke van verpleegsters in infeksie voorkoming en beheer binne 'n tersiêre hospitaal in Zambië en
- om aanbevelings te maak aan die risiko program en beleid van die tersiêre hospitaal.

**Metode:** 'n Kwantitatiewe beskrywende studie is uitgevoer in 'n tersiêre hospitaal in Zambië. Steekproef: 'n Gestratifiseerde steekproefneming is uitgevoer. 'n Totaal van  $n = 196$  verpleegsters van alle kategorieë (70% van elke kategorieë) is gewerf vir die studie. Data-insameling instrument: 'n self-ontwikkelde gevalideerde geslote vraelys gelei deur die hospitaal beleid, prosedures standaarde, Wêreld Gesondheid Organisasie en Zambiese sentrums vir Infeksievoorkoming en beheer is ontwikkel en is gebruik om data in te samel.

**Resultate:** Gedurende die hoof studie, was  $n = 196$  vraelyste versprei, al  $n = 196$  deelnemers het die vraelyste voltooi, met 'n responskoers van 100%. Die meeste van die deelnemers was vroulik, 84,7% ( $n = 166$ ), terwyl 15,3% ( $n = 30$ ) manlike was. Die meeste van die deelnemers het 'n goeie kennis van infeksie voorkoming en beheer getoon met die gemiddelde telling van 83.21. Die houding teenoor infeksie

voorkoming en beheer was goed met die gemiddelde telling van 81.37. Die praktyk in infeksie voorkoming en beheer is swak met die gemiddelde telling van 48.88.

**Slotson:** Op grond van die bevindinge van die huidige studie, kan dit afgelei word dat, ten spyte van goeie prestasie in kennis en die toon 'n positiewe houding teenoor infeksie voorkoming en beheer, het verpleegsters onbevredigende praktyk vlakke met betrekking tot infeksie voorkoming en beheer, blootstelling van die pasiënte aan infeksie verwante siektes.

**Aanbevelings:** Versterk die infeksie voorkoming en beheer praktyk deur gereelde indiensopleiding / werkswinkel; verseker dat personeellede toepaslike inentings ontvang met betrekking tot infeksie voorkoming en beheer; verseker dat hulpbronne b.v.persoonlike beskermende toerusting deurentyd beskikbaar is; waarneming van verpleegsters praktyke (hand higiëne ouditering en tydens indringende prosedures) and voorsien terugvoering. Verder, navorsing omtrent die hindernisse in infeksie voorkoming en beheer praktyke.

**Sleutelwoorde:** Kennis, Houdings, Praktyk, Infeksie voorkoming en beheer

## ACKNOWLEDGEMENTS

I would like to express my sincere thanks to:

- God the Father, Son and Holy Spirit for making it possible for me to complete the study.
- My husband Alex Makupe, Anna Pascall, my children; Mwange, Twange, Yande and Yangeni for being there for me.
- My Parents Mr. and Mrs. Chitimwango, my brothers and sisters and friends for your support and encouragements.
- Mrs. Dawn Hector, my supervisor and Mrs. Anneleen Damons my co-supervisor from Stellenbosch University, nursing division, for their continuous support and guidance throughout the study.
- Mrs. T Crowley our lecturer, from Stellenbosch University, for your time and guidance.
- Ms. T Esterhuizen the biostatistician, from Stellenbosch University, for your assistance with data analysis.
- All nurses, from Ndola Central Hospital who participated in the study for your time to complete the questionnaire.
- David Kwao-Sarbah – the editor for his support.

<b>TABLE OF CONTENTS</b>	<b>PAGE</b>
Declaration.....	ii
Abstract.....	iii
Opsomming.....	v
Acknowledgements.....	vii
List of tables.....	xiv
List of figures.....	xv
Abbreviations.....	xvii
 <b>CHAPTER 1: FOUNDATION OF THE STUDY.....</b>	 <b>1</b>
1.1 INTRODUCTION BACKGROUND.....	1
1.2 SIGNIFICANCE OF THE PROBLEM.....	3
1.3 RATIONALE.....	3
1.4 PROBLEM STATEMENT.....	6
1.5 RESEARCH QUESTION.....	6
1.6 RESEARCH AIM.....	6
1.7 RESEARCH OBJECTIVES.....	6
1.8 CONCEPTUAL FRAMEWORK.....	7
1.8.1 Application of Florence Nightingale' Environmental Theory related to the conceptual framework	8
1.9 RESEARCH METHODOLOGY.....	8
1.9.1 Research design.....	8
1.9.2 Study setting.....	8



1.9.3 Population and Sampling.....	8
1.9.3.1 Inclusion criteria.....	10
1.9.3.2 Exclusion criteria.....	10
1.9.4 Instrumentation.....	10
1.9.5 Pilot study.....	10
1.9.6 Validity .....	10
1.9.7 Reliability.....	11
1.9.8 Data collection.....	11
1.9.9 Data analysis and interpretation.....	11
1.10 ETHICAL CONSIDERATION.....	11
1.11 OPERATIONAL DEFINITIONS.....	12
1.11.1 Clinical environment.....	12
1.11.2 Hospital-acquired infections (HAIs).....	12
1.11.3 Standard precautions (SPs).....	12
1.12 DURATION OF THE STUDY.....	12
1.13 CHAPTER OUTLINE.....	12
1.14 SUMMARY.....	13
1.15 CONCLUSION.....	13
<b>CHAPTER 2: LITERATURE REVIEW.....</b>	<b>14</b>
2.1. INTRODUCTION.....	14
2.2. LITERATURE REVIEW.....	14
2.2.1. Hospital-Acquired Infections .....	14

2.2.1.1. Infection-related diseases.....	<b>16</b>
2.2.1.2. Central line-associated bloodstream infection .....	<b>16</b>
2.2.1.3. Catheter-associated urinary tract infection.....	<b>17</b>
2.2.1.4. Surgical site infection after surgery.....	<b>18</b>
2.2.1.5. Clostridium Difficile.....	<b>18</b>
2.2.2. Infection prevention and control.....	<b>19</b>
2.2.2.1. Primary Prevention and control.....	<b>20</b>
2.2.2.2. Secondary prevention and control.....	<b>21</b>
2.2.2.3. Tertiary prevention and control.....	<b>21</b>
2.2.3. Nurse's role in infection prevention and control.....	<b>22</b>
2.2.4. Clinical environment.....	<b>23</b>
2.2.4.1. Patient outcome in the clinical environment.....	<b>24</b>
2.2.5. Knowledge in infection prevention and control.....	<b>25</b>
2.2.5.1. Adequate knowledge in infection prevention and control.....	<b>25</b>
2.2.5.2. Inadequate knowledge in infection prevention and control.....	<b>26</b>
2.2.6. Attitude towards infection prevention and control.....	<b>27</b>
2.2.6.1. Negative attitude in infection prevention and control.....	<b>30</b>
2.2.6.2. Positive attitude in infection prevention and control.....	<b>30</b>
2.2.7. Practices of nurses in infection prevention and control.....	<b>31</b>
2.2.7.1. Good practices in infection prevention and control.....	<b>31</b>
2.2.7.2. Patient safety in infection prevention and control.....	<b>33</b>
2.2.7.3. Negligence.....	<b>33</b>

2.2.8. Nurses code of conduct regarding infection prevention and control	35
2.2.8.1. Nursing Act.....	35
2.2.8.2. Nursing standard.....	36
2.2.8.3. Ethics in nursing.....	37
2.2.8.4. Social responsibility of the nursing profession.....	38
2.3. THE ROLE OF THE CONCEPTUAL FRAMEWORK (FLORENCE NIGHTINGALE'S ENVIRONMENTAL THEORY)	38
2.4. SUMMARY.....	40
2.5. CONCLUSION.....	40
<b>CHAPTER 3: RESEARCH METHODOLOGY.....</b>	<b>41</b>
3.1. INTRODUCTION.....	41
3.2. AIM OF THE STUDY.....	41
3.3. THE OBJECTIVES OF THE STUDY.....	41
3.4. STUDY SETTING.....	41
3.5. RESEARCH METHODOLOGY.....	42
3.5.1. Research design.....	42
3.5.2. Research question.....	42
3.5.3. Population and sampling.....	42
3.5.4. Inclusion criteria.....	43
3.5.5. Exclusion criteria.....	43
3.5.6. Instrumentation.....	44
3.5.7. Pilot study.....	45

3.5.8. Reliability .....	47
3.5.9. Validity.....	47
3.5.10. Data collection.....	48
3.5.11. Data analysis and interpretation.....	49
3.5.12. Ethical consideration.....	50
3.6. SUMMARY.....	52
<b>CHAPTER 4: RESEARCH FINDINGS.....</b>	<b>53</b>
4.1. INTRODUCTION.....	53
4.2. SECTION 1: BIOGRAPHICAL DATA.....	53
4.2.1. Variable 1: Gender.....	53
4.2.2. Variable 2: Age.....	54
4.2.3. Variable 3: Marital status.....	54
4.2.4. Variable 4: Nursing category.....	54
4.2.5. Variable 5: Years practiced as a nurse.....	55
4.2.6. Variable 6: Employment status.....	56
4.2.7. Variable 7: Number of years worked in current department.....	56
4.3. SECTION 2: QUESTIONS ON KNOWLEDGE, ATTITUDE AND PRACTICES ON INFECTION PREVENTION AND CONTROL AMONG NURSES.	57
4.3.1. Knowledge questions from 2.1.1 to 2.1.12.....	60
4.3.2. Attitude questions from 2.2.1 to 2.2.12.....	67
4.3.3. Practice questions from 2.3.1 to 2.3.13.....	74

4.4. GENERAL STATISTICS ANALYSIS REGARDING THE THREE SET VARIABLES AS STATED IN THE STUDY OBJECTIVES	82
4.5. ASSOCIATION BETWEEN KNOWLEDGE, ATTITUDE AND PRACTICES.	86
4.6. SUMMARY OF RESEARCH FINDINGS.....	87
4.7 CONCLUSION.....	87
<b>CHAPTER 5: DISCUSSION, CONCLUSION AND RECOMMENDATIONS</b>	<b>89</b>
5.1. INTRODUCTION.....	89
5.2. DISCUSSION.....	89
5.2.1. Objective 1: To determine the knowledge of nurses in infection Prevention and control within a tertiary hospital in Zambia	91
5.2.2. Objective 2: To determine practices of nurses in infection Prevention and control within a tertiary hospital in Zambia	95
5.2.3. Objective 3: To determine the practices of nurses in infection Prevention and control within a tertiary hospital in Zambia	97
5.3. LIMITATIONS OF THE STUDY.....	102
5.4. CONCLUSIONS.....	102
5.5. RECOMMENDATIONS FOR FUTURE PRACTICE.....	103
5.5.1. Observation of nurse' practice and correction of poor practice.....	105
5.5.2. Provision of vaccination to all health workers regarding infection Prevention and control e.g. Hepatitis B Vaccine	106

5.6. RECOMMENDATIONS FOR FUTURE RESEARCH.....	<b>106</b>
5.7. CONCLUSION.....	<b>106</b>
REFERENCES	
ADDENDUMS	
Addendum A: Questionnaire used for the pilot study.....	<b>124</b>
Addendum B: Questionnaire used for the main study.....	<b>129</b>
Addendum C: Ethical Approval from Stellenbosch University.....	<b>135</b>
Addendum D: Preliminary Consent.....	<b>138</b>
Addendum E: Participants information leaflet and consent form.....	<b>139</b>
Addendum F: Letter from the editor.....	<b>142</b>
Addendum G: Letter to the Senior Medical Superintendent.....	<b>143</b>

### **List of Tables**

Table 1.1: Sample framework.....	9
Table 2.1: Five moments of hand hygiene according to WHO.....	28
Table 3.1: Sample framework.....	43
Table 3.2: Pilot study framework.....	46
Table 3.3: Summary of the number of questionnaires distributed and returned...	49
Table 4.1: Gender distribution of participants (n=196).....	53
Table 4.2: Age distribution of participants who participated in the study.....	54
Table 4.3: Marital distribution of participants who participated in the study.....	54
Table 4.4: Distribution of nursing categories who participated in the study.....	55

Table 4.5: Distribution of years practiced for nurses who participated in the Study.....	55
Table 4.6: Distribution of employment status for nurses who participated in the study.....	56
Table 4.7: Distribution of the number of years worked in current departments for nurses who participated in the study.....	56
Table 4.8: 2.1 Knowledge consist of question 2.1.1 to 2.2.12.....	57
Table 4.9: 2.2 Attitudes consist of questions 2.2.1 to 2.2.12.....	58
Table 4.10: 2.3 Practice consist of questions 2.3.1 to 2.3.13.....	59
Table 4.11: Questions on nurse's knowledge in infection prevention and control among nurses.....	60
Table 4.12: Questions on nurse's attitudes towards infection prevention and control among nurses.....	67
Table 4.13: Questions on practices regarding infection prevention and control among nurses.....	75
Table 4.14: Frequencies reflecting knowledge, attitude and practices scores of nurses regarding infection prevention and control.....	83
Table 4.15: Association between knowledge, attitude and practices.....	87

## LIST OF FIGURES

Figure 1.1: Florence Nightingales Environmental Theory.....	7
Figure 2.1: Florence Nightingales Environmental Theory.....	39
Figure 4.1: Extent of agreement on knowledge among nurses in infection prevention and control.....	65

Figure 4.2: Extent of agreement on attitudes among nurses in infection prevention and control.....	73
Figure 4.3: Extent of agreement on Practices towards infection prevention and control among nurses.....	81
Figure 4.4.1: Graphic representation of the distribution of knowledge scores among nurses in infection prevention and control.....	84
Figure 4.4.2: Graphic representation of the distribution of attitude scores among nurses in infection prevention and control.....	85
Figure 4.4.3: Graphic representation of the distribution of practice scores among nurses in infection prevention and control.....	86



## **ABBREVIATIONS**

CDC	Centres for Disease Control
HAI	Hospital Acquired Infections
HIV	Human Immunodeficiency Virus
ICU	Intensive Care Unit
IPC	Infection Prevention and Control
KAP	Knowledge, Attitude and Practices.
MRSA	Methicillin-Resistance Staphylococcus Aureus
TB	Tuberculosis
VAP	Ventilator Associated Pneumonia
WHO	World Health Organisation

# CHAPTER 1

## INTRODUCTION

### 1.1 BACKGROUND

Infection-related diseases are still the main cause of death in Zambia, according to the 2013 health profile acquired by the World Health Organisation (WHO, 2013) statistics. The burden of disease in Zambia includes HIV, TB, Malaria, other infectious diseases and respiratory infections. Expansion of the infection prevention and control movements occur due to the increase in infection occurrences in the country. This increase in infection-related disease's impact the increase health financing in Zambia with a government contribution to health care of 57.5% above the figures budgeted for (WHO, 2014).

Infectious patients are admitted into hospitals and therefore hospitals have become common settings for transmission of diseases. In hospitals, infected patients are a source of infection transmission to other patients, health care workers and visitors (Sydnor & Perl, 2011). Nosocomial infection, also known as hospital-acquired infections is one of the leading causes of death and has much economic cost due to increased hospitalization and prognosis (WHO, 2015). According to WHO (2010), Hospital acquired infection is defined as an infection occurring in a patient during the process of care within a health care facility which was not present or incubating at the time of admission. These infections are those occurring more than 48 to 72 hours after admission and within ten days after hospital discharge (Collins 2008:2). Due to the admission of patients with different organisms, the hospital environment has become saturated with highly virulent organisms, namely: *Staphylococcus aureus*, *Streptococcus pyogenic*, *Escherichia coli*, *Pseudomonas aureginosa* and Hepatitis viruses that survive in a hospital. These organisms cause diseases ranging from minor skin infections to life-threatening conditions such as sepsis (Sydnor, & Perl, 2011).

The Zambian Ministry of Health has indicated that Ebola virus disease epidemic in the Democratic Republic of Congo is a public health risk as a neighbouring country and therefore preparedness in infection prevention and control measures should be strengthened. Efficient knowledge, good attitude and best practices by nurses in

infection prevention and control may contribute to decreasing in infection rate in the hospital.

The Zambian Public Health Act, Cap 295, stipulates that the health care institution should provide a safe environment for the patients in their care. Hospital nurses form the backbone of infection prevention and control, therefore possibly, will either contribute to infection transmission or prevent and control infection. According to Damani (2012), the environment in which a patient is nursed must be planned to reduce the risk of transmission of infection. Infection prevention and control measures aim to protect the vulnerable people from acquiring an infection while receiving health care (Damani, 2012). Lack of knowledge, bad attitudes and poor practices amongst nurses in the prevention and control of infections can lead to hospital-acquired infections.

In clinical practice, the researcher has observed cases where nurses handle contaminated linen with bare hands, put needles in the patient's mattress after giving injections, do not clean the stethoscope between patients and do not wash hands regularly in the clinical environment. Poor infection prevention and control practices among nurses increase the rates of hospital-acquired infections.

Hand hygiene is the single most important intervention to prevent transmission of infection and should be a quality standard in all health institutions. An attitude of not washing hands among individuals involved in the provision of health care can increase the rate of hospital-acquired infections. In a study that was conducted in India, where Nair, Hanumantappa, Hinemath, Siraj and Raghunath (2013:3) assessed knowledge, attitude and practices of hand hygiene among medical and nursing students at a tertiary health care centre, the majority of students had poor knowledge with regard to hand hygiene.

Lack of knowledge among nurses can increase the rate of hospital-acquired infections. This is supported by a study that was conducted in Zimbabwe by Tirivanhu, Ancia and Petronella (2014:73) who determined the barriers of infection prevention and control practices among nurses at the Bindura provincial hospital. The study revealed that the majority of nurses' lack knowledge on infection control principles as only n= 14 (28%) of n= 50 (100%) nurses had excellent knowledge on

infection control principles, n= 21 (42%) of n= 50 nurses did not utilize the infection control manuals. Infection control workshops were poorly organised as 68% of the nurses did not attend any workshop on infection prevention and control practices (Tirivanhu et al., 2014). Hayeh and Esena (2013:47) assessed the infection prevention and control (IPC) practices among health workers at Ridge Regional Hospital in Accra (Ghana). The study showed that knowledge in IPC practices among health care workers was moderate 51% (n= 204), as availability and access to material for IPC practices at the facility was 58% (n= 118) and overall compliance with IPC guidelines was 54% (n= 110).

The World Health Organisation (2016) has indicated that surgical site infections at this particular tertiary hospital in Zambia are a research priority as there was an increase in wound infections of those people who had surgery at this hospital and this coincides with the researcher's experiences and proposal. Therefore, this study determined the knowledge, attitude and practices of nurses in infection prevention and control within a tertiary hospital in Zambia.

## **1.2 SIGNIFICANCE OF PROBLEM**

Infection-related diseases are still the main cause of morbidity and mortality in Zambia (WHO, 2015). Deaths related to nosocomial infection in the hospital continue to be a health care priority. Nurses with inadequate knowledge, bad practices in infection control and prevention, jeopardize the safety of the patient. The WHO has indicated that infection at this particular tertiary hospital in Zambia is a research priority and this coincides with the proposal. According to the European Centre for Disease Prevention and control (2014), the Zambian Ministry of Health has indicated that the Ebola virus epidemic in the Democratic Republic of Congo is a public health risk as a neighbouring country and therefore preparedness in infection prevention and control measures should be strengthened. Efficient knowledge, good attitude and best practices by the nurse in infection prevention and control may contribute to decreasing in infection rate in the hospital.

## **1.3 RATIONALE**

Patient safety is being jeopardized through exposure to hospital acquired infections. The majority of health care professionals are nurses and therefore nurses have the

ability to facilitate safe patient care through infection prevention and control knowledge, attitude and practice in hospitals (Benson and Powers, 2011:36-41). Hospital Associated Infections (HAIs) have been associated with significant morbidity and attributable mortality, as well as greatly increased health care costs (Rosenthal, Maki, Graves, Aires, Madison, Wisconsin & Bribane 2008:1). According to Custodio and Steele (2013:4), hospital acquired infections are of important wide-ranging concern in the medical field; they can be localized or systemic, can involve any system of the body and can be associated with medical devices or blood product transfusions.

Erasmus, Dahan, Brug, Richardus, Behrendt, Vos and van Beeck (2010) assessed the prevalence and correlate of compliance and non-compliance with hand hygiene guidelines in hospital care. From the study, it became clear that although there is a great deal of research available on the topic of hand hygiene compliance, few firm conclusions can yet be drawn. To facilitate comparison and learning in the future, there is a great need for a standardised measuring instrument and standardised reporting (Erasmus et al., 2010). More recently, the world health organisation has taken steps to enable more standardized guidelines and measurement, and the effects of these efforts will hopefully become visible in future studies. Many more recent studies have adopted stronger designs (i.e. larger samples sizes, better controlled conditions, and use of behavioural theories) than did older studies and it would appear that research in hand hygiene compliance has matured. However, much remains unclear, making it not always easy to implement in practice. To develop successful interventions, more research into the behavioural determinants is needed (Erasmus et al., 2010).

Oral care is proposed as a key to preventing ventilator-associated pneumonia yet little work has been done to reliably measure current oral care practices nationwide (William & Wilkins, 2009). According to Rosenthal et al. (2008:1), relatively little has been reported from limited resource countries and it has been shown that intensive care units (ICUs) in these countries have rates of device associated HAIs. These device associated HAIs include; central lines related blood stream infections, ventilator associated pneumonia (VAP) and catheter-associated urinary tract infection, 3 to 4 times higher than those reported from United States ICUs. Most

limited-resource countries do not have the law mandating HAI control programs and hospital accreditation is rarely required, funds and resources for infection control are very limited (Rosenthal et al., 2008:1). Nurse to patient staffing ratios are often far lower on the average in the ICUs than in developed countries and there are higher proportions of inexperienced nurses, all of which have been shown to have a powerful association with greatly increased the risk of device-associated infections (Rosenthal et al., 2008:1).

De Oliveira, Cardoso and Mascarenhas (2009:1) assessed the knowledge and behaviour of professionals working in ICU related to the adoption of contact precautions for the control of hospital-acquired infections. The researchers suggested the need to implement educational activities so as to permit a balance between theory and professional practice concerning hospital infection preventive measures aiming to improve knowledge and behaviour (De Oliveira et al., 2009:1).

Sessa, Di Giuseppe, Albano and Angelillo (2011:1) assessed the level of knowledge, attitudes and practices regarding disinfection procedures among nurses in Italian hospitals. The survey found that the level of knowledge, particularly of the most common hospital-acquired infections, was not satisfactory and a small percentage of nurses reported that they appropriately performed the disinfection in their practical activity. Moreover, the study also revealed an extremely positive attitude towards the utility of guidelines and protocols for disinfections. Sessa et al. (2011:5) recommended HAIs control education and training programmes to address these shortfalls and to improve knowledge and adherence to procedures and HAI prophylaxis and management as essential strategies for patient safety and reduction of HAIs.

Jain, Mishra, Thakur and Loomba (2011:1) performed an assessment of knowledge and practices of 400 health care personnel on hospital infection and control practices. The practices included hand hygiene, standard precautions (SPs), needle stick injury (NSI), Post-exposure prophylaxis (PEP) and environmental cleaning protocols of the hospital. The result showed that the hospital had suboptimal knowledge regarding the SPs with n=220 (55%) and risks associated with NSI with n=128 (32%). The implementation of SPs was biased towards HIV positive status of

the patient. Only n=228 (57%) of the doctors and nurses followed the maximal barriers precautions before a Central Venous Catheter (CVC) insertion. Jain et al. (2011:1) concluded that the lack of knowledge and practices regarding basic infection control protocols should be improved by way of educational intervention, in the form of formal training of doctors and nurses and reinforcement of the same.

#### **1.4 PROBLEM STATEMENT**

A research problem is an area of concern in which there is a gap in the knowledge base needed for nursing practice (Burns & Grove 2011:146). The researcher has observed that nurses do not apply infection prevention and control measures in the hospital setting which is required to ensure patient safety. Lack of knowledge, attitude and practices in infection prevention and control contribute to high rates of hospital-acquired infections (Jain, Dogra, Mishra, Thaku and loomba, 2012 & Hayeh and Esena, 2013). Uncontrollable nosocomial infection contributes to prolonged stay, morbidity and mortality which put stress on health care economics of the country (Mishta, Banerjee & Gosain, 2014).

#### **1.5 RESEARCH QUESTION**

What is the level of knowledge, attitudes and practices of nurses in infection prevention and control within a tertiary hospital in Zambia?

#### **1.6 RESEARCH AIM**

In order to address the research question, the aim of the study is to determine the knowledge, attitudes and practices of nurses regarding infection prevention and control within a tertiary hospital in Zambia.

#### **1.7 RESEARCH OBJECTIVES**

Based on the aim, the following objectives have been set for the study to determine:

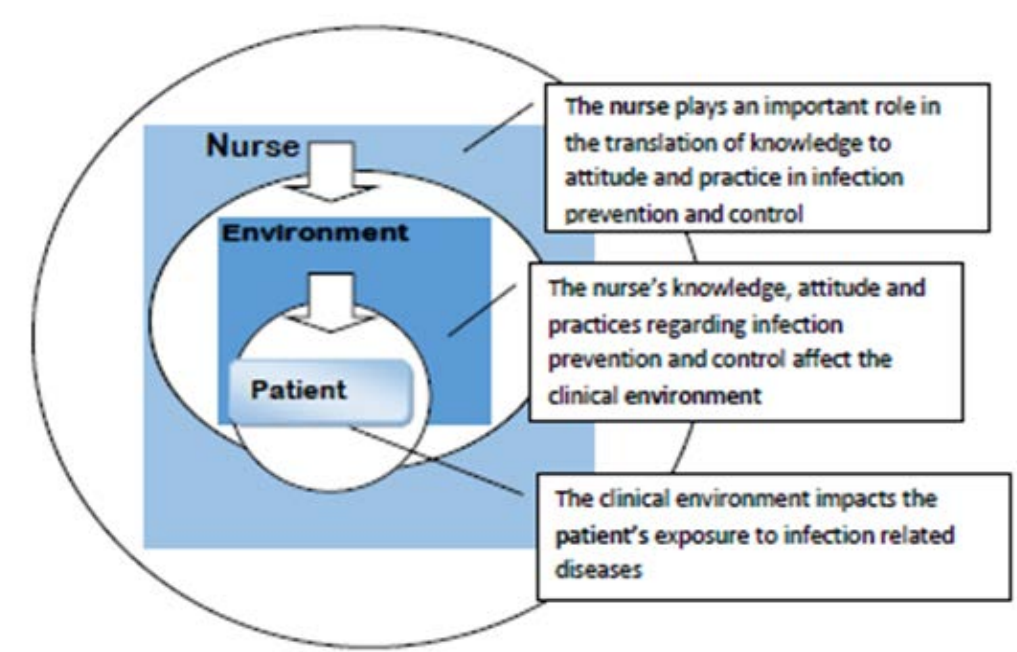
- the knowledge of nurses in infection prevention and control within a tertiary hospital within Zambia.
- the attitude of nurses in infection prevention and control within a tertiary hospital in Zambia.
- the practices of nurses in infection prevention and control within a tertiary hospital in Zambia and

- To make recommendations to the risk programme and policies of the tertiary hospital.

## 1.8 CONCEPTUAL FRAMEWORK

The researcher adopted the Florence Nightingale's theory (2013, 2014) on infection control to illustrate the research study. According to Florence Nightingale, the role of the nurse is to place the patient in the best position for nature to act upon him, thus encouraging healing. The theory implies that the nurse has to provide a clean environment to the patient (in this case infection prevention and control). Florence Nightingale proposed a link between cleanliness and disease transmission indicating that there is a correlation between hand washing and a decrease in infection rates. Proper hand hygiene is the primary method for reducing infection (Frello & Carraro, 2013). Nurses' knowledge, attitudes and practices in infection prevention and control can affect the health environment of the patient. The framework below shows how the nurses (knowledge, attitudes and practices in infection control practices) influence the environment (infection prevention and control) which impacts the disease profile of the patient.

**Figure 1.1: Florence Nightingale's conceptual frame work on environmental theory (Hegge, 2013 and Gurler, 2014).**





### **1.8.1 Application of the Florence Nightingale's Environmental Theory related to the conceptual framework.**

**Nurse:** The nurse plays an important role in the translation of knowledge to attitude and practice in infection prevention and control. Nightingale acted out prevention and control practices through her knowledge, attitude regarding infection prevention and control which placed the patient in the best possible position for healing (Hegge, 2013 and Gurler, 2014).

**Environment:** The nurses' knowledge, attitudes and practices affect the clinical environment. Nightingale stressed that cleanliness (sanitation, hygiene) and infection prevention and control measures in the clinical environment contribute to improving health care (Hegge, 2013 and Gurler, 2014).

**Patient:** The nurses' knowledge, attitudes and practices in infection prevention and control have an effect on the clinical environment which in turn impacts the patient's exposure to infection-related diseases. Nightingale focused on caring for the sick and placed emphasis on the importance of hygiene and patient care in infection prevention and control (Hegge, 2013 and Gurler, 2014).

## **1.9 RESEARCH METHODOLOGY**

### **1.9.1 Research design**

A descriptive quantitative design was proposed to determine knowledge, attitudes and practices of nurses regarding infection prevention and control within a tertiary hospital in Zambia.

### **1.9.2 Study setting**

The study setting was the clinical environment of a tertiary government hospital in Zambia. The clinical environment of the hospital consisted of general wards, surgical ward, gynaecology, postnatal, maternity, special baby care, intensive care, casualty, and theatre, and multidrug resistance, orthopaedic and psychiatric unit.

### **1.9.3 Population and sampling**

312 nurses working in all above-mentioned disciplines was the total population of nurses at this tertiary hospital of which 140 were registered nurses, 80 enrolled

nurses, 47 registered midwives, 23 enrolled midwives, 10 certified midwives and 12 registered mental health nurses.

Following the pilot study the total number of nurses at the government tertiary hospital where the study was conducted came down to 281 nurses after taking away  $n = 31$  nurses who participated in the pilot study. Therefore 70% of  $N = 281$  nurses gave  $n = 196$  nurses who participated in the main study.

The sampling method that was used in this study was stratified random sampling. This method of sampling enabled the study population to have an equal and independent chance of appearing in the study sample. The nurses were placed in categories by which each category of nurses was allocated numbers using an excel spread sheet developed by the statistician. The statistician utilised stratified simple random sampling to select 70% of nurses from each category as a sample for the study as indicated in Table 1.1 The sample size 70% ( $n = 196$ ) for this study was selected in consultation with a statistician, supervisor and co-supervisor. A large sample size was more representative of the population and broadened the data collected for analysis.

**Table 1.1: Sample framework of nurses who participated in the study**

No.	Category	Total per category	Sample (70% per category)
1	Registered Nurses	126	88
2	Enrolled Nurses	72	50
3	Registered Midwives	42	29
4	Enrolled Midwives	21	15
5	Certified Midwives	9	6
6	Registered Mental Health Nurse	11	8
	<b>Total</b>	<b>N=281</b>	<b>N=196</b>

#### 1.9.3.1 Inclusion criteria

All categories of nurses working in clinical environment at government tertiary Hospital in Zambia.

#### 1.9.3.2 Exclusion criteria

- Participants utilised for the pilot study
- Nursing unit managers

#### 1.9.4 Instrumentation

The instrument (Addendum A) compiled through literature review, in consultation with experts in the field of infection control, the supervisor and co-supervisor as well as qualified statistician who supervised the application of statistics was utilised to collect data for this study.

#### 1.9.5 Pilot study

A pilot study is a smaller version of a proposed study conducted to develop and refine the methodology such as the treatment, instruments or data collection process to be used in the larger study (Burns & Grove 2011:544). During the pilot study the questionnaire was pre-tested to identify problems with the design and to refine the questionnaire. To conduct the pilot study 10% of N=312 nurses (n= 31) at the same government tertiary hospital from each category was selected using stratified random sampling method as indicated in Table 3.2 (n= 31). The pilot study consisted of 10% of N= 312 nurses which is n= 31 nurses of which N= 281 nurses from which 70% (n= 196) was enrolled in the main study. The field worker was trained to assist with data collection before and during the pre-test refining of data collection method or technique. The time required to complete the questionnaire was also observed and confirmed.

#### 1.9.6 Validity

The validity of an instrument is determined by how well the instrument reflects the abstract concept being examined (Burns & Grove 2011:334). In this case, during the pilot study, a self-developed, closed-ended questionnaire was used to determine knowledge, attitudes and practices (KAP) among nurses in infection prevention and control. Therefore, the validity of the instrument was evaluated. To maximize validity,

representative questions for each category (KAP) were designed and evaluated against the desired outcome. A specialist in nursing practice, infection prevention and control professional nurse and nursing academic agreed on the face validity of the questionnaire.

### **1.9.7 Reliability**

Reliability is defined as the extent to which an instrument consistently measures a concept (Burns & Grove 2011:546). The instrument was designed by the researcher in conjunction with supervisor, co-supervisor and statistician employed by Stellenbosch University. To establish the reliability of the instrument, the pilot study was conducted, that is 10% of N= 312 nurses, (n= 31) at the same government tertiary hospital from each category was selected using stratified random sampling method as indicated in table 3.2 (n= 31).

### **1.9.8 Data collection**

The questionnaires were given to participants by the researcher and field workers who waited for the participants to complete the questionnaires. At least ten questionnaires were completed per day.

### **1.9.9 Data analysis and interpretation.**

Data was analysed and reported using descriptive statistics (frequencies, means and standard deviations) and illustrated using bar charts, frequency tables, and histograms.

