PRACTICE OF INFECTION CONTROL MEASURES AMONG NURSING STUDENTS IN A TERTIARY ACADEMIC INSTITUTION IN BENIN CITY, EDO STATE.

BY

OKHAWERE OMOLEGHO RUTH

BMS2006834

FACULTY OF NURSING SCIENCE

COLLEGE OF MEDICAL SCIENCES

UNIVERSITY OF BENIN

BENIN CITY

OCTOBER, 2025

PRACTICE OF INFECTION CONTROL MEASURES AMONG NURSING STUDENTS IN A TERTIARY ACADEMIC INSTITUTION IN BENIN CITY, EDO STATE.

BY

OKHAWERE OMOLEGHO RUTH

BMS2006834

FACULTY OF NURSING SCIENCE

COLLEGE OF MEDICAL SCIENCES

UNIVERSITY OF BENIN

BENIN CITY

IN PARTIAL FULFILLMENT OF THE AWARD OF THE DEGREE OF BACHELOR OF NURSING SCIENCE, FACULTY OF NURSING SCIENCES, UNIVERSITY OF BENIN, BENIN CITY.

OCTOBER, 2025

DECLARATION

This is to declare that this research project titled **PRACTICE OF INFECTION CONTROL MEASURES AMONG NURSING STUDENTS IN A TERTIARY ACADEMIC INSTITUTION IN BENIN CITY, EDO STATE** was carried out by **OKHAWERE OMOLEGHO RUTH** is solely the result of my work except were acknowledged as being derived from other person(s) or resources.

MATRICULATION NUMBER: BMS2006834

FACULTY /COLLEGE: NURSING SCIENCE, COLLEGE OF MEDICAL SCIENCES, UNIVERSITY OF BENIN, BENIN CITY.

SIGNATURE: ______________________________

DATE: ______________________________

CERTIFICATION

This is to certify that this project was carried by **OKHAWERE OMOLEGHO RUTH** with Matriculation number **BMS2006834.** Faculty of Nursing Sciences, under the supervision of **MRS RUKAYAT LAWAL**

Signature: ____________________

____

MRS RUKAYAT LAWAL **DATE**

Project Supervisor

Signature: ____________________

____

PROF (MRS.) C. E. OMOROGBE **DATE**

Head of Department of

Medical surgical nursing

____

____

External Examiner

DATE

DEDICATION

This research project is dedicated to Almighty God, the source of all wisdom and knowledge. His divine guidance has illuminated my path, and his unwavering support has sustained me throughout this endeavour. May this work serve as a testament to His glory and inspire others to seek His blessings in all their pursuits.

ACKNOWLEDGEMENT

I would like to express my heartfelt to Almighty God, for His divine guidance, wisdom, knowledge, aspirations, and good health, which have enabled me to undertake this project. I would like to extend my sincerest gratitude to my supervisor, MRS. **RUKAYAT LAWAL** for her invaluable guidance, support, and commitment to excellence throughout this research journey.

I also wish to acknowledge the Dean of the Faculty of Nursing Sciences, Prof. F.U OKAFOR, Assistant Dean, Dr. T.A Ehwarieme, Head of Department (Medical Surgical Nursing) Prof. (Mrs), C.E Omorogbe, Head of department (Maternal and Child health Nursing) Prof. (Mrs) R.E. ESEWE and also Head of department (Community health Nursing) Prof. Mrs. J. A. Afemikhe for striving for excellence and upholding pristine standards in nursing education.

My profound gratitude also goes out to Mrs. N.E. Oyana for her motherly love, Dr (Mrs) C. E. Enuku, Rev. Sr. Joan Chukwura, Mrs C.C Edo-Osagie, Mrs. M.A Iniomor, Mrs. R. Lawal, Mrs. Ikhuobase, and Mr. Aragua as well as all other lecturers and non- academic staff for their immense contribution, dedication and support.

I also extend my heartfelt gratitude to my family, Mrs Queen Okhawere, my siblings and Mrs Adun Gladys for their unconditional love and unwavering support, which have been my driving force.

Special thanks to Mr Akpoghiran Fred for he's love and support in this academic journey.

I am incredibly grateful to my friends Rita, Gloria,success, Khim. Their encouragement, along with the support of so many other dear friends, made this research possible.

Special thanks to the study participants, who without their valuable insights this work would have not been possible Thank you for your trust and willingness to share your experiences.

ABSTRAST

This study assessed the practice of infection control measures, influencing factors, barriers, and the relationship between academic level and adherence among undergraduate nursing students in a tertiary institution in Edo State. A descriptive cross-sectional design was adopted, and data were collected from 244 students using a structured self-administered questionnaire. Analysis was done using SPSS version 27, with descriptive and inferential statistics applied. Findings revealed generally good adherence, particularly in hand hygiene (65.6%), proper disposal of sharps (70.5%), and use of personal protective equipment (60.7%). Compliance was lower for equipment disinfection (56.6%) and isolation precautions (53.3%), with a grand mean of 3.47. Factors positively influencing practice included belief in patient safety (72.1%), continuous education (64.8%), and supervision (62.3%). Major barriers reported were overcrowding (61.5%), time constraints (58.2%), workload (57.4%), inadequate PPE (53.3%), and insufficient supervision (52.5%). A Chi-square test revealed a significant association between academic level and adherence (χ^2 = 6.481, df = 4, p = 0.039), with 300-level students showing higher compliance (68.2%) than 400-level (59.3%) and 500-level (53.3%) students. The study concludes that while nursing students demonstrate commendable infection control practices, gaps remain, highlighting the need for stronger institutional support, continuous education, and resource provision to sustain compliance.

Keywords: Infection control, nursing students, practice, barrier, personal protective equipment, hand hygiene,

TABLE OF CONTENTS

Contents

DECLARATION iii
CERTIFICATION iv
DEDICATION v
ACKNOWLEDGEMENT vi
ABSTRAST vii
CHAPTER ONE 1
INTRODUCTION 1
Background to the Study 1
1.2 Statement of Problem 4
1.3 Aim of the study 5
1.4 Objectives of the Study 5
1.5 Research Questions 5
1.6 Hypothesis 5
1.7 Significance of the Study 5
1.8 Scope/ Delimitation of the Study 6
1.9 Operational Definition of Terms 7
CHAPTER TWO 8
LITERATURE REVIEW 8
2.1 Conceptual review 8
2.1.1 Concept of infection control measures 8
2.1.2 Historical evolution of infection control measures 9
2.1.3 Principles of infection control measures 11
Hand hygiene 11
2.1.4 Components of infection prevention measures 17
2.1.5 Factors that influence compliance to infection prevention measures 20
2.1.6 Barriers to compliance with infection control measures 21
2.2 Theoretical review 23
2.2.1 The Theory of Planned Behavior (TPB) 23
2.2.2 Application of Theory of Planned Behavior 27

2.3 Empirical review 28
2.3.1 Practice of infection control measures among nursing students 28
2.3.2 Factors influencing the practice of infection control measures among nursing students 32
2.3.3 Barriers to compliance with infection control measures among nursing students 37
2.4 Summary of literature review 41
CHAPTER THREE 42
METHODOLOGY 42
3.1 Research Design 42
3.2 Research Setting 42
3.3 Target Population 43
3.4 Sample Size Determination 43
3.5 Sampling Technique 45
3.6 Instrument for Data Collection 46
3.7 Validity of instrument 47
3.8 Reliability of the Instrument 47
3.9 Method of Data Collection 47
3.10 Method of Data Analysis 48
3.11 Ethical Considerations 48
CHAPTER FOUR 49
RESULTS 49
4.1 Demographic characteristics of respondents 49
4.2 Answers to research questions 50
4.3. Hypothesis testing 57
CHAPTER FIVE 60
DISCUSSION OF FINDINGS 60
5.1 Discussion of major findings 60
5.2 Summary of key findings 66
5.3 Implications to nursing 68
5.5 Recommendations 70
5.6. Limitations of the study 70
5.7 Suggestions for further research 71
References 72
APPENDIX I 89
APPENDIX II 93

CHAPTER ONE

INTRODUCTION

Background to the Study

"Infection control is not just a practice; it is a responsibility that safeguards both healthcare providers and patients. Infections have long been a hazard in hospital settings, threatening patient safety and taxing healthcare infrastructures. Every year, millions of individuals worldwide suffer from healthcare-associated infections (HAIs), many of which can be avoided with adequate infection prevention and control (IPC) strategies (Hill et al., 2024). infection prevention and control (IPC) measures, ranging from simple hand hygiene to more complicated protocols like as antimicrobial stewardship, are intended to break the chain of infection. However, due to staff shortages, budget restrictions, and inadequate training, these strategies are not regularly implemented in many hospitals (Zimba et al., 2022). The effects can be disastrous, including extended hospital stays, greater costs, and even death. In low-resource areas, where overcrowding and inadequate sanitation exacerbate the problem, the stakes are considerably higher.

Nursing students stand at the frontline of learning and applying these measures and are the heralds of a future in healthcare". Health Care Professionals are in the forefront of public health efforts to stop the transmission of disease and provide medical care to exposed or afflicted individuals more necessarily in instance of disease outbreaks. (Homer et al., 2021). In order to prevent the acquisition and spread of communicable diseases, healthcare workers professionals must have a solid understanding of how to use Personal Protective Equipment (PPE) appropriately and follow both Standard Precautions (SP) and Transmission-Based Precautions (Ungar et al., 2024). They frequently run the danger of contracting blood-borne infections including HIV, hepatitis B, and hepatitis C as a result of needlestick injuries. Additionally, they come into contact with human fluids and blood, which can be quite dangerous, particularly because HIV/AIDS remains a significant public health challenge in the Sub-saharan Africa, thus health care professionals must

apply infection prevention and control (IPC) principles to protect themselves. Nurses are at the vanguard of diagnosing transmissible infections (beginning with triage), initiating isolation, applying universal and transmission-based precautions, and evaluating multidisciplinary healthcare workers' adherence to infection prevention control practice in the clinical setting.

Healthcare-associated infections (HAIs) pose a significant threat to the safety of patients and healthcare workers (HCWs), and preventing them must be a top priority for healthcare systems and organisations (Alhumaid et al., 2021). HAIs occur in 5 to 15% of hospitalised patients and can affect 9-37% of individuals admitted to critical care units (ICUs) (WHO, 2021). Fortunately, up to 55-70% of HAIs could be prevented, measures like isolation precautions, which stop the risk of pathogen transmission (contact, droplet, and airborne precautions), and standard precautions, which include hand hygiene, the use of gloves, gowns, eye protection, cough etiquette, and the safe disposal of sharp objects, are widely used to prevent HAIs (Ji & Ye, 2024). The World Health Organization (WHO) (2022), defines infection prevention and control, or IPC, as a scientific method and workable solution intended to stop infections from harming patients and healthcare professionals. While it is a part of epidemiology, it is also crucial to the social sciences, infectious diseases, and global health. Infection Prevention and Control (IPC) is a systematic, evidence-based approach designed to prevent harm to patients, healthcare workers, and the community by reducing the spread of infections, including healthcare-associated infections (HAIs). It encompasses a broad range of strategies, including hand hygiene, the use of personal protective equipment (PPE), environmental cleaning, and antimicrobial stewardship (McCloy et al., 2024). IPC includes guidelines and measures such as sterilization of medical instruments, safe injection practices, and waste management. It is particularly important in hospital settings where infections such as catheter-associated urinary tract infections and ventilator-associated pneumonia pose significant risks (Dar, 2021).

The undergraduate education of healthcare professionals plays a vital role in shaping their attitudes toward implementing Infection Prevention and Control (IPC) guidelines in clinical practice (Amavasi & Zimmerman, 2024). However, prior studies have demonstrated that nursing students' understanding of IPC guidelines ranged from "satisfactory" to "disappointing," with reported levels of knowledge of important practice elements ranging from 49.6% to 89.3% (Hambridge et al., 2021). Awareness of best practice guidelines for standard precautions has been shown to be a key factor influencing adherence to these measures in clinical practice settings (Hamed et al., 2024). Nursing students can learn about IPC guidelines and standard precautions using synchronous instruction, self-directed online resource use, simulated learning, and experiential learning during clinical assignments. It is also feasible to teach and reinforce theoretical information using simulation in which behaviors are mimicked. Student nurses' comprehension of IPC appears to be impacted by what they learned in class, however contradictions between theory and practice may arise throughout practical training (Eronen et al., 2024).

Additionally, adherence to IPC guidelines depends on factors such as access to personal protective equipment (PPE), institutional policies, and the presence of structured IPC training programs. A study evaluating infection control education in long-term care facilities found that geriatric care workers often struggled with IPC protocols, and they expressed a need for more visual and hands-on training methods to improve compliance (Song et al., 2024). Also, a study assessing nurses' performance in infection prevention and control training reported that educational interventions significantly improved adherence to IPC protocols, particularly in high-risk environments like chest disease wards (Rezian et al., 2024), these findings emphasize the need for standardized, evidence-based IPC education programs to ensure that future healthcare professionals receive the necessary training to prevent infections effectively. Hence, this study seeks to assess the practice of infection control measures among nursing students in a tertiary institution in Edo state.

1.2 Statement of Problem

Infection control is a critical component of healthcare delivery, especially for nursing students who work directly with patients throughout clinical training. Adherence to infection prevention and control (IPC) strategies is critical for reducing healthcare-associated infections (HAIs), safeguarding patient health, and guaranteeing healthcare professional safety (Adams et al., 2021). Despite established guidelines from the World Health Organization (WHO) and the Nigerian Center for Disease Control (NCDC), research has shown that compliance with standard infection control protocols among healthcare workers, including nursing students, is inconsistent and frequently inadequate (Mutaru et al., 2022).

In the hospital, nursing students are exposed to various infectious agents during clinical rotations. Several factors may contribute to non-compliance with infection control measures, including inadequate knowledge, limited access to personal protective equipment (PPE), time constraints, improper supervision, and a lack of institutional enforcement of IPC protocols. These challenges not only compromise patient safety but also put nursing students at risk of occupational exposure to infectious diseases. Moreover, the rise in multidrug-resistant organisms (MDROs) and the persistent threat of hospital-acquired infections underscore the urgency of assessing infection control practices among nursing students. Without strict adherence to IPC measures, nursing students may unknowingly contribute to the transmission of infections within healthcare settings. Additionally, gaps in their infection control practices could reflect broader issues in nursing education, such as insufficient training, lack of practical reinforcement, and inadequate monitoring of IPC compliance.

In spite of an increased emphasis on infection prevention, there is little empirical evidence on how well nursing students in Edo State follow IPC recommendations. Understanding their infection control procedures, identifying challenges to compliance, and assessing institutional support

systems are critical for improving nursing education and practical training. This study aims to analyze nursing students' compliance with infection prevention and control procedures, investigate the factors influencing their adherence.

1.3 Aim of the study

The aim of this study is to assess the practice of infection control measures among nursing students in a tertiary institution in Edo state.

1.4 Objectives of the Study

1. The specific objectives of this study include to;
2. assess the practice of infection control measures among nursing students in a tertiary institution in Edo state.
3. identify the factors influencing the practice of infection control measures among nursing students in a tertiary institution in Edo state.
4. identify the barriers to compliance with infection control measures among nursing students in a tertiary institution in Edo state.

1.5 Research Questions

1. What is the practice of infection control measures among nursing students in a tertiary institution in Edo state.
2. What are the factors influencing the practice of infection control measures among nursing students in a tertiary institution in Edo state.
3. What are the barriers to compliance with infection control measures among nursing students in a tertiary institution in Edo state.

1.6 Hypothesis

H_0: There is no significant relationship between academic level of clinical nursing students and adherence to infection control measures.

1.7 Significance of the Study

To the Students

This study will enhance nursing students' knowledge and awareness of infection control measures, helping them develop proper habits that reduce the risk of hospital-acquired infections. It will also reinforce the importance of adhering to standard precautions, thereby fostering a culture of safety in their clinical practice.

To Nursing Practice

The findings of this study will provide valuable insights into the level of adherence to infection control measures among nursing students. This will help in identifying gaps in practice and recommending strategies to improve compliance, ultimately reducing the spread of infections in healthcare settings.

To the Nursing Profession

By addressing infection control practices at the student level, this study contributes to the overall improvement of nursing as a profession. It promotes adherence to global standards of infection prevention and control, thereby enhancing the credibility and professionalism of nursing practice.

To Nursing Research

This study will serve as a reference for future research on infection control practices among nursing students and other healthcare workers. It may also highlight areas that require further investigation, such as barriers to compliance and the effectiveness of different training approaches.

To Nursing Administration

The study will provide nursing administrators with data to assess the effectiveness of infection control training and policies within the institution. It may also inform the development of new protocols or reinforce existing ones to ensure nursing students adhere to best practices in infection prevention.

1.8 Scope/ Delimitation of the Study

This study focuses on the practice of infection control measures among nursing students.

This study is delimited practice of infection control measures among nursing students in a tertiary institution in Edo state and will be carried out in the University of Benin, Department of Nursing and Nursing science, Edo state.

1.9 Operational Definition of Terms

Infection Control Measures: In this study, refer to the standard precautions and practices adopted by nursing students to prevent and control the spread of infections in healthcare settings. This includes hand hygiene, use of personal protective equipment (PPE), safe injection practices, waste disposal, and environmental cleaning.

Practice of Infection Control Measures: In this study, refers to the extent to which nursing students consistently apply infection prevention techniques during their clinical training. It includes compliance with guidelines, proper handling of medical equipment, and adherence to hygiene protocols.

Nursing Students: In this study, refer to individuals undergoing formal education and training in nursing at University of Benin, Edo State. They participate in both theoretical and clinical training in preparation for professional nursing roles. This include nursing students from 300l to 500l who are in clinical training.

Factors: In this study, refer to any variable or condition that influences nursing students' adherence to infection prevention and control (IPC) measures. These factors may include knowledge level, availability of personal protective equipment (PPE), supervision quality, institutional policies, workload, and time constraints.

Barriers: In this study, refer to the factors that hinder or limit the effective practice of infection control measures among nursing students in a tertiary institution in Edo State. These obstacles may be knowledge-based, resource-related, attitudinal, or institutional, and they affect compliance with infection prevention and control guidelines in clinical settings.

CHAPTER TWO

LITERATURE REVIEW

This chapter focuses on the review of related literature under the headings; conceptual review, theoretical review and empirical review. These are organized in order of the most important to least important to the variable of interest. Necessary literature would be gotten from published and unpublished works, articles, journals and textbooks in this study.