## **1.10 ETHICAL CONSIDERATION**

Ethical reviewing and approval were obtained from the Health Research Ethics Committee of the University of Stellenbosch (Addendum C). Preliminary permission letter (Addendum D) to conduct the study was obtained from the Ethics Committee of the Tropical Disease Research Centre (TDRC). Permission to collect data was obtained from the Chief executive officer (CEO) and the head of nursing of the tertiary hospital where the study was conducted. The principle of justice was maintained throughout the study, which included confidentiality, privacy anonymity. An informed consent form (Addendum E) was signed by each participant who participated in the study. Participants were informed that participation was voluntary and that they may withdraw at any point of the study without penalty.

## **1.11 OPERATIONAL DEFINITIONS**

### **1.11.1 Clinical environment**

A clinical environment is a location where nursing practice takes place which includes direct patient care ranging from preventative care to chronic care to end of life care (Warshawsky & Havens 2011).

### **1.11.2 Hospital-acquired infections (HAIs)**

Hospital-acquired infections formerly called nosocomial infections is defined as infections acquired in the hospital within 48 to 72 hours of hospitalization that were neither present nor incubating upon admission. Infections that present within 10 days after hospital discharge are considered as HAIs (Collins 2008:1).

### **1.11.3 Standard precautions (SPs)**

Standard precautions mean a basic level of infection control in the treatment of every patient, regardless of their diagnosis or infection status (Minnaar 2008:7).

## **1.12 DURATION OF THE STUDY**

Ethical approval for this study was obtained on 17<sup>th</sup> June 2015. Protocol approval period: 17-June-2015 to 17-June-2016. Data was collected in the month of August 2015 as indicated in the proposal. Data was analysed in October 2015. The final thesis was submitted for examination in November 2016.

## **1.13 CHAPTER OUTLINE**

The chapters of the thesis are outlined as follows:

### **Chapter 1: Introduction and background**

Chapter 1 introduces the topic, describes the background and rationale for the study. It includes the problem statement, aim of the study, research objectives, and brief overview of the research methodology. Definition of terms and ethical considerations are also discussed in this chapter.

### **Chapter 2: Literature review**

This chapter reviews literature relevant to the research topic (Knowledge, attitudes and practices of nurses in infection prevention and control at a tertiary hospital in Zambia).

**Chapter 3: Research methodology**

Research design and methodology that were employed during this study is described in this chapter.

**Chapter 4: Discussion of the findings**

Chapter 4 describes and discusses the analysis and interpretation of the collected research data.

**Chapter 5: Recommendations and Conclusion**

This chapter discusses the results relevant to the study objectives. Conclusions and recommendations based on the study are described in this chapter.

**1.14 SUMMARY**

Nosocomial infection, also known as hospital-acquired infections is one of the leading causes of death and has much economic cost due to increased hospitalization and prognosis (WHO, 2015).

The nurses' knowledge, attitude and practices in infection prevention and control have an effect on the clinical environment which in turn impacts the patient's exposure to infection-related diseases. Nightingale focused on caring for the sick and placed emphasis on the importance of hygiene and patient care in infection prevention and control (Hegge, 2013 and Gurler, 2014).

Infectious patients are admitted into hospitals and therefore hospitals are an ideal setting for transmission of diseases. In hospitals, infectious patients are a source of infection transmission to other patients, health care workers and visitors (Sydnor, & Perl, 2011).

**1.15 CONCLUSION**

In this chapter, the researcher described how the study was undertaken. It included the topic, described the background and rationale for the study, the problem statement, aim of the study, research objectives, a brief overview of the research methodology, the definition of terms and ethical consideration.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

In this chapter, an overview of existing literature on the Hospital-acquired infection and aspects related to knowledge, attitude and practices of nurses in infection prevention and control is presented. Due to limited studies conducted in Africa on this topic, the researcher decided to broaden the literature review to other continents. Broadening the literature review to other continents enabled the researcher to gather the latest and updated data on the topic. Furthermore, the literature review showed that infection prevention and control and hospital-acquired infections are not only a problem in Africa but also affect developed countries as indicated in the review. The review includes relevant research findings on knowledge, attitude and practice of nurses in infection prevention and control. The purpose of the literature review was to understand what is currently known about knowledge, attitude and practices of nurses in infection prevention and control. The role of nurses in infection prevention and control, as well as the impact of inadequate knowledge in infection prevention, were included in the literature review. Furthermore, the impact of negative and positive attitudes towards infection prevention and control and nurses' understanding of the code of conduct regarding infection prevention and control was reviewed too.

#### **2.2 LITERATURE REVIEW**

The researcher identified key terms and variables in this case knowledge, attitude and practices in infection prevention and control among nurses to perform a literature review. Electronic databases such as PubMed was used to search for relevant articles and journals to perform a literature review. Textbooks as well as online articles were used to perform a literature review.

##### **2.2.1 Hospital-acquired infection**

Health-acquired conditions (HACs) are complications that originate from a stay in a clinical or hospital facility (Lobdell, Stamou & Sanchez 2012:65). Hospital-acquired infections are also known as nosocomial infections (Khan, Ahmad & Mehboob 2015:509-514). Hospital-acquired infection is an infection contracted by the patient

while receiving care in a health facility but not seen at the time of admission (Nejad, Allegranzia, Syed, Ellis & Pittet 2011:757-765). Hospital-acquired infections are the main challenge for low and middle-income countries with inadequate health-care resources (Shahida, Islam, Dey, Islam, Venkatesh & Goodman 2016:28-39). Health-care associated infections (HAI) is a major worldwide safety concern for both patients and health-care professionals (Nejad, Allegranzi, Syed, Ellis & Pittet, 2011:757-765). Risk factors include lack of proper health care facilities such as isolation units, sinks, bed space; appropriate waste management, decontamination of equipment and hand hygiene facilities (Shahida et al., 2016:28-39).

According to McQuoid-Mason (2012:353-354), hospital acquired infections may develop from surgical operations, urinary catheter, central lines and endotracheal tubes in intubated patients. According to Khan et al. (2015:509-514), organisms that are frequently involved in hospital-acquired infections include *Streptococcus* spp., *Acinetobacter* spp., enterococci, *Pseudomonas Aeruginosa*, Coagulase-negative staphylococci, *Staphylococcus aureus*, *Bacillus cereus*, *Legionella* and Enterobacteria family members. These micro-organisms can be transferred from person to person, environment and contaminated water and food, infected individuals, contaminated health care personnel's skin or contact via shared items and surfaces. According to NICE (2014:5), Health care associated infections can develop either as a result of health care intervention (such as medical or surgical treatment) or from being in contact with a health care setting. They can worsen current or primary conditions, increase the length of hospital stay and increase mortality rates.

Unnecessary and improper use of broad-spectrum antibiotics, especially in health care settings, is elevating nosocomial infection (Khan et al., 2015:509-514). Nosocomial infections can be prevented by practicing hand hygiene, identifying patients at risk of nosocomial infections and following standard precautions to decrease transmission (Mehta, Gupta, Todi, Myatra, Samaddar, Patil, Bhattacharya & Ramasubban 2014:149-163). Infection prevention in special subset patients – burns patients, include identifying the source of the organism, identification of organisms, isolation if required, early removal of necrotic tissue, prevention of tetanus, early nutrition and surveillance (Mehta et al., 2014:149).



### 2.2.1.1 Infection-related diseases

Mayo Clinic (2016:1) defines infectious disease as conditions caused by bacteria, viruses, fungi or parasites. Some infectious diseases can be passed from one person to the other while others are acquired by ingesting contaminated food. According to Mandal (2012:1), Staphylococcus is one of the five most common causes of infection following injury or surgery and it affects around 500,000 patients in American hospitals annually. The spread of Staphylococcus aureus (S. Aureus) is through air droplets and through direct contact with objects that are contaminated with the bacteria. Mandal (2012:1) states that S. Aureus can be prevented by observing good hygiene and regular hand hygiene. Moreover, the fatal strain Methicillin Resistance Staphylococcal Aureus may also be prevented from spreading by adopting proper hand washing habits. Infection-related diseases have adverse clinical and economic consequences. As indicated by Nathwani, Raman, Sulham, Gavaghan and Menon (2014:32), patients who acquire Multidrug Resistance Pseudomonas aeruginosa seem to have an increased death rate and length of hospital stay. The most common types of nosocomial infections are surgical wound infections, respiratory infections, genital-urinary infections and gastrointestinal infection (Shahida et al., 2016:33). According to Pasquale, Aliberti, Mantero, Bianchini and Blasi (2016:1) hospital acquired pneumonia is a frequent cause of nosocomial infection with mechanical ventilation demonstrating the main risk factor specifically ventilator-associated pneumonia.

### 2.2.1.2 Central line-associated blood stream infections

Central venous catheters (CVCs) are accessed lines that are inserted into the central veins like femoral, subclavian and internal jugular veins. CVCs can lead to life-threatening sepsis. (Chopra, Krein, Olmsted, Safdar & Saint, 2013:211). O'Grady, Alexander, Burns, Dellinger, Garland, Heard, Lipsett, Masur, Mermel, Pearson, Raad, Randolph, Rupp, Saint & the Healthcare Infection Control Practices Advisory Committee (ICPAC;2011:8) provides evidence-based recommendations for preventing central line associated infections.

Recommendations were made for catheter-associated infections by O'Grady et al. (2011:8) who indicated that the major areas of emphasis include:

- Education and training health-care personnel caring for the central line.
- Using of aseptic techniques during insertion.
- Use central lines on selected patients.
- Not to keep the central lines longer than necessary.

#### 2.2.1.3 Catheter-associated urinary tract infections

Catheterization is an aseptic procedure and should only be undertaken by health-care workers trained and competent in this procedure (Loveday, Wilson, Pratt, Golsorkhi, Tingle, Bak, Browne, Prieto & Wilcox, 2014: 7). Catheter maintenance is vital in preventing catheter-associated urinary tract infections. According to Loveday et al. (2014:7), positioning the urine drainage bag below the level of the bladder on the stand that prevents contact with the floor is recommended.

According to Nicolle (2014:1), urinary tract infection is one of the most common nosocomial infections in patients with indwelling urinary catheters. 50% of catheterized patients lack documentation on indications for insertion of urinary catheters (Welden, 2013:1). According to Nicolle (2014:1), catheter-related- urinary tract infection are seen in 20% of patients with bacteremia in acute care facilities, and over 50% in long-term care facilities. Prasanna and Radhika (2015:182-186) assessed the knowledge regarding catheter care among staff nurses; the study reviewed that only 46.7% had adequate knowledge. In this regard, Opina and Oducado (2014:93) conducted a study to determine the relationship between the level of knowledge and practices of nurses on infection control in the use of the urethral catheter. The study revealed that nurses have a low level of knowledge and poor infection control practices in the use of urethral catheters. The study further indicated that nurses' level of knowledge has a bearing on their practices on infection control in the use of urethral catheters (Opina and Oducado, 2015:99). Labib and Spasojevic (2013:4) indicated that assessing the need for catheterisation, selecting the appropriate type of catheter, aseptic technique during insertion and catheter care can prevent CAUTIs. However, catheterization in the Sub-Saharan setting is quite often performed using clean rather than aseptic technique which of course may lead to CAUTI (Labib & Spasojevic, 2013:5). This is because not all of the necessary equipment for catheterization is available all the time especially in remote areas (Labib & Spasojevic, 2013:5).

#### 2.2.1.4 Surgical site infections after surgery

According to Salkind and Kavitha (2011:1), surgical site infection is defined as an infection seen on the incision site within 30 days of surgery or within one year of implant insertion. Andreson and Sexton (2016:135-153) indicated that surgical site infections account for 38 percent of nosocomial infections. Surgery that involves a cut (incision) in the skin can lead to a wound infection after surgery. It is important to track patients after discharge for a period of time to ensure that no infection has occurred (Magill, Edwards & Bamberg, 2014:1198-1208). Surgical operations provide opportunities for transmission of infection between patients and health-care workers and between patients (McGaw, Tennant, Harding, Cawich, Crandon & Waiters 2012:1). According to McGaw et al. (2012:1), the risk of transmission of infection may increase in under-developed and developing countries by low compliance with infection control policies and precautions. For most patients undergoing clean-contaminated surgeries (cardiothoracic, gastrointestinal, orthopaedic, vascular, gynecologic), a cephalosporin is the recommended prophylactic antibiotic (Salkind & Kavitha, 2011:1). Mukosai, Bowa, Labib and Spasojevic (2014:1-5) assessed the effectiveness of using preoperative bladder irrigation with 1% povidone-iodine in reducing post transversical prostatectomy surgical site infections (SSIs). The study reviewed that irrigating the bladder with 1% povidone-iodine resulted in significant reduction in post-prostatectomy surgical site infection. It was evident that in the control group 15 out of 65 patients developed SSI while in the study group, 6 out of 65 patients developed SSIs (Mukosai, Bowa, Labib & Spasojevic, 2014:1-5).

Teshager, Engeda and Worku (2015:1-6) indicated that over 50% of nurses who participated in the survey lacked knowledge about surgical site infection prevention and practiced inappropriately. According to Abbas and Pittet (2016: 319-322), SSI is a leading cause of health-care associated infections that is why surveillance of SSI should be a priority for infection control programmes even in resource-limited settings.

#### 2.2.1.5 Clostridium Difficile

Clostridium difficile infections (CDI) is the leading cause of hospital-associated gastrointestinal disease leading to increased length of stay for patients and placing a

high burden on health care system. (Surawicz, Brandt, Binion, Ananthakrishnan, Curry, Gilligan, McFarland, Mellow & Zuckerbraun, 2013: 478-498).

*Clostridium Difficile* infection transmission and infection has proven to be difficult to prevent (Carrico, 2013:8). According to Carrico (2013:8). Some of the patient care activities that provide an opportunity for transmission of CDI include improper oral care procedure. Procedures such as intubation, patient feeding and administration of drugs coupled with poor hand hygiene and ineffective environmental cleaning provide an opportunity for transmission of CDI (Carrico 2013:8). To prevent the spread of the disease early identification of patients who are being investigated for, or diagnosed with CDI is the first step, followed by isolation, use of personal protective equipment, encouraging hand hygiene, ensuring clean environment and use of individual bedside commode for each patient with CDI which cannot be placed into a private room (Carrico, 2013:8). Prevention of intestinal colonization of toxigenic strains of CDI can be achieved through restoration of the intestinal microbiota with faecal microbiota transplantation, as well as by colonising the gut with non-toxigenic CDI strains (Kocielek & Gerding, 2016:150-160). Agency for Health-care Research and Quality, (2012:7) indicated that Antimicrobial stewardship targeted to CDI reduction shows promise as a complementary strategy for addressing the problem of CDI, because inappropriate antibiotic use may contribute to increasing rates of CDI. Roth, Parker, Wale and Warriar (2014:122-127), indicated poor knowledge of CDI among health professions, recommending a potential for further education.

## **2.2.2 Infection prevention and control**

According to Ojulong, Mitonga and Lipinge (2013:1071-1078), infection control practices are aimed at reducing the incidence of nosocomial infections. Ojulong et al. (2013:1071-1078), evaluated knowledge and attitudes of infection prevention and control among health science students at the University of Namibia. The study revealed that knowledge about infection prevention and control and awareness of its importance among health science students was poor. It was therefore concluded that serious efforts are needed to improve or review curriculum so that health science students' knowledge on infection prevention and control is imparted early, before they are introduced to the wards (Ojulong et al., 2013:1071-1078).

### 2.2.2.1 Primary prevention and control

Primary prevention is a way of preventing disease as well as injury before it occurs. Preventing (hazards leading to injury and disease are examples of primary prevention, (Institute for Work and Health (IWH) 2015:1). According to IWH (2015:1), examples of primary prevention include education about healthy and safe habits (hand hygiene) and immunization against infectious diseases. In this regard, CDC (2016:144) indicates that health-care personnel influenza vaccination is important to prevent getting and spreading the infection. Influenza can easily spread from person to person, including from health-care workers to patients. WHO (2010:41) considers universal immunisation to be the most effective preventive measure against disease induced by infection with Hepatitis B.

Unsafe injection practices can result in transmission of a wide variety of pathogens, including viruses, bacteria, fungi and parasites (WHO, 2010:13). Safe injection practice is a primary intervention for prevention of transmission of infection. Therefore, according to the WHO (2010:13), a safe injection does not harm both the recipient and the provider and does not harm other people when disposed.

In order to make decisions about actions needed to control the risk and prevent the spread of infection, risk assessment is performed (Advisory Committee on Dangerous Pathogens-ACDP, 2015:9). This includes implementation of practical infection control measures, information provision, training and health surveillance (ACDP, 2015:9). Hand Hygiene is another measure that promotes primary infection prevention. CDC's Clean Hands Count campaign aims at improving adherence to hand hygiene recommendations among health workers and empowers patients to play a role by reminding health workers to perform hand hygiene (CDC, 2016:1).

Primary prevention may be accomplished by procedures intended to uphold general health and welfare of people (Salama, 2015:13). Salama (2015:14) states that Protection against occupational hazards are primary prevention, for example, safe handling of sharps by the use of the sharps box. Encouraging patients and health-care workers to know their HIV status so that they can reduce their exposure to TB infection (T.B 4, 2015:24) is another example of primary infection prevention. Educating all staff on TB transmission and prevention is primary infection prevention.

Service providers should ensure that they have antimicrobial stewardship initiatives in place, including local antibiotic formularies for antibiotic prescribing, this is to try to reduce the problem of antibiotic resistance (NICE, 2014:11).

#### 2.2.2.2 Secondary prevention and control

Secondary prevention aims to lessen the bearing of illnesses or injury that has already happened (Institute for Work and Health (IWH), 2015:1). By detecting and treating disease or injury as soon as possible, as well as encouraging personal strategies to prevent re-injury the impact of the disease is reduced (IWH, 2015:1). Use of personal protective equipment and appropriate ventilation are good examples of secondary infection prevention as well as Isolation of patients with TB, rapid diagnostic evaluation and rapid initiation of treatment (T.B 4, 2015:7). Patients with TB are encouraged to stop smoking and minimize intake of alcohol so as to reduce the impact of the disease (T.B 4, 2015:23). Paryford (2015:9) indicated that patients should be instructed to follow the recommendations for respiratory hygiene and cough etiquette by;

- Using a disposable, single use tissue to cover mouth and nose when coughing, sneezing, wiping or blowing nose.
- Dispose of tissues promptly in a bin.
- Practice hand hygiene by washing hands with soap and water, and drying them thoroughly after coughing, sneezing or using tissues.

Maintenance of an indwelling catheter is another example of secondary infection prevention. NICE guidelines (2012:139) indicate that indwelling catheters should be connected to a sterile closed urinary drainage system or catheter valve. The urine drainage bag should be below the level of the bladder and should not be in contact with the floor. The urine bag should frequently be emptied enough to maintain urine flow and prevent reflux. Urine samples must be obtained from a sampling port using an aseptic technique and the meatus should be washed daily with soap and water as part of routine daily personal hygiene (NICE guidelines 2012:139).

#### 2.2.2.3 Tertiary prevention and control

Tertiary prevention aims to reduce the influence of an ongoing disease or injury that has extensive effects. This is done by helping people cope with long-term, often

difficult conditions and injuries (e.g. chronic diseases, permanent impairments) in order to expand as much possible their capability to function, the value of life and their life expectancy (HIV, HAART) (IWH, 2015:1). T.B 4 (2015: Slide 4-3) states that BCG vaccination does not stop infection with T.B but it does stop severe forms of childhood T.B and thus can be considered tertiary prevention. All HIV- infected individuals are susceptible to a wide array of opportunistic infections and are at higher risk to pathogenic organisms that plague the general population (Haburchak, 2016:1). Prevention of opportunistic infections in patients with HIV disease is important to optimize outcome (Haburchak, 2016:1). According to Haburchak (2016:1), all HIV-related infections and malignancies escalate in frequency and morbidity as the absolute CD4 T-lymphocyte count falls towards 200 cells/l/4L and below. HIV patients should be aware of their CD4 count and their risk of specific infections. An imperative function of infection control and hospital epidemiology programs is the prevention of disease transmission (Sydnor & Perl, 2011:141-73). Infection prevention is accomplished through surveillance, outbreaks, education and training of health care providers and instituting effective HAI prevention (Sydnor & Perl, 2011:141-73).

### **2.2.3 Nurses' role in infection prevention and control**

Using their infection control training, nurses play a vital role in creating a culture of patient safety (Stone, 2013:1). According to Stone (2013:1), nurses are on the front lines and can take the lead to explain infection control procedures to the patients. According to NACNS (2013:1), research and demonstration tasks have shown that the clinical nurse specialist's (CNS) role is distinctively suited to lead the execution of evidence-based quality development actions that also lessen cost throughout the health care system. The CNS has an important part to play in care organisation and transitions of care that result in reduced hospital length of stay, fewer hospital readmissions and fewer nosocomial conditions (NACNS, 2013:1).

The role of the professional nurse in preventing hospital-acquired infections is significant (Benson & Powers, 2011: 36-41). The nurse is a member of a health-care team who leads the rest of the group in performing prevention approaches to keep the patient from infection (Benson et al., 2011:36-41). However, Hakim, Mohsen and Bakr (2014:347) revealed that housekeepers were significantly more knowledgeable



than physicians or nurses about hospital policies and systems for waste disposal, but less so about specific details of disposal. Housekeepers also had the highest overall scores for attitudes to waste disposal among nurses and physicians (Hakim et al., 2014:347).

Health care-associated infection is a prominent problem among patients in paediatric intensive units as it could result in significant morbidity, prolonged hospitalization and an increase in medical care costs (Yasmine, John & Walaa, 2014: 22). According to Yasmine et al. (2014:22), who assessed the effect of health education program regarding infection control measures on nurse' knowledge and attitude in paediatric intensive care units stated that the role of nurses is important in preventing hazards and sequels of health care-associated infections. The study concluded that there is a scope for improvement in knowledge and attitude after the educational program was offered to the nursing staff.

All nurses, in all roles and settings, can show leadership in infection prevention and control by using their knowledge, expertise and immediately apply decisions to start appropriate interventions. According to Yamin, Jain, Mandelia and Jayaram (2012:68), health-care workers must know the various measures for their protection. They should improve the organisation of work, implement standard precautions and dispose of biomedical waste properly to prevent occupational exposure. Health-care workers should get themselves immunised against Hepatitis B and report accidental exposure to infectious samples to the infection control committee (Yamin et al., 2012:68-73). Nurses play a key role in infection prevention, the health, and well-being of their patients and the financial health of their employers (Olin, 2012:1).

#### **2.2.4 Clinical environment and infection prevention and control**

According to Garrett (2015:207) now more than ever, a clean and sanitary patient environment is being measured as a component of infection prevention and control process. In addition, outcome measures such as patient satisfaction and cleanliness of the environment are common metrics in this era of continual health care reform (Garrett, 2015:207). Garrett (2015:207) further indicates that patients, visitors and health care providers routinely contaminate health care environments through daily activities. This can increase the risk of infection transmission. According to Weber,



Anderson and Rutala (2013:338), the contaminated surface environment in hospitals plays an important role in the transmission of pathogens like Methicillin-Resistance Staphylococcus Aureus (MRSA) and Clostridium Difficile. Weber et al. (2013: 338), further indicates that admission to a room previously occupied by a patient with MRSA and C.difficile increases the risk for the subsequent patient admitted to the room to acquire the pathogen. Therefore, improved surface cleaning and disinfection of room surfaces decreases the risk of health-care associated infections (Weber al., 2013:338).

Hygiene and environmental cleaning are important in helping to control the spread of infection (Parryford, 2015:5). According to Parryford (2015:5), experimental studies on the survival of respiratory pathogens suggest that, depending on the organism, the type of surface and the organic material load, they can survive for a limited time in the environment.

#### 2.2.4.1 Patients' outcome in the clinical environment.

Maintaining a clean and safe environment is an important component of infection prevention and control (Vang, 2014:12). According to Parryford (2015:7), some people are at greater risk of developing more severe disease and complications respiratory tract infection (typically Pneumonia). Such people include patients with Diabetes Mellitus, immunosuppression, pregnant mothers, chronic diseases (lung, heart, liver and kidney), and children under five years old as well as people aged 65 years and older. Lemass, McDonnell, O'Connor and Rochford (2013:4) indicates that patients are cared for in an environment that is safe and clean, and where the risk of them acquiring an infection is kept as low as possible. A person-centered approach is taken respecting the dignity, privacy and the needs of individual patients. Every interaction in general practice should include a risk assessment of the potential for infection transmission (Lemass, McDonnell, O'Connor & Rochford, 2013: 4). According to NICE (2014:5), a number of factors can increase the risk of acquiring an infection, but high standards of infection prevention and control including providing clean environments, can minimise the risk.

### **2.2.5 Knowledge in infection prevention and control.**

According to Olowookere, Abioye-Kuteyi, Adepoju, Esan, Adeolu, Adeoye, Adepoju and Aderogba (2015:1), the study in which preparedness of health workers in the control and management of Ebola Viral Disease (EVD) was assessed, the results showed knowledge gap and poor infection control preparedness among respondents. Thus, knowledge and practices of health workers towards EVD need improvement. The WHO Update (2014:1) states that the occurrence of fatal infections such as severe acute respiratory syndrome (SARS) and viral haemorrhagic fevers (e.g., Ebola Viral Disease) highlight the serious need for effective infection control practices in health care. Failure to apply infection control measures leads to transmission of infection, and health-care settings can act as amplifiers of disease in the course of outbreaks, with a bearing on both hospital and public health (WHO Update, 2014:1).

#### **2.2.5.1 Adequate knowledge in infection prevention and control**

According to the Oxford dictionary (2010:827), knowledge is the information, understanding and skills that are gained through education and experience in this case knowledge about infection prevention and control. The surveillance of hospital-acquired infections are regarded as an essential part of infection control and prevention. In this regard, Razine, Azzouzi, Barkat, Khoudri, Hassouni, Chefchaouni and Abouqal (2012:26) determined the prevalence of hospital-acquired infections (HAIs) in all institutions of Rabat University Medical Centre in Morocco. The study showed that the prevalence of HAIs was high. Therefore, recommendations for future control measures to focus on patients who stay longer in the hospital, patients with invasive devices and irrational use of antibiotics were made. Sessa, Giuseppe, Albano & Angelillo (2011:148) recommended education and training programmes for nurses after their study found that although nurses level of knowledge was not satisfactory. Lack of knowledge among nurses can increase the rate of the hospital-acquired infections. Supported by a study that was conducted in Zimbabwe, Tirivanhu, Ancia and Petronella (2014:73), determined the barriers of infection prevention and control practices among nurses at the Bindura provincial hospital. The study revealed that the majority of nurses' lack knowledge of infection control principles as only 14 (28%) of 50 nurses had excellent knowledge on infection control

principles, 21 (42%) of 50 nurses did not utilize the infection control manuals. Infection control workshops were poorly organised as 68% of the nurses did not attend any workshop on infection prevention and control practices. (Tirivanhu et al., 2014:69-73). Hayeh and Esena (2013:47) assessed the infection prevention and control (IPC) practices among health workers at Ridge Regional Hospital in Accra (Ghana). The study showed that knowledge in IPC practices among health care workers was moderate 51% (n=204) as availability and access to material for IPC practices at the facility was 58% and overall compliance with IPC guidelines was 54%.

Assessing knowledge, attitudes and sources of information among Nursing Students towards infection control and standard precautions, Ghalya and Ibrahim (2014:249-260), results revealed that the overall knowledge scores for nursing students towards infection control and standard precautions were acceptable, students achieved the highest score in hand hygiene domain and lowest score in sharps disposal and sharps injuries. The main source of information for students was the curriculum.

#### 2.2.5.2 Inadequate knowledge of infection prevention and control

Failure to apply infection control procedures favours the transmission of pathogens, and health-care settings can act as amplifiers of disease during epidemics, with a bearing on both hospital and public health (WHO, 2016:1). According to WHO (2016:1), a huge gap exists between the knowledge accumulated over the past decades and implementation of infection control practices. This gap is even deeper in poor-resource settings with devastating consequences. Breaches of infection control measures undermine every advance and investment in health care (WHO, 2016:1). According to Eskanderl, Morsy and Elfeky (2013:160), critical care nurses have an obligation to protect critically ill patients against infection. The study to assess critical care nurse' knowledge and evaluate their practice regarding infection control standard precautions was performed. The study reviewed that two-thirds (63.6%) of the studied sample had unsatisfactory Knowledge level. Hence recommendations were made of updating knowledge and performance of critical care nurses through continuing in-service educational programs (Eskanderl et al., 2013:160-174). El-Enein, Younis, Mahdy and Hala (2011:3-10) determined the degree to which standard precautions were applied by nurses in a dialysis unit in

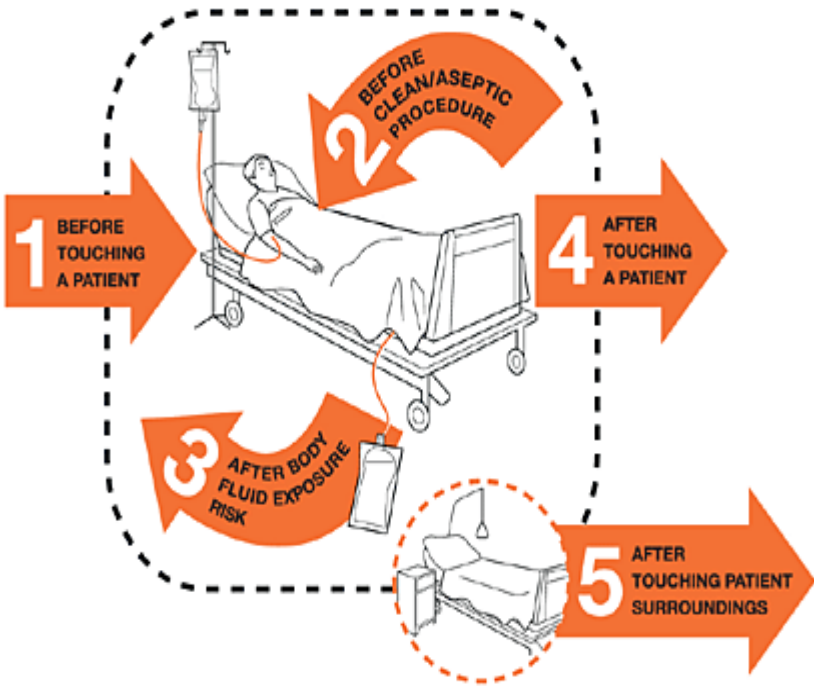
terms of hand hygiene and use of personal protective equipment. The study reviewed that less than half of the nurses (47.1%) correctly knew that they had to wash their hands before and after caring for a patient.

According to Sessa et al. (2011:148), who assessed the level of knowledge, attitude and practice regarding disinfection procedures among nurses in Italian hospitals. The study indicated that the level of knowledge, particularly of the most common HAIs, was not satisfactory and a small percentage of nurses reported that they appropriately perform the disinfection in their working activity. Therefore, Sessa et al. (2011:148) recommended HAIs control and training programmes to address shortfalls and to improve knowledge and adherence to procedures and HAIs prophylaxis and management for patient safety and the reduction of HAIs.

To assess the knowledge, attitude and practices of health-care personnel concerning the transmission of pathogens via Fomites a study was conducted. The results showed a large gap between the knowledge about fomites acting as vectors in the spread of pathogens and practices are done to minimize this spread (Aftab, Zia, Zahid, Raheem & Beg, 2015: 208)

#### **2.2.6 Attitude towards infection prevention and control**

According to the Oxford dictionary (2010:80), attitude is the way you think, feel and behave about something, in this case, attitude towards infection prevention and control. Despite the knowledge that dirty hands play a significant role in the spread of health-care related pathogens, and that hand hygiene (HH) decreases the spread of these organisms, health-care worker's adherence with HH is poor (Dixit, Hagtvedt, Reay, Ballermann & Forgie, 2012:1). Dixit et al. (2012:1), who explored the attitude and beliefs about hand hygiene among paediatric residents showed that paediatric residents' compliance with HH was influenced by role modeling, balancing hand hygiene with other competing factors and the drive for self-protection and personal cues. According to Lemass et al. (2013:11), hands of practice staff are the most important vehicles of cross-infection. Furthermore hands of patients can also carry microbes to other body sites, equipment and staff. Hand hygiene is one of the most effective means of preventing nosocomial infections (Lemass et al., 2013:18).

**Table 2.1: The five moments of hand hygiene according to WHO**


Source: WHO Guidelines on hand hygiene in health-care facilities (2009)

1	Before touching a patient	Perform hand hygiene before touching a patient.
2	Before clean/ Aseptic procedure	Perform hand hygiene before a clean/ sterile procedure.
3	After body fluid exposure risk	Wash your hands with soap and water immediately after exposure risk to body fluids.
4	After touching a patient	Perform hand hygiene after touching a patient.
5	After touching a patient surrounding	Perform hand hygiene after touching any object or furniture in the patient's immediate surroundings.

There is now absolute indication that strict adherence to hand hygiene decreases the risk of cross-transmission of infection (Mathur, 2011:611-620). In settings with insufficient financial and human resources, lack of time is an important observed and self-reported barrier to hand hygiene (WaterAid, 2016:3).

Standard Precautions are a set of practices that should be used in the care and treatment of all patients, regardless of whether they are known or suspected to be infected with a transmissible organism (Lemass et al., 2013:11). According to Lemass et al. (2013:11), the purpose of Standard Precautions is to break the chain of infection. Sarani, Balouchi, Masinaeinezhad and Ebrahimitabs (2015:193-198)

assessed the knowledge, attitude and practices of nurses about Standard Precautions for Hospital-Acquired Infections in Teaching Hospitals. The results showed that 43% of nurses had a poor attitude, 37% had an average attitude and 33% had a good attitude towards standard precautions. Implementation of Standard precautions is vital in the prevention of transmission of infection to patients and staff (Lemass et al., 2013:11).

Previous studies had shown that it is possible to determine nurses' attitude. Hu, Zhang, Li, Liu, He, Zhu, Wang, Cao and Zhao (2012:1), examined the knowledge, attitudes and self-reported behaviour and barriers to compliance with the use of personal protective equipment (PPE). The study involved ICU health care workers (HCWs) during pandemic influenza. The study showed that only 55% of Chinese critical care clinicians reported compliance with PPE use during pandemic influenza, putting HCWs and their patients at risk. Both attitudes towards PPE use and perceived organisational norms have been recognised as predictors of compliance. Hand hygiene is the single most important intervention to prevent transmission of infection and should be a quality standard in all health institutions.

An attitude of not washing hands among individuals involved in the provision of health care can increase the rate of hospital-acquired infections. In a study that was conducted in India, where Nair, Hanumantappa, Hinemath, Siraj and Raghunath (2013:3) assessed knowledge, attitude and practices of hand hygiene among medical and nursing students at a tertiary health care centre, the majority of students had poor knowledge with regard to hand hygiene.

Transmission of blood-borne viruses and other microbial pathogens to patients during routine health care procedures continues to occur due to unsafe and incorrect injection practice, Infusion and medication vial practices being used by health care professionals (PIDAC, 2015:35). Despite advances in health care system, nosocomial infections remain a preventable disease threatening public health (Olalekan, Olusegun, Olufunimalayo and Lanre, 2012:285-289). The study assessed awareness and attitude of health care workers in LAUTECH Teaching Hospital Osogbo towards nosocomial infections. The study showed that there was a need to raise awareness of nosocomial infections among health care workers as well as

preventive measures against these infections as preventive practices towards nosocomial infections were favourable for hand washing, and unfavourable for self-reporting to the staff clinic when sick. There was no significant ( $p>0.05$ ) association between ever reported or willingness to report nosocomial infections and awareness of hospital policy or the presence of infection control committee in the hospital (Olalekan, Olusegun, Olufunimalayo and Lanre, 2012:285-289).

#### 2.2.6.1 Negative attitude towards infection prevention and control

The negative attitude towards infection prevention and control can promote transmission of infection from one point to another. According to Ward (2012:301-306), nursing students generally observed a bad approach towards infection prevention and control from qualified staff, besides IPC was considered to be an added job load as different to a central feature of patient safety and excellent care. Surgical operations provide opportunities for the transmission of infection between patients and health-care workers (HCWs) and between patients. This risk may increase in underdeveloped and developing countries by low compliance with infection control policies and precautions (McGaw, Tennant, Harding, Cawich, and Crandon & Waters, 2012:1-9). MacGaw et al. (2012:1-9) investigated HCWs attitudes and compliance with infection control practices in the operating department of a Jamaican teaching hospital, with the objective of obtaining data to design evidence-based interventions. The study concluded that HCWs had sub-optimal levels of compliance with standard infection control guidelines as only 17% of all participants were compliant with all seven infection control policies.

#### 2.2.6.2 Positive attitude towards infection prevention and control

Positive attitude towards infection prevention and control can reduce the rate of Hospital acquired infections. Conducting a study to assess knowledge and attitude of health-care workers (HCWs) and patients on health care associated infections (HAIs) in the central regional hospital in Ghana, Ocran and Tagoe (2014:135-139) indicated that attitudinal change is the best means of prevention. The study showed an increase in the number of subjects in each category scoring good and excellent in the post-education questionnaire. Sessa, Giuseppe, Albano and Angelillo (2011: 148) assessed the level of knowledge, attitudes and practices regarding disinfection procedures among nurses in Italian hospitals. The study revealed an extremely



positive attitude towards the utility of guidelines and protocols for disinfection procedures.

### **2.2.7 Practices of nurses in infection prevention and control**

According to the Oxford dictionary (2010:1148), to practice is to do something regularly as part of your normal behaviour which in this case is infection prevention and control practices. It is, therefore, important that all health workers strictly adhere to infection control guidelines, especially nurses because they spend more time with the patients.

In dwelling urinary catheters (IUCs) are frequently used in hospitalised elderly patients. Catheter-associated urinary tract infections (CAUTIs) account for 34% of all hospital-acquired infections in the United States associated with additional ill health and leading to health care costs. Devotion to CAUTI prevention practices has not been well defined (Fink, Gilmartin, Richards, Capezuti, Boltz & Wald, 2012: 1). Fink et al. (2012:1), examined IUC care practices for CAUTI prevention and concluded that even though CAUTI prevention practices at Nurses Improving Care for Health system Elders hospitals are in alignment with evidence-based guidelines, there is a possibility for improvement.

A safe injection is one that does not hurt the recipient, does not render the provider to any preventable risks and does not cause harm to the community when disposed of. Unsafe injection practices can lead to the transmission of bloodborne pathogens, with their associated burden of disease (WHO, 2010:13). Safe injection practices are standard precautions aimed at maintaining basic levels of patient safety and provider protections. In this regard, Ambulatory Surgical Center (ASC) quality collaboration (2016:1) states that when safe injection practices are not used, diseases like HIV, hepatitis C virus and hepatitis B virus can be spread from patient to patient when safe injection practices are not used.

#### **2.2.7.1 Good practices in infection prevention and control**

According to NHS Professionals (2013:3), good hand hygiene is the most important practice in reducing transmission of infectious agents as well as health-care associated infections. Respiratory hygiene or cough etiquette has been added to standard infection control precautions due to a recent global influenza pandemic



(NHS professionals, 2013:4). Furthermore general good practices include ensuring that occupational immunisation and clearance are up to date for all staff. All staff must dispose of clinical waste according to local policy with sharps in assembled sharp container.

Personal protective equipment (PPE) refers to a range of barriers and respirators used alone or in combination to protect mucous membranes, airways, skin, and clothing from contact with infectious agents (Lemass et al., 2013:26). According to Lemass et al. (2013:26), practice staff should make a risk assessment of planned procedure/action and select PPE depending on the nature of the procedure, the risk of exposure to blood, body fluids, mucous membranes and non-intact skin as well as the risk of contamination. Furthermore, glove use does not remove the need to comply with hand hygiene. Hands should be washed prior to putting on gloves and hand hygiene should be performed immediately after glove removal.

The Tuberculosis (TB) epidemic in South Africa is characterised by one of the highest levels of TB/HIV co-infection and growing multidrug-resistant TB worldwide (Sissolak, Marais & Mehtar, 2011:1). Sissolak et al. (2011:1), investigated nurse' experiences of factors influencing TB infection prevention and control (IPC) practices to identify risks associated with potential nosocomial transmission. The study recommended the need for the implementation and evaluation of comprehensive contextually appropriate TB-IPC policy with the setting and auditing of standards for IPC provision and practice, adequate TB training for both staff and patients, and the establishment of a cross-cultural communication strategy, including rapid access to interpreters ( Sissolak et al., 2011:9).

Assessing knowledge, attitudes and sources of information among Nursing Students towards infection control and standard precautions, Ghalya and Ibrahim (2014:249-260), results revealed that the overall knowledge scores for nursing students towards infection control and standard precautions were acceptable. Students achieved the highest score in hand hygiene domain and lowest score in sharps disposal and sharps injuries.

Good practices of nurses in infection prevention and control reduces the potential for nosocomial infection thereby promoting patient safety. However, patient safety can

be jeopardised if nurses intentionally fail to comply with implemented infection control measures leading to negligence/malpractice.

Lemass et al. (2013:15) indicates that immunisation must be seen as one part of a wider policy to prevent transmission of infection to health workers and their patients. Therefore vaccination should ideally take place before employment, routine review of general immunisation status may also be appropriate.

#### 2.2.7.2 Patient safety in infection prevention and control.

Patient safety has become a cornerstone of care, and preventing health-care associated infections remains a priority (NICE, 2012:139). According to CDC (2016:3), health-care associated infections are a major yet preventable threat to patient safety. Health-care associated infections can occur in otherwise healthy individuals, especially if invasive procedures or devices are used. For example, indwelling urinary catheters are the most common cause of urinary tract infections, and bloodstream infection is associated with vascular access (NICE, 2012:139). Preventing transmission of microorganisms to other patients is a patient safety issue and preventing transmission to staff is an occupational health and safety issue (PIDAC, 2015:7).

According to Benson and Powers (2011:36-41), a nurse is an essential member of the health care team who can transform patients negative experience to a positive health-care experience. A nurse can also make a major influence in reducing the patient likeliness for contracting nosocomial infections. Infectious diseases can be transmitted to patients who are taken care of by ill health workers. Health-care workers have the responsibility to look after their own health to avoid compromising patient safety (Benson & Powers, 2011:36-41).

#### 2.2.7.3 Negligence

Negligence is defined as failure to practice that amount of care that any sensible and cautious person would practice under similar situations. If a professional such as a physician or nurse, is negligent while acting in his/her professional capacity, the term is coined medical negligence or malpractice (Dearmon, 2014:470-493). According to McQuiod-Mason (2012:353-354), liability for hospital-acquired infections (HAIs) depends on whether the hospital has introduced best practice infection control

measures and has implemented them. Alternatively, will be vicariously liable for negligent or intentional failures by staff to comply with infection control measures implemented (McQuiod-Mason, 2012:353-354). According to McQuiod-Mason (2012:353-354) a hospital and hospital administrators may be held directly liable for not introducing or implementing best practice infection control measures, resulting in harm to patients. The hospital may also be held vicariously liable where patients have been harmed because hospital staff negligently or intentionally failed to comply with the infection control measures that have been implemented by the hospital, during the course and scope of their employment (McQuiod-Mason, 2012:353-354). According to PIDAC (2015:16), Personal hand hygiene for patients is also important and is often overlooked. Alcohol-based hand rub should be provided for patients and visitors in the area to reduce the risk of environmental contamination.

The risk of cross infection is reduced by appropriate use of and adhering to the WHO 5 moments of hand hygiene. Handling contaminated linen with bare hands pose a risk for nosocomial infection. Contaminated linen is described as infected and should be handled with personal protective equipment. The nurse is negligent if the risk of disease transmission occurs while not wearing protective equipment (Damani, 2012:338). To stick a needle in the mattress is not an injection safety practice. Onyemoho, Anekoson and Pius (2013:171) assessed the level of knowledge and practice of injection safety among health-care workers of a Nigerian prison service health facility in Kaduna State Command. The findings of this study showed that n= 74 (54%) of health workers had good knowledge scores of key injection safety practice, n= 20 (17%) had fair knowledge while n= 40 (29%) had poor general knowledge scores. Furthermore, n= 70 (50%) of n= 138 prison health workers had fair practices of injection safety. Lemass et al. (2013:31) recommends that providers should use one sterile needle and one syringe only a single time. Each practice should have a policy in place that outlines the risk assessment, management and advice to staff following needle stick injury and blood and body fluid exposure. Education of all practice staff on sharps injuries, their significance, prevention and management are essential (Lemass et al., 2013:33).

Stethoscopes utilised in clinical practice should be cleaned on a continuous basis as it is a source for micro-organisms to be transmitted from patient to patient. A study

done by Jain, Shah, and Sharman (2013:236) confirmed that the majority of the stethoscopes are contaminated with micro-organisms and recommended regular reminders such as posters or circulars. Jain et al. (2013:236) further recommended motivating posters for health care workers to clean the diaphragm of the stethoscope. Indwelling urinary catheters (IUCs) are usually used in certain hospitalised patients. Catheter-associated urinary tract infection (CAUTIs) account for 34% of all nosocomial infections in the United States, related to additional ill health and health-care expenses (Fink, Gilmartin, Richards, Capezuti, Bolt & Wald, 2012:1-6). Fink et al. (2012:1-6) suggested further research to find the effect of improved compliance related to prevention practices on the prevalence of CAUTI.

### **2.2.8 Nurses' code of conduct regarding infection prevention and control**

Nurses are required to uphold their Code of conduct of the profession which includes Infection prevention and control. According to Nurses and Midwives Act No. 55 of 1970 in Zambia which was reviewed in the late 1980's, the nursing profession would be allowed to improve the quality of nursing and midwifery services delivery through expanded scope of education and practice to meet the challenging care trends and needs in Zambia. According to Sharp, Palmore and Grady (2014:307-309), information about hospital-acquired infection (HAI) could empower patients to make day-to-day decisions. Such decisions include; personal hygiene, specific procedures and intervention, interaction with care providers, and adherence to recommendations. However, some may argue that HAI information might produce undue stress without expanding patient' rational options in any meaningful way. Nevertheless, in extreme cases, such concerns are insufficient to override an obligation to disclose risks (Sharp et al., 2016:307-309). Sharp et al. (2014:307-309) indicated that health-care facilities should inform patients about HAI risk, prevention, and hospital policies. This will empower them to act as partners in creating a safer health-care environment, motivated by respect for patient autonomy and promotion of patient autonomy.

#### **2.2.8.1 Nursing Act**

Under the Health and Social Care Act 2008 of The United Kingdoms (UK), the Code of Practice health and adult social care on the prevention and control of infections and related guidance requires all trusts to have perfect measures for the effective

prevention, detection and control of hospital acquired infections (Royal Cornwall Hospitals, 2015:1-15). According to the Missouri nursing practice act, the aim of the nursing practice act is to protect the public from unsafe and unlicensed practice by regulating nursing practice and nursing education. The nursing practice act defines nursing, set standards for the nursing profession and gives guidance regarding the scope of practice issues. Nursing practice requires specialized knowledge, skill as well as independent decision making (Russell, 2012:36). Russell (2012:36) furthermore states that nursing practice involves behaviour, attitude and judgement, as well as bodily and sensual abilities in the use of information, services and capabilities for the advantage of the client. Additionally, Russell (2012:36) indicated that health services expose the public to the risk of harm if practiced by professionals who are unskilled. In this regard, professionals are ruled by laws and guidelines intended to reduce the risk of harm.

#### 2.2.8.2 Nursing standards

According to Russell (2012: 36) education and standards provided by laws designed to protect the public provide guidance in nursing practice. Nursing profession takes widely different paths- practice emphasis differs by setting, by nature of clients, by different illnesses and by therapeutic method or level of rehabilitation (Russell, 2012:36).

Nurses have the distinctive opening to lessen the potential for nosocomial infections. Utilizing the skills and knowledge of nursing practice can facilitate patient recovery while minimizing complications related to infections (Benson & Powers, 2011:36-41). According to Benson and Powers (2011:36-41) some of the most basic strategies resulting in positive patient outcomes include:

- Exercising hand hygiene
- Routine use of sterile technique
- Clean and safe environment
- Use of universal precautions
- Patient education
- Patient nursing diagnosis and extra safety measures.
- Practice of safe strategies
- Avoiding use of unnecessary invasive devices

- Use of bundle strategies
- Fit for duty.

Hand hygiene is one of the most important procedures for preventing the transmission of hospital acquired infection (HAI).

#### 2.2.8.3 Ethics in nursing

The code of ethics for registered nurses serves as a foundation for nurses' ethical practice (Canadian Nurses association 2008:1-64). According to Canadian Nurses association (CNA) 2008:1-64, the code provides guides for ethical relationships, responsibilities, behaviours and decision-making, and it is to be used in conjunction with the professional standards, laws and regulation that guide practice. The code helps as an ethical foundation from which nurses can promote for clean and safe work environments that support the delivery of quality, empathetic, skilled and just care. Nurses encounter personal risk when providing for those with known or unknown communicable or infectious disease. During the natural or human-made disaster, including a communicable disease outbreak, nurses have a duty to provide care using appropriate safety precautions (CNA, 2008:1-64).

Two deeply intertwined ethical considerations – patient autonomy and patient welfare – Motivate empowering patients for Hospital Acquired Infection Prevention (Sharp, Palmore & Grandy, 2014:307-309). According to Sharp et al. (2014:307-309), hospitalised patients are often vulnerable, and vast asymmetries in medical knowledge exist between providers and patients. These conditions can jeopardize adequate consideration of patients' values and interests. Giving patients an opportunity to act in light of their beliefs and welfare as well as to promote patient autonomy. Providing patients with the right to information relevant to the medical decision is important to this practice (Sharp et al., 2014:307-309). Empowering patients could also possibly improve patient safety and well-being by prompting behaviours that could prevent nosocomial infections. Improving hand hygiene among health workers is a major focus of HAI prevention efforts (Sharp et al., 2014:307-309).

#### 2.2.8.4 Social responsibility of the nursing profession

According to Royal Cornwall Hospital Infection Prevention and Control Policy (2015:1-15); Under the Health and Social Care Act 2008 of The United Kingdoms, the Code of Practice health and adult social care on the prevention and control of infections and related guidelines requires all hospitals to have clear schedules for the effective prevention, detection and control of hospital acquired infections. The policy further states that the Chief Executive Officer (CEO) is eventually accountable for ensuring that there are effective measures in place for infection prevention and control and that appropriate funds are accessible to manage the risk of infection. The CEO will designate the prevention and control of health-care associated infection as a core part of the organisations clinical governance. The infection prevention and control team is multi-disciplinary. The infection control nurse is specialised in identifying, controlling, and preventing outbreaks of infection in health-care settings and the community. Activities include the collection and analysis of infection-control data as well as planning, implementation, and evaluation of infection prevention and control measures. Other activities include education of individuals about infection risk, prevention, and control as well as development and revision of infection control policies and procedures. Investigation of suspected outbreaks of infection, provision of the consultation on infection risk assessment, prevention and control strategy too (Royal Cornwall Hospital Infection Prevention and Control Policy, 2015:1-15).

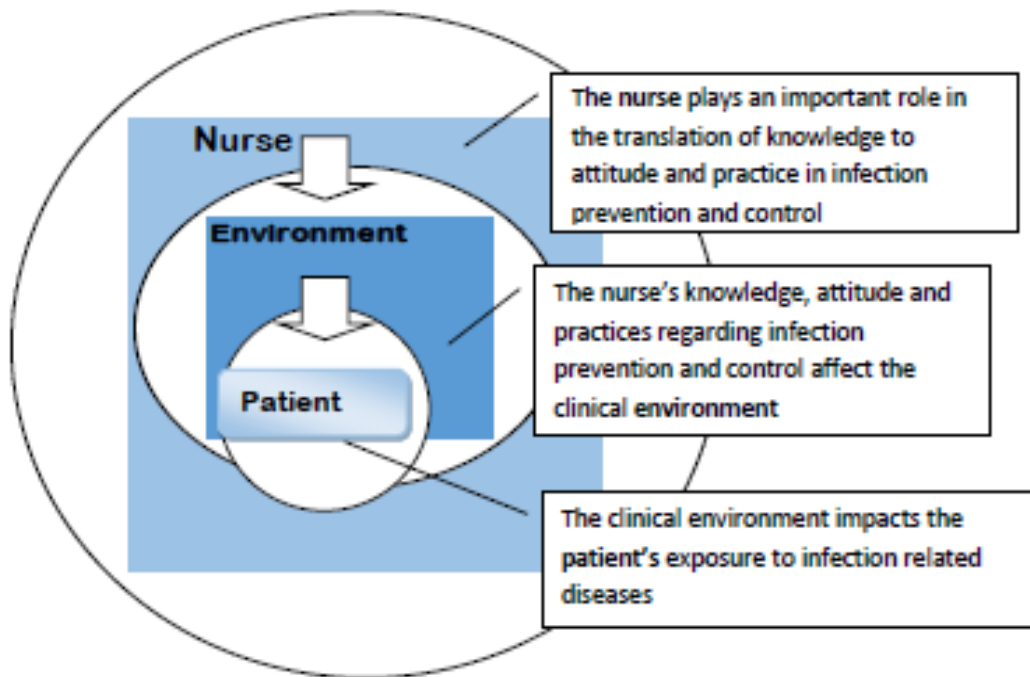
### **2.3 THE ROLE OF THE CONCEPTUAL FRAMEWORK (FLORENCE NIGHTINGALE'S ENVIRONMENTAL THEORY) IN INFECTION PREVENTION AND CONTROL**

Florence Nightingale's theory on infection control was adopted for this study. The theory states that nurses have to provide a clean environment for the patient by promoting infection prevention and control in this case. The nurse plays an important role in the translation of knowledge to attitude and practice in infection prevention and control. Nightingale acted out prevention and control practices through her knowledge, attitude regarding infection prevention and control which placed the patient in the best possible position for healing (Hegge, 2013 and Gurler, 2014). Nightingale stressed that cleanliness (sanitation, hygiene) and infection prevention and control measures in the clinical environment contribute to improving health care



(Hegge, 2013 Gurler, 2014). The clinical environment impacts the patients' exposure to infection-related diseases. Nightingale focused on caring for the sick and placed emphasis on the importance of hygiene and patient care in infection prevention and control (Hegge, 2013 and Gurler, 2014).

**Figure 2.1: Florence Nightingale's Environmental theory (Hegge, 2013 and Gurler, 2014).**



- **Nurse:** the knowledge and skills that the nurses acquire enable them to translate it into a positive attitude and good practice in preventing and controlling infection. Nurses have the responsibility to prevent the spread of infection in a clinical setup (Hegge, 2013 and Gurler, 2014).
- **Environment:** the nurse's knowledge, attitude and practices in infection prevention and control affect the clinical environment. A poor evidenced-based practice environment exposes the patient to infection. Isolation procedures should be well known by nurses to prevent the spread of infectious conditions (Hegge, 2013 and Gurler, 2014).
- **Patient :** the clinical environment exposes the patient to hospital acquired infections. These infections have an impact on patient outcome such as delayed hospitalization (Hegge, 2013 and Gurler, 2014).



## **2.4 SUMMARY**

The available literature review suggests that nurses play a major role in preventing and control of infection at primary, secondary and tertiary levels. Nurses play a vital role in promoting evidence-based infection control practices which ensure the continuity of quality care. All nurses in all roles and settings can demonstrate leadership in infection prevention and control by using their knowledge, skills and judgement to initiate appropriate and immediate infection control procedures. The knowledge, attitudes and practices of nurses affect clinical environment where infection prevention and control is concerned as stressed by Florence Nightingale. A number of issues have been raised including lack of knowledge in infection prevention and control (IPC), barriers to IPC, poor practices and bad attitudes towards IPC. Patients' safety has become the cornerstone of care. A nurse can make a difference in dropping down the patient possibilities for acquiring hospital acquired infections.

## **2.5 CONCLUSION**

In this chapter, an overview of literature regarding knowledge, attitude and practices of nurses in infection prevention and control was presented. The next chapter discusses the research methodology applied during this study.

## **CHAPTER 3**

### **RESEARCH METHODOLOGY**

#### **3.1 INTRODUCTION**

This chapter includes the research methodology that was applied to determine the knowledge, attitudes and practices of nurses regarding infection prevention and control within a tertiary hospital in Zambia. The research design, population and sampling procedures, data collection and data analysis methods are also discussed.

#### **3.2 AIM OF THE STUDY**

The aim of this study is to determine the knowledge, attitudes and practices of nurses regarding infection prevention and control within a tertiary hospital.

#### **3.3 THE OBJECTIVES OF THE STUDY**

The objectives of this study were to determine:

- the knowledge of nurses in infection prevention and control within a tertiary hospital in Zambia
- the attitude of nurses in infection prevention and control within a tertiary hospital in Zambia
- the practices of nurses in infection prevention and control within a tertiary hospital in Zambia and
- To make recommendations to the risk programme and policies of the tertiary hospital.

#### **3.4 STUDY SETTING**

The study setting was the clinical environment of a government tertiary hospital in Zambia which consist of general wards, high- risk multidrug resistance, surgical ward, gynaecology, post-natal, maternity, special baby care unit, intensive care unit, casualty, outpatient, theatre, orthopaedic and the psychiatry unit. The study was conducted at Ndola Central Hospital, situated in an urban area of the city of Ndola a provincial headquarters of Coperbelt Province within Zambia.

### **3.5 RESEACH METHODOLOGY**

#### **3.5.1 Research design**

The research design is defined as a plan or blue print of how you intend conducting the research (Mouton 2011:55). A quantitative, descriptive study was conducted to determine the level of knowledge, attitudes and practices of nurses regarding infection prevention and control within a tertiary hospital in Zambia. Quantitative research is defined as an official, objective, organized procedure used to describe variables, test relationship between them, and examines cause and effect relations among variables (Burns & Grove 2011). The descriptive study can provide information about the naturally according to status, behaviour attitude and relationships (Brink, Van der Walt & Van Rensburg, 2012).

The research design enabled the researcher to describe the data gathered. The researcher applied the research design by aiming at gathering information about knowledge, attitudes and practices of nurses in infection prevention and control, describing it, as well as identifying problems that lead to poor practices among nurses' in infection prevention and control. Hence the recommendations for future practice.

#### **3.5.2 Research question**

The research question guiding the study is: What is the knowledge, attitudes and practices of nurses in infection prevention and control within a tertiary hospital in Zambia?

#### **3.5.3 Population and sampling**

The population is all elements (individuals, objects, or substances) that meet certain criteria for inclusion in a study (Burns & Grove 2011:544). The population for the study was nurses working in clinical environment at a government tertiary hospital in Zambia. 312 nurses were the total population of nurses at this government tertiary hospital of which n= 140 (98%) were registered nurses, n= 80 (56%) enrolled nurses, n= 47 (33%) registered midwives, n= 23 (16%) enrolled midwives, n= 10 (7%) certified midwives and n= 12 (8%) registered mental health nurses. The above information was obtained from Human Resource department who got the information from the register. The letter was written by the researcher (addendum G) to the

Senior Medical Superintendent explaining why the information was needed before the above information could be released. The sample is a subgroup of the population that is designed for a study (Burns & Grove 2011).

The sample set for this study was n=196 participants (Table 1.1). The sampling method that was utilized in this study was stratified simple random sampling. This method of sampling enabled the study population to have an equal and independent chance of appearing in the study sample. In each category of nurses were allocated numbers using an Excel spreadsheet developed by the statistician? The researcher utilised stratified simple random sampling to select 70% (n= 196) of nurses from each category as a sample for the study as indicated in Table 1. The sample size 70% for this study was selected in consultation with a statistician, supervisor and co-supervisor. A large sample size was more representative of the population and broadened the gathered data for analysis (Burns & Grove 2011).

**Table 3.1: Sample framework of nurses who participated in the study**

No.	Category	Total per category	Sample (70% per category)
1	Registered Nurses	126	88
2	Enrolled Nurses	72	50
3	Registered Midwives	42	29
4	Enrolled Midwives	21	15
5	Certified Midwives	9	6
6	Registered Mental Health Nurse	11	8
	<b>Total</b>	<b>N=281</b>	<b>n=196</b>

### 3.5.4 Inclusion criteria

The inclusion criteria was nurses working at the government tertiary hospital in the urban area of Zambia. All nurses working in a clinical environment were included in the study because it is in the clinical environment where transmission of infection occurs.

### 3.5.5 Exclusion criteria

Participants utilised for the pilot study were excluded from the main study. That was 10% (N= 31) of the total population of each category of nurses at the government tertiary hospital where the study was conducted. To conduct the pilot study 10% of

312 nurses (n= 31) at the same government tertiary hospital from each category was selected using stratified random sampling method as indicated in table 3.2 (n= 31). The pilot study consisted of 10% from N= 312 nurses which is n= 31 nurses of which N= 281 nurses from which 70% (n= 196) was enrolled in the main study. Nursing managers were also excluded because they do not practice in a clinical environment as they spend most of their time in offices performing administrative work.

### **3.5.6 Instrumentation**

A questionnaire is a document containing questions and other types of items designed to solicit information appropriate for analysis (Babbie & Mouton 2007; 646). The researcher utilized a self-developed structured questionnaire with closed-ended questions to collect data for the study. The compilation of the questionnaire was done through literature review, consultation with experts in the field of infection control, the supervisor and co-supervisor as well as the statistician who supervised the application of statistics. The content of the questions included best practices from Zambian infection control guidelines (2003), Centre for Disease Control guidelines(2009 & 2011) as well as WHO's guidelines on prevention of hospital-acquired infections (2002 & 2013). The questionnaire was validated because the same questionnaire was used during the pilot study and it measured what it was expected to measure in a specific population (nurses).

The questionnaire consisted of 44 closed ended questions. There are no open-ended questions. It consisted of a Likert scale of agree (1), disagree (2) and not applicable (3) to choose from, which provided greater uniformity of responses as such data was easily processed. A Likert scale is psychometric response scale used in questionnaires to obtain participants' degree of agreement with set statements (Brink, Van der Walt & Van Rensburg, 2012). The time frame to complete the questionnaire was 40 minutes as observed during the pilot study.

The questionnaire consisted of 2 sections (Appendix A):

#### **Section 1: Demographical information which included:**

- Gender
- Age
- Marital status

- Nursing category
- Years practiced as a nurse
- Employment status
- Number of years in current nursing department

**Section 2 consisted** of questions on Knowledge, Attitudes and Practices related to infection prevention and control. The questionnaire consisted of closed-ended questions with a Likert scale of agree (1), disagree (2) and not applicable (3) to choose from. A Likert scale is psychometric response scale used in questionnaires to obtain participants' degree of agreement with set statements (Brink, Van der Walt & Van Rensburg, 2012).

The questions included;

- The **Variable knowledge** had questions from 2.1.1 to 2.1.12.
- The **Variable attitude** had questions from 2.2.1 to 2.2.12.
- The **Variable Practices** had questions from 2.3.1 to 2.3.13.

### 3.5.7 Pilot study

A pilot study is a smaller version of a proposed study conducted to develop and refine the methodology such as the treatment, instruments or data collection process to be used in the larger study (Burns & Grove 2011:544). To conduct the pilot study 10% of 312 nurses ( $n = 31$ ) at the same government tertiary hospital from each category was selected using stratified random sampling method as indicated in table 3.2 ( $n = 31$ ). The pilot study consisted of 10% from  $N = 312$  nurses which is  $n = 31$  nurses of which  $N = 281$  nurses from which 70% ( $n = 196$ ) was enrolled in the main study.

Table 3.2 shows the framework of 31 nurses who participated in the pilot study. Before the pilot study, the field worker was trained on how to collect data. The time required to complete the questionnaire was confirmed as proposed in the research protocol. The pilot data and participants were excluded from the main study but reported on within chapter 3. All 31 nurses completed the questionnaire. Performing a pilot study ensured content and face validity of the instrument.

**Table 3.2: Pilot study framework**

Category	Total per category	10% no of total category
Registered Nurses	140	14
Enrolled Nurses	80	8
Registered Midwives	47	5
Enrolled Midwives	23	2
Certified Midwives	10	1
Registered Mental Health Nurses	12	1
<b>Total</b>	<b>N= 312</b>	<b>n=31</b>

A qualified statistician employed by The Biostatistics Unit, Stellenbosch University was consulted for pilot data analysis. A statistical package (IBM SPSS version 22) was used to statistically analyse the data.

**The following findings of the pilot study were recorded:**

Of the 31 questionnaires distributed, 31 participants completed the questionnaires, response rate of 100%. The majority of the participants were female; 87.1% (n= 27) while 12.9% (n= 4) were male. The majority of participants had good knowledge in infection prevention and control with the mean score of 83.21%. The attitude towards infection prevention and control was good with the mean score of 81.37%. The practice in infection prevention and control was poor with the mean score of 48.88%.

**3.5.7.1 Shortcomings identified during the pilot study**

Questionnaire: During the pilot study, shortcomings were identified within the questionnaire (addendum A) which relates to the numbering of variable 2.3 relating to practice. The number 2.3.7 till 2.3.13 had missing numbers in between as well as duplications of numbers. This affected the data analysed during the pilot study as data pertaining to the questions appeared twice. This has been corrected on the questionnaire for data collection of the main study.

**The correct numbering due to technical fault was as follows:**

- 2.3.7 – 2.3.8 was missing and was corrected.
- 2.3.9. Was duplicated and was corrected
- 2.3.8. Was incorrectly listed and was then corrected for the main study.
- The second 2.3.9 was replaced with 2.3.10

- 2.3.10 was replaced with 2.3.11
- 2.3.11 was replaced with 2.3.12
- 2.1.12 was replaced with 2.1.13

**The following approach was applied:**

- The numbering of variable 2.3 on the questionnaire was corrected before distribution of the questionnaire to collection data for the main study.
- The questionnaire was again checked by supervisor and co-supervisor before distribution

### **3.5.8 Reliability**

Reliability is defined as the extent to which an instrument consistently measures a concept (Burns & Grove 2011:546). The instrument was designed by the researcher in conjunction with the supervisor, the co-supervisor and the statistician employed by the Biostatistics Unit, Centre for Evidence Based Health Care, Stellenbosch University who supervised the application of statistics. Compilation of the instrument was done through literature review and consultation with experts in the field of infection control. The contents of the instrument included best practices from the Zambian (2003) Infection Control Guidelines, CDC guidelines (2009 & 2011) as well as WHO's guidelines for prevention of HAIs (2001 & 2013).

### **3.5.9 Validity**

Validity is the extent to which an instrument accurately reflects the abstract construct (or concept) being examined (Burns and Grove 2011:552). To maximize validity, representative questions for each category (KAP) were designed and evaluated against the desired outcome. To establish the validity of the instrument, a pilot study was conducted on 31 nurses, that is, 10% of each category of nurses at the same government tertiary hospital where the main study was conducted. The nurses that participated in the pilot study did not participate in the main study. To conduct the pilot study 10% of 312 nurses ( $n = 31$ ) at the same government tertiary hospital from each category was selected using stratified random sampling method as indicated in table 3.2 ( $n = 31$ ). The pilot study consisted of 10% from  $N = 312$  nurses which is  $n = 31$  nurses of which  $N = 281$  nurses from which 70% ( $n = 196$ ) was enrolled in the main



study. Therefore, the piloted sample was protected from participating in the main study.