2.1 Conceptual review

2.1.1 Concept of infection control measures

Infection control measures are defined as a systematic set of evidence-based actions, precautions, and protocols meant to prevent, decrease, and control the spread of infectious organisms in healthcare and community settings (Hill et al., 2024). This definition is more than just a technical term; it refers to a proactive and structured response to invisible threats that can spread through direct contact, contaminated surfaces, airborne particles, or droplets, causing illness in patients, healthcare workers, and bystanders (Alshahrani et al., 2024). This complex framework is implemented through what are known as standard precautions and transmission-based precautions. Standard precautions are universal and apply to all patient care circumstances, regardless of the suspected infection status. These include core procedures including appropriate hand hygiene, using gloves and gowns correctly, handling sharps safely, respiratory hygiene, and disinfecting patient-care equipment (Ramadan, 2023). Transmission-based precautions are additional measures that are implemented when patients are known or suspected to have highly transmissible pathogens. They include contact precautions (the use of PPE and dedicated equipment), droplet precautions (masking and patient isolation), and airborne precautions (negative pressure rooms and the use of N95 respirators (El Shazly et al., 2023). Infection control measures are defined as more than only therapeutic actions; they include institutional policy structures, surveillance systems, and continual education. It includes hospital-based surveillance of healthcare-associated

infections (HAIs), outbreak management strategies, antimicrobial stewardship, and environmental controls such as safe hospital design and engineering solutions to reduce cross-contamination risk (Okeke et al., 2024). In academic settings, especially for nursing students who are continuously switching between classrooms and clinical sites, infection control measures serve as both a learning tool and a moral commitment to patient safety and personal protection (Zgham et al., 2024).

2.1.2 Historical evolution of infection control measures

Infection control refers to a collection of actions intended to reduce the risk of illness spread within populations (Ukwenya et al., 2021). It includes both transmission-based and standard precautions. Any violation of these infection control measures promotes and maintains the infection chain's spread from patients to healthcare providers, other patients, and visitors (Noveen et al., 2023). It is a basic, evidence-based strategy that aims to protect patients, healthcare professionals, students, visitors, and caregivers from preventable infections (El Shazly et al., 2023). Infection control measures date back to ancient civilizations, where early types of cleanliness and primitive public health policies were recognized long before scientific validation. Ancient Egyptians embraced hygiene as part of religious ceremonies, bathing often and using antiseptics derived from natural oils and herbs to treat wounds and prevent infections, however their knowledge was spiritual rather than biological (Alhumaid et al., 2021). Similarly, Hippocrates, an ancient Greek physician, campaigned for clean settings and appropriate sanitation to prevent sickness, emphasizing environmental elements as contributors to health, even if germ theory was unknown (Vinh et al., 2024). In the Roman Empire, elaborate aqueducts and public baths demonstrated the importance of public cleanliness, and the separation of waste and pure water was one of the first kinds of environmental infection control methods (Ramadan, 2023). During plague outbreaks in medieval times, societies instinctively adopted quarantine practices, isolating ships and travelers for periods of forty days—a term derived from the Italian

"quarantino"—representing one of the earliest structured infection prevention efforts, even without understanding disease transmission mechanisms (Alshahrani et al., 2024). Additionally, ancient texts from India's Ayurveda and China's traditional medicine emphasized cleanliness in handling food and water, highlighting the intuitive recognition of contamination as a cause of illness (Hill et al., 2024). Although these early measures were based more on observation, tradition, and superstition than science, they formed the critical foundation upon which later, more systematic approaches to infection control were built. Early healthcare settings, such as monastic hospitals in medieval Europe, focused on cleanliness, fresh air, and isolation wards for the sick, illustrating a developing awareness of cross-contamination risks long before microbial causes were identified (Alhumaid et al., 2021). Despite a lack of modern knowledge, these ancient and medieval infection control efforts show that the concept of preventing disease spread through environmental and behavioral interventions has deep historical roots, laying the groundwork for later centuries' scientific advances in infection prevention and control (Vinh et al., 2024).

The germ theory of disease marked one of the most pivotal shifts in medical history, fundamentally transforming our understanding of infection causation and prevention. Before its acceptance, the dominant explanation for disease was the miasma theory, which attributed illness to foul air and environmental vapors. This perspective began to erode in the mid-19th century with scientific breakthroughs by Louis Pasteur and Robert Koch, who demonstrated that specific microorganisms were responsible for distinct infectious diseases. Pasteur's work on fermentation and his experiments disproving spontaneous generation offered critical experimental validation of germ theory (Hall et al., 2025). Robert Koch's discovery of the anthrax bacillus, tuberculosis, and cholera pathogens laid the groundwork for Koch's postulates, which provided a systematic framework for tying germs to disease and catalyzed contemporary infection control techniques (Hall et al., 2025). This pioneering work not only established sanitary procedures such as antisepsis and sterilization, but also paved the way for clinical microbiology and vaccine

production. Parallel to these advances, Ignaz Semmelweis pioneered clinical infection prevention through hand hygiene in obstetrics wards, reducing puerperal fever mortality rates long before microbial causation was accepted, though his contributions remained underappreciated during his lifetime (Dash et al., 2024). Germ theory had a far-reaching impact, reshaping public health campaigns and sanitary reforms all over the world. Educational efforts in bacteriology during the late 19th and early 20th centuries were instrumental in translating laboratory knowledge into community hygiene interventions, teaching both healthcare workers and the public to adopt infection prevention behaviors (Steere-Williams, 2023). The development of antiseptic surgery was a watershed moment in the history of infection prevention, transforming surgical practice from a high-risk endeavor to a much safer medical procedure. Early observations by Ignaz Semmelweis, who stressed hand hygiene in lowering maternal mortality, set the framework for antiseptic procedures (Barannyk et al., 2023). Building on this, Joseph Lister applied Louis Pasteur's germ theory by introducing carbolic acid (phenol) in the sterilization of surgical instruments and wound care, significantly reducing surgical infections and postoperative complications (Hinzpeter, 2023). Modern infection control measures have evolved into structured, evidence-based practices that include hand hygiene, environmental sanitation, standard precautions, transmission-based precautions, aseptic techniques, and the use of personal protective equipment (PPE), all supported by institutional guidelines from global organizations such as the WHO and CDC (Schlich & Strasser, 2022). Despite these gains, the COVID-19 pandemic exposed shortcomings in preparedness, resource allocation, and compliance with infection control policies, while also accelerating progress in areas such as quick vaccine development and enhanced cleaning techniques (Faltin & Figlerowicz, 2023).

2.1.3 Principles of infection control measures

Hand hygiene

Hand hygiene is often regarded as the most effective and essential approach for reducing healthcare-associated infections (HAIs). It consists of two important steps: handwashing with soap and water and hand rubbing with alcohol-based hand sanitizers. Handwashing is advised when hands are clearly unclean or come into contact with bodily fluids, but alcohol-based hand rubs are used when hands are not visibly dirty but require quick microbiological decontamination (Alharbi & Alshammari, 2024). Proper handwashing entails thoroughly cleaning all hand surfaces, including palms, backs of hands, between fingers, and beneath nails, for at least 40-60 seconds (Speth, 2023).

Scientific studies demonstrate that hand hygiene can prevent up to 50% of HAIs, making it a low-cost and important intervention in all healthcare settings (Costa, 2023). The WHO's Five Moments of Hand Hygiene — before touching a patient, before clean procedures, after exposure to body fluids, after touching a patient, and after touching patient surroundings — are essential for training healthcare providers and ensuring hand hygiene is performed at all critical points of care (Gupta et al., 2023). Unfortunately, compliance with adequate hand hygiene remains varied among healthcare professionals, with observed adherence rates ranging from 55% to 70%, and frequently lowest during "moment 1" — before patient contact, when it counts the most (Gupta et al., 2023). Handwashing is also important in reducing antimicrobial resistance (AMR) since it prevents drug-resistant organisms from spreading in both hospitals and communities (Bhattacharya, 2023). Hand hygiene education is an important part of nursing students' clinical training. Live demonstrations, simulations, the use of visual reminders, and direct supervision in clinical placements are examples of educational tactics that extend beyond lectures (Filatova et al., 2023). The emphasis is not just on the technique, but also on comprehending when and why hand cleanliness is necessary, so developing both skill and behavioral habit. Innovative teaching methods, such as UV lamps to highlight missing regions during handwashing and'secret observer' compliance monitoring, have been beneficial in reinforcing trainee adherence (Nwaogu, 2023).

Personal protective equipment

Personal protective equipment (PPE) is an important line of defense in infection prevention and control because it provides a physical barrier between healthcare personnel and infectious organisms. Gloves, gowns, masks, face shields, goggles, and respirators are all examples of personal protective equipment (PPE), and each is meant to guard against unique transmission channels such as droplets, aerosols, or direct contact with contaminated materials. Proper PPE use has been found to minimize healthcare-associated infections by up to 85%, especially during high-risk surgeries and outbreaks like COVID-19 (Aloufi et al., 2024). The notion of PPE use extends beyond simply wearing equipment; it necessitates proper donning and doffing processes to prevent self-contamination. According to studies, inappropriate glove or gown removal remains a major cause of contamination among healthcare professionals, particularly during crises when time constraints make adherence difficult (Pottier et al., 2021). Compliance issues are exacerbated by discomfort, insufficient supply, and views that PPE interferes with workflow – hurdles identified by up to 69.6% of healthcare workers in some contexts (Hassan, 2024). In the classroom, nursing students are taught that personal protective equipment (PPE) is more than just equipment; it is a professional requirement that protects both the caregiver and the patient from cross contamination. However, peer modeling, institutional rules, and availability all have an impact on student adherence. One study discovered that senior staff's behavior toward PPE use had a substantial impact on students' compliance, with poor example-setting leading to poorer adherence rates (Biku et al., 2021). Furthermore, hospitals with established PPE policies and continuous education programs reported improved levels of compliance among both staff and trainees Wahab & Adie, 2021).

Environmental cleanliness

Environmental cleanliness is a critical component of infection control, aiming to reduce the presence of microorganisms on surfaces, equipment, and in the healthcare environment.

Contaminated surfaces have been found as reservoirs for infectious organisms, which can considerably contribute to healthcare-associated illnesses (HAIs) if not properly cleaned and disinfected (Curryer et al., 2021). The necessity of environmental hygiene was emphasized even more during the COVID-19 pandemic, when the fast transmission of illness reaffirmed the need for strict cleaning practices in both clinical and community settings (Anicetus et al., 2022). Effective environmental cleaning entails routine and terminal cleaning of high-touch surfaces, patient care areas, and medical equipment with disinfectants that have been certified as effective against a wide range of pathogens (Feusner et al., 2023). Inadequate cleaning, particularly of peripheral surfaces such as door knobs, light switches, and IV poles, has been found to greatly increase the risk of disease transmission in hospital settings (Feusner et al., 2023).

Educational approaches have been effective in raising cleanliness standards. The TEACH CLEAN pilot study in Tanzanian hospitals found that systematic training for cleaning workers resulted in significant increases in microbiological cleanliness, with Aerobic Colony Counts decreasing significantly following educational intervention (Gon et al., 2021). Furthermore, research show that patient perceptions of cleanliness are related to healthcare satisfaction and trust, with cleaner settings leading to lower infection rates and improved patient outcomes (Stowe, 2022).

Safe injection practice

Safe injection practices are vital infection control measures aimed at ensuring that every injection administered is sterile, performed under aseptic conditions, and properly disposed of to prevent the transmission of infections. According to the World Health Organization, a safe injection is one that does not harm the recipient, does not expose the provider to avoidable risk, and does not result in waste that is dangerous to the community (Haja & Rizwan, 2023). Breaches in safe injection protocols — such as reusing needles, improper handling of multi-dose vials, and incorrect disposal — have been responsible for significant outbreaks of hepatitis B and C, as well as HIV, especially in resource-constrained settings (Beers, 2022). The use of sterile needles and

syringes, proper skin preparation, drawing medication in a sterile environment, and never reusing equipment between patients are all key elements of safe injection. Furthermore, injections should only be administered in designated clean areas, with sharps immediately disposed of in puncture-proof containers (Park et al., 2024). Studies highlight that continuous education and training are crucial, as healthcare workers who receive recent training show significantly better adherence to aseptic techniques (Ibrahim et al., 2021). Among nursing students, improper injection practices and needle-stick injuries are unfortunately common, with prevalence rates as high as 52.1% reported in academic studies, largely due to inadequate knowledge and improper techniques (Ibrahim et al., 2021). Training programs have emphasized the "six moments" of infection prevention in injection settings, mirroring WHO’s Five Moments for Hand Hygiene, to improve awareness and provider confidence (Harvey et al., 2022). Furthermore, strict monitoring and institutional policies regarding the use of single-use vials, appropriate labeling, and correct disposal procedures are associated with better compliance and reduced contamination events (Kottapalli et al., 2023).

Medical waste management

Medical waste management is a critical aspect of infection prevention, ensuring that hazardous and infectious waste generated in healthcare settings does not become a source of disease transmission to healthcare workers, patients, or the community. Biomedical waste includes sharps, pathological waste, microbiological cultures, pharmaceuticals, and items contaminated with bodily fluids — all of which, if improperly handled, pose significant risks of infections such as hepatitis B, hepatitis C, HIV, and other bloodborne pathogens (Omo & Hassan, 2024). The World Health Organization emphasizes that safe waste management begins with segregation at the point of generation, using color-coded bins for infectious, non-infectious, and sharps waste, followed by safe collection, transportation, treatment, and disposal (Khakimova & Tursunov, 2024). However, studies indicate that many health facilities, especially in low-resource settings, still face challenges

in enforcing these protocols. Inadequate segregation, improper labeling, and unsafe disposal methods such as open-air burning are common issues that increase the risk of environmental contamination and human exposure (Khakimova & Tursunov, 2024). The rise in disposable items — while reducing reuse-related infections — has also led to an exponential increase in waste volume, demanding better disposal infrastructure and continuous monitoring (Singh et al., 2024).

For nursing students, understanding medical waste management is integral to both patient safety and environmental health. Poor practices can expose them to needle-stick injuries and infections, which are preventable through strict adherence to waste handling protocols and regular training (Sujon et al., 2022). Hospitals with effective policies on waste disposal — including the use of secure, puncture-proof containers, designated disposal routes, and certified incineration or autoclaving facilities — report lower incidence of infections among staff and visitors (Attrah et al., 2022). Furthermore, during pandemic situations, the volume of infectious waste multiplies significantly, placing additional strain on healthcare systems. Effective management, as demonstrated during COVID-19, includes standardization of disposal protocols and increased environmental surveillance to prevent secondary transmission from waste sources (Pardhi & Khan, 2021).

Surveillance

Surveillance is one of the most critical pillars of infection prevention and control (IPC), providing real-time data that guides interventions, identifies outbreaks, and supports continuous quality improvement in healthcare settings (Shenoy & Branch-Elliman, 2023). Infection surveillance involves systematic collection, analysis, and interpretation of health data concerning healthcare-associated infections (HAIs), antibiotic resistance, and hygiene compliance — with findings used to inform both clinical practice and institutional policy (El-Saed et al., 2023). Surveillance systems can be active (through regular monitoring and sample collection) or passive (based on reported cases). Active surveillance has been shown to be more effective in early outbreak

detection and control, though it is resource-intensive (Shaikh et al., 2022). The shift toward automated and electronic surveillance systems has made real-time reporting and early intervention more feasible, as demonstrated by countries like Saudi Arabia, where the Health Electronic Surveillance Network (HESN) improved efficiency and data accuracy across hospitals (Humayun et al., 2021).

Education and continous training

Education and continuous training are critical components of infection prevention and control (IPC), ensuring that healthcare professionals and trainees, such as nursing students, stay current on best practices, build competency, and maintain safe behaviors in both clinical and academic settings. Infection control knowledge is not static; new pathogens, changing guidelines, and growing healthcare technologies necessitate ongoing learning and adaptation (Amavasi & Zimmerman, 2023). Formal education programs and repeated training have consistently been shown to improve knowledge retention, confidence, and clinical performance in infection control measures (Faraz et al., 2024). Studies using models such as the Kirkpatrick evaluation framework show that focused educational interventions result in behavioral improvements as well as measurable reductions in hospital-acquired infection rates (Faraz et al., 2024).

2.1.4 Components of infection prevention measures

Standard precautions

Standard precautions form the foundation of infection prevention and control, requiring their application to all patient care activities, regardless of the patient's diagnosis or infection status. These strategies are intended to limit the risk of transmission of both known and unknown sources of infection in healthcare settings (Emilia et al., 2024). Standard precautions include strict hand hygiene, proper use of personal protective equipment (PPE), respiratory hygiene and cough etiquette, safe injection practices, environmental cleaning and disinfection, and proper handling of

contaminated linens and sharp instruments (Hokororo et al., 2022). Despite the clarity of these guidelines, research from multiple settings reveals persisting gaps in adherence. Wong et al. (2021) revealed unsatisfactory compliance among healthcare personnel during the COVID-19 pandemic, with notable breaches in invasive operations and patient handling, which were partly due to dissatisfaction with institutional infection prevention measures. Furthermore, Bouchoucha et al. (2021) discovered that the presence of strong clinical leadership and contextual signals had a substantial influence on self-reported compliance among nursing students, emphasizing the importance of mentorship and environment in promoting adherence.

Transmission-based precautions

Transmission-based precautions are additional infection control measures used in conjunction with standard precautions when caring for patients who are known or suspected of being sick with diseases that can transmit by contact, droplet, or airborne routes (Sebastian et al., 2021). These precautions are necessary in healthcare settings to prevent certain forms of transmission and are customized to the pathogen's characteristics. Contact precautions include the use of gloves and gowns to prevent spread through direct or indirect contact; droplet precautions include surgical masks and patient isolation for infections spread by large respiratory droplets; and airborne precautions include negative pressure rooms and the use of N95 respirators for pathogens transmitted via airborne particles (Plachouras et al., 2023). Despite the essential role these measurements serve, research reveal significant knowledge and performance differences among healthcare personnel and nursing students. According to Alshafey et al. (2024), 56.8% of nurses in a fever hospital indicated low knowledge, and 95.5% demonstrated incompetent performance levels regarding transmission-based precautions, emphasizing the urgent need for on-duty training and performance monitoring. Furthermore, developing evidence about respiratory transmission patterns during the COVID-19 pandemic has prompted demands to improve guidelines and modify transmission-based precautions based on solid scientific findings (Yen et al., 2021). As a

result, transmission-based precautions are ever-changing, necessitating constant adaptation by healthcare staff and students, led by evidence-based protocols and institutional support.

Environmental cleaning and disinfection

Environmental cleaning and disinfection are critical components of infection prevention, focusing on the removal of organic matter and the elimination of dangerous bacteria from healthcare surfaces. Clostridioides difficile, methicillin-resistant Staphylococcus aureus (MRSA), and vancomycin-resistant enterococci (VRE) can survive on inanimate surfaces for long periods of time, serving as reservoirs for cross-infection if not effectively removed (Roshanali, 2022). Evidence suggests that routine cleaning and disinfection of high-touch surfaces like as bed rails, IV poles, door handles, and over-bed tables greatly reduces microbial contamination and the risk of HAIs (Verhougstraete et al., 2024). Recent randomized controlled research shown that, while standard disinfectant-based cleaning is still extremely effective, other techniques like probiotic cleaning may provide environmental advantages while maintaining patient safety (Leistner et al., 2023). Training, staff workload, and monitoring systems all continue to have an impact on compliance with correct cleaning practices. In one large-scale initiative, complete cleaning education, performance audits, and real-time feedback systems led to a significant drop in multidrug-resistant organism (MDRO) colonization (Leite et al., 2025).

Antimirobial stewardship

Antimicrobial stewardship is an important aspect of infection control that aims to optimize the use of antimicrobials, reduce antimicrobial resistance (AMR), and avoid healthcare-associated infections. Antibiotic misuse, including inappropriate prescriptions and inaccurate administration, has greatly contributed to the global increase of multidrug-resistant organisms (MDROs), compromising treatment effectiveness and infection control efforts (Zhou et al., 2021). Antimicrobial stewardship programs work by promoting evidence-based prescribing, monitoring antibiotic consumption, and intervening through feedback and educational outreach (Panditrao et

al., 2021). Recent study indicates that antimicrobial stewardship interventions combined with infection control measures provide in measurable reductions in antimicrobial resistance and healthcare-associated infections, particularly when accompanied by interprofessional education and collaborative practice methods. Furthermore, the role of nurses, notably student nurses, in AMS is becoming more prominent; nurses help by assuring appropriate administration, monitoring for adverse effects, and educating patients about antimicrobial usage (Lim et al., 2021). However, gaps in awareness and formal training remain, especially in low- and middle-income countries where structural and resource restrictions impede successful antimicrobial stewardship implementation.

2.1.5 Factors that influence compliance to infection prevention measures

Level of Knowledge

One important factor influencing adherence to IPC regulations is having sufficient knowledge. Guidelines are more likely to be followed by nursing students who are well-versed in infection transmission pathways, hand hygiene precautions, and safe medical equipment handling. Practice adherence is weakened by inadequate understanding in areas such as waste management and equipment disinfection (Shrestha et al., 2023).

Perception and Attitude

Strong compliance motivators include a good attitude toward infection prevention and the belief that these precautions are essential for patient and personal safety. Research indicates that adherence is stronger among students who have positive opinions and confidence in IPC measures (Inegbenosun et al., 2021).

Clinical Guidance and Modeling

Student compliance is significantly impacted by clinical teachers' and senior nurses' leadership and role modeling. Students are more likely to follow IPC procedures in settings with excellent leadership (Bouchoucha et al., 2021).

Methods of Instruction and Training

Compared to traditional classroom instruction alone, it has been discovered that simulation-based training and multimodal educational interventions improve nursing students' infection control compliance (Alanazi et al., 2023).

Institutional Support and Supply Availability

Compliance is influenced by the availability of essential supplies, including gloves, hand sanitizers, running water, and specific IPC rules. Research from Ghana and Nigeria shows that bad institutional policies and insufficient supplies act as obstacles to adherence (Ekuma et al., 2022); (Mutaru et al., 2022).

Clinical Stress and Workload

Under time pressure, students may put patient care ahead of rigorous infection control protocols, which has a detrimental effect on compliance (Muthoni et al., 2021).

Frequency and Duration of Clinical Exposure

As students get more accustomed to IPC procedures and expectations, more and more frequent exposure to clinical environments enhances compliance (Muthoni et al., 2021).

Local norms and cultural beliefs

Students' perceptions and practices of infection control can be influenced by local beliefs or misconceptions about infections in certain situations. To overcome these obstacles, training materials should be culturally adjusted (Botha et al., 2023).

2.1.6 Barriers to compliance with infection control measures

Inadequate IPC Resource Supply

One of the biggest obstacles to compliance is still the absence of necessary supplies including masks, gloves, hand sanitizers, and running water. In environments with limited resources, nursing students who are willing to comply might not be able to (Ekuma et al., 2022).

Absence of Clear Institutional Policies and Guidelines

Students are left without clear expectations when schools lack IPC policies that are effectively communicated and upheld, which results in uneven compliance (Ofili & Nwogueze, 2024).

Time Restraints and Clinical Workload

Due to heavy workloads and pressure to fulfill clinical requirements, students frequently overlook to use protective gear or practice good hand hygiene. This obstacle frequently occurs in crowded wards when patient care takes precedence over following procedures (Ezike et al., 2021).

Inadequate Clinical Leadership and Supervision

Nursing students' adherence is undermined in settings when senior staff members or clinical instructors do not set an example of appropriate IPC procedures (Bouchoucha et al., 2021).

Limited and Irregular Training

Knowledge gaps result from irregular or sporadic IPC training, especially in hands-on domains like waste management and equipment decontamination. According to Albarmawi et al. (2024), students frequently report receiving theoretical education without enough practical experience, which results in low compliance.

Low Risk Perception and Negative Attitudes

IPC measures are seen as excessive or unnecessary by some students, particularly those who feel that their own danger is little. According to Inegbenosun et al. (2021), this psychological barrier lowers motivation to follow recommended precautions.

Cultural Perceptions and Misconceptions

Adherence to IPC protocols can occasionally be hampered by cultural myths or traditional beliefs regarding the cause of sickness. Culturally specific education initiatives are required to overcome this obstacle (Botha et al., 2023).

Insufficient Feedback and Constant Monitoring

Students frequently complain about supervisors not following up with them or keeping an eye on

them, which gives the impression that adherence is not given priority. Students might keep engaging in risky behaviors if they don't receive feedback (Muthoni et al., 2021).

2.2 Theoretical review

This study reviews the Theory of Planned Behavior (TPB) which is well-suited for studying how attitudes, social influences, and perceived control shape nursing students' intentions and actual practice of infection control measures, accounting for both motivation and external constraints. This model is adopted as theory of best fit for this study.

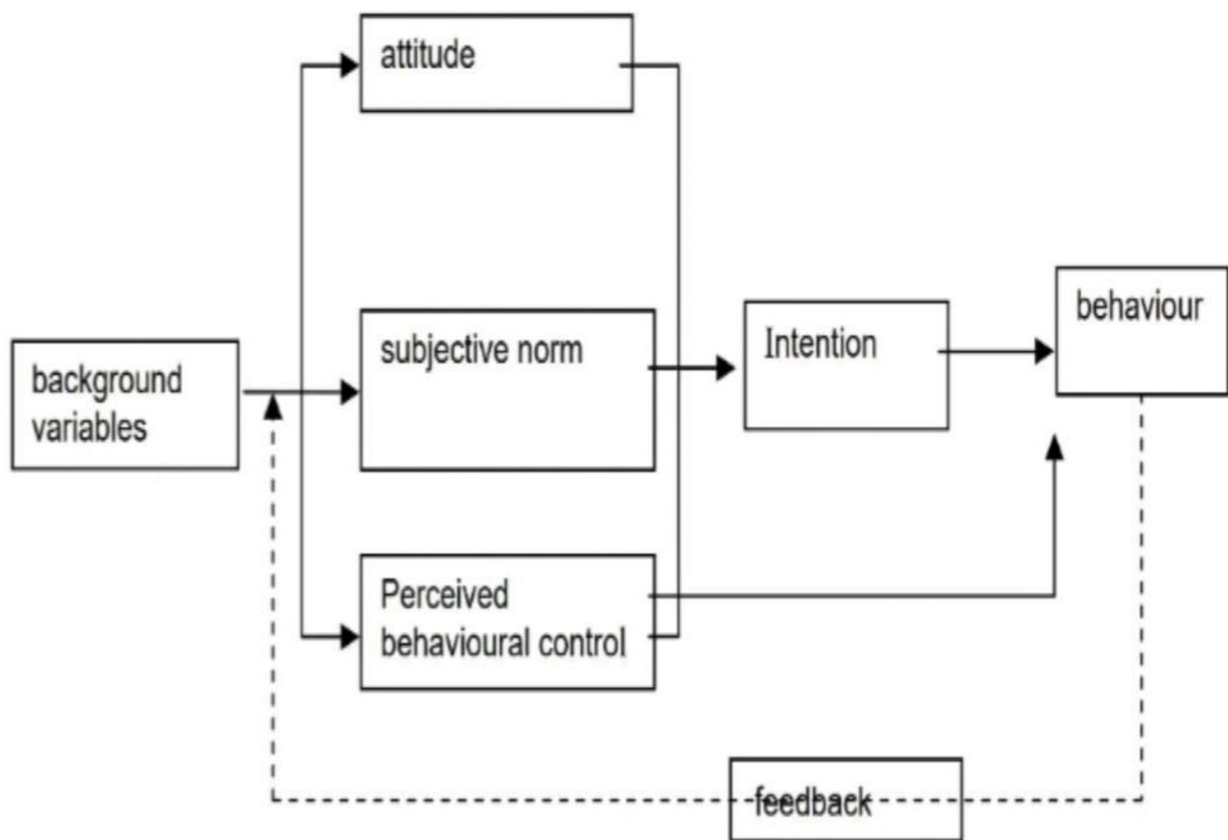

Figure 2.1. Adapted from theory of planned behaviour, Ajzen (1991).

2.2.1 The Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) is a psychological framework developed by Icek Ajzen in 1991 to explain and predict human behavior in various contexts. It builds upon the Theory of Reasoned Action (TRA) by incorporating an additional component—Perceived Behavioral Control (PBC)—to account for situations where individuals may face external or internal

constraints that influence their ability to perform a behavior. TPB posits that human behavior is not merely spontaneous but is guided by intentions, which in turn are shaped by attitudes, subjective norms, and perceived behavioral control.

The fundamental assumption of TPB is that an individual's intention to engage in a particular behavior is the most significant determinant of whether they will actually perform that behavior. However, the theory also acknowledges that intentions alone may not always translate into action if the individual perceives barriers that limit their control over the behavior. This makes TPB particularly relevant for understanding behaviors that require conscious decision-making and may be influenced by personal, social, and environmental factors.

The theory is widely used in fields such as health behavior, environmental psychology, workplace safety, education, and consumer behavior. By examining how attitudes, social pressures, and perceived control interact, TPB provides a structured approach to understanding why individuals choose to engage in—or refrain from—certain actions.

Components of the Theory of Planned Behavior

The Theory of Planned Behavior consists of three main components that shape an individual's behavioral intention: attitude toward the behavior, subjective norms, and perceived behavioral control. These components collectively determine the strength of an individual's intention, which in turn influences whether they will perform the behavior.

1. Attitude Toward the Behavior

Attitude toward the behavior refers to an individual's overall evaluation of a particular action as favorable or unfavorable. This evaluation is based on two key elements:

Behavioral beliefs – The individual's perception of the likely consequences of performing the behavior.

Outcome evaluations – The value the individual places on these expected consequences.

A person is more likely to develop a strong intention to engage in a behavior if they hold a positive attitude toward it, believing that it will lead to desirable outcomes. Conversely, if they perceive the behavior negatively, they may lack the motivation to perform it.

In the context of health behaviors, an individual who believes that regular physical exercise improves well-being and prevents disease is likely to have a positive attitude toward exercising. If they also place a high value on good health, their motivation to exercise will be strong. On the other hand, someone who perceives exercise as exhausting, time-consuming, or unnecessary may develop a negative attitude, reducing their intention to engage in it.

Attitudes are influenced by personal experiences, cultural background, education, and exposure to information. Over time, they can change as individuals acquire new knowledge, observe others, or personally experience the effects of a behavior.

2. Subjective Norms

Subjective norms refer to the perceived social pressure to perform or avoid a behavior. This component of TPB suggests that individuals take into account the opinions, expectations, and behaviors of important people in their social environment when deciding whether to engage in a behavior.

Subjective norms are determined by two key factors:

Normative beliefs – The individual's perception of whether influential people (such as family, friends, colleagues, or authority figures) approve or disapprove of the behavior.

Motivation to comply – The extent to which the individual is influenced by these social expectations.

If an individual perceives that significant others strongly support and expect them to engage in a behavior, they are more likely to develop a strong intention to do so. Conversely, if they feel that important figures in their life do not value the behavior or actively discourage it, their intention to engage in it may weaken.

For instance, in the case of smoking cessation, a person whose family, friends, and colleagues disapprove of smoking and encourage quitting is more likely to develop the intention to stop smoking. However, if their social circle consists of smokers who do not view quitting as important, they may feel less pressure to change their behavior.

Subjective norms play a crucial role in shaping socially driven behaviors such as workplace compliance, health practices, and ethical decision-making. Individuals are often influenced by peer behavior, cultural norms, and institutional expectations, making subjective norms a powerful force in behavior change.

3. Perceived Behavioral Control (PBC)

Perceived behavioral control refers to an individual's perception of their ability to perform a behavior, considering both internal and external factors that may facilitate or hinder execution. This concept is particularly important because it acknowledges that even if a person intends to engage in a behavior, they may not always follow through if they believe they lack the necessary resources, skills, or opportunities.

PBC is shaped by:

Control beliefs – The individual's perception of factors that may enable or obstruct the behavior (e.g., access to resources, time constraints, physical ability).

Perceived power – The degree to which the individual believes these factors will influence their ability to perform the behavior.

This component of TPB is unique because it can directly predict behavior, even in the absence of strong intention. If an individual believes they have full control over a behavior, they are more likely to perform it, regardless of their level of motivation. Conversely, if they perceive significant barriers, their likelihood of executing the behavior decreases, even if they have a strong intention.

PBC is particularly relevant in situations were external constraints, environmental factors, or lack of personal skills may affect behavior. It highlights the importance of addressing structural barriers and providing resources to facilitate behavior change.

Interaction Between the Components of TPB

The three components of TPB—attitude, subjective norms, and perceived behavioral control—interact to determine an individual’s intention, which then predicts behavior. The stronger the intention, the more likely the behavior will occur. However, perceived behavioral control can directly influence behavior, meaning that even if intention is present, actual behavior may not occur if PBC is low.

If an individual has a positive attitude toward a behavior, feels strong social support, and believes they have control over performing it, their intention to engage in the behavior will be high, and they are likely to follow through. However, if any of these components are weak—such as negative attitudes, lack of social encouragement, or perceived barriers—intention may be weak, reducing the likelihood of behavior execution.

2.2.2 Application of Theory of Planned Behavior

1. Attitude Toward the Behavior

Attitudes toward infection control measures reflect nursing students' personal beliefs and evaluations of these practices. If students believe that adhering to infection control measures (such as hand hygiene, proper use of PPE, and safe handling of sharps) effectively prevents infections and protects both patients and themselves, they are more likely to engage in these behaviors.

However, negative attitudes—such as seeing infection control as time-consuming, inconvenient, or unnecessary—can reduce their willingness to comply. These attitudes may be shaped by previous experiences, level of knowledge, or perceived effectiveness of the measures.

2. Subjective Norms

Subjective norms influence nursing students based on the social pressure and expectations from peers, instructors, and healthcare professionals. If students perceive that clinical instructors, supervisors, and fellow students expect and encourage strict infection control practices, they will be more likely to comply.

Conversely, if they observe non-compliance among senior colleagues, mentors, or even hospital staff, they may feel less obligated to follow protocols. The institutional culture and policies also play a role in reinforcing social norms, shaping whether infection control is perceived as a standard professional expectation.

3. Perceived Behavioral Control (PBC)

Perceived behavioral control refers to the students' confidence and ability to adhere to infection control measures, considering internal and external barriers. Even if they have positive attitudes and strong social support, they may struggle to comply if they lack access to PPE, proper training, or face time constraints during clinical rotations.

For example, if students feel they have adequate training, resources, and institutional support, they are more likely to practice infection control effectively. However, if they experience shortages of PPE, lack of supervision, or high patient workload, they may feel limited control over compliance, reducing their adherence to infection control guidelines.

barriers like lack of resources or institutional policies may still affect behavior even if individuals intend to comply.

2.3 Empirical review

This review aims to show areas of convergence and conflict by assessing the strength and weakness of reviewed studies with the aim of providing evidentiary value to this research study.

2.3.1 Practice of infection control measures among nursing students

Kim & Park, (2021) carried out a study aimed to examine compliance with infection prevention and control practice among nursing students who were about to graduate. A cross-sectional survey design was used. A total of 178 students from two nursing colleges in South Korea responded to self-reported questionnaires. Descriptive statistics, independent t-test, Pearson correlation, and multiple regression analysis were conducted. The findings revealed that the level of infection control practice compliance among Korean nursing students is moderate and majority of students have positive attitude towards infection control meaasures.

Alanazi et al. (2023) conducted a systematic review to identify effective strategies for improving infection control practices among prelicensure nursing students. A systematic search of peer-reviewed English literature published before October 2021 was conducted in three databases, followed by critical appraisal. Outcomes included either observed or self-reported infection control behaviors. Twelve eligible studies met inclusion criteria for qualitative synthesis. Results showed that studies that used integrated simulation or multimodal treatments had higher infection control compliance rates than those that focused on traditional teaching. The assessment identified intervention/instrument heterogeneity and poor control concluding didactic infection control education should be supplemented with other methods, but more controlled trials are needed to determine which approach is most beneficial.

Bouchoucha et al. (2021) investigated undergraduate nursing students' self-reported compliance with Standard Precautions in the School of Nursing and Midwifery at an Australian University. A cross-sectional survey design was used, all undergraduate nursing students were invited to participate in an online survey; 321 participated, mean age 25.7 years (SD = 8.4). The majority, 196 (61%), had no healthcare work experience, 54 (17%) were patient-care assistants, 40 (13%) enrolled nurses, and 31 (9%) were nurses registered overseas, a validated instrument was used; the Compliance with Standard Precautions Scale (CSPS) and Linear regression was used to measure the impact of psychosocial factors on self-reported compliance. Findings revealed overall self-

reported compliance with prevention of cross-infection was 83%, use of Personal Protective Equipment (81%), correct disposal of sharps (83%) and general waste (75%), and equipment decontamination (69%). Multivariate linear regression demonstrated that after adjusting for age, gender and years of nursing study, the Leadership factor predicted participants' self-reported compliance on the 'prevention of cross-infection' ($p < .001$), 'use of PPE' ($p < .001$), 'waste disposal' ($p = .021$), and 'decontamination of equipment' ($p < .001$) sub-domains of the CSPS. These findings highlight that strong clinical leadership and role modelling are essential to ensure all healthcare students prioritise rigorous adherence with infection prevention and control guidelines.