A specialist in nursing practice, infection prevention and control professional nurse and nursing academic agreed on the face and content validity of the questionnaire. The questionnaire consisted of questions on knowledge, attitude and practices (KAP) of nurses in infection prevention and control. The pilot data was excluded from the main findings. Data from the pilot study revealed that participants were able to complete the questionnaire within 40 minutes as anticipated in the proposal.

- **Content validity:** is the extent to which the method of measurement includes all the major elements relevant to the construct being measured (Burns & Grove 2011:535). In this cases Knowledge, attitudes and practices among nurses were measured in relation to infection prevention and control. The contents of the instrument included best practices from the Zambian (2003) Infection Control Guidelines, CDC guidelines (2009 & 2011) as well as WHO's guidelines in the prevention of HAIs (2001 & 2013).
- **Face validity:** A specialist in nursing practice, infection prevention and control professional nurse and nursing academic agreed on the face and content validity of the questionnaire. The questionnaire was validated because the same questionnaire was used to during the pilot study and it measured what it was supposed to measure.
- **Construct validity:** To maximize validity, representative questions for each category knowledge, attitudes and practices (KAP) were designed and evaluated against the desired outcome of infection prevention and control.

### 3.5.10 Data collection

- Burns and Grove (2011:535) define data collection as the identification of subject and the precise, systemic gathering of information (data) related to the research purpose or the specific objectives, or hypothesis of the study. The researcher utilized a self-developed validated close-ended questionnaire (Addendum B) to collect data. The timeline for collecting data was from 1<sup>st</sup> August to 31<sup>st</sup> August 2015 as indicated in the study time frame. The

researcher collected the data with the help of a qualified health care provider as a field worker. About 10 (ten) questionnaires were completed every day excluding weekends. Distribution of questionnaires to identified participants for the main study was by hand. The researcher and fieldworker waited for the participants to complete the questionnaire, which improved the response rate. 196 questionnaires that were distributed and 196 were returned. Therefore the response rate was 100%.

**Table 3.3: Summary of the number of questionnaires distributed and returned**

Category	Questionnaires distributed	Questionnaires returned	Questionnaires Discarded
Registered Nurses	88	88	0
Enrolled Nurses	50	50	0
Registered Midwives	29	29	0
Enrolled Midwives	15	15	0
Certified Midwives	6	6	0
Registered Mental health Nurses	8	8	0
<b>Total</b>	<b>196</b>	<b>196</b>	<b>0</b>

### 3.5.11 Data analysis and interpretation

According to Burns and Grove (2011:535), data analysis is the technique used to reduce, organise and give meaning to data. Upon completion of data collection, data was coded and captured on to excel spreadsheet as advised by a qualified statistician employed by The Biostatistics Unit, Stellenbosch University. The statistician was further consulted for data analysis. A statistical package (IBM SPSS version 22) was used to statistically analyse the data which was analysed and reported on by using descriptive and inferential statistics, such as frequency tables and relative frequencies, and graphically illustrated by using bar charts. Continuous variables were summarised, using means and standard deviations. Knowledge was scored by summing up correct responses to knowledge items and expressing as a percentage of the total items. Attitudes and practices were scored in the same way, using the more favourable response as correct. Scores were checked for normality using histograms and the Kolmogorov-Smirnov test. Kolmogorov-Smirnov test is used to test for 'goodness of fit' between a sample distribution and another

distribution, which often is the normal (bell-shaped) distribution. The test compares the set of scores in the sample to a normally distribute set of scores with the same mean and standard deviation (Changing minds, 2016). Standard deviation is the square root of the variance (spread or dispersion of scores), it provides a measure of the average deviation of a value from the mean in a particular sample (Burns & Grove 2011:388).

All scores were found to be plausibly normally distributed, and parametric correlation coefficients (Pearson's correlation) were calculated to assess the correlation between the three scores of knowledge, attitudes and practices of infection prevention and control. Pearson's correlations is the parametric test used to determine relationships among variables (Burns & Grove 2011:394). The level of statistical significance (P-value) is the probability level at which the results of statistical analysis, are judged to indicate a statistically significant difference among groups (Burns & Grove, 2011:377).

Standard deviation is the square root of the variance (spread or dispersion of scores), it provides a measure of the average deviation of a value from the mean in a particular sample (Burns & Grove 2011:388). The mean is the sum of the scores divided by number of scores being summed (Burns & Grove 2011:387). It indicates therefore the average score as referred to above in text. The median is the midpoint or the score at the exact center of the ungrouped frequency distribution. The median is obtained by rank ordering the scores, if the number of scores is even then the median is the average of the two median scores (Burns & Grove 2011:385)

### **3.5.12 Ethical considerations**

Where research involves the acquisition of material and information provided on the basis of mutual trust, it is essential that rights, interests and sensitivities of those studied be protected (Mouton 2011:243). Ethical reviewing and approval for this study will be done by the Health Research Ethics Committee of the University of Stellenbosch (Addendum C). Preliminary permission letter (Addendum D) to conduct the study has been obtained from the Ethics Committee of the Tropical Disease Research Centre (TDRC). Permission to conduct the study was obtained from the

Senior Medical Superintendent (addendum G) and the head of nursing of the tertiary hospital where the study will be conducted.

#### 3.5.12.1 Right to confidentiality and anonymity

Confidential information provided by research participants must be treated as confidential, even when this information enjoys no legal protection or privilege, and no legal force is applied (Mouton, 2011:244). Informants/ Participants have the right to remain anonymous (Mouton, 2011:243). Principles of confidentiality and anonymity were maintained throughout the study. No personal details appeared on the questionnaire. Only the researcher, supervisor, co-supervisor and statistician had access to any information and data obtained for the purpose of this study. Data will be kept in a locked cupboard in the researcher's house for a period of 5 years allowing access to only the researcher.

#### 3.5.12.2 Right to self-determination

This principle states that participants have the right to refuse to participate in the study as well as to decline at any stage during the research process. The principle of respect for participants indicates that people should be treated as autonomous agents with the right to self-determination (Burn & Grove, 2011:107). Participation was entirely voluntary and participants were informed that they are free to decline to participate any time without suffering any negative consequences. Participants were given adequate information about the study. A written informed consent (addendum E) was obtained from participants before answering the questionnaire.

#### 3.5.12.3 Right to protection from harm and discomfort

The researcher has the primary responsibility to protect participants from physical and mental harm. The process of conducting research must not expose the participants to the substantial risk of personal harm (Mouton 2011:245). In order to minimise harm the researcher should ensure that confidentiality and anonymity of participants are protected. By allowing participants to withdraw from the study at any time, participants are protected from harm and discomfort. Researchers have to be extremely watchful in respecting participants' right to privacy (Mouton, 2011:243). The right to privacy was maintained throughout the study. Participants were informed

that they had the right to refuse to answer the questionnaire. The principle of beneficence was ensured throughout the study by maximising possible benefits, minimising possible harms and by ensuring that participants are not harmed.

### **3.6 SUMMARY**

This chapter included the research methodology that was applied to determine the knowledge, attitudes and practices of nurses regarding infection prevention and control within a tertiary hospital in Zambia. The research design, population and sampling procedures, data collection and data analysis methods were discussed too. In the next chapter, the results and interpretation of the collected and analysed data are presented and discussed.

## CHAPTER 4

### RESEARCH FINDINGS

#### 4.1. INTRODUCTION

In this chapter, the findings on the data collected and analysed are presented. The study results are described, discussed and analysed data is presented in tables, histograms and graphs. Data was analysed to determine nurses' knowledge, attitude and practices in infection prevention and control at a tertiary Hospital in Zambia. The Statistical package (IBM SPSS version 22) was used to analyse data with the support of an experienced statistician from Stellenbosch University. The collected data was captured on to excel spreadsheet that was prepared by the statistician for the purpose of the study.

#### 4.2. SECTION 1: BIOGRAPHICAL DATA.

This section aims at collecting participants information which consists of seven questions regarding gender, age, marital status, nursing category, years practiced as a nurse employment status and the number of years in the current department.

##### 4.2.1. Variable 1: Gender

The majority of the participants who completed the questionnaire were female  $n=166$  (84.7%), compared to male participants  $n=30$  (15.3%).

**Table 4.1: Gender distribution of participants (n=196)**

Gender	n	%
Male	30	15.3
Female	166	84.7
Total (N)	196	100.0

It is evident that nursing profession is populated by females. Of the total 196 participants 166 were female nurses while  $n=30$  were male nurses. According to Zamanzadeh, Valizadeh, Negarandeh, Monadi and Azadi (2013:49-56) male nurses confront challenging traditional gender-defined roles and stereotypes from the society when choosing to enter a female-dominated profession (nursing). That is why the nursing profession is female-dominated.

#### 4.2.2. Variable 2: Age

The largest age group that completed the questionnaire were 30 – 39 years  $n = 80$  (40.8%), followed by age group 20 – 29 years old  $n = 72$  (36.7%) and age group 40 – 49 years  $n = 32$  (16.3%), lastly >50 years of age were  $n = 12$  (6.1%).

**Table 4.2: Age distribution of participants who participated in the study**

Age	n	%
20-29	72	36.7
30-39	80	40.8
40-49	32	16.3
>50	12	6.1
Total (N)	196	100.0

According to Table 4.2 the majority of nurses were between 30 to 39 age group  $n = 80$  (40.8%), followed by 20 to 29 age group  $n = 72$  (36.7%) then 40 to 49 age group  $n = 32$  (16.3%) and lastly above 50 years old  $n = 12$  (6.1%)

#### 4.2.3. Variable 3: Marital status

The majority of participants were married participants  $n = 97$  (49.5%) followed by single participants  $n = 86$  (43.9%) while other was  $n = 13$  (6.6%)

**Table 4.3: Marital distribution of participants who participated in the study**

Marital Status	n	%
Single	86	43.9
Married	97	49.5
Other	13	6.6

According to Table 4.3, it is evident that most of the nurses are married while a good number was single. Least number of nurses were neither married nor single.

#### 4.2.4. Variable 4: Nursing category

The majority of participants were registered nurses  $n = 89$  (45.4%), followed by enrolled nurses  $n = 52$  (26.5%), then registered midwives  $n = 25$  (12.8%), then enrolled midwives  $n = 16$  (8.2%), then certified midwives  $n = 6$  (3.1%) and lastly registered mental health nurses  $n = 8$  (4.1%).

**Table 4.4: Distribution of nursing categories who participated in the study**

type	n	%
RN	88	45.4
EN	50	26.5
RM	29	12.8
EM	15	8.2
CM	6	3.1
RMHN	8	4.1
Total	196	100.0

To conduct the pilot study 10% of 312 nurses (n= 31) at the same government tertiary hospital from each category was selected using stratified random sampling method as indicated in table 3.2 (n= 31). The pilot study consisted of 10% from N= 312 nurses which is n= 31 nurses of which N= 281 nurses from which 70% (n= 196) was enrolled in the main study. Therefore, the piloted sample was protected from participating in the main study.

#### **4.2.5. Variable 5: year practiced as a nurse**

The number of nurses who had practiced as a nurse for 0-1 were n= 23 (11.7%), 1-3 years were n= 63 (32.1%), 4 to 10 years were n= 63 (32.1%), 10 years and above n= 47 (24%).

**Table 4.5: Distribution of years practiced for nurses who participated in the study**

Years practiced	n	%
0-1	23	11
1-3	63	32.1
4 -10	63	32.1
10 and above years.	47	24

Table 4.5 indicates that the number of nurses that practiced from 1 to 3 years and 4 to 10 year was the same. The number of nurses that practiced for 10 years and above were more than those who practiced for 0 to 1 years.



#### 4.2.6. Variable 6: Employment status

The majority of participants were full-time employees  $n= 173$  (88.3%),  $n= 16$  (8.2%) were employed on a contract, while other had  $n= 3$  (3.6%).

**Table 4.6: Distribution of employment status for nurses**

Employment status	n	%
Full-time	173	88.3
Contract	16	8.2
Agency		
Other	3	3.6
Total (N)	196	100

According to table the majority  $n= 173$  (88%) of nurses who participated in the study were full-time followed by a few on a contract while the least were in the other category.

#### 4.2.7. Variable 7: number of years worked in current department

The majority of nurses  $n= 106$  (54.1%) worked for two years in the same department before they were placed to another department. While  $n= 61$  (31.1%) had worked for 2-4 years in the same department. Nurses who worked for 5-10 years in the same department were  $n= 21$  (10.7%) while  $n= 8$  (4.1%) worked for 10 years and above in the same department.

**Table: 4.7. The Distribution of number of years worked in current departments for nurses who participated in the study.**

Years worked in current department	n	%
0-2	106	54.1
2-4	61	31
5-10	21	10
>10	8	4.1

Table 4.7 shows that the majority of nurses had worked in the same department for 0-2, while some nurses worked in the same department for 2-4 years. Very few  $n= 8$  (4.1%) nurses have worked in the same department for more than 10 years.

#### 4.3. SECTION 2: QUESTIONS ON KNOWLEDGE, ATTITUDE AND PRACTICES ON INFECTION PREVENTION AND CONTROL AMONG NURSES

Refer to questionnaire:

**Table 4.8: 2.1. Knowledge consists of questions 2.1.1 to 2.1.12.**

Question 2.1. referring to Knowledge component	Variable
2.1.1	Hospital acquired infection can be transmitted by medical equipment such as syringes, needles, catheters, stethoscopes, thermometers etc.
2.1.2	Nosocomial infection is an infection that the patient comes with from home.
2.1.3	I know the worlds health organisation's '5 moments of hand hygiene.
2.1.4	Some instrument can be stored in an antiseptic solution for up to 36 hours.
2.1.5	If there is limited beds available, patients with communicable diseases may be admitted in the same ward with other patients.
2.1.6	Micro-organisms are destroyed by using clean water
2.1.7	Bathing every day is a universal precaution
2.1.8	Standard precautions apply to all patients regardless of their diagnosis.
2.1.9	I am familiar with hospital-acquired infection guidelines
2.1.10	All staff and patients should be considered potentially infectious.
2.1.11	You can handle body fluids with bare hands if gloves are not available
2.1.12	I know how to prevent and control hospital-acquired infections

**Table 4.9: 2.2. Attitudes consist of questions 2.2.1 to 2.2.12.**

Question 2.2. referring to attitude component	Variable
2.2.1	I do not have to wash hands if I used gloves.
2.2.2	Policies and procedures on infection control should be adhered to at all times
2.2.3	I should attend in-service training/workshop related to infection prevention and control regularly.
2.2.4	The workload affects my ability to apply infection prevention guidelines
2.2.5	I am aware that patients expect me to wash hands before touching them and after touching them.
2.2.6	I feel that infection control policies and guidelines are enough in the hospital
2.2.7	It is not my responsibility to comply with hospital-acquired infection guidelines.
2.2.8	Infection prevention guidelines are important to this hospital.
2.2.9	I have enough time to comply with infection prevention guidelines
2.2.10	I believe that following the prevention guidelines will reduce rates of hospital-acquired infection.
2.2.11	I should follow the procedure guidelines of the unit.
2.2.12	I feel that needles should be recapped after use and before disposal

**Table 4.10: 2.3. Practices consist of question 2.3.1 to 2.3.13**

Question 2.3. referring to Practice component	Variable
2.3.1	I always wash hands before and after direct contact with the patients
2.3.2	I always put on a mask and glasses when performing invasive and body fluid procedures.
2.3.3	Knowledge of infection prevention and control are being monitored in the hospital
2.3.4	I attend in-service training/workshop related to infection prevention and control yearly.
2.3.5	Surgical operation sites are shaved with razors.
2.3.6	The latest infection and prevention guidelines date is between 2015 and 2013.
2.3.7	Screening of patients is being done to detect colonisation even if no evidence of infection.
2.3.8	Vaccination is provided to staff.
2.3.9	Personal protective equipment are always accessible
2.3.10	Our hospital monitors patients with urinary catheters for urinary tract infection and gives feedback on urinary tract infection rates.
2.3.11	Infection prevention does not improve patient outcome
2.3.12	We wear personal protective equipment when handling linen.
2.3.13	We shake linen out to release dust from the linen.

#### 4.3.1. Knowledge questions from 2.1.1 to 2.1.12.

**Table 4.11.** Questions on nurse's knowledge in infection prevention and control  
(Variables 2.1.1 - 2.1.12).

VARIABLE		AGREE	DISAGREE	NOT APPLICABLE	TOTAL (N)
2.1.1	Hospital acquired infection can be transmitted by medical equipment such as syringes, needles, catheters, stethoscopes, thermometers etc.	n=189 (96.4%)	n=6 (3.1%)	n=1 (0.5%)	N=196 (100%)
2.1.2	Nosocomial infection is an infection that the patient comes with from home.	n=36 (18.4%)	n=158 (80.6%)	n=2 (1%)	N=196 (100%)
2.1.3	I know the world's health organisation's '5 moments of hand hygiene.	n=167 (85.2%)	n=29 (14.8%)	n=0 (0%)	N=196 (100%)
2.1.4	Some instrument can be stored in an antiseptic solution for up to 36 hours.	n=66 (33.7%)	n=123 (62.8%)	n=7 (3.6%)	N=196 (100%)
2.1.5	If there is limited beds available, patients with communicable diseases may be admitted in the same ward with other patients.	n=25 (12.8%)	n=169 (86.2%)	n=2 (1%)	N=196 (100%)
2.1.6	Micro-organisms are destroyed by using clean water	n=9 (4.6%)	n=183 (93.4%)	n=4 (2%)	N=196 (100%)
2.1.7	Bathing every day is a universal precaution	n=123 (62.8%)	n=61 (31.1%)	n=12 (6.1%)	N=196 (100%)
2.1.8	Standard precautions apply to all patients regardless of their diagnosis.	n=182 (92.9%)	n=14 (7.1%)	n=0 (0%)	N=196 (100%)
2.1.9	I am familiar with hospital acquired infection guidelines.	n=165 (84.2%)	n=31 (15.8%)	n=0 (0%)	N=196 (100%)
2.1.10	All staff and patients should be considered potentially infectious.	n=187 (95.4%)	n=9 (4.6%)	n=0 (0%)	N=196 (100%)
2.1.11	You can handle body fluids with bare hands if gloves are not available	n=4 (2%)	n=192 (98%)	n=0 (0%)	N=196 (100%)
2.1.12	I know how to prevent and control hospital acquired infections	n=181 (92.3%)	n=15 (7.7%)	n=0 (0%)	N=196 (100%)

**4.3.1.1. Variable 2.1.1. Hospital acquired infection can be transmitted by medical equipment such as syringes, needles, catheters, stethoscopes, thermometers, etc (N=196):** According to Table 4.11, the majority of nurses n= 189 (96.4%) agreed that hospital-acquired infections can be transmitted by medical equipment such as syringes, needles, catheters, stethoscopes, thermometers etc. While a few participants n=6 (3.1%) disagreed and only one participant n=1 (0.5%) thought it was not applicable.

If nurses are knowledgeable in infection prevention and control, the rate of hospital acquired infection can be reduced.

Literature has shown that hospital acquired infection can be transmitted through contaminated equipment. In agreement, (CDC) Centres for Disease Control and Prevention (2014:24) indicated that *Pseudomonas Aeruginosa* could spread by equipment that gets contaminated and not properly cleaned. In this regard, the study has shown that n= 7 (3.6%) of the nurses who participated in the study lacked knowledge in infection prevention and control posing a risk in transmitting HAIs.

**4.3.1.2. Variable 2.1.2 Nosocomial infection is an infection that the patient comes with from home. (N= 196):** Table 4.11 indicates that the majority of nurses n=158 (80.6%) disagreed with the statement that nosocomial infection is an infection that the patient comes with from home. A number of nurses n= 36 (18.4%) agreed while only two participants n= 2 (1%) thought that it was not applicable.

However, the study has shown that n= 38 (19, 4%) of the nurses who participated in the study have the knowledge that nosocomial infection is acquired at home. This indicates that these nurses did not know how hospital-acquired infections were acquired hence posing a risk of transmitting nosocomial infection.

**4.3.1.3. Variable 2.1.3 I know the worlds health organisation's '5 moments of hand hygiene. (N= 196):** According to Table 4.11 the large majority of nurses n= 167 (85.2%) agreed that they were aware of the world health Organisation's "5 moments of hand hygiene" the remaining portion of nurses n= 29 (14.8%) disagreed. However, n= 29 (14.8%) of nurses who participated in the study did not have

knowledge about WHO (2009) 5 moments of hand hygiene hence posing a risk of transmitting infection.

**4.3.1.4. Variable 2.1.4 Some instruments can be stored in an antiseptic solution for up to 36 hours (N= 196):** Table 4.11 shows that the majority of nurses n= 123 (62.8%) disagreed that instruments can be stored in an antiseptic solution for up to 36 hours. A third n= 66 (33.7%) of the participants agreed that instruments could be stored in an antiseptic solution for up to 36hrs while a few nurses n= 7 (3.5%) thought it was not applicable.

According to the current study n= 189 (97.5%) lack knowledge on instrument decontamination and therefore pose a risk of hospital acquired infection.

**4.3.1.5. Variable 2.1.5 If there is limited beds available, patients with communicable diseases may be admitted in the same ward with other patients (N= 196):** As per table 4.11 the large majority of nurses n= 169 (86.2%) disagreed with the statement that if there are limited beds available, patients with communicable diseases may be admitted in the same ward with other patients. A quarter of the participants n= 25 (12.8%) agreed while n= 2 (1%) thought it was not applicable.

Isolation is necessary to either prevent transmission of infection from an infected patient to others or to protect a patient who is susceptible to infection (West Hertfordshire Hospital Policy, 2013:3). However, the current study shows that n= 27 (13.8%) had no knowledge about the importance of isolating patients with communicable diseases hence posing a risk for hospital-acquired infections.

**4.3.1.6. Variable 2.1.6 Micro-organisms are destroyed by using clean water (N= 196):** according to the table 4.11 the majority n= 183 (93.4%) of participants disagreed with the statement that micro-organisms are destroyed by clean water. A few nurses n= 9 (4.6%) agreed that micro-organism can be destroyed by clean water, while four n= 4 (2%) thought it was not applicable.

Micro-organisms can not be destroyed by clean water. Micro-organisms are killed by disinfectants which are antimicrobial agents that are applied to non-living objects to destroy micro-organisms. However, n= 13 (6.6%) believe that clean water can

destroy micro-organisms indicating that they lack knowledge in infection prevention and control.

**4.3.1.7. Variable 2.1.7 Bathing every day is a universal precaution (N= 196):** according to Table 4.11 most of the participants n= 123 (62.8%) agreed that bathing every day is a universal precaution. A third of the nurses n= 61 (31.1%) disagreed with the statement that bathing every day is a universal precaution while n= 12 (6.1%) indicated that it is not applicable.

The current study n= 123 (62.8%) agreed with the statement that bathing every day is a universal precautions indicating that the majority of nurses did not understand the meaning of the term universal precautions. This is an indication of a gap in knowledge.

**4.3.1.8. Variable 2.1.8 Standard precautions apply to all patients regardless of their diagnosis (N= 196):** Accordind to table 4.11 a large majority of nurses n=182 (92.9%) agreed that standard precautions apply to all patients regardless of their diagnosis. A relatively small number of nurses n= 14 (7.1%) disagreed with the statement that standard precaution apply to all patients regardless of their diagnosis as per Table 4.11.

The current study shows that n= 14(7.1%) indicated that standard precautions do not apply to all patients regardless of their diagnosis. These nurses pose a risk to transmission of infection. Srejjc (2015:1) indicated that standard precautions are basic effective practices designed to protect health-care workers (HCWs) and prevent HCWs from spreading infections among patients. These safety measures apply to all hospitalised patients, regardless of the disease the patient is suffering from. (Srejjc 2015:1).

**4.3.1.9. Variable 2.1.9 I am familiar with hospital-acquired infection guidelines (N= 196):** According to Table 4.11 the majority of participants n= 165 (84.2%) agreed that they were familiar with hospital-acquired infection guidelines, whereas some participants n= 31 (15.8%) disagreed that they were unfamiliar with hospital-acquired infection guidelines.



Infection control guidelines are important because they guide health-care workers in prevention of hospital acquired the infection. Brisibe, Ordinioha and Gbeneolol (2014:691-695) indicated that implementation of infection control policy result in some improvements in certain infection control practices. However, the present study indicated that n= 31 (15.8%) were not familiar with hospital-acquired infection guidelines.

**4.3.1.10. Variable 2.1.10. All staff and patients should be considered potentially infectious (N= 196):** As indicated in Table 4.11, a large number of participants n= 187 (95.4%) considered all staff and patients as potentially infectious whereas a relatively small group of participants n= 6 (4.6%) did not consider all staff and patients as potentially infectious.

Standard precautions apply to the care and treatment of all patients in the clinic environment, regardless of their infectious status as well as in handling all bodily fluids, non-intact skin and mucous membranes (The University of Sydney, 2015:2)

**4.3.1.11. Variable 2.1.11. You can handle body fluids with bare hands if gloves are not available (N= 196):** The results in Table 4.11 showed that almost all participants n= 192 (98%) disagreed with the statement that they can handle body fluids with bare hands if gloves are not available. Unfortunately, four participants n= 4 (2%) agreed that they could handle body fluids with bare hands if gloves are not available.

Use of personal protective equipment (gloves) is one of the practices required to achieve a basic level of infection control (The University of Sydney 2015:1).

**4.3.1.12. Variable 2.1.12: I know how to prevent and control hospital-acquired infections (N= 196):** Table 4.11 showed that a large number of participants n= 181 (92.3%) agreed that they know how to prevent and control hospital acquired infections whereas only a minority n= 15 (7.7%) disagreed to know how to prevent and control hospital acquired infections.

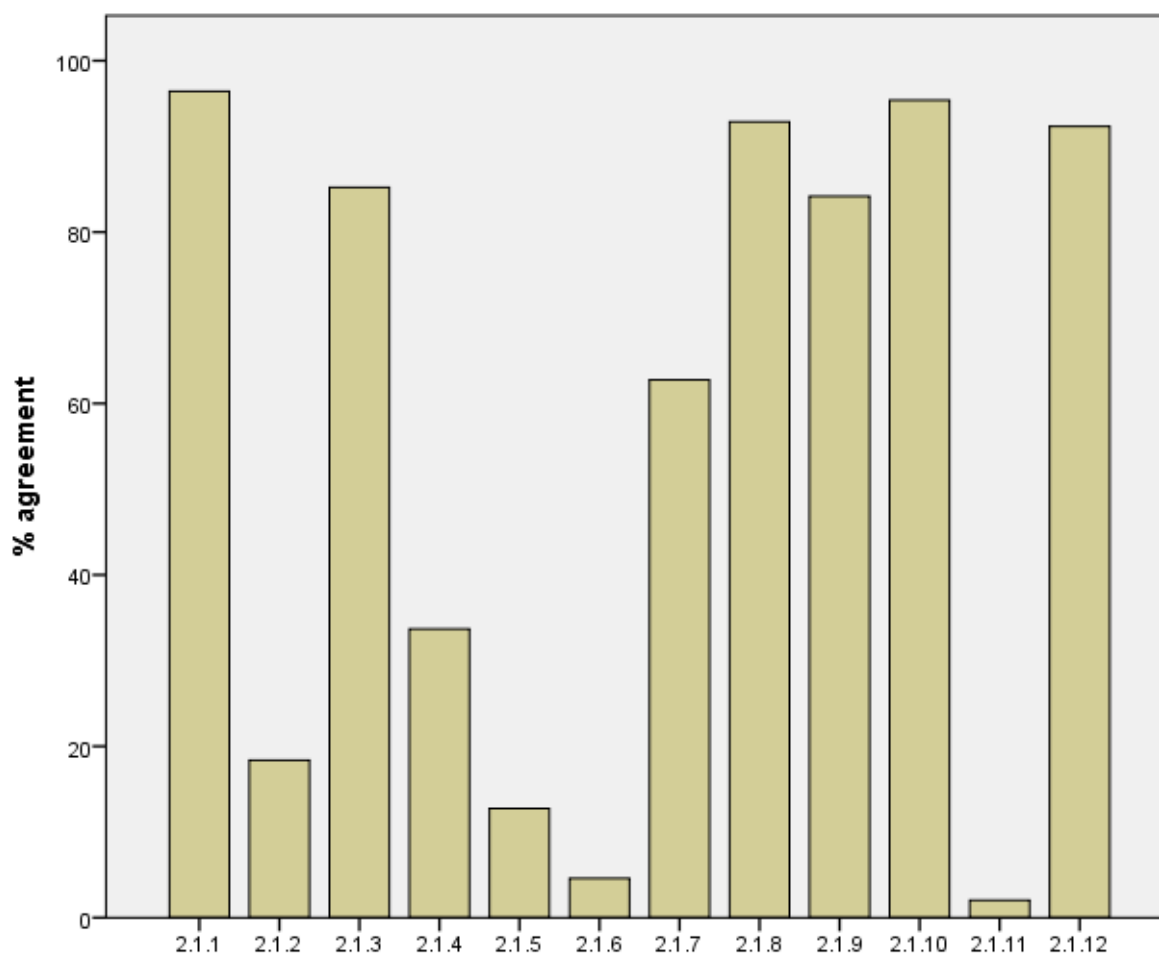
Even though the majority n= 181 (92%) of nurses indicated that they have knowledge on how to prevent hospital acquired infection, the current study reviewed that the majority n= 123 (62.8%) of nurses did not understand the meaning of universal

precautions. Furthermore, n= 15 (7.7%) did not know how to prevent and control hospital acquired infections. This indicates that there is still a gap in the level of knowledge on how to prevent hospital acquired infections.

#### **4.3.1.13. Summary of the extent agreement on knowledge towards infection prevention and control among nurses..**

Results are reflected within the graph below Figure 4.1 shows the extent of agreement on knowledge among nurses in infection prevention and control. The high or low level of agreement does not indicate a favourable answer. Each variable is explained in section 4.3.1 above.

**Figure 4.1. Results reflected within the graph below shows the extent of agreement on knowledge among nurses in infection prevention and control**



*(y= Questions on knowledge 2.1.1-2.1.12)*

#### **4.3.1.14. Questions on knowledge**

##### **Feedback of responses on the y-axis of fig 4.1 referring to knowledge**

**2.1.1.** 96.4% of the nurses agreed that hospital acquired infection can be transmitted by medical equipment such as syringes, needles, catheters, stethoscope, thermometers etc.

**2.1.2.** 18.4% of the nurses agreed that nosocomial infection is an infection that a patient comes with from home.

**2.1.3.** 85.2% of the nurses agreed that they know the world health organisation's 5 moments of hand hygiene.

**2.1.4.** 33.7% of the agreed that some instrument could be stored in an antiseptic solution for up to 36 hours.

**2.1.5.** 12.8% of the nurses agreed that if there is limited beds available, patients with communicable diseases may be admitted in the same ward with other patients.

**2.1.6.** 4.6% of the nurses agreed that micro-organisms are destroyed by using clean water.

**2.1.7.** 62.8% of the nurse agreed that bathing every day is a universal precaution.

**2.1.8.** 92.9% of the nurses agreed that standard precautions apply to all patients regardless of their diagnosis.

**2.1.9.** 84.2% of the nurses agreed that they were familiar with hospital-acquired infections (HAIs) guidelines.

**2.1.10.** 95.4% of the nurses agreed that all staff and patients should be considered potentially infectious.

**2.1.11.** 2% of the nurses agreed that they could handle body fluids with bare hands if gloves were not available.

**2.1.12.** 92.3% of the nurses agreed that they knew how to prevent and control HAIs.

### 4.3.2. Attitudes questions from 2.2.1 to 2.2.12

One participant did not complete the section on Attitudes questions from 2.2.1 to 2.2.12. Therefore this section was completed by N=195.

**Table 4.12: Questions on attitudes towards infection prevention and control among nurses.**

VARIABLE		AGREE	DISAGREE	NOT APPLICABLE	TOTAL (N)
2.2.1	I do not have to wash hands if I used gloves.	n=6 (3.1%)	n=189 (96.9%)	n=0 (0%)	N=195 (100%)
2.2.2	Policies and procedures on infection control should be adhered to at all times	n=188 (96.4%)	n=7 (3.6%)	n=0 (0%)	N=195 (100%)
2.2.3	I should attend in-service training/workshop related to infection prevention and control regularly.	n=188 (96.4%)	n=7 (3.6%)	n=0 (0%)	N=195 (100%)
2.2.4	The workload affects my ability to apply infection prevention guidelines.	n=129 (66.2%)	n=66 (33.8%)	n= (0%)	N=195 (100%)
2.2.5	I am aware that patients expect me to wash hands before touching them and after touching them.	n=151 (77.4%)	n=42 (21.5%)	n=2 (1%)	N=195 (100%)
2.2.6	I feel that infection control policies and guidelines are enough in the hospital	n=92 (47.2%)	n=103 (52.8%)	n=0 (0%)	N=195 (100%)
2.2.7	It is not my responsibility to comply with hospital acquired infection guidelines.	n=13 (6.7%)	n=181 (92.8%)	n=1 (0.5%)	N=195 (100%)
2.2.8	Infection prevention guidelines are important to this hospital.	n=192 (98.5%)	n=2 (1%)	n=1 (0.5%)	N=195 (100%)
2.2.9	I have enough time to comply with infection prevention guidelines	n=85 (43.6%)	n=109 (55.9%)	n=1 (0.5%)	N=195 (100%)
2.2.10	I believe that following the prevention guidelines will reduce rates of hospital acquired infection.	n=190 (97.4%)	n=5 (2.6%)	n=0 (0%)	N=195 (100%)
2.2.11	I should follow the procedure guidelines of the unit.	n=190 (97.4%)	n=4 (2%)	n=1 (0.5%)	N=195 (100%)
2.2.12	I feel that needles should be recapped after use and before disposal	n=13 (6.7%)	n=181 (92.8%)	n=1 (0.5%)	N=195 (100%)

**4.3.2.1. Variable 2.2.1: I do not have to wash hands if I used gloves (N= 195):** According to Table 4.12 the majority of nurses n= 189 (96.4%) disagreed with the statement that they do not have to wash hands after using gloves. While a relatively small group of nurses n= 6 (3.1%) agreed with the statement that they do not have to wash hands after using gloves.

It is important to wash hands with soap and water after removing gloves because there is a risk of hand contamination during removal of gloves. In agreement Pang, Carter, Scott, Salazar and Johnson (2014:14-16) indicated that gloves should be removed as soon as the episode of care is completed followed by decontamination of hands. Moreover, gloves provide an ideal, warm, moist environment where bacteria thrive, therefore, hand decontamination will remove any transient bacteria from a previous patient environment (Pang et al., 2014:14-16). Pang et al., (2014:14-16) indicated that hand hygiene remains the cornerstone of infection prevention and all health workers must be aware that wearing PPE does not replace the need to carry out safe hand-hygiene practices and hand decontamination. However, the present study shows that n= 6 (3.1%) of nurses still feel that they do not need to wash hands after removing gloves posing a risk to transmission of infection.

**4.3.2.2. Variable 2.2.2: Policies and procedures on infection control should be adhered to at all times (N= 195):** as per Table 4.12 the majority of nurses n= 188 (96.4%) agreed that they should adhere to policies and procedures on infection control at all times. A few nurses n= 7 (3.6%) disagreed with the fact that they should adhere to policies and procedures on infection control at all times.

Even though n= 188 (96.4%) agreed that they should adhere to policies and procedures on infection control all the time, the current study shows that n= 103 (53%) as shown in (Table 4.12) indicated that policies and guidelines on infection control are not enough at their hospital. Furthermore n= 7 (3.6%) indicated that they should not adhere to policies and procedures on infection control at all times posing a risk of infection transmission.

**4.3.2.3. Variable 2.2.3: I should attend in-service training/workshop related to infection prevention and control regularly. (N= 195):** Table 4.12 indicates that a good number of nurses n=188 (96.4%) agreed that they should attend in-service

training/workshop related to infection prevention and control regularly. A few participants  $n=7$  (3.6%) disagreed with the statement that they should attend in-service training/workshop related to infection prevention and control regularly.

Even though  $n=188$  (96.4%) agreed that they should attend in-service training/workshop related to infection prevention and control regularly, the current study in table 4.13 indicated  $n=178$  (91.3%) do not attend in-service training/workshop related to infection control regularly. Furthermore,  $n=7$  (3.6%) indicated that it is not important to attend in-service training/workshop related to infection control.

**4.3.2.4. Variable 2.2.4: The workload affects my ability to apply infection prevention guidelines. (N= 195):** Table 4.12 indicates that most of the participants  $n=129$  (66.2%) agreed that the workload affects their ability to apply infection prevention guidelines, while some participants  $n=66$  (33.8%) disagreed that the workload affects their ability to apply infection prevention and control. The current study shows that  $n=129$  (66.2%) nurses agreed that the workload affects their ability to comply with infection prevention guidelines. In agreement, Cimiotti, Aiken, Sloane & Wu (2012:486-490) indicated that there is a relationship between nurse staffing and hospital acquired infections. Therefore, decreasing exhaustion in nurses is a favourable approach to help control transmission of infections in hospitals. Therefore recommendations were made to improve nurse staffing and alleviate job-related burnout in nurses hence improving the quality of patient care.

**4.3.2.5. Variable 2.2.5: I am aware that patients expect me to wash hands before touching them and after touching them. (N= 195):** As shown in Table 4.12 most of the participants  $n=151$  (77.4%) agreed that they are aware that patients expect them to wash their hands before and after touching them while some nurses  $n=42$  (21.5%), disagreed that they are aware that patients expect them to wash their hands before and after touching them. Very few nurses  $n=2$  (1%) thought it was not applicable.

The current study shows that  $n=44$  (22.5%) of nurses are not aware that patients expect them to wash their hands before and after touching them. In this regard, according to Safe Care Campaign (2007 to 2016:1), the literature shows that patients

can have a role in promoting hand hygiene among doctors and nurses. Hand hygiene video empowers patients to remind hospital caregivers to clean their hands, a strategy that is critical in the fight to prevent infections (Safe Care Campaign 2007 to 2016:1).

**4.3.2.6. Variable 2.2.6: I feel that infection control policies and guidelines are enough in the hospital (N= 195):** Table 4.12 indicates that a large group of nurses n= 103 (52.8%) feels that infection control policies and guidelines are not enough in the hospital while close to half of the participants n= 92 (47.2%) reported that infection control policies and guidelines are enough in the hospital.

Infection control policies and guidelines are documents that contain information used to minimise the risk of spreading infection. Therefore these documents are important because they help reduce the rate of nosocomial infection if the nurses comply to them. However the current study reviews that n= 103 (52%) indicated that infection control policies and guidelines are not enough in the hospital.

**4.3.2.7. Variable 2.2.7: It is not my responsibility to comply with hospital-acquired infection guidelines. (N= 195):** As per table 4.12 the large majority of nurses n= 181 (92.8%) disagreed with the statement that it is not their responsibility to comply with the hospital acquired infection guidelines. While some participants n= 13 (6.7%) agreed that it is not their responsibility to comply with the hospital acquired infection guidelines and one n= 1(0.5%) thought it was not applicable. The current study shows that n= 14 (7.2%) nurses indicated that it was not their responsibility to comply with HAIs guidelines hence posing a risk with HAIs. Transmission of HAIs through health-care workers can be avoided. Therefore it is their responsibility to comply with HAIs guidelines in order to reduce the rate of HAIs.

**4.3.2.8. Variable 2.2.8: Infection prevention guidelines are important to this hospital (N= 195):** Table 4.12 shows that the large majority of participants n= 192 (98.5%) agreed that infection prevention guidelines are important to their hospital. While very few participants n= 2 (1%) disagreed that infection prevention guidelines are important to their hospital and one participant n= 1 (0.5%) thought it was not applicable.

Infection prevention guidelines are important to all health-care settings because they guide health-care workers on how to control and prevent hospital acquired infection. In the current study  $n = 192$  (98.5%) indicated that infection prevention guidelines are important to their hospital. However, the study shows that these guidelines are not enough in the hospital.

**4.3.2.9. Variable 2.2.9: I have enough time to comply with infection prevention guidelines (N= 195):** Table 4.12 indicates that although some participants  $n = 85$  (43.6%) agreed that they have enough time to comply with infection prevention guidelines, the majority of participants  $n = 109$  (55.9%) disagreed with the statement that they have enough time to comply with infection prevention guidelines. While one participant  $n = 1$  (0.5%) thought it was no applicable.

The current study shows that  $n = 110$  (56.4%) disagreed with the statement that they have enough time to comply with infection prevention guidelines. In this regard, Cimiotti, Aiken, Sloane and Wu (2012:486-490) revealed a significant relationship between staffing of nurses and urinary tract infection as well as surgical site infection. The study indicated that reducing stress among nurses is a tactic to help control hospital acquired infections in acute care facilities.

**4.3.2.10. Variable 2.2.10: I believe that following the prevention guidelines will reduce rates of hospital-acquired infection (N= 195):** According to table 4.12 the majority of participants  $n = 190$  (97.4%) agreed that they believed that following the infection prevention guidelines will reduce the rates of hospital acquired infection. While very few participants  $n = 5$  (2.6%) did not believe (disagreed) that following infection prevention guidelines will reduce the rates of hospital acquired infection.

**4.3.2.11. Variable 2.2.11: I should follow the procedure guidelines of the unit. (N= 195):** According to table 4.12 the majority of participants  $n = 190$  (97.4%) agreed that they should follow the guidelines of the unit whereas very few participants  $n = 4$  (2%) disagreed that they should follow the guidelines of the unit. One participants  $n = 1$  (0.5%) thought it was not applicable.

Nurses are at risk of occupational exposure and can spread infection from one patient to the other. Therefore, implementing relevant control measures which



include following the units guidelines are key to successful infection control management. However, n= 4 (2%) indicated that they should not follow infection control guidelines of the unit posing a risk of hospital acquired infections.

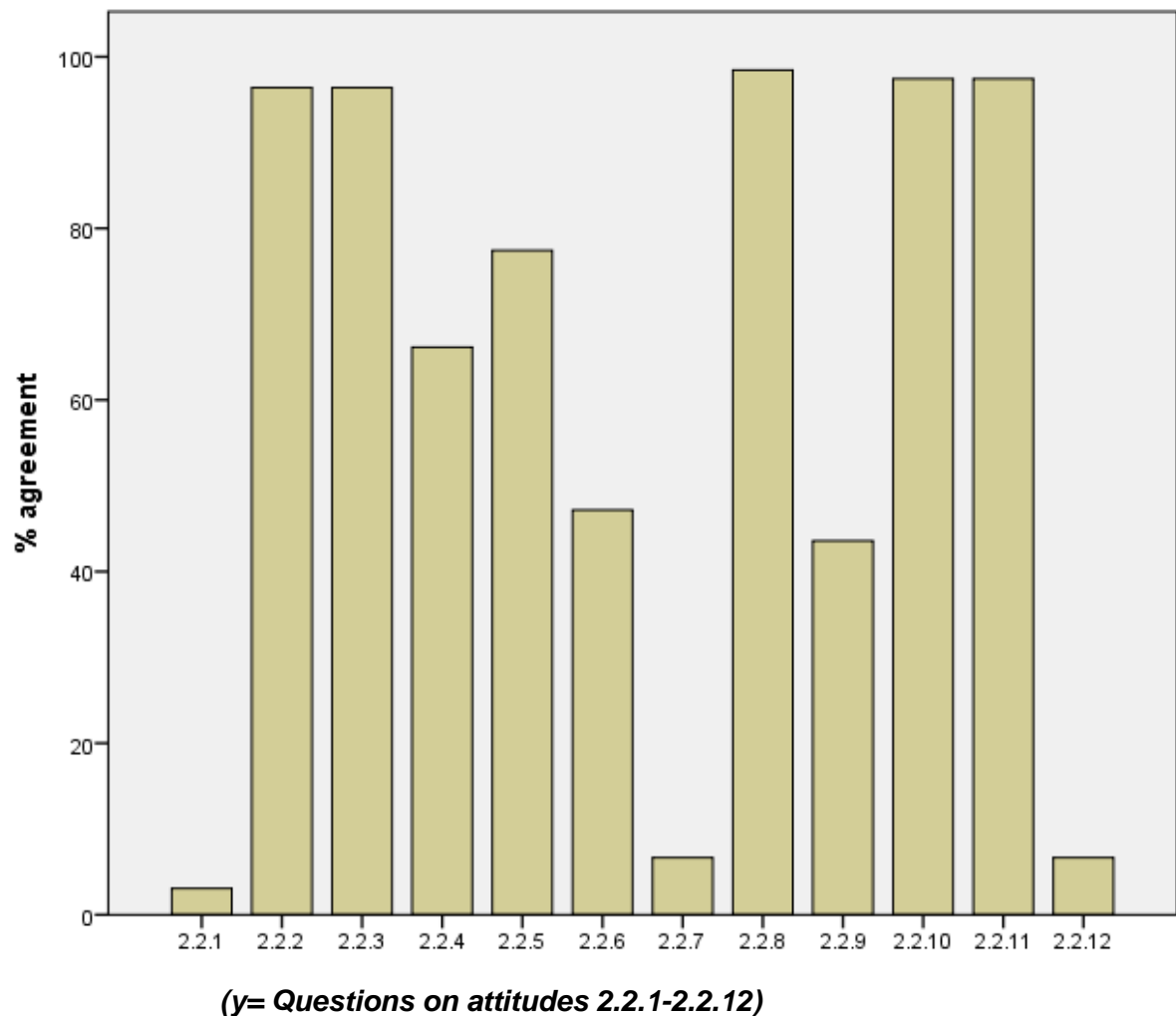
**4.3.2.12. Variable 2.2.12: I feel that needles should be recapped after use and before disposal (N= 195):** Table 4.12 indicates that the majority of participants n= 181 (92.8%) disagreed with the statement that needles should be recapped after use and before disposal. A few participants n= 13 (6.7%) agreed with the statement that needles should be recapped after use and before disposal, while a participant n= 1 (0.5%) thought it was not applicable.

According to OSEH (2010:2-3), recapping needles is a dangerous practice as many accidental needle stick injuries occur when employees are recapping needles. This practice predisposes health-care workers to infections like HIV and Hepatitis B virus infections. However, n= 14 (7.2%) still feel that needles should be recapped after use.

#### **4.3.2.13. Summary of the extent agreement on attitudes towards infection prevention and control among nurses.**

Figure 4.2 shows the extent of agreement on attitudes among nurses in infection prevention and control. The high or low level of agreement does not indicate the favourable answer. Each variable is explained in section 4.3.2 above.

**Figure 4.2. The results reflected within the graph below shows the extent of agreement on attitudes among nurses in infection prevention and control.**



#### **4.3.2.14. Questions on attitudes**

##### **Feedback of responses on the y axis of fig 4.2 referring to attitudes**

**2.2.1.** 3.1% of the nurses agreed that they do not have to wash their hands after using gloves.

**2.2.2.** 96.4% of nurses agreed that policies and procedures on infection control should be adhered to at all times.

**2.2.3.** 96.4% of nurses agreed that they should attend in-service training/workshop related to infection prevention and control regularly.

**2.2.4.** 66.2% of the nurses agreed that the workload affects their ability to apply infection prevention guidelines.

**2.2.5.** 77.4% of the agreed that they are aware that patients expect them to wash hands before touching them and after touching them.

**2.2.6.** 47.2% of the agreed that they feel that infection control policies and guidelines are enough in the hospital.

**2.2.7.** 6.7% of the nurses agreed that it is not their responsibility to comply with hospital-acquired infection guidelines.

**2.2.8.** 98.5% of the nurses agreed that Infection prevention guidelines are important to their hospital.

**2.2.9.** 43.6% of the nurses agreed that they have enough time to comply with infection prevention guidelines.

**2.2.10.** 97.4% of the nurses agreed that they believed that following the prevention guidelines will reduce rates of hospital acquired infection.

**2.2.11.** 97.4% of the nurses agreed that they should follow the procedure guidelines of the unit.

**2.2.12.** 6.7% of the nurses agreed that they feel needles should be recapped after use and before disposal.

#### **4.3.3. Practice questions from 2.3.1 to 2.3.13**

One participant did not complete the section on Practice questions from 2.3.1 to 2.3.13. Therefore this section was completed by N=195.

**Table 4.13: Questions on practices regarding infection prevention and control among nurses**

Variable		Agree	Disagree	Not applicable	Total (N)
2.3.1	I always wash hands before and after direct contact with the patients	n=147 (75.4%)	n=46 (23.6%)	n=2 (1%)	N=195 (100%)
2.3.2	I always put on a mask and glasses when performing invasive and body fluid procedures.	n= 37 (19%)	n= 147 (75.4%)	n=11 (5.6%)	N=195 (100%)
2.3.3	Knowledge of infection prevention and control are being monitored in the hospital	n=155 (79.5%)	n=38 (19.5%)	n=2 (1%)	N= 195 (100%)
2.3.4	I attend in-service training/workshop related to infection prevention and control yearly.	n=17 (8.7%)	n=169 (86.7%)	n=9 (4.6%)	N=195 (100%)
2.3.5	Surgical operation sites are shaved with razors.	n=100 (51.0%)	n=90 (45.9)	n=5 (2.6%)	N=195 (100%)
2.3.6	The latest infection and prevention guidelines date is between 2015 and 2013.	n =78 (40%)	n =53 (27.2%)	n =64 (32.8%)	N =195 (100%)
2.3.7	Screening of patients is being done to detect colonisation even if no evidence of infection.	n =98 (50.3%)	n=82 (42.1%)	n=15 (7.7%)	N=195 (100%)
2.3.8	Vaccination is provided to staff.	n=31 (15.8%)	n=148 (76.4%)	n=15 (7.7%)	N=195 (100%)
2.3.9	Personal protective equipment are always accessible	n=76 (39.0%)	n=119 (61%)	n=0 (0%)	N= 195 (100%)
2.3.10	Our hospital monitors patients with urinary catheters for urinary tract infection and gives feedback on urinary tract infection rates.	n=35 (17.9%)	n=154 (79%)	n=6 (3.1%)	N=195 (100%)
2.3.11	Infection prevention does not improve patient outcome	n=36 (18.5%)	n= 158 (81%)	n=1 (0.5%)	N=195 (100%)
2.3.12	We wear personal protective equipment when handling linen.	n=132 (67.7%)	n=57 (29.2%)	n=6 (3.1%)	N=195 (100%)
2.3.13	We shake linen out to release dust from the linen.	n=6 (3.1%)	n=185 (95.4%)	n=3 (1.5%)	N=195 (100%)

**4.3.3.1. Variable 2.3.1: I always wash hands before and after direct contact with the patients (N= 195):** as per table 4.13 a large group of participants n= 147 (75.4%) agreed that they always wash hands before and after direct contact with the patients while some participants n= 46 (23.6%) disagreed that they always wash hands before and after direct contact with the patient. A small proportion of participants n= 2 (1%) indicated that it is not applicable. Nurses should practice good infection prevention, the basis of which is effective hand washing (Hillier 2015:34-36). However, the current study reviews that n= 48 (24.6%) pose a risk to nosocomial infection as they do not always wash hands before and after direct contact with the patient.

**4.3.3.2. Variable 2.3.2: I always put on a mask and glasses when performing invasive and body fluid procedures (N= 195):** As indicated in Table 4.13 the majority of participants disagreed n= 147 (75.4%) with the statement that they always put on a mask and goggles when performing invasive and body fluid procedures. Some participants n= 37 (19%) agreed that they always put on a mask and glasses when performing invasive and body fluid procedures. A few participants n= 11 (5.6%) thought it was not applicable to always put on a mask and goggles when performing invasive and body fluid procedures.

**4.3.3.3. Variable 2.3.3: Knowledge of infection prevention and control are being monitored in the hospital (N= 195):** Table 4.13 Indicates that most of the participants n= 155 (79.5%) agreed that knowledge of infection prevention and control are being monitored in the hospital, while some participants n= 38 (19.5%) disagreed that knowledge of infection prevention and control are being monitored in the hospital. Very few participants n= 2(1%) thought it is not applicable to monitor knowledge of infection prevention and control in the hospital.

**4.3.3.4. Variable 2.3.4: I attend in-service training/workshop related to infection prevention and control yearly (N= 195):** As per Table 4.13 most of the participants n= 169 (86.7%) disagreed that they attend in-service training /workshop related to infection prevention and control yearly. Some participants n= 17 (8.7%) agreed that they attend in-service training/workshop related to infection prevention and control yearly. A few participants n= 9 (4.6%) thought it is not applicable to

attend in-service training/workshop related to infection prevention and control yearly. A significant proportion of nurses n= 178, (91.3%) do not update their knowledge regarding infection prevention and control on a yearly basis hence posing a risk of spreading infection.

**4.3.3.5. Variable 2.3.5: Surgical operation sites are shaved with razors (N= 195):** from the results in table 4.13 most participants n= 100 (51.3%) agreed that surgical operation sites are shaved with razors while the good number n= 90 (45.9%) of participants disagreed that surgical operations sites are shaved with razors. A few participants n= 5 (2.6%) thought it is not applicable to shave surgical operation sites with razors.

Also, n= 100 (51.3%) still shave with razor although literature shows that this practice predisposes the patient to skin injuries and wound infection. In this regard Suvera, Vyas, Patel, Varghese, Ahmed, Kashyap and Nair (2013:885-888), found that there was a significant association between pre-operative skin injuries and post-operative wound infection.

**4.3.3.6. Variable 2.3.6: The latest infection and prevention guidelines date is between 2015 and 2013 (N= 195):** As per table 4.13 a large number of participants (n= 78, 40%) agreed that the latest infection control and prevention guidelines date is between 2015 and 2013. However, an alarming number of participants n= 64 (32.8%) thought it was not applicable. Some participants n= 53 (27.2%) disagreed that the latest infection and prevention guidelines date is between 2015 and 2013. However, n= 117 (60%) of the nurses indicate that guidelines are not reviewed and updated regularly.

**4.3.3.7. Variable 2.3.7: Screening of patients is being done to detect colonisation even if no evidence of infection (N= 195):** As indicated in table 4.13 a large number of participants n= 98 (50.3%) agreed that screening of patients to detect colonisation even if no evidence of infection are done. Some participants n= 82 (42.1%) disagreed with a screening of patients to detect colonisation even if no evidence of infection are being done, while a minority of participants n= 15(7.7%) reported as not applicable to screen patients to detect colonisation even if there is no evidence of colonisation.

**4.3.3.8. Variable 2.3.8: Vaccination is provided to staff. (N= 195):** As indicated in Table 4.13 some nurses n= 31 (15.9%) agreed that vaccinations regarding infection control is being provided to staff members. However, the large majority of participants n= 149 (76.4%) disagreed that vaccinations regarding infection prevention is provided to members of staff. A few participants n= 15, (7.7%) indicated that it is not applicable to provide vaccination to members of staff.

Furthermore, high influenza vaccination rates of health care professionals (HCP) and patients is an important step in preventing transmission of influenza from HCP to patients and the other way round. Abeje and Azage (2015:1-6) indicated that out of N= 370 respondents, only n=20 (5.4%) reported that they took three or more doses of hepatitis B vaccine. Indicating that health care workers are at increased risk of acquiring hepatitis B infection due to occupational exposure. In agreement, this study reviews that n= 164 (84.1 %) of nurses indicated that vaccinations regarding infection control are not provided to members of staff.

**4.3.3.9. Variable 2.3.9: Personal protective equipment are always accessible (N= 195):** Personal protective equipment (PPE) has to be accessible for nurses to comply with infection prevention measures. However, Table 4.13 indicates that the majority of nurses n= 119 (61%) reported that personal protective equipment is not always accessible for them to comply with infection prevention measures. Nevertheless some participants n= 76 (39%) agreed that personal protective equipment is always accessible.

**4.3.3.10. Variable 2.3.10: Our hospital monitors patients with urinary tract infection and gives feedback on urinary tract infection rates. (N= 195):** According to Table 4.13 the majority of participants n= 154 (79%) disagreed with the statement that their hospital monitors patients with urinary catheters for infection and gives feedback on urinary tract infection rates. Some participants n= 35 (17.9%) agreed that their hospital monitors patients with urinary catheters for infection and gives feedback on urinary tract infection rates. A minority of participants n= 6 (3.1%) indicated that it is not applicable for the hospital to monitor patients with urinary catheters for infection and give feedback on urinary tract infection rates.

The current study reviews that the hospital does not monitor patients with urinary catheter for infections and does not give feedback on urinary tract infection rates as indicated by n= 160 (82.1%)

**4.3.3.11. Variable 2.3.11: Infection prevention does not improve patient outcome (N= 195):** Table 4.13 indicates that the majority of participants n= 158 (81%) disagreed with the statement that infection prevention does not improve patient outcome while some participants n= 36 (18.5%) agreed with the statement that infection prevention does not improve patient outcome. A participant n= 1 (0.5%) indicated that it was not applicable. Literature has shown that infection prevention does improve patient outcome as it reduces on days of patient hospitalization. However n= 37 (19%) of the nurses indicated that infection prevention does not improve patient outcome hence posing a risk for hospital- acquired infections.

**4.3.3.12. Variable 2.3.12: We wear personal protective equipment when handling linen. (N= 195):** According to Table 4.13 the majority n= 132 (67.7%) agreed that they wear personal protective equipment when handling linens, while some participants n= 57 (29.1%) disagreed that they wear personal protective equipment when handling linen. A few participants n= 6 (3.1%) indicated that it is not applicable to wear personal protective equipment when handling linen.

Some of the nurses n= 63 (32.2%) indicated that they do not wear personal protective equipment when handling linen. According to MOH (2013:57), hospital linen may become contaminated by blood, body fluids or excreta and by skin shedding. Hospital linen thus poses an infection risk to staff during handling on the ward, during transport or processing at laundry. Therefore safe handling of linen are required to prevent unnecessary exposure

**4.3.3.13. Variable 2.3.13: We shake linen out to release dust from the linen (N= 195):** As per table 4.13 the large majority of participants n= 185 (95.4%) disagreed that they shake linen out to release dust from the linen, while very few nurses n= 6 (3.1%) agreed that they shake linen out to release dust from the linen. Fewer nurses n= 3 (1.5%) indicated that it is not applicable to shake line out to release dust from linen.

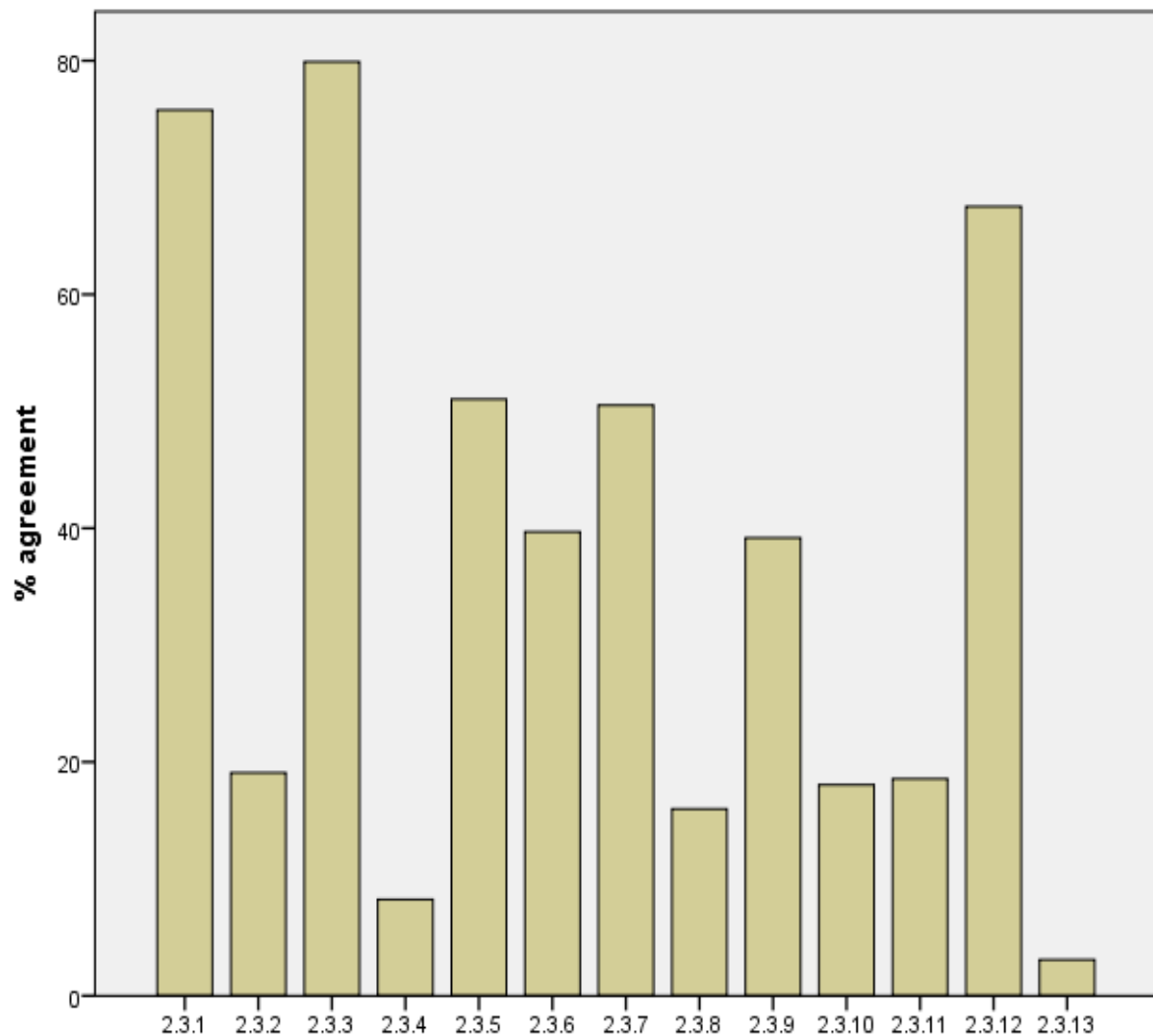


The current study shows that n= 9 (4.6%) agreed that they shake linen out to release dust from the linen hence posing a risk for transmission of infection. In this regard, Mathews (2015:1) indicated that shaking soiled linen in the air can disseminate secretions, excretion and the micro-organism they contain. Contamination of the environment and the people around occurs.

#### **4.3.3.14. Summary of the extent agreement on practices towards infection prevention and control among nurses.**

Figure 4.3 shows the extent agreement on practices towards infection prevention and control among nurses. High or low level of agreement does not indicate a favourable answer. Each variable is explained in section 4.3.3 above.

**Figure 4.3.** The results reflected within the graph below shows the extent of agreement on practices towards infection prevention and control among nurses.



*(Y= Questions on practices 2.3.1.-2.3.13.)*

### **3.3.3.15. Questions on practices**

#### **Feedback of responses on the y-axis of fig 4.2 referring to practice**

**2.3.1.** 75.4% of the nurses agreed that they always wash hands before and after direct contact with the patients.

**2.3.2.** 19% of the nurses agreed that they always put on a mask and glasses when performing invasive procedures.

**2.3.3.** 79.5% of the nurses agreed that knowledge of infection prevention and control are being monitored in their hospital.

**2.3.4.** 8.7% of the nurses agreed that they attend in-service training/workshop related to infection prevention and control yearly.

**2.3.5.** 51% of the nurses agreed that surgical operation sites are shaved with razors.

**2.3.6.** 40% of the nurses agreed that the latest infection and prevention guidelines date is between 2015 and 2013.

**2.3.7.** 50.3% of the nurses agreed that screening of patients is being done to detect colonisation even if no evidence of infection.

**2.3.8.** 15.8% of the nurses agreed that vaccination is provided to staff.

**2.3.9.** 39% of the nurses agreed that personal protective equipment (PPE) is always accessible.

**2.3.10.** 17.9% of the nurses agreed that their hospital monitors patients with urinary catheters for urinary tract infection and gives feedback on urinary tract infection rates.

**2.3.11.** 18.5% of the nurses agreed that infection prevention does not improve patient outcome which is incorrect.

**2.3.12.** 67.7% of the nurses agreed that they wear PPE when handling linen.

**2.3.13.** 3.1% of the nurses agreed that they shake linen out to release dust from the linen.

#### **4.4. GENERAL STATISTICAL ANALYSIS REGARDING THE THREE SET VARIABLES AS STATED IN THE STUDY OBJECTIVES BELOW:**

- To determine the knowledge of nurses in infection prevention and control within a tertiary hospital in Zambia.
- To determine the attitude of nurses in infection prevention and control within a tertiary hospital in Zambia.

- To determine the practices of nurses in infection prevention and control within a tertiary hospital in Zambia.

#### 4.4.1 Descriptive statistics for the sample knowledge, attitudes and practices scores.

A summary of the descriptive statistics will be discussed which will be followed by graphic representations of the distribution of the variable in figures 4.4.1 to 4.4.3

Table 4.14 below shows summary of descriptive statistics for the sample knowledge, attitudes and practices scores.