Albarmawi et al. (2024) carried out a study aimed to measure nursing students' adherence to infection prevention and control protocols in Saudi Arabia. This study included a pretest-posttest time series follow-up and an observational part. During the first part of the study, students attended a workshop, which was preceded by a pretest. It was then followed by a posttest directly after finishing the workshop and in 12 weeks. Participants were submitted to an observational part by a trained observer to document certain skills taught earlier during the workshop. Students from three nursing schools in Saudi Arabia participated in the study. A total number of 130 completed the study protocol, and 100 completed the observation part. Results revealed that students were found to experience an improvement in their knowledge, beliefs, and commitment scales after the workshop. The attitude scale remained relatively unchanged over different tests. Most students performed the skills properly and adequately, but some failed to perform certain skills, like hand rub, and the proper use of disinfectants.

Al-Quraan et al. (2024) carried out a study aimed to assess the knowledge and practice of infection control measures among nurses in Jordan. A non-experimental, descriptive cross-sectional design was used in a not-for-profit, specialised cancer centre and two private hospitals in Jordan. A self-reported questionnaire was completed by 267 nurses. The questionnaire was

divided into three parts. The first part collected sociodemographic data. The second part consisted of 17 multiple-choice questions assessing knowledge of infection control measures, with a score range of 0–17. The third part comprised 16 questions on a 5-point Likert scale (1=strongly disagree; 5=strongly agree), with a higher mean score indicating better self-reported infection control practice. Responses were analysed using standard statistical methods, with a P value of 0.05 indicating statistical significance. Findings showed The majority of the sample were women (65.2%), with a mean age of 26.7±2.1 years. The mean total knowledge score was 13.81 out of 17.00 and the mean practice score was 4.02 out of 5.00. Significant differences were found across groups depending on hospital type (private vs not for profit), area of practice, years of experience, level of education and whether respondents had received specific training.

Ekuma et al. (2022) carried out a study aimed to assess and identify gaps in IPC practice across selected hospitals in Akwa Ibom State. A survey of hospitals in Akwa Ibom State in Southern Nigeria. Information for each hospital was provided by IPC representatives of each hospital through a 24-point questionnaire covering administrative controls, hand hygiene, available laboratory tests for infections, and waste disposal. Results revealed that There were 25 hospitals across 15 local government areas in the state included in the survey. The average number of beds in the hospitals was 57 (6–300); the average number of wards was 6 (1–20); the average number of staff was: doctors 9 (2–40); nurses 33 (6–200); other staff 19 (3–100). There were 16 hospitals with a designated staff to oversee IPC activities, 4 with a staff dedicated to IPC activities, and one with a written IPC policy. Adequate number of hand washing stations was reported in 11 centers while 9 had regular supply of running water and 9 had regular supply of alcohol-based hand sanitizers for hand hygiene. There was low capacity for onsite microbiology cultures to identify infectious agents, although most centers had HIV and hepatitis B virus rapid diagnostic test kits.

Akinwaare et al. (2020) conducted research titled "Perceived barriers, knowledge and reported practices of infection prevention and control among clinical nursing and medical students of a

Nigerian University".A descriptive cross-sectional study design was utilized for this study. A total of 239 clinical students participated in the study. Simple random sampling technique was used to select eligible participants. An interviewer-administered structured questionnaire was used to collect relevant information from the participants. Findings revealed the greatest proportions of the respondents, 91.6%, have adequate knowledge about infection control. However, a large proportion of them, 43.4%, have low compliance to infection control measures.

Olorunfemi et al. (2020) carried out an investigation to find out the level of knowledge and practice of infection control (KPIC) among student nurses posted to Medical-Surgical and Burns Unit, and also determine if knowledge level will statistically predict the practice of infection control. A cross-sectional study was conducted on student nurses posted to Burns and Medical-Surgical Unit of University of Benin Teaching Hospital, Nigeria, 2019. This study was conducted among 100 student nurses who were posted to Medical-Surgical and Burn Units through census method and KPIC questionnaires were administered. Data collected were analyzed using descriptive statistics and Spearman's correlation coefficient at 0.05 significant levels. Results showed that the nursing students had low knowledge and do not practice infection prevention with mean score of 15.38 (3.32) and 14.17 (2.80), respectively. The result also revealed that there is a significant relationship between KPIC among nursing students using Spearman's correlation coefficient, which showed $P < 0.001$. it was concluded that the level of KPIC measures was poor among nursing students, and those who are knowledgeable about infection control also have high compliance to infection control; they therefore, recommended laborious training on infection control measures of nursing students prior to clinical posting.

2.3.2 Factors influencing the practice of infection control measures among nursing students

Bouchoucha et al. (2021) conducted a study in Australia to investigate the factors influencing undergraduate nursing students' compliance with infection prevention and control measures. The research was carried out at the School of Nursing and Midwifery in an Australian university,

utilizing a cross-sectional survey design. A total of 321 nursing students participated in an online survey, which included validated instruments such as the Compliance with Standard Precautions Scale and the Factors Influencing Adherence to Standard Precautions Scale—Student Version (FIASPS-SV). The study employed linear regression analysis to assess the impact of psycho-social factors on self-reported compliance with infection control practices. Findings indicated that strong clinical leadership and contextual cues significantly predicted students' adherence to infection control protocols. Specifically, leadership was identified as a crucial factor influencing compliance in key areas such as the prevention of cross-infection ($p < .001$), use of personal protective equipment ($p < .001$), waste disposal ($p = .021$), and decontamination of equipment ($p < .001$). The study concluded that fostering strong leadership and role modeling within clinical settings is essential for ensuring that nursing students rigorously adhere to infection control guidelines.

Similarly, Kim and Park (2021) carried out a study in South Korea to examine compliance with infection prevention measures among final-year nursing students. The research was conducted in two nursing colleges using a cross-sectional survey design. A total of 178 nursing students completed self-administered questionnaires, and the data were analyzed using descriptive statistics, independent t-tests, Pearson correlation, and multiple regression analysis. The findings revealed that students demonstrated moderate levels of compliance with infection prevention measures, with the highest adherence recorded in cross-infection prevention (4.42 ± 0.54) and the lowest in the use of protective devices (3.86 ± 0.78). Further analysis showed that students' perception of a safe clinical environment ($\beta = 0.28$, $p < 0.001$) and a positive attitude toward infection prevention ($\beta = 0.18$, $p = 0.014$) were significant predictors of compliance. The study emphasized the need for nursing education to reinforce positive attitudes toward infection control and to create a healthcare environment that prioritizes safety.

Shrestha et al. (2023) conducted a study in Nepal to assess the knowledge, perception, and confidence in performing infection prevention and control measures among nursing students. This cross-sectional descriptive study was conducted among 163 nursing students, who were selected using a purposive sampling method. Data were collected through self-structured questionnaires distributed via email. The questionnaire assessed multiple domains, including general principles, waste management, and confidence in infection control practices. The results indicated that while students had fair overall knowledge (71%), there were notable gaps in specific areas, particularly waste management, where knowledge was as low as 2%. The study also found that students' confidence in infection control measures was strongly correlated with both their knowledge and perception levels. The researchers recommended that nursing curricula be revised to include standardized infection prevention content across all nursing schools to improve students' competency in infection control measures.

Another study in Indonesia by Suarnianti & Haskas (2023) aimed to determine factors influencing the practice of infection prevention and control among nurses in Makassar City, South Sulawesi. This descriptive survey included 360 nurses across four hospitals, with data collected between January and June 2021. The study employed the canonical multivariate test for data analysis. Findings revealed that self-labeling as an at-risk individual ($r = 0.703$) and a strong commitment to infection prevention ($r = 0.791$) were key determinants of adherence to infection control measures. Additionally, nurses who actively sought information on infection prevention practices demonstrated significantly higher compliance rates ($r = 0.884$, $p < 0.05$). The study concluded that strengthening nurses' self-awareness and commitment is vital for improving infection control practices.

In Eastern Uganda, Julius (2022) conducted a study to identify factors associated with the prevention and control of hospital-acquired infections (HAIs) among nurses, including nursing students. The research was carried out at Ngora Fredica Hospital in Ngora District using a

descriptive cross-sectional design. The study involved nurses and nursing students, with data collected via self-administered structured questionnaires. Descriptive statistics and chi-square analysis were used for data analysis. The findings revealed that 63.6% of nurses were knowledgeable about causes of HAIs and 77.3% understood modes of transmission. Positive practices were observed in medical waste segregation (85.2%) and safe disposal of sharps (92%). Key factors influencing adherence to infection prevention measures included gender (female nurses showed higher compliance), shorter work experience (less than four years), and educational cadre. The study concluded that individual characteristics and level of knowledge significantly influenced adherence to infection prevention and control practices.

In Kenya, Muthoni et al. (2021) carried out a descriptive cross-sectional study to assess nurse-related factors influencing adherence to World Health Organization guidelines on the prevention of surgical site infections (SSIs). The study was conducted in a selected hospital in Central Kenya with a target population of 115 nurses, including nursing students undergoing practical placements. Stratified random sampling was used, and data were collected using self-administered questionnaires and checklists. The data were analyzed using SPSS version 26 with chi-square tests applied to identify associations. The study found that 55.1% of nurses demonstrated low adherence to WHO guidelines. Factors that significantly influenced compliance included knowledge levels ($p = 0.012$), frequency of caring for surgical patients ($p = 0.003$), use of proper hair removal tools before surgery ($p = 0.043$), and work experience ($p = 0.032$). The study concluded that improved knowledge, frequent patient exposure, and professional training were crucial determinants of adherence to infection prevention measures.

In Somalia, Said et al. (2023) conducted a cross-sectional study to determine infection prevention practices and associated factors among healthcare workers, including nursing students, in public health facilities in Mogadishu. The study took place in government health facilities, with a sample of 562 healthcare workers selected using systematic random sampling. Data were collected using

pretested self-administered questionnaires and analyzed with SPSS using logistic regression. The study found that only 42.4% of respondents had good infection prevention practice. Significant factors influencing compliance included positive attitudes toward infection prevention (AOR=0.478), occupational training (AOR=0.177), work experience (AOR=3.215), availability of infection prevention guidelines (AOR=0.489), and availability of dedicated budgets (AOR=0.421). The study concluded that improving attitudes, training, and resource availability are essential to improving adherence to infection control measures.

In Ghana, Balegha et al. (2021) conducted a cross-sectional study to assess the knowledge, attitude, and practice (KAP) of hepatitis B infection (HBI) prevention and associated factors among nursing students. The research was carried out among 402 nursing students from two nursing training colleges in the Upper West Region. Data collection was done through an online structured questionnaire, and composite scores were computed for knowledge (maximum score of 18), attitude (maximum 8), and practice (maximum 8). Data were analyzed using STATA and a generalized ordered logistic regression model. Findings revealed moderate knowledge (median score 12), moderate attitude (median 6), but poor practice (median score 5) among students. Factors significantly associated with better practice included being male, in second year, having parents with tertiary education, and having a high knowledge level. The study recommended targeted interventions for female, first-year, and unmarried nursing students to improve compliance with infection prevention practices.

In Sierra Leone, Kamara et al. (2022) conducted a study assessing the knowledge and factors influencing compliance with infection prevention measures among nursing students and healthcare workers in urban hospitals. The research was conducted in three major urban hospitals in Freetown, employing a descriptive cross-sectional design. The study sampled 312 participants, including 102 nursing students, selected via stratified random sampling. Data collection involved interviewer-administered questionnaires, and analysis was performed using SPSS with chi-square

tests and logistic regression. The findings indicated that 62% of nursing students had moderate knowledge of infection prevention, but only 48% demonstrated good compliance. Key factors influencing compliance included prior infection prevention training (AOR = 2.4, $p < 0.05$), availability of protective equipment (AOR = 3.1, $p < 0.01$), and supportive supervision (AOR = 2.7, $p < 0.05$). The study concluded that structured training and improved supervision are crucial for enhancing adherence to infection control practices among nursing students.

Ezike et al. (2021) focused on infection control practices among nurses in neonatal intensive care units in Enugu, Nigeria. Fifty-eight nurses participated in this cross-sectional descriptive study using both questionnaires and observational checklists. Findings revealed poor adherence to effective handwashing and instrument decontamination despite good waste disposal practices. The variance in infection control practice strategies was statistically significant ($F = 22.79$; $p < 0.05$), suggesting that factors beyond knowledge, such as institutional support and availability of supplies, influenced practices

Ofili and Nwogueze (2024) conducted a study at Central Hospital, Sapele, Delta State, focusing on factors impacting nurses' compliance with infection prevention and control protocols. Using a descriptive research design and convenience sampling, data from 100 retrieved questionnaires revealed that while nurses had adequate knowledge, key barriers included poor provision of IPC supplies (44%) and absence of clear institutional policies (23%). The study emphasized the urgent need for institutional frameworks and consistent provision of materials to enhance compliance levels.

2.3.3 Barriers to compliance with infection control measures among nursing students

Bouchoucha et al. (2021) conducted a study aimed at investigating undergraduate nursing students' knowledge and self-reported compliance with standard infection prevention precautions. This study was conducted at the School of Nursing and Midwifery, an Australian university, using a cross-sectional survey design. A total of 321 undergraduate nursing students participated in an

online survey. Data collection utilized validated instruments, including the Compliance with Standard Precautions Scale (CSPS), and analysis was done using linear regression to identify factors influencing compliance. The findings showed that students had high knowledge regarding the prevention of cross-infection (83%), but weaker knowledge was noted in equipment decontamination (69%). The regression analysis identified clinical leadership and contextual cues as significant predictors of students' compliance, indicating that while knowledge was strong in some areas, institutional support and role modeling were essential to translate knowledge into consistent practice.

Shrestha et al. (2023) conducted a study aimed at assessing the knowledge, perception, and confidence in infection prevention and control measures among nursing students. The research was carried out in Nepal using a cross-sectional descriptive design. A purposive sample of 163 nursing students participated in the study, with data collected through self-structured questionnaires distributed via email. The questionnaire consisted of four parts: demographic information, knowledge (40 items), perception (42 items), and confidence in performance (42 items). Data were analyzed using descriptive and inferential statistics, including Scheffe's post hoc test and Pearson correlation test. The study findings revealed that although students had a fair overall knowledge level (71%), there were significant knowledge gaps in waste management, where only 2% showed adequate understanding. The study concluded that inadequate knowledge in key areas could negatively affect infection prevention practices and recommended curriculum revisions with a focus on standardized infection prevention content for nursing students.

In Saudi Arabia, Albarmawi et al. (2024) conducted a multi-institutional follow-up observational study to measure nursing students' knowledge and adherence to infection prevention and control protocols. The study involved students from three nursing schools and employed a pretest-posttest time series follow-up design along with observational assessments. A total of 130 students completed the study, with 100 participating in observational components. Data were collected

using pre- and post-tests surrounding an educational workshop and analyzed using descriptive statistics. The results showed significant improvements in students' knowledge scores after attending the workshop, with corresponding increases in beliefs and commitment to infection prevention protocols. However, the attitude scale remained relatively unchanged. Observational assessments revealed that most students performed practical skills correctly, although some deficiencies were observed in proper hand rub technique and disinfectant use. The study highlighted the positive impact of structured education and recommended regular training to sustain knowledge improvement.

Silago et al. (2022) conducted a cross-sectional hospital-based study aimed at determining the knowledge, attitudes, and practices of hand hygiene — a core component of infection prevention — among nursing students and nurse staff in Mwanza, Tanzania. The study setting included two health centres, two district hospitals, one regional referral hospital, and one zonal referral hospital. A total of 726 nurses and nursing students aged between 18 and 59 years participated, selected via convenience sampling. Data were collected using pretested structured questionnaires and analyzed with STATA version 13. The results indicated that 76.4% of participants had a good level of knowledge of hand hygiene, attributed to rigorous training provided during the COVID-19 pandemic. The study also found that being a student nurse was associated with lower odds of good knowledge compared to nurse staff (OR: 0.30, $p<0.001$), and that education level and work experience significantly influenced knowledge. The study concluded that ongoing training and continuous education efforts are critical to maintaining and improving knowledge levels among student nurses.

Olebo (2024) conducted a cross-sectional mixed-methods study in Kasese District, Uganda, investigating infection prevention and control practices and associated factors among healthcare workers, including nursing students, in preparation for Ebola outbreaks. The study was carried out across six Health Centre III facilities near the Democratic Republic of Congo border. A sample of

106 healthcare workers was purposively selected. Data collection involved structured questionnaires, with descriptive statistics and logistic regression used for analysis. Findings revealed that 72.6% of participants exhibited poor IPC practices, with knowledge and duration of IPC training emerging as significant factors influencing compliance ($p<0.05$). The study emphasized that insufficient knowledge and irregular training opportunities among student nurses were key contributors to low IPC adherence. Recommendations included routine IPC training integrated into both the curriculum and professional development plans for nursing students

Ranoto et al. (2025) conducted a qualitative study to assess infection prevention and control (IPC) nurses' knowledge, attitudes, and practices in public hospitals in Limpopo Province, South Africa — relevant to North African contexts as part of broader continental studies. The study used a descriptive qualitative design with semi-structured interviews of IPC nurses from 12 public hospitals. The data were analyzed using thematic analysis. Findings revealed that while nurses and students demonstrated good theoretical knowledge, practical challenges, limited resources, and systemic issues hampered full implementation of infection control practices. Themes such as affective mood, coherence of interventions, and perceived efficacy influenced knowledge application. The study recommended focused training and institutional support to bridge the gap between theoretical knowledge and clinical practice.

Mutaru et al. (2022) carried out a cross-sectional study in Yendi Municipality, Northern Ghana, aimed at assessing nurses' knowledge of infection prevention and determinants of compliance with infection prevention measures. The study was conducted in Yendi Municipal Hospital, involving 209 nurses recruited using a stratified random sampling technique. Data were collected with adapted structured questionnaires and analyzed using SPSS with descriptive statistics and binary multivariate logistic regression. The results revealed high knowledge scores (mean 7.26 out of 10) and good compliance with IPC guidelines (mean 5.41 out of 8). Availability of IPC guidelines in departments (aOR: 3.48; $p=0.03$) and working in maternity or outpatient wards were

significant predictors of higher compliance. The study concluded that while nurses had good knowledge, ensuring departmental guidelines and consistent training were key to improving adherence.

Akinwaare et al. (2020) conducted research titled “Perceived barriers, knowledge and reported practices of infection prevention and control among clinical nursing and medical students of a Nigerian University”.A descriptive cross-sectional study design was utilized for this study. A total of 239 clinical students participated in the study. Simple random sampling technique was used to select eligible participants. An interviewer-administered structured questionnaire was used to collect relevant information from the participants. Findings revealed respondents identified unavailability of gloves, 88.9%, non-availability of colour codes for waste disposals, 73.2%, lack of time, 75.3%, tasking nature of hand washing, 76.2%, as major barriers to effective infection control practices.

2.4 Summary of literature review

The review of literature for this study comprehensively addressed infection prevention and control measures by discussing key concepts, historical developments, principles, and components essential to infection control. The conceptual review highlighted that infection control measures are institutional frameworks that involve hand hygiene, use of personal protective equipment, environmental cleaning, safe injection practices, medical waste management, surveillance, and continuous education. The historical evolution traced early infection control efforts from ancient practices to modern, evidence-based guidelines shaped by germ theory and scientific discoveries.

The theoretical review adopted the Theory of Planned Behavior (TPB), demonstrating its relevance in understanding how attitudes, subjective norms, and perceived behavioral control influence nursing students' compliance with infection control measures. This theory effectively explained the role of personal beliefs, social expectations, and perceived ability in shaping

behavior, though its limitations in accounting for spontaneous actions and environmental constraints were also acknowledged.

The empirical review presented studies from various parts of the world, showing diverse practices of infection prevention among nursing students. Studies consistently revealed that compliance with infection control protocols is often suboptimal. Factors influencing compliance include clinical leadership, positive attitudes, perceived safety, and adequate training. Research highlighted that institutional support, availability of resources, and supervision significantly enhance adherence, while barriers such as resource shortages, unclear policies, workload, and cultural misconceptions impede compliance.

CHAPTER THREE

METHODOLOGY

This chapter discusses the research methodology that will be applied in the study. The method that will be employed to undertake the study are outlined into research design, research setting, target population, sample technique, sample size, instrument for data collection, validity and reliability of instrument, method of data collection, method of data analysis and ethical considerations.

3.1 Research Design

A descriptive cross-sectional research design will be used for this study. This design will be chosen because it allows for the collection of data at a single point in time to assess the practice of infection control measures among nursing students in a tertiary academic institution in Edo state. It will involve a survey to assess the practice of infection control measures among nursing students in a tertiary academic institution in Edo state.

3.2 Research Setting

This study will be conducted at the University of Benin, located in Benin City, Edo State, Nigeria. The University is a first-generation federal institution known for its academic excellence and large student population spread across various faculties. The study will specifically take place within

the Faculty of Nursing Sciences, which is part of the College of Medical Sciences. The faculty offers a robust Bachelor of Nursing Science (B.N.Sc) program, structured from 100 to 500 level, with a curriculum that integrates theoretical learning and clinical practice. Clinical training is conducted at the University of Benin Teaching Hospital (UBTH), a major tertiary hospital situated adjacent to the main campus. The Faculty of Nursing Sciences provides a conducive learning environment with well-equipped lecture halls, laboratories, simulation rooms, and access to an extensive academic library. The university setting offers access to a diverse population of nursing students across multiple academic levels, making it ideal for a study that requires stratified representation.

3.3 Target Population

The study was carried out among undergraduate nursing students enrolled in the Bachelor of Nursing Science (B.N.Sc.) program at the University of Benin (300 level to 500 level), ensuring a comprehensive analysis of the practice of infection control measures 00across different levels of education and experience. The total number of students in 300- 500l are 652 (Nursing Department, 2024), as outlined below:

Table 3.1 Number of nursing student in each academic level

LEVEL	NUMBER OF STUDENT
300 Level	190
400 Level	173
500 Level	160
Total	523

Source: Department of Nursing Science (2025)

3.4 Sample Size Determination

The sample size for this study was determined using Cochran's formula of known population for sample size calculation in a finite population. The formula is:

$$n = \frac{N \cdot Z^2 \cdot p \cdot (1-p)}{e^2 \cdot (N-1) + Z^2 \cdot p \cdot (1-p)n}$$

Where:

- n = required sample size
- N = total population size
- Z = Z-value (1.96 for 95% confidence level)
- p = estimated proportion of the population with the attribute of interest (assumed to be 0.5 for maximum sample size)
- e = margin of error (0.05)

N = population of 300 level + 400 level + 500 level

= 190+173+160 = 523

$$n = \frac{\left(523 \times (1.96)^2 \times 0.5 \times (1-0.5)\right)}{((0.05)^2 \times (523-1) + (1.96)^2 \times 0.5 \times (1-0.5))}$$

$$n = \frac{(523 \times 3.8416 \times 0.25)}{(0.0025 \times (523-1) + 3.8416 \times 0.25)}$$

$$n = \frac{(502.29)}{(0.0025 \times (523-1) + 3.8416 \times 0.25)}$$

$$n = \frac{(502.29)}{(0.0025 \times (522) + 3.8416 \times 0.25)}$$

$$n = \frac{(502.29)}{(1.305 + 0.9604)}$$

$n = \frac{(502.29)}{(2.2658)}$

n = 222

Calculation For Potential Non-Responses

Initial sample size = 222

Non-response rate = 10% = 0.10

Final sample size = 222 + (0.10 × 222)

Final sample size = 222 + 22.2 = 244.2 = 244

After calculating using the total number of undergraduate nursing students (200 level – 500 level) at the University of Benin, the sample size was determined to be approximately **"222"** students. To account for potential non-responses, 10% was added to this number, bringing the final sample size to **"244"** students.

3.5 Sampling Technique

The sampling technique employed in this study is a stratified convenience sampling technique. This method ensures that subgroups within the target population are proportionately represented while allowing for practical selection of participants. The population was divided into strata based on academic year. The Department of Nursing Science, University of Benin, has a hierarchical arrangement of students into levels corresponding to their year of study (100–500 level); hence, this sampling technique was appropriate. Within each stratum, participants were selected based on their availability and willingness to participate.

Table 3.2 Proportionate sample of respondents

Level	Population (N)	Proportion ($\frac{N}{523}$)	Proportion × sample size	Rounded sample size

			(244)	
300	190	190 ÷ 523 ≈ 0.3632	0.3632 × 244 ≈ 88.63	88
400	173	173 ÷ 523 ≈ 0.3306	0.3306 × 244 ≈ 80.68	81
500	160	160 ÷ 523 ≈ 0.3059	0.3059 × 244 ≈ 74.64	75
Total	523			244

Inclusive Criteria

Undergraduate nursing students currently enrolled in the Faculty of Nursing Science at the University of Benin.

Students who have given informed consent to participate in the study.

Students available and willing to complete the questionnaire during the data collection period.

Exclusive Criteria

Students who have not provided informed consent.

Students who have already participated in a pilot study related to this research to avoid bias.

3.6 Instrument for Data Collection

A self- constructed Likert scale questionnaire derived from standardized questionnaires in the study was the instrument for collecting the data from the respondents. The questions were carefully constructed to give an in-depth understanding of the topic and relevance to the study and to also answer the research questions, attached in appendix I. The questionnaire was divided into four sections.

Section A: Comprises of demographic information (data) to gather basic information about the participants.

Section B: Questions on practice of infection control measures among nursing students.

Section C: Questions on factors influencing the practice of infection control measures among nursing students.

Section D: Questions on Barriers to compliance with infection control measures among nursing students.

3.7 Validity of instrument

Validity in this study will refer to the extent to which the research instrument will accurately measure what it is intended to measure and how effectively it will capture the various aspects of the specific construct under investigation. To ensure validity, both face and content validity will be employed. Face validity was established by submitting the questionnaire to the research supervisor to assess whether the items appear appropriate and relevant to the study objectives. Content validity was achieved by presenting the instrument to experts in Nursing and a statistician, who will review the questionnaire to ensure it comprehensively covers all relevant areas of the phenomenon under study and is suitable for data collection purposes.

3.8 Reliability of the Instrument

Reliability is seen as a test that is carried out to provide the same results for the practice of infection control measures among nursing students in a tertiary academic institution in Edo state if measured again by the same scale.The questionnaire was also assessed using Cronbach's alpha coefficient. A pilot study was conducted with a sample of 24 students whicch constitute 10% of the study population at the University of Benin Teaching Hospital College of Nursing. Cronbach's alpha will be calculated to assess internal consistency, with a target value of 0.71 or higher considered acceptable. See results attached in appendix II

3.9 Method of Data Collection

Data was collected through self-administered questionnaires physically distributed to participants during breaks and online questionnaire through each class social media platforms. The questionnaires were distributed to the selected participants during class sessions, collected and collated immediately after completion. The purpose of the study and instructions for completing the questionnaire was explained to the participants prior.

3.10 Method of Data Analysis

Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS) software, version 27.0. Descriptive statistics. Quantitative data was analyzed using descriptive and inferential statistics. Descriptive statistics (frequencies, percentages, means, and standard deviations) will be used to summarize demographic data and responses. Chi-square tests were used to examine associations between independent (infection control measures) and dependent variables (practice).

3.11 Ethical Considerations

Ethical approval was obtained from the University of Benin, Basic Medical Science Ethics Committee, attached in appendix III. And also, permission was obtained from the faculty of Nursing science.

The following ethical principles was observed:

Informed consent and right of self-determination;

Respondents were informed about the research study and their consent sought through proper explanation of the research topic, aim of the study and its benefits to the patients and nursing profession.

The use of ambiguous terminologies was avoided, and this led to the acceptance of the instrument (questionnaire) and useful information will be provided for the research study.

Right to privacy, anonymity and confidentiality;

Throughout the process of this research project, the respondents were respected and privacy secured.

Non falsification of data;

All the data collected during the study was not adulterated but true data from the findings and respondents.

CHAPTER FOUR

RESULTS

This chapter presents the data analysis, answers to the research questions, and testing of hypotheses based on responses obtained from the questionnaires administered to older adult in-patients and out-patients receiving treatment at the University of Benin Teaching Hospital, Benin City. The respondents were selected using a convenience sampling technique.

4.1 Demographic characteristics of respondents

Table 4.1: Demographic characteristics of respondents

Variable	Category	Frequency (f)	Percentage (%)
Gender	Male	74	30.3
	Female	170	69.7

Year of Study	300 Level	88	36.1
	400 Level	81	33.2
	500 Level	75	30.7
Marital Status	Single	236	96.7
	Married	8	3.3
Religion	Christianity	188	77.0
	Islam	44	18.0
	Others	12	5.0
Ethnicity	Yoruba	58	23.8
	Igbo	64	26.2
	Hausa	28	11.5
	Benin	70	28.7
	Others	24	9.8

Table 4.1 above presents the demographic distribution of respondents. The majority of the respondents were females (69.7%), while males accounted for 30.3%. With respect to year of study, 36.1% were in 300 level, 33.2% in 400 level, and 30.7% in 500 level. This suggests a fairly balanced representation across academic levels. Marital status data shows that almost all respondents (96.7%) were single, with only 3.3% married. Regarding religion, Christianity was the dominant faith (77%), followed by Islam (18%) and others (5%). In terms of ethnicity, Benin (28.7%) and Igbo (26.2%) groups were most represented, followed by Yoruba (23.8%), Hausa (11.5%), and others (9.8%).

4.2 Answers to research questions

Table 4.2: Practice of infection control measures

Item	Strongly Agree f (%)	Agree f (%)	Disagree f (%)	Strongly Disagree f (%)
Hand hygiene before and after patient contact	160 (65.6)	66 (27.0)	12 (4.9)	6 (2.5)
Use of PPE appropriately during procedures	148 (60.7)	70 (28.7)	18 (7.4)	8 (3.3)
Proper disposal of sharps and infectious waste	172 (70.5)	54 (22.1)	12 (4.9)	6 (2.5)
Cleaning/disinfecting equipment before and after use	138 (56.6)	72 (29.5)	24 (9.8)	10 (4.1)
Adherence to isolation precautions	130 (53.3)	74 (30.3)	28 (11.5)	12 (4.9)

Item	Mean	Std. Deviation
Hand hygiene before and after patient contact	3.56	0.72
Use of PPE appropriately during procedures	3.47	0.8
Proper disposal of sharps and infectious waste	3.61	0.71
Cleaning/disinfecting equipment	3.39	0.86

Item	Strongly Agree f (%)	Agree f (%)	Disagree f (%)	Strongly Disagree f (%)
before and after use				
Adherence to isolation precautions	3.32		0.89	
Grand Mean	3.47		-	

Table 4.2a presents the distribution of responses on infection control practices. The results show that a large majority of respondents strongly agreed to practicing hand hygiene (65.6%) and proper disposal of sharps (70.5%), indicating strong adherence to these critical practices. Use of personal protective equipment (PPE) was also highly observed (60.7%), though about 10.7% reported lapses. Cleaning/disinfecting equipment and adherence to isolation precautions had relatively lower agreement rates, suggesting areas requiring further improvement.

Table 4.2b shows the descriptive statistics. The mean scores range from 3.32 to 3.61, with a grand mean of 3.47, suggesting that respondents generally agreed with practicing infection control measures. Sharps disposal (Mean = 3.61) and hand hygiene (Mean = 3.56) were the most highly adhered to practices, while isolation precautions (Mean = 3.32) recorded the lowest compliance. This indicates that while overall compliance is good, some measures require more emphasis during training and supervision.

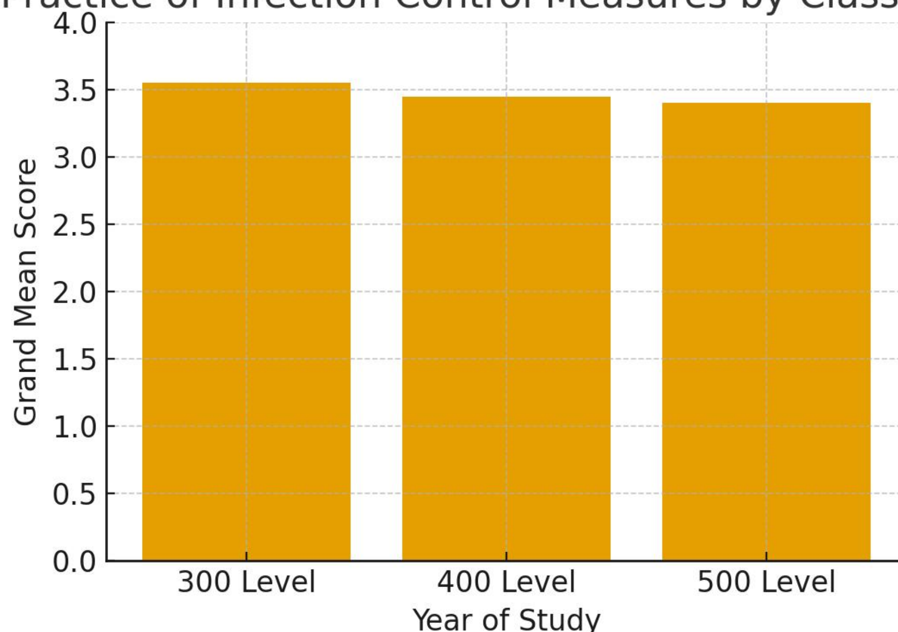

Figure 4.1 illustrates the average practice levels across academic classes. The chart shows that students in 300 level recorded the highest grand mean (3.55), followed closely by those in 400 level (3.45) and 500 level (3.40). This trend suggests that enthusiasm for infection control may be higher among students at earlier stages of training, while those in higher levels could be influenced by clinical workload and complacency. The findings highlight the importance of continuous reinforcement of infection control practices throughout all levels of training.

Table 4.3: Factors influencing the practice of infection control measures

Item	Strongly Agree f (%)	Agree f (%)	Disagree f (%)	Strongly Disagree f (%)
Infection control is	176 (72.1)	52 (21.3)	10 (4.1)	6 (2.5)

essential for patient safety				
Adequate training to implement infection control measures	140 (57.4)	68 (27.9)	24 (9.8)	12 (4.9)
Supervision from clinical instructors influences compliance	152 (62.3)	60 (24.6)	20 (8.2)	12 (4.9)
Continuous education improves practice	158 (64.8)	62 (25.4)	16 (6.6)	8 (3.3)
Institutional policies motivate adherence	150 (61.5)	66 (27.0)	18 (7.4)	10 (4.1)

Table 4.3 presents the distribution of responses on the factors that influence the practice of infection control measures among nursing students. The results demonstrate that an overwhelming majority of the respondents (72.1%) strongly agreed that infection control

practices are essential for patient safety. This finding highlights the strong conviction among students that infection control is not only a professional requirement but also a moral and ethical obligation to safeguard the well-being of patients. Such recognition of the importance of infection control indicates a good level of awareness, which is a positive predictor of practice compliance. In addition, continuous education and supervision emerged as vital determinants of compliance. About 64.8% of respondents strongly agreed that continuous education improves their ability to practice infection control effectively. This implies that regular training, refresher courses, and seminars play a crucial role in reinforcing students' knowledge and ensuring consistent adherence to standards. Similarly, supervision by clinical instructors was also highlighted as influential, with 62.3% of students strongly agreeing that it shapes their level of compliance. This reflects the importance of mentorship, role modeling, and constant monitoring in shaping behavior. Institutional policies and adequate training were also acknowledged by the majority of students as important factors, although their percentages were slightly lower compared to safety awareness and continuous education. This may suggest that while training and policy frameworks exist, they may not always be fully comprehensive or strictly enforced. The implication is that strengthening institutional support through well-structured policies and enhanced training opportunities could further improve students' compliance with infection control practices. Overall, the findings from this section reveal that both intrinsic factors (such as personal belief in patient safety) and extrinsic factors (such as education, supervision, and policy support) work hand-in-hand to influence practice levels.