**Table 4.14: Descriptive statistic summary reflecting knowledge, attitude and practice scores of nurses regarding infection prevention and control (n=196).**

		Knowledge score %	attitude_score	practise_score
N	Valid	196	195	195
	Missing	0	1	1
Mean		83.2058	81.3675	48.8757
Median		83.3333	83.3333	46.1538
Std. Deviation		11.46272	10.82158	16.99165
Minimum		25.00	41.67	15.38
Maximum		100.00	100.00	92.31

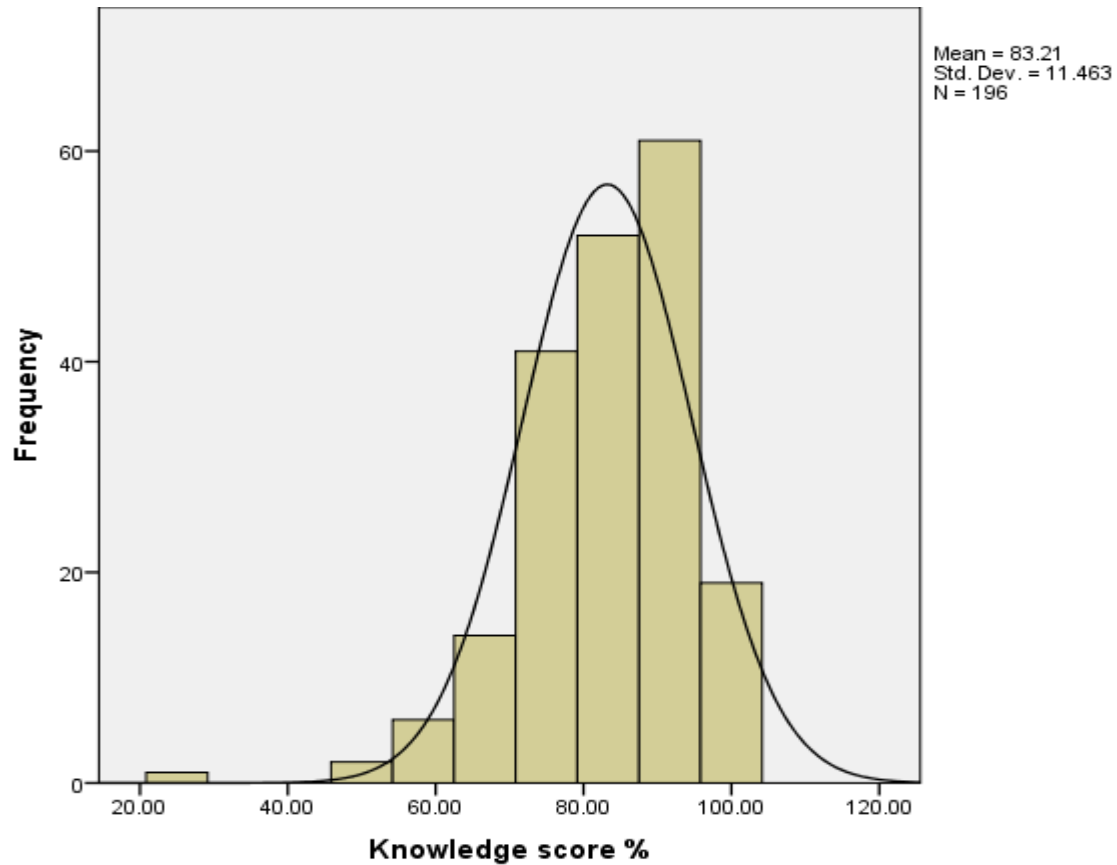
The knowledge score show a mean of 83.33 a mean of 83.20 with a SD of 11.46 in a range of 25-100 where the minimum was 25 and the maximum was 100. It therefore indicate that nurses has adequate knowledge on infection prevention and control.

The attitude score show a mean of 81.36 and a median of 83.33 with a SD of 10.82 in a range of 41.67-100 where the minimum is 41 and maximum 100. It therefore indicate that the nurses has positive attitudes towards infection prevention and control.

The practice score show a mean of 48.87 and a median of 46.15 with SD of 16.99 in a range of 15.35-100 where the minimum is 15.35 and the maximum 100. It therefore indicate that the nurses' practices was poor with regard to infection prevention and control.

The graph 4.4.1. below, shows the distribution of only knowledge scores among nurses in infection prevention and control.

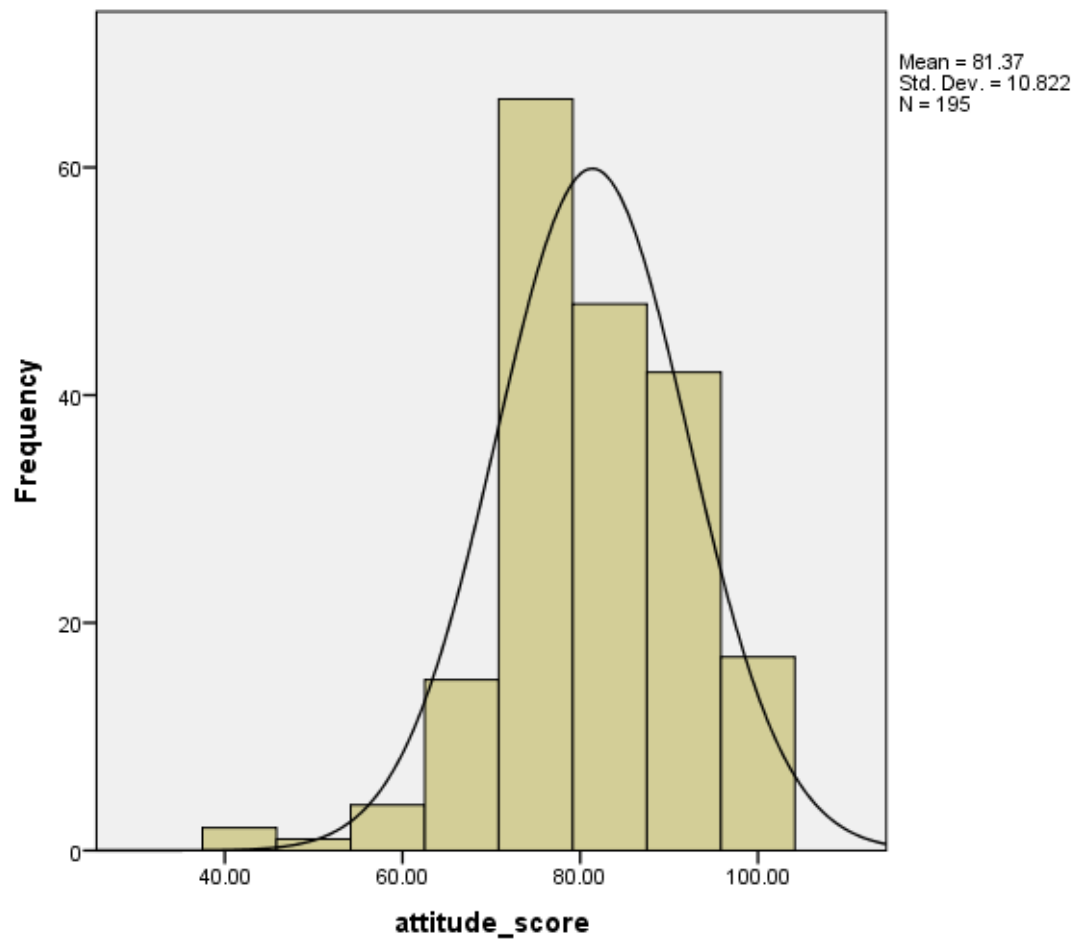
**Figure 4.4.1: Graphic representation of the distribution of knowledge scores**



The distribution of the knowledge score on infection prevention and control shows a normal distribution.

The figure 4.4.2 that follows shows the distribution of attitudes scores among nurses in infection prevention and control.

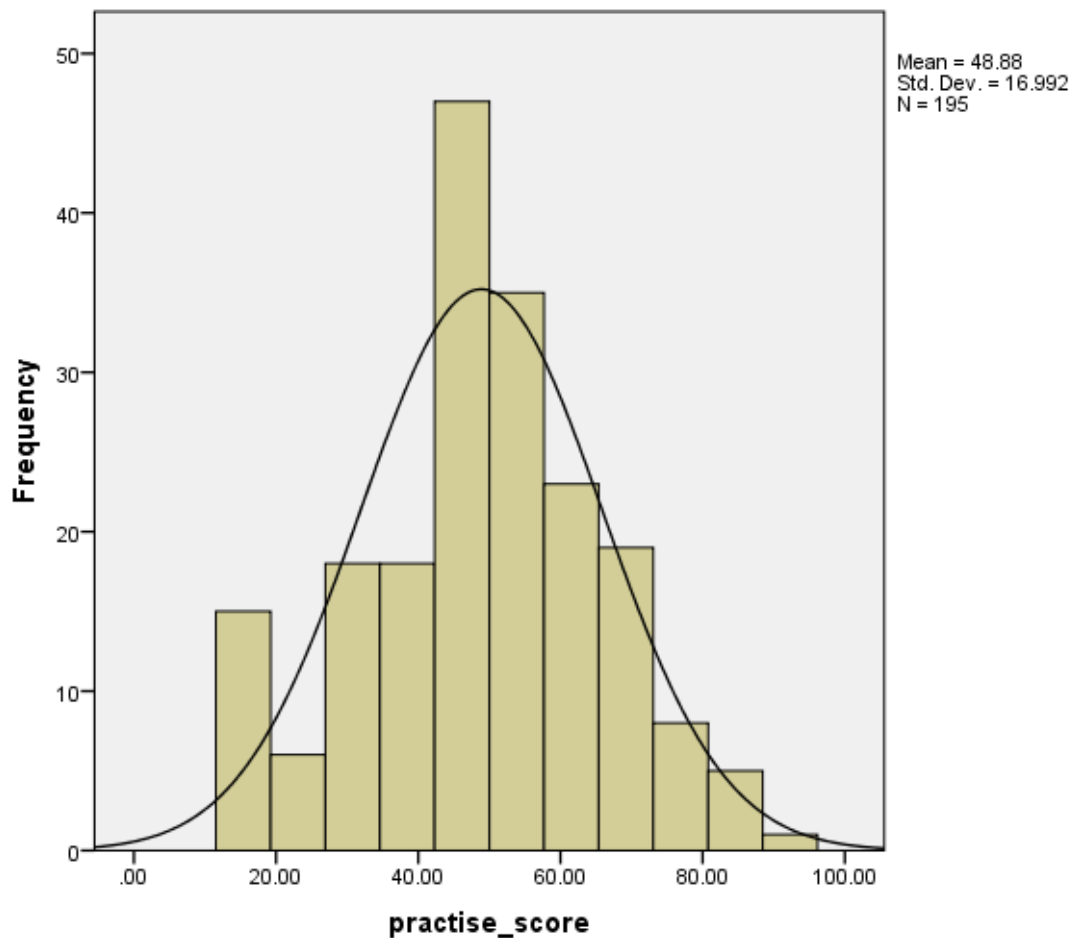
**Figure 4.4.2 Graphic representation of the distribution of the distribution of attitudes scores**



The distribution of the attitude score on infection prevention and control has a normal distribution with N=195, mean 81.37 and SD=10.82.

The figure 4.4.3. that follows shows a graph of the distribution of practice score among nurses in infection prevention and control. Based on the graph the mean attitude score (48.88),

**Graph 4.4.3 Graphic representation of the distribution of practice sores among nurses in infection prevention and control**



The distribution of the practice score on infection prevention and control has a normal distribution with N=195, mean 48.887 and SD=16.99.

#### **4.5 ASSOCIATION BETWEEN THE VARIABLES KNOWLEDGE, ATTITUDES AND PRACTICES**

The table 4.15 that follows, shows that the association between knowledge and attitudes is 0.136. The association between attitudes and practices is 0.23 while the association between practice and knowledge is 0.09 .

**Table 4.15: Association between the knowledge, attitudes and practice**

VARIABLES		Knowledge score %	attitude_score	practise_score
Knowledge score %	Pearson Correlation	1	.136	.009
	Sig. (2-tailed)		.058	.905
	N	196	195	195
attitude score	Pearson Correlation	.136	1	.227**
	Sig. (2-tailed)	.058		.001
	N	195	195	195
practise score	Pearson Correlation	.009	.227**	1
	Sig. (2-tailed)	.905	.001	
	N	195	195	195

If the level of significance is 0.05 or less, the compared group is considered to be significantly different (Burns & Grove, 2011:377)

#### 4.6. SUMMARY OF RESEARCH FINDINGS

This chapter presents and describes the research data that was collected during the study. The variables regarding knowledge, attitudes and practices of nurses with reference to infection prevention and control were investigated and results analysed.

The findings analysed were presented in tables, histograms and graphs in order to interpret the data collected.

#### 4.7. CONCLUSION

Based on the study findings it was evident that nurses were knowledgeable in infection prevention and control. The mean score for knowledge among nurses in infection prevention and control were 83.21 and median; 83.33. The scores for attitude among nurses in infection prevention and control were as follows; mean;



81.37 and median; 83.33. Therefore nurses had positive attitudes towards infection prevention and control. The scores for practices among nurses in infection prevention and control were as follows; mean; 48.88 and median; 46.15. Based on the mean and median practice scores among nurses in infection prevention and control, it is evident that nurses had poor practices. All scores were found to be plausibly normally distributed, and parametric correlation coefficients (Pearson's correlation) were calculated to assess the correlation between the three scores of knowledge, attitudes and practices of infection prevention and control. The association between knowledge, attitude and practice is not significant. The study results will be discussed in-depth in relation to the objectives in chapter 5.

## **CHAPTER 5**

### **DISCUSSION, CONCLUSION AND RECOMMENDATION**

#### **5.1 INTRODUCTION**

Within this chapter, the study findings will be discussed in terms of the study aim and objectives along with the conceptual framework, study limitations, future recommendations and the conclusion of the research study.

#### **5.2 DISCUSSION**

The aim of the study is to determine the knowledge, attitude and practices of nurses regarding infection prevention and control within a tertiary hospital in Zambia. Infection-related diseases are still the main cause of death in Zambia according to the 2013 health profile acquired by World Health Organization (WHO) statistics.

According to WHO (2016:1) a huge gap still exists between the knowledge accumulated over the past decades and implementation of infection control practices. This gap is even deeper in poor-resource settings with devastating consequences. Every advance and investment in health care is undermined by breaches in infection control measures (WHO, 2016:1).

The current study revealed that 76.4% (table 4.13) of nurses did not receive appropriate vaccination regarding infection prevention and control. Furthermore, 61% (table 4.13) of the nurses indicated that personal protective equipment is not always accessible. Therefore, both patients and nurses are exposed to hospital acquired infections. The researcher has observed that nurses do not apply infection prevention and control measures in the hospital setting which is required to ensure patient safety. In agreement with the current study, 23.6% (table 4.13) of the nurses indicated that they do not wash their hands before and after direct contact with the patients. According to WHO the prevalence of hospital acquired infection (HAI) in Zambia/Africa is high. However, 42.1% (table 4.13) of the nurses of the current study indicated that screening of patients to detect colonization even when there is no evidence is not done at the tertiary hospital. These findings are in agreement with Razine, Azzouzi, Barkat, Khoudri, Hanssouni, Chefchaouni and Abouqua (2012:1) who determined the prevalence of HAI in the University Medical Center of Rabat, Morocco. The study revealed that HAI prevalence was 10.3%. Urinary tract infection

was the most common (35%) and 34.5% of hospital acquired infection were from critical care units. However, 83.1% (table 4.13) participants of the current study revealed that the hospital does not monitor patients with urinary catheters for urinary tract infections. Razine et al. (2012:1) further revealed that *Staphylococcus* was the organism most commonly isolated 18.7% and was methicillin- resistance in 50% of cases. Stubblefield (2014:1-9) define nosocomial infections as an infection acquired in a hospital or other health-care facilities within 48 hours after admission that showed no signs of active or incubating infection. Moreover, the patient could have presented with a different disease other than the infection acquired in the hospital. These infections occur up to 3 days after discharge as well as 30 days after an operation (Stubblefield, 2014:1-9). Determining knowledge, attitudes and practices in infection prevention and control among nurses is vital to protect patients from acquiring hospital acquired infections.

A descriptive, research design with a quantitative approach was applied to determine the level of knowledge, attitudes and practices of nurses regarding infection prevention and control within a tertiary hospital in Zambia. The population for the study was nurses working in clinical environment at a tertiary hospital in Zambia. 312 nurses were the total population of nurses at this tertiary hospital of which n= 140 (70%) were registered nurses, n= 80 (56%) enrolled nurses, n= 47 (33%) registered midwives, n= 23 (16%) enrolled midwives, n= 10 (7%) certified midwives and n= 12 (8%) registered mental health nurses. According to table 3.1, n= 31 nurses participated in the pilot study (10% of N= 312) while n= 196 nurses participated in the main study (70% of N= 281). The sampling method that was utilized in this study was stratified simple random sampling. This method of sampling enabled the study population to have an equal and independent chance of appearing in the study sample. Upon completion of data collection, data was coded and captured on to excel spreadsheet as advised by a qualified statistician employed by The Biostatistics Unit, Centre for Evidence Based Health Care, Stellenbosch University. The statistician was further consulted for data analysis. A statistical package (IBM SPSS version 22) was used to statistically analyse data. Data was analysed and reported on by using descriptive and inferential statistics, such as frequency tables

and relative frequencies, and graphically illustrated by using bar charts. Continuous variables were summarised, using means and standard deviations.

The discussion in this chapter is conducted using each individual objective and integrating the study findings reported in Chapter Four.

The discussion is based on the following study objectives:

1. To determine the knowledge of nurses in infection prevention and control within a tertiary hospital in Zambia.
2. To determine the attitudes of nurses towards infection prevention and control within a tertiary hospital in Zambia.
3. To determine the practices of nurses in infection prevention and control within a tertiary hospital in Zambia.
4. To make recommendations to the risk programme and policies of the tertiary hospital.

### **5.2.1 OBJECTIVE 1: TO DETERMINE THE KNOWLEDGE OF NURSES IN INFECTION PREVENTION AND CONTROL WITHIN A TERTIARY HOSPITAL IN ZAMBIA.**

#### **Discussion**

The first section of the questionnaire was about determining knowledge among nurses in infection prevention and control. Infection prevention and control of HAIs is determined by knowledge, practice and level of commitment invested by health care organisations to bring the HAIs under control (Khamis, Wambura & Verma, 2014:34-38). In this regard monitoring the level of knowledge in infection prevention and control will help to work on the gaps so that the rate of HAIs can be reduced. However, according to the current study  $n = 38$  (19.5%) of nurses (table 4.13) indicated that their hospital does not monitor the knowledge of infection prevention and control hence posing a risk to increased rates of HAIs.

From the data presented in chapter 4 Table 4.14, it is clear that participants had adequate knowledge as the mean knowledge scores were 83.21. However, 68.9%

(table 4.11) of participants had poor knowledge where universal precautions are concerned (Variable 2.1.7; participants agreed that bathing every day is a universal precaution). Sarani, Balouchi, Masinaeinezhad and Ebrahimitabs (2014:193-198) assessed knowledge, attitudes and practices of nurses about standard precautions for hospital-acquired infection in teaching hospitals affiliated to Zabol University of Medical Sciences.

The study revealed that 43% of the participants had poor knowledge (Sarani et al., 2016:193). According to Florence Nightingale's conceptual framework applied to the current study, nurses play an important role in the translation of knowledge to attitude and practice in infection prevention and control. Nightingale acted out prevention and control practices through her knowledge, attitudes regarding infection prevention and control which placed the patient in the best possible position for healing. That is why Eskander, Morsy and Elfeky (2013:166), who assessed nurses' knowledge and evaluated their practice regarding infection control standard precautions, recommended updating knowledge and performance of intensive care unit nurses through continuing in-service educational programs.

However, even though nurses in the current study had good knowledge score (mean: 83.21 and median: 83.33) 86.7% in table 4.13 indicated that they do not attend in-service training regarding infection prevention and control. Nurses need to update knowledge through continuous educational programs. Furthermore, Fashafsheh, Ayed, Eqtaït and Harazneh (2016:1) recommended updating knowledge and practice of nurses through continuing in-service educational programs emphasising the importance of following latest evidence-based practices of infection control. According to the current study 19.5% of the nurses in table 4.13 indicated that knowledge of infection prevention and control are not being monitored at their hospital to help identify training needs so that the training program can be formulated.

Ghalya and Ibrahim (2014:249) assessed knowledge, attitudes and sources of information among nursing students towards infection control (IC) and standard precautions (SPs). Ghalya and Ibrahim (2014:249) indicated that IC and SPs are evidence-based practices that can reduce the risk of transmission of microorganism.

However, according to the current study 75.4% (table 4.13) indicated that they do not always put on a mask and glasses when performing invasive and body fluid procedures. Tirivanhu et al., (2014:69-73) assessed the barriers to infection prevention and control (IPC) practices among nurses at Bindura Provincial Hospital in Zimbabwe. The study revealed a lack of knowledge as one of the barriers to IPC practices as only n=14 (28%) of the nurses had excellent knowledge on infection control principles. Nurses spend most of their time with patients. Therefore, determining their knowledge, attitudes and practices patterns concerning hospital acquired infections may provide one approach by which health-care associated infections would be addressed ( Kamunge, Cahill, Zipp & Parasher 2015:60).

Kamunge et al. (2015:60) investigated whether differences existed between novice and experienced registered nurses' knowledge, attitudes and practices; and further explored the impact of organisational support with regard to the spread of hospital acquired infections. The study showed that organisational support plays a pivotal role towards reducing the spread of hospital acquired infections. Both the novice and experienced registered nurses had good knowledge about the spread of hospital acquired infections. This is supported by the current study that revealed that 96.4% (table 4.11) of the participants had good knowledge about transmission of hospital acquired infection (Variable 2.1.1; 96.4% of the nurses agreed that hospital acquired infections can be transmitted by medical devices such as catheters, needles, syringes, stethoscopes and thermometers).

Arthi, Abarna, Bagyalakshmi, Anitharaj and Vijayasree (2016:1203) assessed knowledge, attitude and practice of hand hygiene among nursing and medical students in a tertiary care hospital in Puducherry, India. The study revealed that of the n=140 participants, 85% of medical and 76% of nursing students had moderate knowledge on hand hygiene. Nair et al. (2014:1-4) assessed knowledge, attitude and practices of hand hygiene among medical and nursing students. The study revealed poor hand hygiene practices as only 9% of the students had good knowledge. Furthermore, the study showed the importance of improving the current training programs targeting hand hygiene practices among medical and nursing students. According to the current study, 23.6% of the nurses (table 4.13) who participated in the study indicated that they do not wash their hands before and after contact with

the patients, hence posing a risk of transmitting infection between patients. Olalekan, Olusegun, Olufunmilayo and Lanre (2012:286) indicated that many nosocomial infections are caused by pathogens transmitted from one patient to another by way of health care workers who do not routinely observe simple hospital hygiene measures like hand washing.

According to Suvera, Vyas, Patel, Varghese, Ahmed, Kashyap and Nair (2013:885), who evaluated the relationship of two methods (shaving and depilation cream) of pre-operative hair removal to post-operative wound infection in a developing country where razor shaving is very popular. The study reviewed that n=18 patients (8%) had post-operative wound infection including n=3 (3%) in the depilatory cream group and n=15 (13%) of the razor group. A significant association was found between pre-operative skin injuries (through shaving) and post-operative wound infections.

According to the current study, the knowledge level among nurses in infection prevention and control was adequate (mean score of 83.21). . A study was conducted by Tirivanhu et al. (2014:69) who assessed barriers to infection prevention and control practices among nurses at Bindura Provincial Hospital in Zimbabwe. The study indicated that the majority (72%) of nurses lack knowledge in infection principles as only n= 14 (28%) of n= 50 professional nurses had excellent knowledge in infection control principles.

Hakim, Mohsen and Bakr (2014:347) assessed knowledge, attitudes and practices of health-care-providers towards waste management at Ain Shams University Hospital, Cairo, Egypt. The study showed that training and duration of work experience were not significantly associated with knowledge, attitude and practice scores, except for nurses with longer experience, who were more likely to have satisfactory knowledge about waste disposal. Onyemocho et al., 2013:(171-176) assessed the level of knowledge and practice of injection safety among health care workers of Nigerian prison service health facilities in Kaduna State, Command. The study showed that 54.3% of the health workers had good knowledge scores of key injection safety practice, 16.7% had fair knowledge while 29% had poor general knowledge scores. According to the current study, 51% of nurses (table 4.13) indicated that surgical operation sites are shaved with razors. Teshager, Engeda and Worku (2015:3)

assessed knowledge, practices and related factors towards prevention of surgical site infection among nurses working in Amhara Regional State Referral Hospitals, Northwest Ethiopia. The study indicated that only 40.7% of the participants were knowledgeable about prevention of surgical site infections. This revealed a gap in knowledge relating to prevention of surgical site infections in 59.3% of the nurses who participated in the study.

## **5.2.2 OBJECTIVE 2: TO DETERMINE ATTITUDE OF NURSES TOWARDS INFECTION PREVENTION AND CONTROL WITHIN A TERTIARY HOSPITAL IN ZAMBIA.**

### **Discussion**

The current study revealed that 66.2% of the participants in table 4.12 (all nursing categories) were unable to apply infection prevention guidelines due to workload (Variable 2.2.4: the workload affects my ability to apply infection prevention guidelines) that is why 55.9% of the participants (table 4.12) lacked enough time to comply with infection prevention guidelines (Variable 2.2.9: I have enough time to comply with infection prevention guidelines).

If nurses have to comply with policies and procedures on infection control at all times, the hospital should have enough infection control policies and guidelines. However, the current study reviewed that 52.8% (table 4.12) of the participants indicated that infection control policies and guidelines are not enough in the hospital. In agreement with the current study, Tirivanhu et al., (2014:69) determined barriers of infection prevention and control practices among nurses at Bindura Provincial Hospital in Zimbabwe. The study showed that utilization of infection control manuals was poor as n=21(42%) of the nurses did not utilize the infection control manuals, either because they did not know about it n=12 (24%) or it was not available n=9 (18%).

According to Nightingale's Conceptual framework applied to the current study, nurses' attitudes have an effect on the clinical environment which in turn have an impact on the patient's exposure to infection-related diseases. Nightingale focused on caring for patients with an emphasis on the importance of hygiene in preventing and controlling infection (Hegge, 2013 and Gurler, 2014).



The current study showed that although 98.5% of the participants in table 4.12 acknowledged that infection prevention guidelines are important to their hospital, 52.8% of the participants in table 4.12 indicated that infection control policies and guidelines are not enough in the hospital for them to read through and acquire the latest information on infection prevention and control in the hospital.

The current study showed that 96.4% of the participants in table 4.12 acknowledged that they should attend in-service training/workshop related to infection prevention and control regularly. This indicates that nurses have got a positive attitude towards in-service training/workshop related to infection prevention and control. according to the current study, 86.7% of the participants in table 4.13 indicated that they did not attend in-service training/workshops related to infection prevention and control yearly. This is in agreement Tirivanhu et al. (2014:69) revealed that infection control workshops were poorly organised.

Some health-care workers feel that they do not have to wash their hands after using gloves because after all hands are not contaminated. However, Tomas, Kundrapu, Thota, Sunkesula, Cadnum, Mana, Jencson, O'Donnell, Zabarsky, Hecker, Ray, Wilson and Donskey (2015:1904-1910) assessed the frequency and sites of contamination on the skin and clothing of personnel during personal protective equipment removal. The study revealed that, contamination of the skin and clothing of health care personnel occurs frequently during removal of contaminated gloves or gowns. The current study showed that participants have a positive attitude towards hand washing because 96.9% of the participants in table 4.12 indicated that they have to wash their hands after using gloves. Supported by Loveday et al., (2016:3) who indicated that hands must be decontaminated immediately after the removal of gloves. Arthi et al. (2016:1203) indicated that the overall attitude of the respondents towards hand hygiene was not satisfactory (good attitude- Medical students was 9%, nursing students was 14%, and only a few (medical students-3%, nursing student-5%) showed good hand hygiene practices.

The current study showed that 77.4% of the participants in table 4.12 acknowledged that they are aware that patients expect them to wash their hands before touching them and after touching them. However due to work overload, 66.2% of the

participants and lack of time 55.9% of the participants are unable to comply with infection prevention and control policies and guidelines (table 4.12). A study was conducted by Porto and Marziale (2016:1-15) who analysed the reasons and consequences of low adherence to standard precautions (SPs) by the nursing team. After analyzing 30 articles, the study revealed that the reasons for low adherence of health workers to standard precautions were poor training, unawareness of the importance of standard precautions and inappropriate work conditions (excessive workload and reduced nursing team). The consequences of low adherence to SPs included occupational accidents and sickening of health workers. Although 97% of the participants acknowledged that following the prevention guidelines will reduce rates of the hospital-acquired infections, 52.8% of the participants indicated that infection control policies and guidelines are not enough in the hospital.

Recapping of used needles after use and before disposal is not allowed in nursing practice because of the danger of nurses pricking themselves and can be a source of infection. A study to determine the knowledge and practices of infection control among health care workers in a tertiary referral center in North-Western Nigeria was conducted by Iliyasu, Dayyab, Habib, Tihamiyu, Abubakar, Mijinyawa and Habib (2016:34-40). The study showed that 31.3% of doctors and 17.3% of nurses recap needles after use most of the time hence posing a risk to infection transmission. However, the current study shows that 92.8% of the participants indicated that needles should not be recapped after use and before disposal, indicating that the participants had a positive attitude towards sharp disposal (table 4.12).

### **5.2.3 Objective 3: To determine the practices of nurses in infection prevention and control within a tertiary hospital in Zambia**

#### **Discussion**

The current study demonstrated poor infection prevention and control practices among nurses as the mean score was 48.8% table 4.15. Neanaa, Fayed, Hanan, Elbahnasawy, Taghreed and Omar (2016:81-92) examined the effect of the institutional program on nurses compliance with Universal Precautions of Infection Control. The findings of the study revealed that nurses who attended an educational program, their knowledge and practice towards compliance with universal

precautions of infection control were improved in post-test than in pre-test. During pre-test, nurses' knowledge was 100% poor, after post-test 28.3% of the nurses had average knowledge while 71.7% had good knowledge. In agreement with the current study in which the researcher determined knowledge, attitudes and practices of nurses in infection prevention and control, 61% of the participants in table 4.13 indicated that personal protective equipment (PPE) are not always accessible (variable 2.3.9). Use of appropriate PPE is vital in implementing infection prevention and control measures. FDA (2016:1) indicates: that PPE acts as a barrier between infectious material such as viral and bacterial contaminants and the care givers skin, mouth, nose, or eyes (mucous membranes).

PPE also protects patients who are at high risk for contracting infections (FDA, 2016:1). DHS (2015:1-2) indicates that goggles or face shields are used to protect eyes from splashes or sprays of blood/body fluids. Surgical masks are used to protect the mouth and nose from splashes or sprays of blood/body fluids, or respiratory secretions. However, according to the current study table 4.13 indicated that n= 158(81%) of nurses do not use masks when performing invasive procedures. Surgical masks are also placed on coughing patients to reduce dissemination of respiratory secretions (DHS 2015:1-2). Lack of PPE can, therefore, promote cross infection leading to hospital acquired infections. The study conducted by Bhebhe, Rooney and Steinberg (2014:1) assessed the knowledge, attitudes and practices of HCWs regarding health-care- associated TB infection and infection control. The study showed that 36.4% of the participants reported poor infection control practices and only 38.8% of the participants reported to be using the appropriate N-95 respirators demonstrating poor infection control practices regarding TB exposure. Catheter-associated urinary tract infection (CAUTIs) is the most common nosocomial infection in hospitals worldwide and the incidence has been reported to be approximately 35% (Labib & Spasojevic, 2013:1). According to Labib and Spasojevic (2013:3), in order to reduce CAUTIs catheter system should be closed. However, lack of urine bags are predisposing factors for CAUTIs. Nurses are accountable for catheter insertion as well as for catheter care and removal. Nurses have an influence on catheter use. There is evidence that nurses can have a significant impact on the

use of urinary catheters and serve as effective stewards of appropriate use of this device (APIC 2014:24).

A study was conducted by Kalantarzadeh, Mohammadnejad, Ehsani and Tamizi (2014:1) who evaluated the level of knowledge and practices on infection control among the nursing staff. The study indicated that nosocomial infections cause mental stress, disability, paralysis and decrease the quality of patient's lives (Kalantarzadeh, Mohammadnejad, Ehsani & Tamizi, 2014:1). Furthermore the results showed that 75.8% had an intermediate level of performance in infection.

Despite a significant number of participants  $n = 188$  (96.4%) acknowledging that they have to attend in-service training/workshop related to infection prevention and control regularly (table 4.12), the current study in table 4.13 revealed that  $n = 169$  (86.7%) of the participants do not attend in-service training/workshop related to infection prevention and control yearly (Variable 2.3.4). To ensure that nurses are updated with current knowledge in infection control in-service training plays a vital role. According to Tirivanhu et al. (2014:69-73), infection control workshops were poorly organised as 68% of the nurses did not attend any workshops on IPC which contributed to poor IPC( infection prevention and control) practice. Fashafsheh, Ayed, Eqtait and Harazneh (2015:82) assessed the level of knowledge and practice of infection control among nurses; the study showed that approximately two-thirds of the study group 63.8% never attended any continuing education courses about infection control. That is why Eskander, Morsy and Elfeky (2013:166) recommended updating knowledge and performance of intensive care unit nurses through continuing in-service educational programs.

The importance of following latest evidence-based practices of infection control in continuing education/ training programs was further emphasised (Eskander et al., 2016:166). Furthermore the current study in table 4.11 showed that 60% of nurses were not aware of the latest infection prevention and control guidelines. Elsheikh, Balla, Abdalla, Elgasim, Swaredahab and Bashir, (2016:18-22) determined the knowledge, attitude and practice of health care workers regarding transmission and prevention of Hepatitis B virus infection. The study indicated that Hepatitis B virus (HBV) infection is a serious blood-borne disease. Elsheikh et al., (2016:18-22) revealed that education of the workers was significantly associated with knowledge

of health care workers about HBV transmission and prevention. Fashafsheh et al., (2015:88) assessed the level of knowledge and practices of infection control among nurses and revealed that the majority of the study group had received hepatitis B vaccine. However, the current study in table 4.13 revealed that the majority of the nurses (76.4%) did not receive any vaccination regarding infection prevention and control which include vaccination against hepatitis B Virus (HBV). 7.7% of the participants indicated that it is not applicable to receive any vaccination regarding infection prevention and control hence posing a risk of infection transmission. Furthermore, Abiola, Agunbiade, Badmos, Lesi, Lawal and Alli (2016:1) determined the prevalence of Hepatitis B surface antigen (HBsAg), knowledge, and vaccination practice against viral hepatitis B infection among doctors and nurses in a secondary health care facility in Lagos state, South-western Nigeria. The study revealed that the prevalence of HBsAg was 1.5%. Among the participants, 56% had good knowledge while 94% reported poor practice of vaccination against Viral Hepatitis B infection. PIDAC (2012:1) recommended that appropriate immunizations must be offered to health care workers.