Table 4.4: Barriers to compliance with infection control measures

Item	**Strongly Agree f (%)**	**Agree f (%)**	**Disagree f (%)**	**Strongly Disagree f (%)**
Lack of PPE	130 (53.3)	70 (28.7)	28 (11.5)	16 (6.6)

Item	Strongly Agree f (%)	Agree f (%)	Disagree f (%)	Strongly Disagree f (%)
prevents adherence				
Time constraints during clinical rotations affect compliance	142 (58.2)	64 (26.2)	26 (10.7)	12 (4.9)
Overcrowding in wards makes practice difficult	150 (61.5)	60 (24.6)	22 (9.0)	12 (4.9)
Inadequate supervision reduces adherence	128 (52.5)	72 (29.5)	28 (11.5)	16 (6.6)
Workload makes compliance challenging	140 (57.4)	66 (27.0)	24 (9.8)	14 (5.7)

Table 4.4 highlights the barriers that hinder nursing students from complying with infection control measures. The results indicate that overcrowding in wards was identified as the most prominent barrier, with 61.5% of respondents strongly agreeing to its impact. This finding underscores the challenge posed by the physical environment in which care is provided, as high patient-to-staff ratios and congested spaces make it difficult to maintain strict adherence to infection prevention protocols. Time constraints during clinical rotations were also a significant barrier, with 58.2% of students strongly agreeing. This reflects the high demands of clinical training, where limited time often compels students to prioritize urgent patient care tasks at the expense of thorough compliance with infection control measures. Similarly, workload pressure was highlighted by 57.4% of students, demonstrating that the demanding nature of nursing responsibilities directly influences the consistency of infection control practices. The lack of personal protective equipment (PPE) and inadequate supervision also emerged as notable barriers, with more than half of respondents acknowledging their impact. The unavailability of essential supplies such as gloves, masks, and gowns discourages adherence to best practices, while insufficient supervision reduces accountability and the reinforcement of safe practices.Overall, the findings reveal that compliance with infection control measures is shaped not only by individual willingness and awareness but also by environmental and institutional constraints. Addressing barriers such as overcrowding, time pressure, workload, insufficient PPE, and weak supervision is therefore critical to strengthening infection control compliance among nursing students. These findings emphasize the need for hospitals and training institutions to invest in resources, effective scheduling, and stronger supervisory frameworks to ensure a safer learning and care environment.

4.3. Hypothesis testing

H_0: There is no significant relationship between academic level of clinical nursing students and adherence to infection control measures.

H_1: There is a significant relationship between academic level of clinical nursing students and adherence to infection control measures.

Table 4.5: Cross-tabulation of academic level and adherence to infection control measures

Academic Level	High Adherence f (%)	Moderate Adherence f (%)	Low Adherence f (%)	Total
300 Level	60 (68.2)	20 (22.7)	8 (9.1)	88
400 Level	48 (59.3)	22 (27.2)	11 (13.6)	81
500 Level	40 (53.3)	20 (26.7)	15 (20.0)	75
Total	148 (60.7)	62 (25.4)	34 (13.9)	244

Table 4.6: Chi-Square Test Results

Test Statistic	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.481	4	0.039*
Likelihood Ratio	6.422	4	0.040
Linear-by-Linear Association	4.122	1	0.042
N of Valid Cases	244		

Interpretation

The cross-tabulation in Table 4.5 shows that adherence to infection control measures decreases slightly with higher academic level. For instance, 68.2% of 300 level students demonstrated high adherence, compared to 53.3% of 500 level students.

The Chi-Square results in Table 4.6 reveal a significant association between academic level and adherence to infection control measures ($\chi^2 = 6.481$, df = 4, p = 0.039). Since the p-value is less than 0.05, the null hypothesis (H_0) is rejected.

This implies that academic level significantly influences the level of adherence to infection control measures among nursing students. In other words, students in lower levels tend to report higher adherence compared to those in higher levels, possibly due to enthusiasm, closer supervision, or reduced clinical fatigue at earlier stages of training.

CHAPTER FIVE

DISCUSSION OF FINDINGS

This chapter presents the analysis of findings from the study, centered on assessing the practice of infection control measures among nursing students in a tertiary academic institution in Edo State. Data obtained from questionnaires highlights the demographic characteristics of respondents, their level of adherence to standard infection control practices, factors influencing their compliance, and barriers that hinder effective implementation. Additionally, the chapter explores the relationship between academic level and adherence to infection control measures using statistical tests to determine their significance. These findings provide valuable insights into the extent of compliance among nursing students, as well as institutional and individual factors that may shape infection prevention and control in clinical training settings.

5.1 Discussion of major findings

Practice of infection control measures among nursing students

Findings from this study revealed that nursing students demonstrated a generally good level of adherence to infection control measures. A majority of respondents strongly agreed that they consistently performed hand hygiene before and after patient contact (65.6%), disposed of sharps properly (70.5%), and made appropriate use of personal protective equipment (60.7%). However, compliance was slightly lower in relation to cleaning and disinfecting equipment (56.6% strongly agreed) and adherence to isolation precautions (53.3% strongly agreed). Taken together, the results, with a grand mean of 3.47, suggest that although compliance was fairly high, it was not uniform across all domains of practice.

These findings are largely consistent with existing empirical literature. For instance, Kim and Park (2021) in South Korea observed that nursing students exhibited moderate compliance with infection prevention practices. While they demonstrated a positive attitude, some domains of infection control were less consistently practiced, which resonates with the present study where

students excelled more in hand hygiene and sharps disposal but lagged in equipment disinfection and isolation precautions. Similarly, Bouchoucha et al. (2021) in Australia found high compliance levels in PPE usage (81%) and sharps disposal (83%) but relatively weaker adherence in equipment decontamination (69%). This mirrors the present findings, where Nigerian nursing students also reported lower compliance with equipment disinfection. Furthermore, the work of Albarmawi et al. (2024) in Saudi Arabia demonstrated that structured training interventions improved students' knowledge and skills, yet some specific practices such as hand rubs and use of disinfectants were inconsistently applied. This parallels the current study's results, where students showed strong compliance in some practices but weaknesses in others, highlighting the need for continuous education and reinforcement.

In contrast, some studies in Nigeria, such as Olorunfemi et al. (2020), reported generally poor practice scores among nursing students, suggesting that compliance was lower in certain Nigerian settings compared to the moderate-to-good adherence observed in this study. This difference may reflect institutional variations in supervision, availability of resources, and emphasis on infection prevention during training. Nonetheless, across studies, there is a general consensus that while nursing students are aware of the importance of infection control, gaps remain in their actual practices, requiring ongoing support, training, and institutional reinforcement.

Factors influencing the practice of infection control measures among nursing students

The findings from this study indicated that several key factors shaped students' adherence to infection control measures. A substantial proportion of respondents strongly agreed that infection control practices are essential for patient safety (72.1%), underscoring the central role of personal conviction in compliance. Continuous education was also viewed as a significant influence, with 64.8% strongly agreeing that it improved their practice. In addition, supervision by clinical instructors (62.3%) and institutional policies (61.5%) were seen as important drivers of adherence. Adequate training, while recognized as influential by 57.4% of respondents, recorded slightly

lower agreement, suggesting that training opportunities may not always be sufficient or consistently effective. Overall, the results point to a combination of personal attitudes, educational reinforcement, and institutional support as important determinants of compliance.

These findings align closely with several empirical studies. For instance, Bouchoucha et al. (2021) in Australia highlighted the importance of strong clinical leadership and contextual cues in predicting compliance, emphasizing that role modeling and supervision within clinical environments significantly shaped students' adherence. This supports the current study's finding that supervision by instructors was a major influence. Similarly, Kim and Park (2021) in South Korea demonstrated that students' perception of a safe clinical environment and positive attitudes toward infection control were significant predictors of compliance. This is consistent with the present study, where students' belief in the essential role of infection control for patient safety strongly influenced their practice.

Further evidence from Shrestha et al. (2023) in Nepal showed that confidence in infection control was closely tied to both knowledge and perception levels, underscoring the importance of ongoing education in reinforcing positive practices. This resonates with the finding in this study that continuous education significantly enhanced students' practice. In addition, Julius (2022) in Uganda and Muthoni et al. (2021) in Kenya both found that individual characteristics such as gender, educational cadre, and work experience, as well as knowledge levels, significantly influenced adherence to infection control practices. These results reinforce the conclusion of the present study that compliance is shaped by both personal and institutional factors.

In contrast, some studies have emphasized systemic and contextual challenges more than personal conviction. For example, Said et al. (2023) in Somalia and Ofili & Nwogueze (2024) in Nigeria found that resource availability, presence of guidelines, and institutional support structures were stronger predictors of compliance than individual attitudes. While the present study acknowledges the role of institutional policies, it highlighted personal conviction and

continuous education as stronger determinants. This suggests that although institutional support is critical, fostering positive attitudes and providing consistent training may be equally, if not more, effective in promoting adherence among nursing students.

Overall, both the present study and reviewed literature demonstrate that compliance with infection control measures is influenced by a dynamic interplay of personal, educational, and institutional factors. This convergence underscores the need for a holistic approach that integrates strong clinical leadership, continuous education, positive reinforcement of attitudes, and supportive institutional frameworks.

Barriers to compliance with infection control measures among nursing students

Findings from this study revealed that nursing students faced several barriers which hindered their ability to consistently adhere to infection control guidelines. The most frequently reported obstacles included overcrowding in wards (61.5% strongly agreed), time constraints during clinical rotations (58.2%), and workload pressures (57.4%). Other barriers such as lack of personal protective equipment (53.3%) and inadequate supervision (52.5%) were also identified by more than half of the respondents. These results suggest that while students recognize the importance of infection control, environmental and institutional constraints often limit their capacity to fully comply.

These findings correspond with evidence from several empirical studies. Akinwaare et al. (2020) in Nigeria reported that students cited unavailability of gloves (88.9%), lack of time (75.3%), and the demanding nature of handwashing (76.2%) as major barriers, which is consistent with the current study's emphasis on resource shortages and time constraints. Similarly, Bouchoucha et al. (2021) in Australia found that although knowledge of infection control was high, compliance was limited by institutional factors such as leadership and contextual support, echoing the present finding that inadequate supervision posed a significant barrier.

Additional support comes from Shrestha et al. (2023) in Nepal, who highlighted knowledge gaps in waste management and noted that inadequate preparation in specific areas could hinder students' adherence. This aligns with the perception in this study that inadequate supervision and insufficient guidance affect compliance. Likewise, Albarmawi et al. (2024) in Saudi Arabia reported that while structured training improved knowledge and skills, students continued to struggle with certain procedures, underscoring that lack of sustained reinforcement and oversight can act as barriers.

Broader African evidence also corroborates these results. Silago et al. (2022) in Tanzania emphasized that student nurses were less likely than staff nurses to maintain good infection control knowledge and practice, attributing this to limited training and experience. Olebo (2024) in Uganda similarly noted that insufficient training and irregular reinforcement contributed to poor infection control practices, which resonates with the barriers identified in the present study. Ranoto et al. (2025) in South Africa further highlighted systemic limitations such as resource shortages and practical challenges as obstacles to translating knowledge into practice.

However, while the present study underscores overcrowding and workload as primary barriers, some reviewed studies, such as Mutaru et al. (2022) in Ghana, emphasized the availability of infection prevention guidelines and departmental structures as the most important predictors of compliance. This contrast suggests that although institutional structures are important, the lived realities of Nigerian students—such as congested wards and overwhelming clinical demands—may exert a stronger influence on their ability to practice infection control effectively.

In summary, the present study's findings on barriers converge with empirical evidence that resource shortages, insufficient supervision, and time constraints hinder compliance among nursing students. Nonetheless, the emphasis on overcrowding and workload in this study highlights contextual challenges unique to Nigerian clinical training environments, emphasizing

the need for both structural interventions (such as improved supervision and provision of PPE) and systemic reforms (such as better ward management and workload distribution).

Hypothesis testing

In this study, a Chi-Square test of independence was conducted to examine whether the academic level of nursing students influenced their adherence to infection control measures. The results showed that adherence decreased slightly as students progressed through their training. Among 300-level students, 68.2% reported high adherence, compared to 59.3% in 400-level and 53.3% in 500-level students. The Chi-Square statistic was significant ($\chi^2 = 6.481$, $df = 4$, $p = 0.039$), leading to the rejection of the null hypothesis. This indicates that academic level has a significant influence on adherence to infection control measures, with students in lower levels reporting better compliance than their counterparts in higher levels.

These findings align with and expand on previous empirical studies. For example, Julius (2022) in Uganda observed that individual characteristics, including educational cadre, significantly influenced adherence, with junior-level nurses and students often demonstrating better compliance than more senior counterparts. Similarly, Balegha et al. (2021) in Ghana found that year of study was a predictor of adherence, with second-year students reporting higher compliance compared to those in later years. This parallels the present study, where early-level (300-level) nursing students displayed stronger adherence compared to those in 400 and 500 levels.

In contrast, other studies, such as Kamara et al. (2022) in Sierra Leone, emphasized the role of structured training and supervision rather than academic level per se. Their findings suggested that compliance was more strongly associated with exposure to infection prevention training and resource availability, regardless of the students' year of study. Likewise, said et al. (2023) in

Somalia highlighted institutional and systemic factors such as availability of infection prevention guidelines and training budgets as stronger determinants than academic progression.

Taken together, the current study suggests that while academic level does play a significant role in influencing adherence among Nigerian nursing students, particularly with higher adherence seen in junior classes, this effect may be mediated by differences in supervision, enthusiasm, and workload across levels. The convergence with regional studies indicates that students at earlier stages of training often show greater motivation and closer compliance, while the divergence with other findings underscores the fact that institutional and systemic factors may moderate or override the influence of academic level.

5.2 Summary of key findings

This study examined the practice of infection control measures among nursing students in a tertiary academic institution in Edo State. The analysis of findings revealed important insights into the demographic characteristics of respondents, their compliance with infection prevention measures, the factors influencing their practice, the barriers they encounter, and the relationship between academic level and adherence.

The demographic profile showed that the majority of respondents were female and that most were single, reflecting the typical composition of the nursing student population. The participants were fairly distributed across academic levels, with all three levels of study (300, 400, and 500) well represented, thereby ensuring that the findings cut across different stages of training.

In terms of practice, the study revealed that nursing students generally demonstrated good adherence to infection control measures. High levels of compliance were observed in areas such as hand hygiene and proper disposal of sharps, where more than two-thirds of respondents strongly agreed that they consistently practiced these measures. The use of personal protective equipment was also reported to be satisfactory. However, compliance was less consistent in areas such as cleaning and disinfecting equipment and adherence to isolation precautions, which

recorded lower levels of agreement. Overall, the findings suggested that while students are aware of and practice infection control, certain areas remain weaker and require greater emphasis.

The study further highlighted several factors that influenced students' adherence. Belief in the importance of infection control for patient safety emerged as the most powerful motivator, while continuous education and supervision by clinical instructors also played critical roles in reinforcing practice. Institutional policies and training were acknowledged as important, though students expressed that these were not always sufficiently implemented or consistently available. This underscored the combined importance of personal conviction, educational reinforcement, and institutional support in shaping compliance.

On the other hand, the study identified numerous barriers that hinder students' ability to fully comply with infection control measures. Chief among these were overcrowding in wards, time constraints during clinical rotations, and workload pressures, all of which limit the ability of students to apply infection control principles in practice. Other obstacles included inadequate provision of personal protective equipment and insufficient supervision, reflecting the role of systemic and institutional shortcomings in limiting compliance.

Finally, the hypothesis test revealed a significant relationship between academic level and adherence to infection control measures. The results demonstrated that students in lower levels, particularly 300 level, exhibited higher levels of adherence compared to those in 400 and 500 levels. This suggests that enthusiasm and close supervision in the earlier stages of training may foster better compliance, while clinical fatigue, workload, and reduced supervision in the higher levels could account for the decline in adherence.

In summary, the findings indicate that while nursing students in Edo State demonstrate a commendable level of infection control practice, variations exist across different domains of practice, influencing factors, and academic levels. The results also highlight the need for stronger

institutional support, continuous education, and targeted interventions to address barriers and sustain compliance across all levels of training.

5.3 Implications to nursing

The findings of this study carry several important implications for nursing practice, education, and institutional policy. The demonstration of generally good adherence to infection control measures among nursing students highlights the effectiveness of ongoing efforts to integrate infection prevention into nursing curricula and clinical training. However, the variations observed across specific domains of practice, as well as the influence of academic level and identified barriers, point to areas where nursing education and practice can be further strengthened.

From a practice perspective, the results underscore the critical need for consistency in the application of infection control measures. While students demonstrated strong compliance with hand hygiene and sharps disposal, weaker adherence to equipment disinfection and isolation precautions suggests gaps that could compromise patient safety. This highlights the responsibility of the nursing profession to not only instill knowledge but also foster practical competence and accountability in every domain of infection control. Clinical instructors and preceptors must therefore serve as role models, reinforcing correct practices during clinical placements and ensuring that students translate theory into safe and effective patient care.

From an educational standpoint, the study emphasizes the value of continuous education and supervision in shaping students' compliance. Nursing curricula should prioritize infection control training as a core competency and ensure that it is reinforced throughout the duration of the program. Simulation-based learning, refresher workshops, and competency-based evaluations can provide opportunities for students to practice skills and receive feedback in a controlled environment. The finding that lower-level students adhered more strongly than those in higher levels further suggests the need for sustained emphasis on infection control throughout training, rather than allowing attention to wane as students' progress.

On an institutional and policy level, the study highlights systemic barriers such as overcrowding, time pressure, inadequate supervision, and shortages of personal protective equipment. Addressing these barriers requires institutional investment in resources, staffing, and infrastructure to create environments that enable adherence. Hospitals and training institutions must ensure that adequate PPE and supportive supervision are consistently available to students, and that infection control policies are not only written but also enforced and monitored.

Overall, the implications of this study reinforce the fact that infection control is not merely an individual responsibility but a collective professional obligation that requires integration of education, practice, and policy. By addressing the identified gaps and barriers, the nursing profession can better prepare students to uphold the highest standards of infection prevention, thereby safeguarding patient safety and strengthening the quality of healthcare delivery.

5.4 Conclusion

This study highlights that nursing students are generally committed to infection control, showing strong adherence in areas like hand hygiene, proper disposal of sharps, and use of personal protective equipment. Yet, the findings also reveal gaps, particularly in cleaning equipment and following isolation precautions, indicating that even well-trained students face challenges in consistently applying all infection control measures.

Personal belief in the importance of infection prevention, continuous education, and guidance from clinical instructors emerged as key motivators, while overcrowded wards, heavy workloads, limited supervision, and insufficient resources were notable barriers. Interestingly, students in lower academic levels demonstrated higher adherence than their senior counterparts, suggesting that early enthusiasm and closer supervision play a crucial role in shaping good practices. Overall, these findings underscore the importance of a balanced approach that combines personal commitment, structured education, and robust institutional support. By addressing barriers and reinforcing best practices, nursing institutions can ensure that students not only learn infection

control in theory but also apply it effectively in practice, ultimately safeguarding both patient safety and their own professional growth.

5.5 Recommendations

1. Nursing institutions should provide regular training and workshops on infection control to reinforce students' knowledge and skills.
2. Clinical instructors and senior staff should offer consistent guidance and supervision, especially for higher-level students.
3. Adequate provision of personal protective equipment, disinfectants, and other necessary materials should be ensured.
4. Efforts should be made to reduce overcrowding in wards and manage workloads to allow proper practice of infection control.
5. Programs that emphasize the importance of infection control for patient safety should be integrated into the curriculum.
6. Students should be encouraged to take personal responsibility and maintain high standards in all aspects of infection prevention.
7. Institutions should conduct periodic assessments of students' practices to identify gaps and provide targeted support.
8. Implementing these measures will help sustain effective infection control practices and improve overall patient safety.

5.6. Limitations of the study

1. The study was conducted in a single tertiary institution in Edo State, which may limit the generalizability of the findings to other nursing schools or regions.

2. Data collection relied on self-reported responses, which may be subject to social desirability bias, with students potentially overstating their adherence to infection control measures.

3. The cross-sectional design of the study captures practices at a single point in time, making it difficult to assess changes in behavior or adherence over the course of students' training.

5.7 Suggestions for further research

1. Future studies could include multiple tertiary institutions across different regions to enhance the generalizability of findings.
2. Longitudinal research is recommended to track changes in infection control practices throughout students' training.
3. Qualitative studies may provide deeper insights into students' perceptions, attitudes, and challenges regarding infection control practices.

.

REFERENCES

Abbas, S. (2024). The challenges of implementing infection prevention and antimicrobial stewardship programs in resource-constrained settings. *Antimicrobial Stewardship & Healthcare Epidemiology, 4*(1), e45. https://doi.org/10.1017/ash.2024.35

Adams, V., Song, J., Shang, J., McDonald, M., Dowding, D., Ojo, M., & Russell, D. (2021). Infection prevention and control practices in the home environment: Examining enablers and barriers to adherence among home health care nurses. American journal of infection control, 49(6), 721-726.

Akinwaare, M. O., Bello, K. O., & Ani, O. (2020). Perceived barriers, knowledge and reported practices of infection prevention and control among clinical nursing and medical students of a Nigerian University. *International Journal of Infection Control, 16*(4). https://doi.org/10.3396/ijic.v16i4.19141

Alanazi, S. J., Haas, T., & Scafide, K. N. (2023). Interventions to Enhance Nursing Student Compliance With Infection Control: A Systematic Review. *Nursing education perspectives, 44*(6), E45–E49. https://doi.org/10.1097/01.NEP.0000000000001168

Albarmawi, M., Al Hadid, L., Alnjadat, R., & Aljabery, A. (2024). A multi-institute, follow-up, observational study measuring nursing students' adherence to infection prevention and control protocols in Saudi Arabia. *Frontiers in medicine,* 10, 1282723. https://doi.org/10.3389/fmed.2023.1282723

Alharbi, A.M., & Alshammari, B.A. (2024). The Scientific Basis and The Critiical Importance of Hand Hygiene in Fighting Infection and Preventing the Transmission of Diseases. *International Journal of Religion, 5*(12):1781-1788. DOI:10.61707/xffk1j09

Alhumaid, S., Al Mutair, A., Al Alawi, Z., Alsuliman, M., Ahmed, G. Y., Rabaan, A. A., ... & Al-Omari, A. (2021). Knowledge of infection prevention and control among healthcare workers and factors influencing compliance: a systematic review. *Antimicrobial Resistance & Infection Control, 10*(1), 86.

Alhumaid, S., Al Mutair, A., Al Alawi, Z., Alsuliman, M., Ahmed, G. Y., Rabaan, A. A., Al-Tawfiq, J. A., & Al-Omari, A. (2021). Knowledge of infection prevention and control among healthcare workers and factors influencing compliance: a systematic review. *Antimicrobial resistance and infection control, 10*(1), 86. https://doi.org/10.1186/s13756-021-00957-0

Aloufi, R. A.., Aljohani , M. A. M.., AL- Harbi, M. A. M. A.., alharbi , H. saleh zaid, Alharbi, A. S. O.., Najdi, I. M. M.., Al Sharif, R. N. B.., Aljohani , F. A. E.., AlHarbi, N. A. A.., & Alharbi, H. R. (2024). Personal Protective Equipment and Infection Control: Evaluating the Impact on Healthcare Worker Safety – A Review. *Journal of Ecohumanism, 3*(8), 9077 –. https://doi.org/10.62754/joe.v3i8.5526

Al-Quraan, H. A., Hussien, N., & Alloubani, A. (2024). Knowledge and practice of infection control measures among nurses in Jordan. *British Journal of Healthcare Management, 30*(4), 1-9. https://doi.org/10.12968/bjhc.2023.0075

Alshafey, A., Ameen, N., & Abd Elraoof, S. (2024). Assessment of Nurses' Knowledge and Performance of Transmission Based Precautions in Mahalla Fever Hospital. *Mansoura Nursing Journal, 11*(1), 307-314. doi: 10.21608/mnj.2024.350358

Alshahrani, I., Alshahrani, A.M., Almansour, S.M., Alsalem, A.H., Althaiban, A.H., Al-Bishi, Y.M., Al Baataj, M.M., Bakri, A.Y., Nazra, R.A., & Alsweidan, S.H. (2024). A Global

Perspective on Infection Control Measures for Healthcare Workers: A Systematic Review. *Journal of Ecohumanism ,3(8*). https://doi.org/10.62754/joe.v3i8.5518

Amavasi, B., & Zimmerman, P. A. (2024). Infection prevention and control continuous education and training in pre-registration nursing programmes. *Nurse Education Today*, 133, 106051.

Amavasi, B., & Zimmerman, P. A. (2024). Infection prevention and control continuous education and training in pre-registration nursing programmes. *Nurse education today*, 133, 106051. https://doi.org/10.1016/j.nedt.2023.106051

Anicetus, H., Manyele, S., Habtu, M., Kiyunge, A., Saria, J., Njee, R., ... & Yoti, Z. (2022). Assessment of environmental cleaning practices and the impacts on infection prevention and control in selected hospitals in Tanzania. *Journal of Environmental Protection, 13*(10), 698-715. DOI: 10.4236/jep.2022.1310045

Attrah, M., Elmanadely, A., Akter, D., & Rene, E. R. (2022). A Review on Medical Waste Management: Treatment, Recycling, and Disposal Options. *Environments, 9*(11), 146. https://doi.org/10.3390/environments9110146

Balegha, A. N., Yidana, A., & Abiiro, G. A. (2021). Knowledge, attitude and practice of hepatitis B infection prevention among nursing students in the Upper West Region of Ghana: A cross-sectional study. *PloS one, 16*(10), e0258757. https://doi.org/10.1371/journal.pone.0258757

Barannyk, S., Shevtsov, V. M., Yehorochkina, V., & Shevtsova, A. I. (2023). One step to the truth. Ignatz Philip Semmelweis-forerunner of antiseptics (to the 205th birthday). *International scientific journal «Grail of Science»|,* (27), 520-526. DOI: 10.36074/grail-of-science.12.05.2023.088

Beers, R. A. (2022). Safe Injection Practices. *ASA Monitor, 86*(8), 22. DOI: 10.1097/01.ASM.0000855664.27093.90

Bhattacharya, S. (2023). Hand washing and hand hygiene in medical practice and day to day life. *Indian Journal of Microbiology Research, 9*(4), 249-251. https://doi.org/10.18231/j.ijmr.2022.043

Biku, T., Mekonnen, A., & Demas, T. (2021). Factors Affecting the Use of Personal Protective Equipment's (PPE) Among Sterile Team Members During Surgical Procedures at St, Paul's Hospital Millennium Medical College and AaBET Hospital Operating Theatre, Addis Ababa / Ethiopia. *Journal of Health, Medicine and Nursing Vol 88*. DOI: 10.7176/JHMN/88-03

Botha, B. S., Hugo-van Dyk, L., & Nyoni, C. N. (2023, October). Simulating infection prevention and control through virtual reality: a vehicle for equity, diversity, and inclusivity in Africa. *In Frontiers in Education* (Vol. 8, p. 1214321). Frontiers Media SA. https://doi.org/10.3389/feduc.2023.1214321

Bouchoucha, S. L., Phillips, N. M., Lucas, J., Kilpatrick, M., & Hutchinson, A. (2021). An investigation into nursing students' application of infection prevention and control precautions. *Nurse education today*, 104, 104987. https://doi.org/10.1016/j.nedt.2021.104987

Bouchoucha, S. L., Phillips, N. M., Lucas, J., Kilpatrick, M., & Hutchinson, A. (2021). An investigation into nursing students' application of infection prevention and control precautions. *Nurse education today,* 104, 104987. https://doi.org/10.1016/j.nedt.2021.104987

Curryer, C., Russo, P. L., Kiernan, M., Wares, K. D., Smith, K., & Mitchell, B. G. (2021). Environmental hygiene, knowledge and cleaning practice: a phenomenological study of nurses and midwives during COVID-19. *American journal of infection control, 49*(9), 1123–1128. https://doi.org/10.1016/j.ajic.2021.04.080

Dar, S. A. (2021). Role of nurses in Infection Prevention and control in Health Care Setting. International Journal of Applied Research, 7(9), 268-270.

Dash, N. R., Singh, G., Mohapatra, A., & Keshetty, S. S. (2024). Dr. Ignaz Phillip Semmelweis: The Unrecognized Pioneer of Aseptic Practices. *Cureus, 16*(8), e68350. https://doi.org/10.7759/cureus.68350

Ekuma, A.E., Etukudo, I.W., Onukak, A.E., Umoh, R.A., & Christian, B. (2022). An assessment of infection prevention and control in hospitals in Akwa Ibom State, Nigeria. *Annals of Tropical Pathology, 13*, 8 - 11. https://doi.org/10.4103/atp.atp_1_22

El Shazly, H. A. E., Ali, W. K., & Tawfik, E. H. (2023). Nurses' Compliance with Infection Prevention and Control Practices (IPC) in Fixed Versus Mobile Family Planning Clinics: A Comparative Study. *Assiut Scientific Nursing Journal, 11*(34), 158-174. DOI: 10.21608/asnj.2023.188641.1499

El-Saed, A., Othman, F., AlMohrij, S., Abanmi, M., Tannous, E., & Alshamrani, M. M. (2023). Coverage and methods of surveillance of healthcare-associated infections in Middle Eastern and North African countries. *American journal of infection control, 51*(10), 1151–1156. https://doi.org/10.1016/j.ajic.2023.03.004

Emilia, A. E., Aheebwa, A., Obiezu, E. J., Jennifer, E., Abdulmuminu, I., Narayana, G., & Victoria, U. C. (2024). KNOWLEDGE AND PREDICTORS OF IMPLEMENTATION OF STANDARD PRECAUTIONS FOR INFECTION PREVENTION AND CONTROL AMONG HEALTH CARE PRACTITIONERS. *African journal of infectious diseases, 18(2 Suppl)*, 22–33. https://doi.org/10.21010/Ajidv18i2S.5

Eronen, R., Helle, L., Palonen, T., & Boshuizen, H. P. (2024). Practical nurse students' misconceptions about infection prevention and control. Vocations and Learning, 17(1), 143-164.

Ezike, O. C., Nwaneri, A. C., Odikpo, L. C., Onyia, E. N., Makata, N. E., Irodi, C. C., & Ndubuisi, I. (2021). Infection control practices among nurses working in neonatal intensive care units (NICU) of two selected tertiary hospitals in Enugu, Nigeria. International Journal of Africa Nursing Sciences, 15, 100344. https://doi.org/10.1016/j.ijans.2021.100344

Faltin, K., & Figlerowicz, M. (2023). Vaccination against COVID-19–historical foundations. DOI: 10.15557/PiMR.2023.0001

Faraz, R., Khajeali, N., Kalantarion, M., & Kheiri, B. (2024). Evaluating the Effectiveness of Existing In-service Training Courses on Infection Prevention and Control in Nurses: An Evaluation Using the Kirkpatrick Model. *Shiraz E-Medical Journal, 25*(12)): e147225. https://doi.org/10.5812/semj-147225

Filatova, V. L., Lyakhovska, A. V., Filatova, O. V., Matvienko, T. M., Sargosh, O. D., & Lyakhovskyi, V. I. (2023). MODERN APPROACHES TO TEACHING HAND HYGIENE IN HIGHER MEDICAL EDUCATIONAL INSTITUTIONS. *Актуальні проблеми сучасної медицини: Вісник Української медичної стоматологічної академії, 23*(2.2), 107-110. DOI:10.31718/2077-1096.23.2.2.107

Gon, G., Kabanywanyi, A. M., Blinkhoff, P., Cousens, S., Dancer, S. J., Graham, W. J., Hokororo, J., Manzi, F., Marchant, T., Mkoka, D., Morrison, E., Mswata, S., Oza, S., Penn-Kekana, L., Sedekia, Y., Virgo, S., Woodd, S., & Aiken, A. M. (2021). The Clean pilot study: evaluation of an environmental hygiene intervention bundle in three Tanzanian hospitals. *Antimicrobial resistance and infection control, 10*(1), 8. https://doi.org/10.1186/s13756-020-00866-8

Gupta, S., Gunjiyal, J., Malhotra, R., Srivastav, S., & Mathur, P. (2023). Hand-hygiene compliance: The importance of WHO's "moment 1" in prevention of healthcare-associated infections. *Indian journal of medical microbiology,* 44, 100374. https://doi.org/10.1016/j.ijmmb.2023.100374

Haja, A., & Rizwan, M. (2023). KNOWLEDGE, ATTITUDE AND PRACTICE ABOUT SAFE INJECTION PRACTICES AMONG MEDICAL STUDENTS: A CROSS-SECTIONAL STUDY. *International Journal of Advanced Research, 11* (Sep). 876-881. https://dx.doi.org/10.21474/IJAR01/17597

Hall, A., Aguilera-Muñoz, J., McGarrigle, L., Eost-Telling, C., Denison-Day, J., Cabral, C., Willcox, M., & Todd, C. (2025). Adapting the Germ Defence Web-Based Intervention to Improve Infection Prevention and Control in Care Homes: Interview Study Among Care Home Staff. *JMIR formative research,* 9, e66706. https://doi.org/10.2196/66706

Hambridge, K., Endacott, R., & Nichols, A. (2021). Investigating the incidence and type of sharps injuries within the nursing student population in the UK. British Journal of Nursing, 30(17), 998-1006.

Hamed, A. M., Moralejo, D., Pike, A., & Curran, V. (2024). Impact of and strategies to address negative role models and adherence of nursing students to standard precautions: An integrative review. Journal of professional nursing: official journal of the American Association of Colleges of Nursing, 54, 92-99.

Harvey, L., Boudreau, J., Sliwinski, S. K., Strymish, J., Gifford, A. L., Hyde, J., Linsenmeyer, K., & Branch-Elliman, W. (2022). Six Moments of Infection Prevention in Injection Drug Use: An Educational Toolkit for Clinicians. *Open forum infectious diseases, 9*(2), ofab631. https://doi.org/10.1093/ofid/ofab631

Hassan, A. A. (2024). Infection Prevention Control: First Cycle Audit Regarding Safe Fitting and Removal of Personal Protective Equipment among Health-Care Workers in Infectious Diseases Wards at Soba University Hospital. *Journal of Quality in Health Care & Economics, 7*(3), 1–7. https://doi.org/10.23880/jqhe-16000391

Hill, B., Lamichhane, G., & Wamburu, A. (2024). Infection prevention and control: critical strategies for nursing practice. British journal of nursing (Mark Allen Publishing), 33(17), 804–811. https://doi.org/10.12968/bjon.2024.0286
Hill, B., Lamichhane, G., & Wamburu, A. (2024). Infection prevention and control: critical strategies for nursing practice. *British journal of nursing (Mark Allen Publishing), 33*(17), 804–811. https://doi.org/10.12968/bjon.2024.0286
Hinzpeter, J.C. (2023). A Man Called Lister. *European Journal of Theoretical and Applied Sciences, 1*(5). https://doi.org/10.59324/ejtas.2023.1(5)

Hokororo, J. C., Nassoro, O. A., Nungu, S. I., Bahegwa, R. P., Ngowi, R. R., Msigwa, Y. S., ... & Eliakimu, E. S. (2022). Health Facilities Readiness to Implement Standard Precautions for Infection Prevention and Control in Tanzania: Lesson Learnt from SARA Reports. *Advances in Infectious Diseases, 12*(3), 392-404. DOI: 10.4236/aid.2022.123031

Homer, C. S., Davies-Tuck, M., Dahlen, H. G., & Scarf, V. L. (2021). The impact of planning for COVID-19 on private practising midwives in Australia. Women and Birth, 34(1), e32-e37.

Humayun, T., Alkhamis, A. M., Saleh, G. M., Al Qahtani, M. A., AlSaedi, M., El Dalatony, M. M., & Alanezi, K. H. (2021). Designing and Implementing National Program of Health Electronic Surveillance Network (HESN); Infection Control Module in Saudi Arabia. *American Journal of Infectious Diseases, 9*(2), 61-70. DOI:10.12691/AJIDM-9-2-6

Ibrahim, S., Salem, N., & Soliman, S. (2021). Assessment of safe injection practices and needlestick injury among nursing students at Mansoura University. *Mansoura Nursing Journal, 8*(1), 59-76. DOI: 10.21608/mnj.2021.179797

Inegbenosun, H., Azodo, C. C., Anionye, J. C., Inegbenosun, C. U., & Njoku, O. C. (2021). Knowledge, attitude, and practices towards COVID-19: a cross-sectional study among

nursing and midwifery students in Jalingo, Nigeria. *International Journal of Community Medicine and Public Health, 8*(3), 1122. https://dx.doi.org/10.18203/2394-6040.ijcmph20210791

Ji, B., & Ye, W. (2024). Prevention and control of hospital-acquired infections with multidrug-resistant organism: A review. Medicine, 103(4), e37018.

Julius, O. (2022). Factors Associated with Prevention and Control of Hospital Acquired Infections within Nurses in Ngora Fredica Hospital Ngora District Eastern Uganda. Texila International Journal of Nursing, 8(2), 1-10. DOI: 10.21522/TIJNR.2015.08.02. Art001

Khakimova M.M., Tursunov R.A (2024). Assessment of Basic Services and Handling of Infectious and Highly Infectious Waste in Health Facilities. *Public Health and Life Environment – PH&LE, 32*(4):59-64. (In Russ.) https://doi.org/10.35627/2219-5238/2024-32-4-59-64

Kim, H., & Park, H. (2021). Compliance with Infection Prevention and Control Practice among Prospective Graduates of Nursing School in South Korea. *International journal of environmental research and public health, 18*(5), 2373. https://doi.org/10.3390/ijerph18052373

Kottapalli, P., Podduturi, N. C. R., Aswini, G., Jyothi, S., & Naveen, A. (2023). Safe injection, infusion and medication-vial practices at a tertiary care centre: a quality improvement initiative. *GMS hygiene and infection control, 18*, Doc03. https://doi.org/10.3205/dgkh000429

Lee, S. H., & Yang, I. S. (2024). Empowering hospital-associated infection prevention and control: a quasi-experimental study on the effect of scenario-based simulation training. Nurse Education in Practice, 76, 103936.