Hands are the most common transport for transmission of germs that can cause infection that is why hand hygiene is the cornerstone of infection prevention and control. However, WHO (2015:1) reported that at Lubwe Mission Hospital, in Luapula Province of Zambia, there is often no water to wash hands or clean the newborn, yet mothers from all over that region are referred to that hospital for delivery and related health-care activities. These findings are in agreement with Gichuhi, Kamau, Nyangena and Otieno-Ayayo (2015:39-44) who reported frequent shortages of water as a barrier to infection prevention practices and control compliance among the health care workers. However, the current study in table 4.13 indicates that 75.5% of participants always wash hands before and after direct contact with the patients while 23.6% reported that they do not always wash hands before and after direct contact with the patient probably due to work overload and lack of time as indicated in Table 4.12. In this regard, Tirivanhu et al. (2014:69-73) indicated that among the factors impeding infection control practices were a lack of time and resources.

The Zambian Public Health Act, Cap 295, stipulates that the health care institution should provide a safe environment to the patients in their care. Hospital nurses form

the backbone of infection prevention and control, therefore possibly will either contribute to infection transmission or prevent and control of infection. The conceptual framework applied in the current study which indicated that a nurse must provide a clean environment for the patient to prevent hospital acquired infection. Florence Nightingale further stressed that cleanliness (sanitation and hygiene) and infection prevention and control measures in the clinical environment contribute to improving health care (Hegge, 2013 & Gurler, 2014). However, the current study revealed that personal protective equipment is always not available making it difficult for the nurse to comply with infection prevention and control, for example to change soiled linen to make the patient comfortable need clean gloves. If gloves are not available, then it put the nurse in an awkward position to comply with infection prevention and control measures. A study to assess the implementation of infection control in health facilities and determine predictors of hand washing among health workers (HCWs) in Arua district, Uganda was conducted (Wasswa, Nalwadda, Buregyeya, Gitta, Anguzu & Nuwaba, 2015:1). The study revealed that most facilities (93.8%, 30/32) had no infection control committees and lacked adequate supplies and equipment for infection prevention and control (Wasswa et al., 2015:1).

Jain et al. (2012:29-33) performed an assessment of knowledge and practices of n=400 health care personnel on hospital infection and control practices in a tertiary care hospital in India. The study showed that only 57% of the doctors and nurses followed the maximal barrier precautions before a central venous catheter (CVC) insertion. In agreement, the current study reviewed that 75.4% of the participants do not always put on a mask and glasses when performing invasive and body fluid procedures.

In-dwelling catheters can lead to catheter-associated urinary tract infection (Labib & Sposojevic 2013:1). However, according to the current study in table 4.13, 79% of the participants indicated that their hospital does not monitor patients with urinary catheters for infection and does not give feedback on urinary tract infection rates. Urinary tract infections are one of the most common hospital-acquired infections and are progressively becoming a serious, very recurrent public health problem in Africa (Dougnon, Bankole, Johnson, Hounmanou, Toure, Houessou, Boko & Baba-Moussa, 2016:1). Dougnon et al. (2016:1-8) determined the prevalence of urinary tract

infections among catheterized patients at a hospital in Zinvie(Benin). Urine was collected twice per patient: 10 minutes and 48 hours after insertion of the catheter and the samples were subjected to bacteriological analysis. 48 hours later the study revealed that n=14(23.33%) out of 60 patients presented with urinary tract infection, of which one (1) patient (1.66%) was already infected before the process. According to Vyawahare, Gandham, Misra, Jadhav, Gupta, and Angadi (2015:585) who determined the effect of days of catheterization and urinary tract infection indicate that duration of catheterization is one of the risk factors of catheter-associated urinary tract infections. According to Khan, Ahmad and Mehboob (2015:509-514), nosocomial infections can be controlled by measuring and comparing the infection rates within health-care settings and sticking to the best health-care practices. It is by means of infection control surveillances that hospitals can devise a strategy comprising of infection control practices (Khan et al., 2015:509-514). The focus area of CIDRZ (Centre for Infectious Disease Research in Zambia) program includes HIV/AIDS prevention and Tuberculosis prevention and control (CIDRZ, 2016:1)

### **5.3 LIMITATIONS OF THE STUDY**

This study assessed the knowledge, attitude and practices of all categories of nurses in infection prevention and control at one tertiary hospital, which may limit the generalisation of the findings to other tertiary hospitals in Zambia.

### **5.4 CONCLUSIONS**

Despite the nurses being knowledgeable (mean score 83%) and having a positive attitude (mean score 81%) towards infection prevention and control the practices were very poor (mean score 48.8%). However if nurses are knowledgeable and have a positive attitude towards infection prevention and control, then the practices of nurses are expected to be good.

Furthermore, according to Florence Nightingale's Environmental theory, the nurse plays an important role in the translation of knowledge, attitude and practices to the clinical environment, it is concluded that the patients are exposed to infection related diseases due to poor infection prevention and control practices.

As a result of these findings the researcher has concluded that there could be barriers to good practice in infection prevention and control which require further



research. In conclusion, the research question “what is the knowledge, attitudes and practices of nurses in infection prevention and control within a tertiary hospital in Zambia?” has been adequately addressed in this setting.

## **5.5 RECOMMENDATIONS FOR FUTURE PRACTICE**

Based upon the scientific evidence generated during the study, the following recommendations are discussed below:

- The Minister of Health to lobby for sufficient funds from the government so that the Permanent Secretary can allocate enough resources specifically for Infection Prevention and Control. The economic recession that began in 2007 led to austerity measures and public sector cut breaks in many European countries. Reduced resource allocation to infection prevention and control (IPC) programmes is impeding prevention and control of tuberculosis, HIV and vaccine-preventable infections. To mitigate the negative effects of recession, there is need to educate our political leaders about the economic benefits of IPC; better quantify the costs of health-care associated infection; and evaluate the effects of budget cuts on health-care outcomes and IPC activities (O’Riordan & Fitzpatricck, 2015:340-345)
- Permanent Secretary to ensure that the resources allocated for infection prevention and control are not deviated to other things. This can be achieved by performing random infection control spot checks of the hospitals.
- Resources should be allocated for Infection prevention and control conferences locally and internationally. This will enable infection control team/committee to attend such conferences so that they are updated with the latest evidence-based information. According to the current study, (Variable 2.3.4) n= 169 (86.7%) of the nurses indicated that they do not attend in-service training/workshops related to infection prevention and control.
- Nursing schools should emphasise the importance of infection prevention and control (Hospital acquired infections) in the syllabus. Ojulong, Mitonga and Lipinge (2013:1071-1078) assessed students’ knowledge and attitudes of infection prevention and control and their sources of information. The study



revealed that medical students had better overall scores 73% compared to nursing students 66% and radiology students 61%. The study indicated that serious efforts are needed to improve or review curriculum so that health science students' knowledge on infection prevention and control is imparted early before they are introduced to the wards.

- The General Nursing Council of Zambia has introduced a Continuous Professional Development Booklet for Nurses. The researcher recommends that training on infection prevention and control be mandatory yearly and that it should be a requirement for yearly nursing registration.
- The General Nursing Council of Zambia through Ministry of Health should facilitate training of trainers in infection prevention and control (IPC) for all institutions in Zambia so that in-service training in IPC is provided to health care workers at the institutional level. According to the current study (variable 2.3.6), n= 53 (27.2%) of nurses indicated that the latest infection control and prevention guidelines date is not between 2013-2015, while n= 64 (32.8%) indicated that it is not applicable to know the latest guidelines.
- The General Nursing Council of Zambia should come up with a policy indicating that all nurses should be up to date with immunisation (Hepatitis B Vaccine) for prevention of infection prior to registration. This will ensure compliance. The current study (variable 2.3.8) revealed that n= 148 (76.4%) of the nurses indicated that vaccinations regarding infection prevention are not provided to staff, while 7.7% thought it is not applicable.
- The infection control committee should be more proactive so that they can be able to monitor the rate of Hospital Acquired infections as well as giving feedback to nurses and relevant authorities. This will make problems visible and hence actionable. The current study (Variable 2.3.10) revealed that n= 154 (79%) of the nurses who participated in the study indicated that monitoring patients with urinary tract infection and giving feedback on urinary tract infection rates is not done at their hospital.

- Availability of personal protective equipment required for applying infection control measures at all the times. According to the current study (variable 2.3.9), n=119 (61%) of the nurses indicated that personal protective equipment are not always accessible.
- The institutions where the research study was done should ensure adequate facilities for hand hygiene. For example hand basins with running water available as well as disposable hand towels. This will help with compliance with hand hygiene. A study conducted by Mearkle, Houghton, Bwonya and Lindfield (2016:1-6) in which current hand washing practices, barriers to hand washing and available facilities in two Ugandan Specialist eye hospital was assessed. The study revealed that facilities for hand washing were inadequate in some key areas having no provisions for hand hygiene. The study indicated that interventions to improve hand hygiene could include increased provision of hand towels and running water as well as improve staff education to challenge their views and perceived barriers to hand hygiene.
- The Tertiary Hospital should ensure that new members of staff (nurses) receive in-service training in infection prevention and control as part of induction. The current study revealed that 86.7% of nurses did not attend inservice training/workshop related to infection prevention and control yearly.

#### **5.5.1 Observation of nurse' practice and correction of poor practice**

According to the current study, it is evident that the practices of nurses in infection prevention and control (mean score of 48.8) were poor. Therefore the infection control team should strictly observe nurses as they practice. This includes auditing of hand hygiene practices, observe the nurses as they perform invasive procedures, a procedure that requires aseptic technique, isolation of infectious conditions to prevent the spread of infection and application of barrier nursing. According to Gastmeier, Behnke, Reichardt and Geffers (2011:207-212), hospitals should compare their own infection rates and find problems concerning specific infection type which should motivate for a careful investigation of procedures of care and the alternatives to improve the situation. Therefore, surveillance plans designed according to exact requirements of the hospital are key component of good infection

control management in hospitals. According to the current study, the low median scores (46.15) suggest poor levels of practices towards infection prevention and control.

### **5.5.2 Provision of vaccination to all health workers regarding infection prevention and control e.g. Hepatitis B Vaccine**

It is evident that, during the current study, most nurses (Table 4.5) indicated that they did not receive vaccination regarding infection prevention and control. Hence a policy has to be developed which will indicate the transmission of hepatitis B, the doses of Hepatitis B Vaccine and complications of Hepatitis B infection. This standard operating procedure should be made known and available to all health care workers and newly qualified nurses.

## **5.6 RECOMMENDATIONS FOR FUTURE RESEARCH**

- Barriers affecting compliance to infection prevention and control measures among nurses.
- The role of policy makers, stakeholders and government leaders in infection prevention and control in a clinical setup.
- The impact of the shortage of nurses on infection prevention practices.
- The perceptions and knowledge of nurses against Hepatitis B vaccinations with regard to infection prevention and control.
- The wrong usage of antibiotic and its impact on infection prevention and control.

## **5.7 CONCLUSION**

Based on the findings, it is evident that lack of personal protective equipment is one of the barriers to infection prevention and control (61%). The study further revealed that workshops relating to infection prevention and control (IPC) are poorly organised as 86.7% of the nurses did not attend workshops related to IPC yearly. Vaccination against preventable infections is not a priority as 96.4% of the nurses did not receive any vaccinations. Therefore, it can be concluded that nurses in the current study have a satisfactory level of knowledge and positive attitude towards infection

prevention and control. However, the practice of infection prevention and control scores were poor (Table 4.6), hence posing a risk of infection transmission leading to increased rates of hospital acquired infections.

## References

Abbas, M. & Pittet, D. 2016. Surgical site infection prevention: a global priority. *Journal of Hospital Infection* 93(4):319-322. Available at: [www.journalofhospitalinfection.com/article/S0195-6701\(16\)30127-X/full text](http://www.journalofhospitalinfection.com/article/S0195-6701(16)30127-X/full-text).

Advisory Committee on Dangerous Pathogens, 2015. *Management of Hazard Group 4 viral haemorrhagic fevers and similar human infectious disease of high consequence*, ACDP: 1-103.

Arthi, E., Abarna, V., Bagyalakshmi, R., Anitharaj, M. & Vijayasree, S. 2016. Assessment of Knowledge, Attitude and Practices of hand hygiene among nursing and medical students in a tertiary care hospital in Puducherry, India. *International Journal of Contemporary Medical Research*, 3(4):1203-1206.

Ambulatory Surgical Center Quality Collaboration. 2016. Safe Injection Practices Toolkit. Available at: <https://www.google.co.zm/?gfe-rd=ssl&ei=8982V8nQKYnFaN6KkcgE#q=ASC+quality+collaboration+injection+safety>. [Date accessed: 16 November 2015]

Aftab, H.B., Zahid, M.F., Zia, B., Reaheem, A. & Beg, M.A. 2015. Knowledge, Attitude, and Practices of healthcare personnel regarding the transmission of pathogens via Fomites at a tertiary care hospital in Karachi, 3(1):208.

Anderson, D.J., & Sexton, D.J. 2016. Antimicrobial prophylaxis for prevention of surgical site infection in Adults. Available at: <http://www.uptodate.com/contents/antimicrobial-prophylaxis-for-prevention-of-surgical-site-infection-in-adults>. [Date accessed: 20 June 2016]

Benson, S. & Powers, J. 2011. *Nursing Made Increasingly Easy*, 9(3):36-41.

Bhebhe, L.T., Rooyen, C.V. & Steinberg, W.J. 2014. Attitudes, Knowledge and Practices of health care workers regarding occupational exposure of Pulmonary Tuberculosis. *African Journal of Primary Health Care & Family Medicine*, 6(1):597.

Brink, H., Van der Walt, C. & Van Rensburg, G. 2012. *Fundamentals of Research Methodology for health care professionals*. 3<sup>rd</sup> edition. Cape Town: Juta.

Burns, N. & Grove, S.K. 2011. *Understanding nursing research. Building an Evidence-based Practice*. 5<sup>th</sup> edition. Missouri: Elsevier.

Canadian Nurses Association. 2008. Code of Ethics for Registered Nurses. Available at: <http://www.cna-aiic.ca/-/media/cnafiles/en/codeofethics.pfd>.

Carrico, R.M. 2013. Guide to Preventing Clostridium difficile Infections. *Association for professionals in Infection Control and Epidemiology, implementation guide:1-100*.

Centers for Disease Control. 2009. Guidelines for Prevention of Catheter-associated urinary tract infection. [Online]. Available at: [http://www.cdc.gov/hicpac/pdf/CAUTI/CAUTIguideline2009final\\_.pdf](http://www.cdc.gov/hicpac/pdf/CAUTI/CAUTIguideline2009final_.pdf). [Date accessed: 24 March 2015].

Centers for Disease Control. 2011. *Guidelines for prevention of intravascular catheter-related infections*. Available at: <http://www.cdc.gov/hicpac/pdf/guidelines/bsi-guidelines.pdf>. [Date accessed: 15 April 2015].

CDC 2015. *Injection safety*. Available at: <http://www.cdc.gov/injectionsafety/>

CDC 2016. *Prevention Strategies for Seasonal Influenza in Healthcare Settings*. Savinglivesprotectingpeople. Available at: <http://www.cdc.gov/flu/professionals/infectioncontrol/healthcaresettings.htm>. [Date accessed: 16 June 2016].

CDC 2016. *Clean Hands Count for Safe HealthCare*. Available at: <http://www.cdc.gov/Features/Handhygiene>. [Date accessed: 20 June 2016].

CDC .2016. National and State Healthcare-Associated Infections Progress Report. Available at: <http://www.cdc.gov/HAI/pdfs/progress-report/hai-progress-report.pdf>. [Date accessed: 13 July 2016].

CDC. 2016. Healthcare-associated Infections. *Saving Lives, Protecting people*. Available at: <http://www.cdc.gov/hai/surveillance>. [Date accessed: 15 July 2016].

College of Nurses of Ontario Practice Standard. 2009. *Infection Prevention and control*, Practice Standards: 1-16.

Collins, A.S. 2008. *Patient safety and quality: an Evidence-based handbook for nurses*.

Changing minds .2016. Available at: <http://www.changingminds.org/explanations/research/analysis/Kolmogorov-simrnov.htm>. [Date accessed: 16 June 2016].

Chopra, V., Krein, S.L., Olmsted, R.N., Safdar, N. & Saint, S. 2013. Making Health Care Safer II: An Updated Critical Analysis of the Evidence for Patient Safety Practices. *Agency for Healthcare Research and Quality*.

Custodio, H.T. & Steele, R.W. 2013. Hospital acquired infections. *Medscape, Drugs, Disease and Procedures*. Available at: <http://www.emedicine.medscape.com/article/967022.overview>. Date accessed: 16 July 2014.

Damani, N. 2012. Manual of infection prevention and control. 3rd edition. Oxford University Press.

Dearmon, V. 2014. Risk management and legal issues. Available at: <http://www.ilearning.com/samples/0763757144-CH15-470-493.pdf>. [Date accessed: 20 March 2015].

De Oliveira, A.C., Cardoso, S.C. & Mascarenhas, D. 2009. Intensive Care Unit professionals' knowledge and behaviour related to the adoption of contact precautions. *Rev. Latino-Am. Enfermagem* 15:5.

Dixit, D., Hagtvedt, R., Reay, T., Ballermann, M & Forgie, S. Attitudes and beliefs about hand hygiene among paediatric residents: *BMJ open* 2012-002188.doi:10.1136

Dougnon, T.V., Bankole, H.S., Johnson, R.C., Hounmanou, G., Toure, I.M., Houessou, C., Boko, M. & Baba-Moussa, L. 2016. Catheter-Associated Urinary Tract Infections at a Hospital in Zinvie, Benin (West Africa). *International Journal of infection*. 3(2).

El-Enein, A., Younis, N., Mahdy, E. & Hal, M. 2011. Standard precautions: a KAP study among nurses in the dialysis unit in a University Hospital in Alexandria. Egypt. *Journal of the Egyptian Public Health Association*. 86(1):3-10.

Elsheikh, T.A., Balla, S.A., Abdalla, A.A., Elgasim, M.A., Swaredahab, Z. & Bashir, A.A. 2016. Knowledge, Attitude and Practice of Health Care Workers regarding transmission and prevention of Hepatitis B Virus Infection, White Nile State, Sudan. *American Journal of Health Research*. 4(2):18-22.

European Centre for Disease Prevention and Control. 2014. Outbreak of Ebola virus disease in West Africa. Stockholm: ECDC. Available at <http://ecdc.europa.eu/en/publication/Publication/Ebola-RRA-West-Africa-8April2014.pdf>. [Date accessed: 14 March 2015].

Erasmus, V., Daha, T.J., Brug, H., Richardus, J.H., Behrendt, M.D., Vos, M.C. & Van Beeck, E.F. 2010. Systematic review of studies on compliance with hand hygiene guidelines in hospital care.

Eskanderl, H.G., Morsy, W.Y.M. & Elfeky, H.A.A. 2013. Intensive Care Nurses' Knowledge & Practices regarding Infection Control Standard Precautions at a Selected Egyptian Cancer Hospital. *Journal of Education and Practice* 4(19):160-174.

Fashafsheh, I., Ayed, A., Eqtait, F. & Harazneh, L. 2015. Knowledge and Practices of Nursing Staff towards Infection Control Measures in the Palestinian Hospitals. *Journal of Education and Practice* 6(4):79-90

Fink, R., Gilmartin, H., Richards, A., Capezuti, E., Boltz, M. & Wald, H. 2012. Indwelling urinary catheter management and catheter-associated urinary tract infection prevention practices. In: *Nurses Improving Care for Health system elders hospitals*: 1-6.

Frello, A.T. & Carraro, T.E. 2013. Florence Nightingale's contribution: An integrative review of literature. *Scielo*. July-September, 17(3):537-579

Garrett, J.H. 2015. The role of the Clinical Environment of Care in Preventing healthcare-Associated Infections. *Safe Healthcare*. Available at:



<http://www.blogs.cdc.gov/safehealthcare/2015/09/14/the-role-of-the-cinical-environment-of-care-in-preventing-healthcare-associated-infections/>. [Date accessed: November 2015].

Gastmeier, P., Behnke, M., Reichardt, C. & Geffers, C. 2011. Quality management for preventing healthcare-acquired infections. The importance of surveillance. *US National Library of Medicine National Institute of Health* 54(2):207-212.

Ghalya, H.A. & Ibrahim, Y. 2014. Knowledge, Attitudes and Sources of information among Nursing Students towards Infection Control and Standard Precautions. *Life Science Journal* 11(9).

Gichuhi, A.W., Kamau, S.M., Nyangena, E. & Otieno-Ayayo, N. 2015. Health Care Workers Adherence to Infection Prevention Practices and Control Measures: A case of a Level Four District Hospital in Kenya. *American journal of nursing science* 4(2):39-44.

Gurler, B. 2014. Holistic approach to infection control and healing: the Florence Nightingale Story. *Microbiology Australia*, 174-176.

Haburchak, R.D 2016. Preventing Opportunistic Infections in patients with HIV. *General Guidelines for prophylaxis. Medscape, 6<sup>th</sup> edition. Elsevier: Churchill Livingstone.*

Hakim, S.A., Mohsen, A. & Bakr, I. 2014. Knowledge, attitudes and practices of health-care personnel towards waste disposal management at Ain Shams University Hospitals, Cairo. *Eastern Mediterranean Health Journal*, 20(5):347-354.

Hayeh, P.A. & Esena, R.K. 2013. Infection prevention and control practices among health workers at Ridge regional hospital in Accra Ghana. *International Journal of health science & research*, 3(8):47-55.

Hegge, M. 2013. Nightingale' environment, *Nursing Science Quarterly*, 26(3)311-219.

Hillier, M.D. 2015. How to wash your hands effectively. *Nursing Standards*, 30(3):34-36. Available at: <https://www.journals.rcni.com/doi/abs/10.7748/ns.30.3.34e9691>.

Hu, X., Zhang, Z., Li, D. & Zhang, L. 2012. Self-reported use of personal protective equipment among Chinese critical care clinicians during H1N1 influenza pandemic. *PloS One*, 7(9).

Institute for Work and Health. 2015. What researchers mean by .... Primary, secondary and tertiary prevention. (Online). Available at: <https://www.iwh.on.ca/wrmb/primary-secondary-and-tertiary-prevention>. [Date accessed: 14 November 2015].

Jain, A., Shah, H., Jain, A. & Sharm, M. 2013. Disinfection of stethoscope: Gap between knowledge and practice in an Indian tertiary care hospital. *Ann Tro med public health* 6:236-9.

Jain, M., Dogra, V., Mishra, B., Thakur, A., & Loomba, P.S. 2012. Infection control practices among doctors and nurses in a tertiary care hospital. *Ann Trop Med Pub Med public health*, 5(1):29-33.

Kalantarzadeh, M., Mohammadnejad, E., Ehsani & Tamizi, Z. 2014. Knowledge and Practice of Nurses about the Control and Prevention of Nosocomial Infections in Emergency Department. *Arch Clin Infect Dis*. 9(4).

Khamis, W.B., Wambura, C.M. & Verma, A. 2014. Compliance to infection prevention and control guidelines among health care workers at Mnazi Mmoja hospital Zanzibar. *IMTU Medical journal*, 5:34-38.

Khan, H.A., Ahmad, A. & Mehboob, R. 2015. Nosocomial infections and their control strategies. *Asian Pacific Journal of Tropical Biomedicine* 5(7).

Kociolek, L.K. & Gerding, D.N. 2016. Break through in the treatment and prevention of Clostridium difficile infection. *Nature Reviews Gastroenterology & Hepatology*. 13:150-160.

Labib, M. & Spasojevic, N. 2013. Problem of Catheter-Associated Urinary Tract Infections in Sub-Saharan Africa. *Department of Surgery, School of Medicine. University of Zambia*, Dio:10.5772/55371.

Lemass, H., McDonnell, N., O'Connor, N & Rochford, S. 2014/ *theory*. Infection prevention and control for primary care in Ireland. *A guide for general practice, Patient safety first*. 1-98.

Loveday, H.P., Wilson, J.A., Pratt, R.J., Golsorkhi, M., Tingle, A., Bak, A., Browne, J., Preto, J. & Wilcox, M. 2014. Epic 3: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England. *Journal of Hospital Infection*, 86S1 S1-S70.

Iliyasu, G., Dayyab, F.M., Habib, Z.G., Tihamiyu, B.A., Abubakar, S., Mijinyawa, M.S. & Habib, A.G. 2016. Knowledge and practices of infection control among healthcare workers in a tertiary referral center in North-Western Nigeria. *Annals of African Medicine* 15(1):34-40.

Lobdell, K.W., Stamou, S. & Sanchez, J.A. 2012. Hospital acquired infections, *Surgical Clinics of North America Pubmed*, 92(1):65-77.

Magill, S.S., Edwards, J.R., & Bamberg, W. 2014. Multistate-Point-prevalence Survey of health Care-associated Infections. *Engl J Med*, 370(13):1198-1208.

Mathur, P. 2011. Hand hygiene: Back to the basics of infection control. *Indian Journal of Medical Research*. 134(5):611-620.

Mandal, A. 2012. What is Staphylococcus aureus? Available at: <http://www.news-medical.net/health/what-is-Staphylococcus-Aureas.aspx>. [Date accessed: 13 March 2016].

Mayo Clinic Staff. 2016. Infectious diseases. Available at: <http://www.mayoclinic.org/disease-conditions/infectious-disease/home/ovc-20168649> [Date accessed: 20 March 2016].

McGaw, C.D., Tennant, I., Harding, H. E., Cawich, S. O., Crandon, I. W & Walters. 2012. Health workers' attitudes to and compliance with infection control guidelines in the operating department at the University Hospital of West Indies, Jamaica. *Int J Infect control* 8(3):1-9.

McQuoid-Mason, D. 2012. Hospital Acquired Infections – When are hospitals legally liable? *Medicine and the law*. *South African Medical Journal* 102(6)2012.

Mearkle, R., Houghton, R., Bwonya, D. & Lindfield, R. 2016. Barriers to hand hygiene in Ophthalmic outpatients in Uganda: Mixed methods approach. *Journal of Ophthalmic Inflammation and Infection*, 6:11.

Mehta, Y., Gupta, A., Todi, S. Myatra, S.N., Samaddar, D.P., Patil, V., Bhattacharya, P.K. & Ramasubban, S. 2014. Guidelines for prevention of hospital acquired infections. *Indian Journal of Critical Care Medicine*, 18(3):149-163.

Mishta, P.H., Banerjee, P. & Gosain, H. 2014. Study of Healthcare-Associated Infections. *Merit Research Journal of Biochemistry and Bioinformatics*, 2(2):38-48.

Missouri Nursing Practice Act. year. Available at: <http://www.mo.gov/living/lpha/phnursing/practiceact.php>. [Date accessed: 20 March 2015].

Mouton, J. 2011. How to succeed in your Master's & Doctoral Studies. *A South African Guide and Resouce Book. Fifteenth Edition*.

Mukosai, S., Bowa, K., Labib, M. & Spasojevic, N. 2014. Pre-operative Bladder Irrigation with 1% Povidone Iodine in Reducing Open Prostatectomy Surgical Site Infection (SSI) at University Teaching Hospital Lusaka. *Medical Journal of Zambia*

Nair, S.S., Hanumantappa, R., Hiremath, S.G. & Raghunath, P. 2014. Knowledge, attitude and practice of hand hygiene among medical and nursing students at a tertiary health care centre in Raichur, India. *ISRN Preventive Medicine*: 1-4. [Online]. Available at: <http://www.hindawi.com/journals/ism/2014/608927/>. Accessed: 23 February 2015.

Nathwani, D., Raman, G., Sulham, K., Gavaghan, M & Menon, V. 2014. Clinical and economic consequences of hospital-acquired resistant and multidrug-resistant *Pseudomonas aeruginosa* infections: a systematic review and meta-analysis. Available at; <http://www.aricjournal.biomedcentral.com/articles/10.1186/2047-2994-3-32>.

National Association of Clinical Nurse speciality. 2013. Impact of the Clinical Nurse Speciality Role on the Costs and Quality of Health Care.

Neanaa, M., Fayed, Hanan, T., Elbahnasawy, Taghreed, K. & Omar. 2016. Effect of Instructional programme on Nurses Compliance with Universal Precautions of Infection Control. *International Journal of Novel Research in Healthcare and Nursing*. 3(1):81-92.

Nejad, S.B., Allegranza, B., Syed, S.B., Ellis, B. & Pittet, D. 2011. Health-Care-Associated Infections in Africa: a systematic review. *Bulletin of the World Health Organisation*.

NHS Professional. 2013. Standard Infection Prevention Control Guidelines Clinical Governance. Available at; <http://www.nhsprofessionals.nhs.uk/download/comms/cg1> [Date accessed: 12 February 2015].

NICE (National Institute for Health and Care Excellence). 2014. Infection prevention and control. Available at: <http://www.his.org.uk/files/7213/9886/7266/infection-prevention-and-control-qs61.pdf>. [Date accessed: 16 March 2015].

NICE. 2012. Healthcare-associated infections: prevention and control in primary and community care

Nicolle, L.E. 2014. Catheter-associated urinary tract infections. *Antimicrobial Resistance and Infection Control* 3:23 DOI: 10.1186/2047-2994-3-23.

Ocran, I. & Tagoe, D.N.A. 2014. Knowledge and attitude of healthcare workers and patients on healthcare-associated infections in a regional hospital in Ghana. *Asian Pac J Trop Dis* 4(2):135-139.

O'Grady, N.P., Alexander, M., Burns, L.A., Dellinger, E.P., Garland, J., Heard, S.O., Lipsett, P.A., Masur, H., Mermel, L.A., Pearson, M.L., Raad, I.I., Randolph, A., Rupp, M.E., Saint, S. & the Healthcare Infection Control Practices Advisory Committee (HICPAC). 2011. Guidelines for Prevention of Intravascular Catheter-Related Infections, *department of health and human services. USA*.

Olalekan, A.W., Olusegun, B.J., Olufunmilayo, E.A. & Lanre, A.O. 2012. Awareness and attitude of healthcare workers in a teaching hospital in Southwestern Nigeria towards nosocomial infections. *Journal of Public Health and Epidemiology* .4(10).

Olin, J. 2012. Nursing plays a major role in infection control. Available at: <http://www.rncentral.com/blog/2012/nursing-plays-a-major-role-in-infection-control/>.

[Date accessed: 20 February 2015].

Olowookere, S.A., Aboiye-Kuteyi, E.A., Adepoju, O.K., Esan, O.T., Adeolu, T.M., Adeoye, T.K., Adepoju, A.A. & Aderogba, A.T. 2015. Preparedness of Health Workers in the control and management of Ebola Viral Disease. *Journal of Tropical Medicine*. Available at: <http://www.dx.doi.org/10.1155/2015/431317>. [Date accessed: 20 November 2016].

Onyemocho, A., Anekoson, J.I. & Pius, E.O. 2013. Knowledge and practice of injection safety among workers of Nigerian Prison Service health Facilities in Kaduna state. *Science and education publishing*. Available at: <http://www.pub.sciepub.com/ajphr/1/7/5/>.

Opina, M.L.F. & Oducado, R.M.F. 2014. Infection Control in the Use of Urethra Catheters: Knowledge and Practices of Nurses in Private Hospital in Iloilo City. *Asia Pacific Journal of Education, Arts and Sciences Vol. 1, No. 5*.

O'Riordan, M. & Fitzpatrick, F. 2015. The impact of economic recession on infection prevention and control. *J Hosp Infect.* 89(4):340-345.

Ojulong, J., Mitonga, K.H. & Lipinge, S.N. 2013. Knowledge and attitude of infection prevention and control among health sciences students at the University of Namibia. *African Health Sciences* 13(4):1071-1078.

Parryford, F. 2015. Infection control precautions to minimise transmission of acute respiratory tract infections in healthcare settings. Protecting and improving the nation's health. *Public health England*.

Pasquale, M.D., Aliberti, S., Mantero, M., Bianchini, S. & Blasi, F. 2016. Non-Intensive care Unit Acquired Pneumonia: A Clinical Entity. *International Journal of Molecular Sciences*.

Porto, J.S. & Marziale, M.H.P. 2016. Reasons and Consequences of low adherence to Standard precautions by the nursing team.

Prasanna, K. & Radhika, M. 2015. Knowledge regarding Catheter Care Among Staff Nurses. *International Journal of Applied Research* 1(8):182-186.

PIDAC 2015. Infection Prevention and Control for Clinical Office Practice. Available at:[Http://www.publichealthontario.ca/en/eRepository/IPAC-Clinical-Office-Practice-2013.pdf](http://www.publichealthontario.ca/en/eRepository/IPAC-Clinical-Office-Practice-2013.pdf). [Date accessed: 20 July 2015].

Razine, R., Azzouzi, A., Barkat, R., Khoudri, I., Hassouni, F., Chefchaoun, A.C., & Abougal. 2012. Prevalence of hospital acquired infections in the university medical center of Rabat, Morocco. *International archives of medicine* 5:26.

Rosenthal, V.D., Maki, D.G. & Graves, N. 2008. The international nosocomial infection control consortium (INICC); Goals and objectives, description of surveillance methods and operational activities. *Infection control and epidemiology. American Journal of Infection Control*. 36(9):1-12.

Roth, H.S., Parker, C.T., Wale, R.J. & Warriar, S.K. 2014. Clostridium difficile-associated disease: how much do we know? A single institutional study. *Official Journal of the Australasian College for Infection Prevention and Control*.

Royal Cornwall Hospitals 2015. Infection Prevention & Control Roles and Responsibilities Policy. *All + all We care*. Available at:<http://www.rcht.nhs.uk/documentlibrary/RoyalCornwallHospitalsTrust/Clinical/InfectionpreventionAndControl/Infection> [Date accessed: 20 July 2015].

Russell, K.A. 2012. Nurses Practice Acts Guide and Govern Nursing Practice. Available at:<https://www.ncsbn.org/2012-JNR-NPA-Guide.pdf>

Salama, R. 2015. Concept of Prevention and Control. Suez Canal University Egypt. *Community medicine*.

Salkind, A.R. & Kavitha, C.R. 2011. Antibiotic prophylaxis to prevent surgical site infections. University of Missouri-Kansas City School of Medicine, Kansas City, Missouri. *Am Fam Physician*.

Sarani,H., Balouchi, A., Masinaeinezhad, N., & Ebrahimitabs 2015. Knowledge, Attitude and Practices of Nurses about Standard Precaution for Hospital Acquired



Infection in Teaching Hospitals Affiliated to Zabol University of Medical Science.  
*Global Journal of health science*

Sessa, A., Di-Giuseppe, G., Albano, L. & Angelillo, I.F. 2011. An investigation of nurses' knowledge, attitudes and practices regarding disinfection procedures in Italy. *BMC infectious diseases*. 11:148.

Shahida, S.M., Islam, A., Dey, B.R., Islam, F., Venkatesh, K. & Goodman, A. 2016. Hospital acquired infections in low and middle-income countries: Cause analysis and the development of infection control practices in Bangladesh. *Open Journal of Obstetrics and Gynaecology*.

Sharma, S., Puri, S. & Whig, J. 2011. Hand hygiene compliance in intensive care units of a tertiary care hospital. *Indian J. community med*. 36(3):217-221.

Sharp, D., Palmore, T. & Grandy, C. 2014. The Ethics of Empowering Patients as Partners in Healthcare-Associated Infection Prevention. *Infection Control and Hospital Epidemiology Volume 35(3):307- 309*.

Sissolak, D., Marais, F. & Mehtar, S. 2011. TB infection prevention and control experiences of South African nurses – phenomenological study. *BMC Public Health*.

Stone, P. 2013. Guidelines Highlight Importance of Nurses in Preventing Bloodstream Infections. Columbia school of nursing. Available at: <http://www.infectioncontrolday.com.news/2013/12/guidelines-highlight-importance-of-nurses-in-preventing-bloodstream-infections.aspx>.

Stubblefield, H. 2014. Hospital acquired (Nosocomial) infections. Available at: <http://www.healthline.com/health/hospital-acquired-nosocomial-infections>.

Surawicz, C.M. 2012. C.Difficile Infection. American College of Gastroenterology. *Advancing gastroenterology, improving patient care*.

Suvera, M., Vyas, P., Patel, M., Varghese, V., Ahmed, A., Kashyap, R. & Nair, D. 2013. Two methods or pre-operative hair removal and their effect on post-operative period. *International Journal of Medical Science and Public health*.



Sydnor, E.R.M, & Perl, T.M. 2011. Hospital Epidemiology and Infection Control in Acute-care Setting. *Clinical microbiology review*.

Teshager, F.A, Engeda, E.H. & Worku, W.Z. 2015. Knowledge, Practices, and Associated Factors towards prevention of surgical site infections among Nurses Working in Amhara Regional State Referral Hospitals, Northwest Ethiopia. *Surg Res Pract*. Available at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4693022/>. [Date accessed: 20 June 2015].

Tb 4. 2015 Infection Control and Prevention of Tuberculosis. Botswana National Tuberculosis Programme Manual Training for Medical Officers. Available at <http;www.slideshare.net/dhasarathanrajaram/tb-4-44851080>

The General Nursing Council of Zambia. Arising to the Challenge: Zambia Nurses and Midwives Success Story. Available at: <http://www.who.int/hiv/topics/vct/toolkit/components/policy/arising-to-the-challenge.pdf>. [Date accessed: 13 March 2016].

Tingle, J. & Cribb, A. 2014. Nursing Law and Ethics. Fourth Edition. United Kingdom: *John Wiley & Sons, Ltd*.

Tirivanhu, C., Ancia, M. & Petronella, S. 2014. Barriers to infection prevention and control practice among nurses at Bindura provincial hospital, Zimbabwe. *Journal of nursing and health science* 1(3):69-73.

Tomas, M.E., Kundrapu, S., Thota, P., Sunkesula, V.C.K., Cadnum, J.L., Mana, T.S.C., Jencson, A., O'Donnell, M., Zabarsky, T.F., Hecker, M.T., Ray, A.J., Wilson, B.M. & Donskey, C.T. 2015. Contamination of health care personnel during removal of personal protective equipment. *JAMA Intern Med*. 175(12):1904-1910.

Vang, J. 2014. Environmental Cleaning in the Emergency Department. *College of Saint Benedict and Saint John's University*.

Vyawahare, C.R., Gandham, N.R., Misra, R.N., Jadhav, S.V., Gupta, N.S. & Angadi, K.M. 2015. Occurrence of catheter-associated urinary tract infection in critical care units. *Med J DY Patil Univ* .8(5):585-589.

Ward, D.J. 2012 Attitude towards infection prevention and control: an interview study with nursing students and nurse mentors. *BMJ Qual Saf* 2012; 21:301-306 doi: 10.1136/bmjqs-2011-000360.

Warshawsky, N.E & Havens, D.S. 2011. Global use of the practice environment scale of the nursing work index. *Nursing Research*, 60(1):17-31

Wasswa, P., Nalwadda, C.K., Buregyeye, E., Gitta, S.N., Anguzu, P. & Nuwaha, F. 2015. Implementation of infection control in health facilities in Arua district, Uganda: a cross-sectional study. *BMC Infectious Diseases*. DOI 10.1186/s12879-015-0999-4.

WaterAid 2016. Hand hygiene in health-care facilities.

Weber, D.J., Anderson, A. & Rutala, W.A. 2013. The role of the surface environment in healthcare-associated infections. Available at: <http://www.rutalapdf.web.unc.edu/files/2015/08/Weber-2013-The-role-of-the-surface-environment.pdf>. [Date accessed: 20 February 2015].

Welden, L.M. 2013. Driving Evidence-Based Catheter-Associated Urinary Tract Infections (CAUTI) Care Practices. *J Issues Nurs*.2013;18(3).

WHO. 2001. Manual Infection prevention and control policies and guidelines. [Online]. Available at: [https://www.spc.int/phs/PPHSN/Activities/PICNet/SECTIONS\\_1-6.pdf](https://www.spc.int/phs/PPHSN/Activities/PICNet/SECTIONS_1-6.pdf). Accessed: [24 February 2015].

WHO. 2009. WHO Guidelines on hand hygiene in health care.[Online]. Available at: [http://whqlibdoc.who.int/publications/2009/9789241597906\\_eng.pdf](http://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf). [Accessed: 24 February 2015].

WHO. 2010. The Burden of Health Care-Associated Infection World Wide. Available at: <http://www.who.int/gpsc/country-work/summary-20100430-en.pdf>. [Accessed: November 2016].

WHO Ban 2010-2011. National Guidelines On Hand Hygiene For Prevention Of Hospital-Acquired Infection (HAI).

WHO. 2010. WHO best practices for injections and related procedures toolkit WHO/EHT/10.02.

WHO. 2012, WHO best practices for injections and related procedures toolkit March 2010.

WHO. 2011. Preventing Bloodstream infections from central line venous catheters.

World Health Organisation, Global Alert and Response (GAR): Ebola Virus Disease Update- West Africa, 2014, [http://www.who.int/csr/don/2014\\_08-15-ebola/en/](http://www.who.int/csr/don/2014_08-15-ebola/en/).

WHO. 2016. Infection prevention and control in health care for preparedness and response to outbreaks. *Emergencies preparedness, response*. Available at: [http://www.who.int/csr/bioriskreduction/infection\\_control/background/en/](http://www.who.int/csr/bioriskreduction/infection_control/background/en/). [Date accessed: 20 April 2016].

WHO. 2015. Infection prevention and control in healthcare. [Online]. Available at: [http://www.who.int/csr/bioriskreduction/infection\\_control/en/](http://www.who.int/csr/bioriskreduction/infection_control/en/). [Accessed: 24 March 2015].

WHO. 2015. Zambia. [Online]. Available at: <http://www.who.int/countries/zmb/en> [Date Accessed: 14 December 2015].

William, L. & Wilkins. 2007. Evidence-based infection control in intensive care units. *Current opinions in critical care*. 13:557-562.

WHO. 2015. WHO announces new policy guidelines on injection safety. The pharmaceutical journal. Available at; <http://www.pharmaceutical-journal.com/news-and-analysis/news-in-brief/who-announces-new-policy-guidelines-on-injection-safety/20067949.article>.

WHO. 2016. Patient safety Ndola Central Hospital, Zambia in partnering with Guy's and St. Thomas' Foundation Trust, London. Available at; <http://www.who.int/patientsafety/implementation/apps/first-wave/ndola-london/en/>.

Yamin, Jain, A., Mandelia, C. & Jayaram, S. 2012. Perception and practice regarding infection control measures amongst healthcare workers in district government hospitals of Mangalore, India. *Int J Health Allied*. 1(2):68-73.

Yasmine, G., John, L.R. & Walaa, A.A. 2014. Impact of an infection-control program on nurses' knowledge and attitude in pediatric intensive care units at Cairo University hospitals. *Journal of the Egyptian Public Health Association* 89(1):22-28.

Zamanzadeh, V., Valizazadeh, L., Negarandeh, R., Monadi, M. & Azadi, A. 2013. Factors Influencing Men entering the nursing profession and understanding the challenges faced by them: Iranian and developed countries' perspectives. *Nursing Midwifery Studies* 2(4):49-56.

---

## **Addendums**

### **Addendum A: Questionnaire used for the Pilot Study**

#### **QUESTIONNAIRE**

#### **RESEARCH STUDY: KNOWLEDGE, ATTITUDES AND PRACTICES OF NURSES IN INFECTION PREVENTION AND CONTROL WITHIN A TERTIARY HOSPITAL IN ZAMBIA**

#### **Dear Participant**

This questionnaire will determine the knowledge, attitudes and practices of nurses in infection prevention and control within a tertiary hospital in Zambia.

All information will be treated as confidential and the researcher undertakes not to reveal any individual information that appears in this questionnaire.

You will require approximately 40 minutes completing this four paged questionnaire. Read the questions and mark your response off with a cross (X) in the box provided.

#### **Section 1: Demographics**

##### **1. Gender:**

1.1. Male:	
1.2. Female:	

##### **2. Age:**

2.1. 20-29:	
2.2. 30-39:	
2.3. 40-49:	
2.4. >50:	

##### **3. Marital status**

3.1. Single	
3.2. Married	
3.3. Other:	

#### 4. Nursing category:

4.1. Registered Nurse:	
4.2. Enrolled Nurse	
4.3. Enrolled Midwife :	
4.4. Certified Midwife:	
4.5. Registered Midwife:	
4.6. Registered Mental Health Nurse:	
4.7. Other: (specify)	

#### 5. Years practiced as a nurse

5.1. 1 year:	
5.2. 1-3 years:	
5.3. 4-10 years:	
5.4. >10 years:	

#### 6. Employment status

6.1. Full time:	
6.2. Contract:	
6.3. Agency :	
6.4. Other(specify):	

#### 7. How long have you work in the current nursing unit/department

7.1. 0 - 2 years	
7.2. 2 - 4 years	
7.3. 5 - 10 years	
7.4. > 10 years	

**SECTION 2****Marking key for the questions/statements below:**

- 1 = Agree  
 2 = Disagree  
 3 = Not Applicable

**2.1. KNOWLEDGE**

**Guided by hospital policies, procedures standards, World Health Organisation (WHO) and Zambian centres for infection prevention and control.**

<b>VIARABLE - KNOWLEDGE</b>	<b>AGREE (1)</b>	<b>DISAGREE (2)</b>	<b>NOT APPLICABLE (3)</b>
2.1.1. Hospital acquired infections (HAI's) can be transmitted by medical equipment such as syringes, needles, catheters, stethoscope, thermometers, etc.			
2.1.2. Nosocomial infection is an infection that the patient comes with from home			
2.1.3. I know the World Health Organisation's '5 moments of hand hygiene.'			
2.1.4. Some instruments can be stored in an antiseptic solution for up to 36 hours			
2.1.5. If there is limited beds available, patients with communicable disease may be admitted in the same ward with other patients			
2.1.6. Micro-organisms are destroyed by using clean water			
2.1.7. Bathing every day is a universal precaution			
2.1.8. Standard precautions apply to all patients regardless of their diagnosis.			

2.1.9. I am familiar with hospital acquired infection guidelines			
2.1.10. All staff and patient should be considered potentially infectious			
2.1.11. You can handle body fluids with bare hands if gloves is not available			
2.1.12. I know how to prevent and control hospital acquired infections.			

## 2.2. ATTITUDES

**Guided by hospital policies, procedures standards, World Health Organisation (WHO) and Zambian centres for infection prevention and control.**

<b>VIARABLE - ATTITUDES</b>	<b>AGREE (1)</b>	<b>DISAGREE (2)</b>	<b>NOT APPLICABLE (3)</b>
2.2.1. I do not have to wash hand if I used gloves			
2.2.2. Policies and procedures for infection control should be adhered to at all times			
2.2.3. I should attend in-service training/workshop related to infection prevention and control regularly.			
2.2.4. The workload affects my ability to apply infection prevention guidelines.			
2.2.5. I am aware that patients expect me to wash hands before touching them and after touching them.			
2.2.6. I feel that the infection control policies and guidelines are enough in the hospital.			
2.2.7. It is not my responsibility to comply with the hospital acquired infection guidelines.			



2.2.8. Infection prevention guidelines are important to this hospital.			
2.2.9. I have enough time to comply with infection prevention guidelines			
2.2.10. I believe that following the prevention guidelines will reduce rates of hospital acquired infection.			
2.2.11. I should follow the procedure guidelines of the unit			
2.2.12. I feel that needles should be recapped after use and before disposal			

### 2.3. PRACTICES

**Guided by hospital policies, procedures standards, World Health Organisation (WHO) and Zambian centres for infection prevention and control**

<b>VIARABLE - PRACTICES</b>	<b>AGREE (1)</b>	<b>DISAGREE (2)</b>	<b>NOT APPLICABLE (3)</b>
2.3.1. I always wash hands before and after direct contact with the patient?			
2.3.2. I always put on a mask and glasses when performing invasive and body fluid procedures			
2.3.3. Knowledge of infection prevention and control are being monitored in the hospital			
2.3.4. I attend in-service training/workshop related to infection prevention and control yearly.			
2.3.5. Surgical operation sites are shaved with razors			
2.3.6. The latest infection and prevention guidelines date is between 2015 and 2013			

2.3.7. Screening of patients are being done to detect colonisation even if no evidence of infection			
2.3.9. Vaccination is provided to staff			
2.3.8. Personal protective equipment are always accessible			
2.3.9. Our hospital monitors patients with urinary catheters for infection and gives feedback on urinary tract infection rates			
2.3.10. Infection prevention does not improve patient outcome			
2.3.11. We wear PPE when handling linens			
2.3.12. We shake linens out to release dust from the linen			

Thank you for taking time off in a busy schedule.

Contact details:

**Student:**

Mrs. P Chitimwango

Email: [nampundu.yande@gmail.com](mailto:nampundu.yande@gmail.com)

or University of Stellenbosch

Tel: 097 981 1757

Cel: +2776 162 4927

Tel: +2721 938 9036

Adress: Marybegg Clinic, 48 Chintu Road

P.O.Box, Kansenshi, Ndola, Zambia

**Supervisor:**

Mrs. D Hector

University of Stellenbosch

Email: [hectord@sun.ac.za](mailto:hectord@sun.ac.za)

Tel: +2721 938 9036

Cel: +2784 402 5260

**Co-supervisor:**

Mrs. A Damons

University of Stellenbosch

Email: [damonsa@sun.ac.za](mailto:damonsa@sun.ac.za)

Tel: +2721 938 9036

**Addendum B:****Questionnaire used for the main study****QUESTIONNAIRE**

RESEARCH STUDY: KNOWLEDGE, ATTITUDES AND PRACTICES  
OF NURSES IN INFECTION PREVENTION AND CONTROL WITHIN A  
TERTIARY HOSPITAL IN ZAMBIA

**Dear Participant**

This questionnaire will determine the knowledge, attitudes and practices of nurses in infection prevention and control within a tertiary hospital in Zambia.

All information will be treated as confidential and the researcher undertakes not to reveal any individual information that appears in this questionnaire.

You will require approximately 40 minutes completing this four paged questionnaire. Read the questions and mark your response off with a cross (X) in the box provided.

**Section 1: Demographics**

## 1. Gender:

1.1. Male:	
1.2. Female:	

## 2. Age:

2.1. 0-29:	
2.2. 30-39:	
2.3. 40-49:	
2.4. >50:	

## 3. Marital status

3.1. Single	
3.2. Married	
3.3. Other:	

## 4. Nursing category:

4.1. Registered Nurse:	
4.2. Enrolled Nurse	
4.3. Enrolled Midwife :	
4.4. Certified Midwife:	
4.5. Registered Midwife:	
4.6. Registered Mental Health Nurse:	
4.7. Other: (specify)	

## 5. Years practiced as a nurse

5.1. 1 year:	
5.2. 1-3 years:	
5.3. 4-10 years:	
5.4. >10 years:	

## 6. Employment status

6.1. Full time:	
6.2. Contract:	
6.3. Agency :	
6.4. Other(specify):	

## 7. How long have you work in the current nursing unit/department

7.1. 0 - 2 years	
7.2. 2 - 4 years	
7.3. 5 - 10 years	
7.4. > 10 years	

**SECTION 2****Marking key for the questions/statements below:**

- 1 = Agree  
 2 = Disagree  
 3 = Not Applicable

**2.1. KNOWLEDGE**

**Guided by hospital policies, procedures standards, World Health Organisation (WHO) and Zambian centres for infection prevention and control.**

<b>VIARABLE - KNOWLEDGE</b>	<b>AGREE</b> <b>(1)</b>	<b>DISAGREE</b> <b>(2)</b>	<b>NOT</b> <b>APPLICABLE</b> <b>(3)</b>
2.1.1. Hospital acquired infections (HAI's) can be transmitted by medical equipment such as syringes, needles, catheters, stethoscope, thermometers, etc.			
2.1.2. Nosocomial infection is an infection that the patient comes with from home			
2.1.3. I know the World Health Organisation's '5 moments of hand hygiene.'			
2.1.4. Some instruments can be stored in an antiseptic solution for up to 36 hours			
2.1.5. If there is limited beds available, patients with communicable disease may be admitted in the same ward with other patients			
2.1.6. Micro-organisms are destroyed by using clean water			
2.1.7. Bathing every day is a universal precaution			
2.1.8. Standard precautions apply to all patients regardless of their diagnosis.			

2.1.9. I am familiar with hospital acquired infection guidelines			
2.1.10. All staff and patient should be considered potentially infectious			
2.1.11. You can handle body fluids with bare hands if gloves is not available			
2.1.12. I know how to prevent and control hospital acquired infections.			

## 2.2. ATTITUDES

**Guided by hospital policies, procedures standards, World Health Organisation (WHO) and Zambian centres for infection prevention and control.**

<b>VIARABLE - ATTITUDES</b>	<b>AGREE (1)</b>	<b>DISAGREE (2)</b>	<b>NOT APPLICABLE (3)</b>
2.2.1. I do not have to wash hand if I used gloves			
2.2.2. Policies and procedures for infection control should be adhered to at all times			
2.2.3. I should attend in-service training/workshop related to infection prevention and control regularly.			
2.2.4. The workload affects my ability to apply infection prevention guidelines.			
2.2.5. I am aware that patients expect me to wash hands before touching them and after touching them.			
2.2.6. I feel that the infection control policies and guidelines are enough in the hospital.			
2.2.7. It is not my responsibility to comply with the hospital acquired infection guidelines.			

2.2.8. Infection prevention guidelines are important to this hospital.			
2.2.9. I have enough time to comply with infection prevention guidelines			
2.2.10. I believe that following the prevention guidelines will reduce rates of hospital acquired infection.			
2.2.11. I should follow the procedure guidelines of the unit			
2.2.12. I feel that needles should be recapped after use and before disposal			

### 2.3. PRACTICES

**Guided by hospital policies, procedures standards, World Health Organisation (WHO) and Zambian centres for infection prevention and control**

<b>VIARABLE - PRACTICES</b>	<b>AGREE</b>	<b>DISAGREE</b>	<b>NOT APPLICABLE</b>
	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>
2.3.1. I always wash hands before and after direct contact with the patient?			
2.3.2. I always put on a mask and glasses when performing invasive and body fluid procedures			
2.3.3. Knowledge of infection prevention and control are being monitored in the hospital			
2.3.4. I attend in-service training/workshop related to infection prevention and control yearly.			
2.3.5. Surgical operation sites are shaved with razors			
2.3.6. The latest infection and prevention guidelines date is between 2015 and 2013			

2.3.7. Screening of patients are being done to detect colonisation even if no evidence of infection			
2.3.8. Vaccination is provided to staff			
2.3.9. Personal protective equipment are always accessible			
2.3.10. Our hospital monitors patients with urinary catheters for infection and gives feedback on urinary tract infection rates			
2.3.11. Infection prevention does not improve patient outcome			
2.3.12. We wear PPE when handling linens			
2.3.13. We shake linens out to release dust from the linen			

Thank you for taking time off in a busy schedule.

Contact details:

**Student:**

Mrs. P Chitimwango

Email: [nampundu.yande@gmail.com](mailto:nampundu.yande@gmail.com)

or University of Stellenbosch

Tel: 097 981 1757

Cel: +2776 162 4927

Tel: +2721 938 9036

Adress: Marybegg Clinic, 48 Chintu Road

P.O.Box, Kansenshi, Ndola, Zambia

**Supervisor:**

Mrs. D Hector

University of Stellenbosch

Email: [hectord@sun.ac.za](mailto:hectord@sun.ac.za)

Tel: +2721 938 9036

Cel: +2784 402 5260

**Co-supervisor:**

Mrs. A Damons

University of Stellenbosch

Email: [damonsa@sun.ac.za](mailto:damonsa@sun.ac.za)

Tel: +2721 938 9036



## Addendum C: Ethical Approval from Stellenbosch



### Approved with Stipulations New Application

17-Jun-2015  
Chitimwango, Priscilla P

**Ethics Reference #: S15/05/108**

**Title: Knowledge, attitudes and practices of nurses in infection prevention and control within a tertiary hospital in Zambia**

Dear Ms Priscilla Chitimwango,

The **New Application** received on **13-May-2015**, was reviewed by members of **Health Research Ethics Committee 1** via Expedited review procedures on **17-Jun-2015**.

Please note the following information about your approved research protocol:

Protocol Approval Period: **17-Jun-2015 -17-Jun-2016**

The Stipulations of your ethics approval are as follows:

**The Informed Consent Document should refer to Declaration of Helsinki 2013 and also include the contact details of the HREC.**

Please remember to use your **protocol number** (S15/05/108) on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

#### **After Ethical Review:**

Please note a template of the progress report is obtainable on [www.sun.ac.za/rds](http://www.sun.ac.za/rds) and should be submitted to the Committee before the year has expired. The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

Translation of the consent document to the language applicable to the study participants should be submitted.

Federal Wide Assurance Number: 00001372

Institutional Review Board (IRB) Number: IRB0005239

The Health Research Ethics Committee complies with the SA National Health Act No.61 2003 as it pertains to health research and the United States

Code of Federal Regulations Title 45 Part 46. This committee abides by the ethical norms and principles for research, established by the Declaration of

Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health).

### **Provincial and City of Cape Town Approval**

Please note that for research at a primary or secondary healthcare facility permission must still be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Contact persons are Ms Claudette Abrahams at Western Cape Department of Health (healthres@pgwc.gov.za Tel: +27 21 483 9907) and Dr Helene Visser at City Health (Helene.Visser@capetown.gov.za Tel: +27 21 400 3981). Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.  
For standard HREC forms and documents please visit: [www.sun.ac.za/rds](http://www.sun.ac.za/rds)

If you have any questions or need further assistance, please contact the HREC office at 0219399657.

#### **Included Documents:**

Declaration Mrs A Damons  
Declaration Ms R Chitimwango  
Questionnaire  
Participant information leaflet & consent form  
CV Ms P Chitimwango  
Protocol  
CV Mrs A Damons  
Declaration Mrs D Hector  
CV Mrs D  
Hector  
Application  
form  
Protocol Synopsis  
Checklist

Sincerely,

Franklin Weber  
HREC Coordinator  
Health Research Ethics Committee 1

# Investigator Responsibilities

## Protection of Human Research Participants

Some of the responsibilities investigators have when conducting research involving human participants are listed below:

1. Conducting the Research. You are responsible for making sure that the research is conducted according to the HREC approved research protocol. You are also responsible for the actions of all your co-investigators and research staff involved with this research.
2. Participant Enrolment. You may not recruit or enrol participants prior to the HREC approval date or after the expiration date of HREC approval. All recruitment materials for any form of media must be approved by the HREC prior to their use. If you need to recruit more participants than was noted in your HREC approval letter, you must submit an amendment requesting an increase in the number of participants.
3. Informed Consent. You are responsible for obtaining and documenting effective informed consent using **only** the HREC-approved consent documents, and for ensuring that no human participants are involved in research prior to obtaining their informed consent. Please give all participants copies of the signed informed consent documents. Keep the originals in your secured research files for at least fifteen (15) years.
4. Continuing Review. The HREC must review and approve all HREC-approved research protocols at intervals appropriate to the degree of risk but not less than once per year. There is **no grace period**. Prior to the date on which the HREC approval of the research expires, **it is your responsibility to submit the continuing review report in a timely fashion to ensure a lapse in HREC approval does not occur**. If HREC approval of your research lapses, you must stop new participant enrolment, and contact the HREC office immediately.
5. Amendments and Changes. If you wish to amend or change any aspect of your research (such as research design, interventions or procedures, number of participants, participant population, informed consent document, instruments, surveys or recruiting material), you must submit the amendment to the HREC for review using the current Amendment Form. You **may not initiate** any amendments or changes to your research without first obtaining written HREC review and approval. The **only exception** is when it is necessary to eliminate apparent immediate hazards to participants and the HREC should be immediately informed of this necessity.
6. Adverse or Unanticipated Events. Any serious adverse events, participant complaints, and all unanticipated problems that involve risks to participants or others, as well as any research-related injuries, occurring at this institution or at other performance sites must be reported to the HREC within **five (5) days** of discovery of the incident. You must also report any instances of serious or continuing problems, or non-compliance with the HRECs requirements for protecting human research participants. The only exception to this policy is that the death of a research participant must be reported in accordance with the Stellenbosch University Health Research Ethics Committee Standard Operating Procedures [www.sun025.sun.ac.za/portal/page/portal/Health\\_Sciences/English/Centres%20and%20Institutions/Research\\_Development\\_Support/Ethics/Application\\_package](http://www.sun025.sun.ac.za/portal/page/portal/Health_Sciences/English/Centres%20and%20Institutions/Research_Development_Support/Ethics/Application_package) All reportable events should be submitted to the HREC using the Serious Adverse Event Report Form.
7. Research Record Keeping. You must keep the following research-related records, at a minimum, in a secure location for a minimum of fifteen years: the HREC approved research protocol and all amendments; all informed consent documents; recruiting materials; continuing review reports; adverse or unanticipated events; and all correspondence from the HREC
8. Reports to the MCC and Sponsor. When you submit the required annual report to the MCC or you submit required reports to your sponsor, you must provide a copy of that report to the HREC. You may submit the report at the time of continuing HREC review.
9. Provision of Emergency Medical Care. When a physician provides emergency medical care to a participant without prior HREC review and approval, to the extent permitted by law, such activities will not be recognised as research nor will the data obtained by any such activities should it be used in support of research.
10. Final reports. When you have completed (no further participant enrolment, interactions, interventions or data analysis) or stopped work on your research, you must submit a Final Report to the HREC.
11. On-Site Evaluations, MCC Inspections, or Audits. If you are notified that your research will be reviewed or audited by the MCC, the sponsor, any other external agency or any internal group, you must inform the HREC immediately of the impending audit/evaluation.

## Addendum D

### Consent

TROPICAL DISEASES  
Tel/Fax +260212 615444  
P O Box 71769  
[tdrc-ethics@tdrc.org.zm](mailto:tdrc-ethics@tdrc.org.zm)  
NDOLA, ZAMBIA



RESEARCH CENTRE

**TDRC ETHICS REVIEW COMMITTEE**  
IRB REGISTRATION NUMBER : 00002911  
FWA NUMBER : 00003729

TRC/C4/10/2014

7<sup>th</sup> October 2014

Priscilla C. Chitimwango  
Investigator  
P. O. Box 48 Chintu Road  
kansenshi  
NDOLA

Dear Priscilla

**RE: ETHICAL APPROVAL OF STUDY PROTOCOL**

Reference is made to the above mentioned concerning the your protocol entitled  
"**Knowledge attitudes and practices of nurses on hospital acquired infections**"

On behalf of the Chairman of the TDRC Ethics Review Committee, I am pleased to  
inform you that your protocol has been reviewed and granted ethical approval.

You are required to submit at least two (2) progress reports annually. A final report to  
the Ethics Review Committee should also be submitted at the end of the study.

This approval is valid for the period 7<sup>th</sup> October 2014 to 7<sup>th</sup> October 2015.

The Committee wishes you and your team success in your studies and in the execution  
of the study.

Yours faithfully  
**TROPICAL DISEASES RESEARCH CENTRE**

Shepherd Khondowe  
**SECRETARY – TDRC Ethics Review Committee**

cc: Chairman – TDRC Ethics Review Committee



## **Addendum E**

### **PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM**

TITLE OF THE RESEARCH PROJECT: Knowledge, attitude and practices of nurses in infection prevention and control within a tertiary hospital in Zambia.

REFERENCE NUMBER: 15463427

PRINCIPAL INVESTIGATOR: CHITIMWANGO PRISCILLA CHISANGA

ADDRESS: Marybegg Community Clinic.

48 Chintu Road,

Kansenshi,

Ndola.

Zambia.

CONTACT NUMBER: +260979811757

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also your participation is entirely voluntary and you are free to decline to participate. If you say no this will not affect you negatively in anyway whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

The research study will be conducted at Ndola Central Hospital. The purpose of the research study is to determine the knowledge, attitudes and practices of all categories of nurses in infection prevention and control. The total of participants is anticipated to be 218 nurses. You are required to complete a questionnaire of 42 questions that would take approximately 40 minutes to complete.

Your input in this study is very important as it will enable the researcher to gather information that will benefit both nurses and patients. For example, nurses may benefit in attending infection control workshops every year, while improving the quality of nursing care that our patients receive. However there will be no financial benefits. No risk or harm will be anticipated during this study. The Health Research Ethics Committee of the University of Stellenbosch and the Ethics review Committee of the Tropical Disease Research Centre has approved this research study.

The information that will be collected will be treated as confidential and protected. The identity of the participants will remain anonymous. Only the researcher will have access to the information.

### **Declaration by participant**

By signing below, I ..... agree to take part in a research study entitled: **knowledge, attitudes and practices of nurses in infection prevention and control**.

I declare that:

- I have read this information and consent form and it is written in the language with which am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the study researcher feels it is in my best interest.

Signed at (place) .....on (date).....2015.

.....

**Signature of participant**

.....

**Signature of witness**

### **Declaration by investigator**

I (name) ..... declare that:

- I explained the information in this document to.....
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that she/he adequately understands all aspects of the research. As discussed above.
- I did not use the interpreter.

Signed at (place) .....on (date).....2015.

## Addendum F: Letter from the editor

C/o Division for Postgraduate Studies  
University of the Western Cape  
Private Bag X17  
Bellville 7535  
South Africa  
  
8 November 2016

To Whom It May Concern,

### RE: THE EDITED MASTER'S THESIS OF PRISCILLA CHISANGA CHITIMWANGO

I hereby acknowledge that the thesis of Priscilla Chisanga Chitimwango was edited by me. It had the title, *Knowledge, Attitudes and Practices of Nurses in Infection Prevention and Control within a Tertiary Hospital in Zambia*, and was the product of research towards Chitimwango's Master's of Nursing Science degree in the Faculty of Medicine and Health Sciences, Stellenbosch University. The work of editing mainly involved ensuring that the language usage and technical layout of the thesis were in accordance with the required standards.

Sincerely,



.....  
David Kwao-Sarbah

Mobile: +27620716979

Email: [dksarb@gmail.com](mailto:dksarb@gmail.com)



## Addendum G: letter requesting for total number of nurses at Ndola central Hospital.

Chitmwango Priscilla Chisanga

Marybegg Community Clinic

48 Chintu Avenue

Northrise

Ndola

Approved  
*[Signature]*



To the Senior Medical Supritendant

Ndola Central Hospital

Postal Agency

Ndola

20 June 2015

Dear Sir,

RE: REQUEST FOR TOTAL NUMBER OF NURSES OF ALL CATEGORIES AT YOUR HOSPITAL.

I hereby write to request for the above stated from your Hospital. I am a registered Critical Care Nurse based at MaryBegg Community Clinic persuing a Masters degree of Nursing at Stellenbosch University. I am suppose to conduct a study at Ndola Central Hospital (Approved by Ethics committee TDRC Ndola). The title for the study is: Knowledge, Attitudes and Practices of nurses in infection prevention and control.

I will be very grateful if my request can be considered.

Yours Sincerely

*[Signature]*

CHITIMWANGO PRISCILLA CHISANGA