Leistner, R., Kohlmorgen, B., Brodzinski, A., Schwab, F., Lemke, E., Zakonsky, G., & Gastmeier, P. (2023). Environmental cleaning to prevent hospital-acquired infections on non-

intensive care units: a pragmatic, single-centre, cluster randomized controlled, crossover trial comparing soap-based, disinfection and probiotic cleaning. *EClinicalMedicine,* 59, 101958. https://doi.org/10.1016/j.eclinm.2023.101958

Leite, E. M., Couto, B. R., Neiva, K., Costa, E., De Oliveira, W. L., Sales, B. L., ... & Miranda, L. (2025, February). P-251. Assessing the Persistent Effects of an Extensive Hospital Cleaning Initiative on Healthcare-Associated Infections and Multidrug-Resistant Microorganism Colonization in Patients: A Longitudinal Study. *In Open Forum Infectious Diseases (Vol. 12, No. Supplement_1, pp. ofae631-455).* US: Oxford University Press. https://doi.org/10.1093/ofid/ofae631.455

Lim, S. H., Bouchoucha, S. L., Aloweni, F., & Bte Suhari, N. (2021). Evaluating knowledge and perception of antimicrobial stewardship among nurses in an acute care hospital. *Infection, disease & health, 26*(3), 228–232. https://doi.org/10.1016/j.idh.2021.02.002

McCloy, O., McGuinness, A., & Craig, S. (2024). Infection prevention and control: understanding the fundamentals. Nursing Standard, 39(10), 39-44.

Mutaru, A. M., Balegha, A. N., Kunsu, R., & Gbeti, C. (2022). Knowledge and determinants of infection prevention and control compliance among nurses in Yendi municipality, Ghana. PLoS One, 17(7), e0270508.

Mutaru, A. M., Balegha, A. N., Kunsu, R., & Gbeti, C. (2022). Knowledge and determinants of infection prevention and control compliance among nurses in Yendi municipality, *Ghana. PloS one, 17*(7), e0270508. https://doi.org/10.1371/journal.pone.0270508

Noveen, A., Rahim, A., Ahmed, M., Ahmed, A., Khair, Z., Baloch, I., ... & Khan, A. (2023). Knowledge of nurses about safety measures during the use of injections in public hospitals in Pakistan. *Archives of Nursing Practice and Care, 9*(1), 001-007. DOI: 10.17352/2581-4265.000064

Nwaogu E. U. M. (2023). 1438. Hand Hygiene Compliance and Monitoring among Healthcare Workers at an Urban Hospital in the Caribbean. Open Forum Infectious Diseases, 10(Suppl 2), ofad500.1275. https://doi.org/10.1093/ofid/ofad500.1275

Ofili, M. I., & Nwogueze, B. C. (2024). Factors impacting nurses' compliance with infection prevention and control protocols: A study at Central Hospital in Sapele, Delta State, Nigeria. *International Journal of Innovative Science and Research Technology (IJISRT), 9*(6), 2447–2453. https://doi.org/10.38124/ijisrt/IJISRT24JUN856

Okeke, K. I., Ahamefule, C. S., Nnabuife, O. O., Orabueze, I. N., Iroegbu, C. U., Egbe, K. A., & Ike, A. C. (2024). Antiseptics: An expeditious third force in the prevention and management of coronavirus diseases. C*urrent research in microbial sciences,* 7, 100293. https://doi.org/10.1016/j.crmicr.2024.100293

Olorunfemi, O., Oyewole, O.M., & Oduyemi, R.O. (2020). Nursing students' knowledge and practice of infection control in burns and medical-surgical units at the University of Benin teaching hospital, Nigeria, 2019. *Journal of Nursing and Midwifery Sciences, 7,* 42 - 46. https://doi.org/10.4103/jnms.jnms_40_19

Omo, Q. G., & Hassan, N. E. (2024). Biomedical waste management and their effects on the Environment: A review. *World Journal of Advanced Engineering Technology and Sciences, 11*(1), 086-095. https://doi.org/10.30574/wjaets.2024.11.1.0020

Panditrao, A., Shafiq, N., Kumar-M, P., Sekhon, A. K., Biswal, M., Singh, G., Kaur, K., Ray, P., Malhotra, S., Gautam, V., Gupta, R., Gupta, V., Yadav, T. D., Laroiya, I., Kumar, H., & Salvania, A. (2021). Impact of an antimicrobial stewardship and monitoring of infection control bundle in a surgical intensive care unit of a tertiary-care hospital in India. *Journal of global antimicrobial resistance, 24*, 260–265. https://doi.org/10.1016/j.jgar.2021.01.003

Pardhi, Dr & Khan, Dr. (2021). Disposale of medical waste during pandemic. *International Journal of Homoeopathic Sciences. 5.* 218-220. https://doi.org/10.33545/26164485.2021.v5.i1d.317.

Plachouras, D., Kacelnik, O., Rodríguez-Baño, J., Birgand, G., Borg, M. A., Kristensen, B., Kubele, J., Lyytikäinen, O., Presterl, E., Reilly, J., Voss, A., Zingg, W., Suetens, C., & Monnet, D. L. (2023). Revisiting the personal protective equipment components of transmission-based precautions for the prevention of COVID-19 and other respiratory virus infections in healthcare. *Euro surveillance: bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin, 28*(32), 2200718. https://doi.org/10.2807/1560-7917.ES.2023.28.32.2200718

Pottier, F., Groizard, C., Briche, G., Haraczaj, N., Garnier, M., Loones, V., Ozguler, A., Baer, M., Baer, G., & Loeb, T. (2021). Personal protective equipment and doffing procedures in out-of-hospital practice: assessment with a contamination simulation. *International journal of emergency medicine, 14*(1), 35. https://doi.org/10.1186/s12245-021-00362-9

Raksha, K., Anand, K., & Prakash, P. Y. (2023). 1248. Implementing Infection Prevention and Control with Antimicrobial Stewardship in a Tertiary Care Hospital in India: An Interprofessional Education and Collaborative Practice Approach. *Open Forum Infectious Diseases, 10*(Suppl 2), ofad500.1088. https://doi.org/10.1093/ofid/ofad500.1088

Ramadan F. (2023). Infection prevention and control: a guide for community nurses. *British journal of community nursing, 28*(4), 184–186. https://doi.org/10.12968/bjcn.2023.28.4.184

Ranoto, L. Q., Ntimana, C. B., Mamogobo, P., & Maimela, E. (2025). Knowledge, Attitudes, and Practices of Infection Prevention and Control Nurses in Public Hospitals in the Limpopo Province: A Qualitative Study. *International journal of environmental research and public health, 22*(1), 116. https://doi.org/10.3390/ijerph22010116

Rezian, A., Shaaban, A. Y., Mohamed, M. A. F., & Hashem, E. S. (2024). Effect of An Educational Program on Improving Nurses Performance Regarding Infection Prevention and Control in Chest Disease Wards. Alexandria Scientific Nursing Journal, 26(3), 73-83.

Roseline Muthoni Gakuanyi, Catherine Syombua Mutunga, Josphat Njuguna (2022). Facility-linked factors and adherence to WHO blueprints on prevention of Surgical Site Infections in Kenya. *International Journal of Scientific and Research Publications (IJSRP) 12*(3) (ISSN: 2250-3153). http://dx.doi.org/10.29322/IJSRP.12.03.2022.p12328

ROSHANALI, R. (2022). Hidden Truth Uncovered: Compromised Environmental Cleaning Practices of Housekeeping Lead to Increased Hospital Acquired Infections in Lower Middle-Income Country. *American Journal of Infection Control, 50*(7), S10. https://doi.org/10.1016/j.ajic.2022.03.136

Sacramento Costa, V.. (2023). HAND HYGIENE AND HEALTHCARE-RELATED INFECTIONS: A LITERATURE REVIEW. *Health and Society, 2*(06), 229–250. https://doi.org/10.51249/hs.v2i06.1097

Said, A.S., Kicha, D.I., Omar, M., Gushchina, Y.S., Geferso, A.T., & Handuleh, J.I. (2023). INFECTION PREVENTION PRACTICE AND ASSOCIATED FACTORS AMONG HEALTH CARE WORKERS IN PUBLIC HEALTH FACILITIES OF MOGADISHU, SOMALIA, 2022. *Archiv Euromedica 13*(3). DOI:10.35630/2023/13/3.301

Schlich, T., & Strasser, B. J. (2022). Making the medical mask: surgery, bacteriology, and the control of infection (1870s–1920s). Medical History, 66(2), 116-134. https://doi.org/10.1017/mdh.2022.5

Sebastian, R., Gopalakrishnan, ., Kumar, P. S., Prashanth, L., & Jose, D. (2021). Prevention and Control of Infections. *Journal of Applied Life Sciences International, 24*(7), 1–9. https://doi.org/10.9734/jalsi/2021/v24i730246

Shaikh, T. G., Waseem, S., Ahmed, S. H., Swed, S., & Hasan, M. M. (2022). Infectious disease surveillance system in Pakistan: challenges and way forward. *Tropical Medicine and Health, 50*(1), 46. https://doi.org/10.1186/s41182-022-00439-y

Shenoy, E. S., & Branch-Elliman, W. (2023). Automating surveillance for healthcare-associated infections: Rationale and current realities (Part I/III). *Antimicrobial stewardship & healthcare epidemiology: ASHE, 3*(1), e25. https://doi.org/10.1017/ash.2022.312

Shrestha, S., , Cho, Y., , Bhuju, C., , Cha, K., , Chung, M., , & Pun, K. D., (2023). Knowledge, Perception and Confidence in Performance on Infection Prevention and Control Measures among the Nursing Students. *Kathmandu University medical journal (KUMJ), 21*(84), 383–388.

Silago, V., Manzi, M. J., Mtemisika, C. I., Damiano, P., Mirambo, M. M., & Mushi, M. F. (2022). Knowledge, attitude and practices of hand hygiene among students and nurses' staff in Mwanza Tanzania: a cross-sectional hospital-based study during global COVID-19 pandemic. *East Africa Science, 4*(1), 11-20.

Singh, H., YT, K., Mishra, A. K., Singh, M., Mohanto, S., Ghumra, S., ... & Thangadurai, D. (2024). Harnessing the foundation of biomedical waste management for fostering public health: strategies and policies for a clean and safer environment. *Discover Applied Sciences, 6*(3), 89. https://doi.org/10.1007/s42452-024-05735-2qq

Song, M. S., Jeong, S. Y., & Park, S. (2024). Infection Control Experiences and Educational Needs of Geriatric Care Workers in Long-Term Care Facilities: A Pilot Study. Healthcare (Basel, Switzerland), 12(3), 301.

Speth J. (2023). Guidelines in Practice: Hand Hygiene. *AORN journal, 118*(2), 101–108. https://doi.org/10.1002/aorn.13964

Steere-Williams, J. (2023). Seeing germs, selling germs: translating Anglo-American bacteriology. *Interdisciplinary Science Reviews, 48*(2), 181-201. https://doi.org/10.1080/03080188.2022.2156149

Stowe, C. (2022, December). 1205. Does Perception of Cleanliness Matter? A Correlational Study Exploring Patient Perception of Cleanliness and HAC Score Performance. *In Open Forum Infectious Diseases* (Vol. 9, No. Supplement_2, pp. ofac492-1038). US: Oxford University Press. https://doi.org/10.1093/ofid/ofac492.1038

Suarnianti, S., & Haskas, Y. (2023). Determinant Infection Prevention and Control Practices among Nurses during COVID-19 Pandemic. *The Open Public Health Journal 16*(10). https://doi.org/10.2174/18749445-v16-e230320-2022-193

Sujon, H., Biswas, T. K., Chowdhury, A., & Chowdhury, M. E. (2022). Medical Waste Management: An Assessment of District-Level Public Health Facilities in Bangladesh. *Cureus, 14*(5), e24830. https://doi.org/10.7759/cureus.24830

Ukwenya, V. O., Fuwape, T. A., Fadahunsi, T. I., & Ilesanmi, O. S. (2021). Disparities in knowledge, attitude, and practices of infection prevention and control of Lassa fever among health care workers at The Federal Medical Centre, Owo, Ondo State, Nigeria. *The Pan African medical journal*, *38*, 357. https://doi.org/10.11604/pamj.2021.38.357.26208

Ungar, R., Gur-Arie, R., Heriot, G. S., & Jamrozik, E. (2024). Burdens of infection control on healthcare workers: a scoping review. Journal of Hospital Infection, 146, 76-81.

Verhougstraete, M., Cooksey, E., Walker, J. P., Wilson, A. M., Lewis, M. S., Yoder, A., Elizondo-Craig, G., Almoslem, M., Forysiak, E., & Weir, M. H. (2024). Impact of terminal cleaning in rooms previously occupied by patients with healthcare-associated infections. *PloS one, 19*(7), e0305083. https://doi.org/10.1371/journal.pone.0305083

Verhougstraete, M., Cooksey, E., Walker, J. P., Wilson, A. M., Lewis, M. S., Yoder, A., Elizondo-Craig, G., Almoslem, M., Forysiak, E., & Weir, M. H. (2024). Impact of

terminal cleaning in rooms previously occupied by patients with healthcare-associated infections. *PloS one, 19*(7), e0305083. https://doi.org/10.1371/journal.pone.0305083

Vinh, R., Azzolin, K. A., Stream, S. E., Carsten, D., Eldridge, L. A., Estrich, C. G., & Lipman, R. D. (2024). Dental unit waterline infection control practice and knowledge gaps. *Journal of the American Dental Association (1939), 155*(6), 515–525.e1. https://doi.org/10.1016/j.adaj.2024.02.011

Wahab, P. A., & Adie, F. A. M. (2021). Knowledge and compliance of standard precautions among the undergraduate nursing students. *International Journal of Care Scholars, 4*(2), 15-21. https://doi.org/10.31436/ijcs.v4i2.184

Wong, E. L., Ho, K. F., Dong, D., Cheung, A. W., Yau, P. S., Chan, E. Y., Yeoh, E. K., Chien, W. T., Chen, F. Y., Poon, S., Zhang, Q., & Wong, S. Y. (2021). Compliance with Standard Precautions and Its Relationship with Views on Infection Control and Prevention Policy among Healthcare Workers during COVID-19 Pandemic. *International journal of environmental research and public health, 18*(7), 3420. https://doi.org/10.3390/ijerph18073420

World Health Organization. (2022). Infection prevention and control. Retrieved from https://www.who.int/health-topics/infection-prevention-and-control

World Health Organization. WHO guidelines on hand hygiene in health care. First global patient safety challenge clean care is safer care 2009 [10 February 2021]. Retrieved from: https://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906_eng.pdf?sequence=1.

Yen, C. F., van den Berg, P., & Pepe, D. E. (2021). Infection prevention measures in acute care settings based on severe acute respiratory syndrome coronavirus 2 transmission patterns and risk: a review. *Current opinion in infectious diseases, 34*(4), 346–356. https://doi.org/10.1097/QCO.0000000000000738

Zgham, W., Sahani, S., & Rahimi, H. (2024). Modeling the Transmission Dynamics of the Ebola Virus: Effects of Quarantine and Vaccination. J*ournal of Natural Science Review, 2*(3), 97-120. https://doi.org/10.62810/jnsr.v2i3.88

Zhou, S., Nagel, J. L., Kaye, K. S., LaPlante, K. L., Albin, O. R., & Pogue, J. M. (2021). Antimicrobial Stewardship and the Infection Control Practitioner: A Natural Alliance. *Infectious disease clinics of North America, 35*(3), 771–787. https://doi.org/10.1016/j.idc.2021.04.011

Zimba, M., Chanda, C., Mulubwa, C., & Hazemba, A. (2022). Infection Prevention and Control practices; an exploratory qualitative study of experiences of health care providers and support staff at the University Teaching Hospital, Lusaka, Zambia. *medRxiv,* 2022-03. https://doi.org/10.1101/2022.03.23.22269760.

APPENDIX I

FACULTY OF NURSING SCIENCES

COLLEGE OF MEDICAL SCIENCES

UNIVERSITY OF BENIN, BENIN CITY

QUESTIONNAIRE ON PRACTICE OF INFECTION CONTROL MEASURES AMONG NURSING STUDENTS IN A TERTIARY ACADEMIC INSTITUTION IN EDO STATE

Dear Respondents,

I am a student at the institution mentioned above, currently conducting research on the topic " **practice of infection control measures among nursing students in a tertiary academic institution in Edo state".** The purpose of this questionnaire is to gather pertinent information regarding the subject matter. I kindly request that you select the most suitable option from the choices provided below. Please be assured that all information shared will be kept completely confidential. Thank you for your cooperation.

INSTRUCTIONS:

Please tick as appropriate in all the boxes provided.

SECTION A: DEMOGRAPHIC INFORMATION

1. Gender: [ ] Male [ ] Female [ ] Prefer not to say

2. Year of study: [ ] 300 level [ ] 400 level [ ] 500 level
3. Marital status: Single ( ) Married ( ) Divorced ( )
4. Religion: Christianity ( ) Islam ( ) Others (please specify) ___________________
5. Ethnicity: Yoruba ( ) Igbo ( ) Hausa ( ) Benin ( ) Others (please specify) _______________

SECTION B: PRACTICE OF INFECTION CONTROL MEASURES AMONG NURSING STUDENTS

Items	Strongly Agree	Agree	Disagree	Strongly Disagree
I always perform hand hygiene before and after patient contact.				
I use personal protective equipment (PPE) appropriately during procedures.				
I follow proper techniques when disposing of sharps and infectious waste.				
I clean and disinfect equipment before and after patient use.				
I adhere to isolation precautions, when necessary, in clinical settings.				

SECTION C: FACTORS INFLUENCING THE PRACTICE OF INFECTION CONTROL MEASURES AMONG NURSING STUDENTS

Items	Strongly Agree	Agree	Disagree	Strongly Disagree
I believe infection control practices are essential for patient safety.				
I feel adequately trained to implement infection control measures.				
Supervision from clinical instructors influences my compliance with infection control.				
I practice infection control more effectively when provided with continuous education.				
Institutional policies motivate me to adhere to infection control guidelines.				

SECTION D: BARRIERS TO COMPLIANCE WITH INFECTION CONTROL MEASURES AMONG NURSING STUDENTS.

Items	Strongly Agree	Agree	Disagree	Strongly Disagree
Lack of PPE prevents me from following infection control guidelines.				
Time constraints during clinical rotations				

affect my ability to follow procedures.				
Overcrowding in the wards makes infection control difficult to practice.				
Inadequate supervision reduces my adherence to infection control practices.				
I find it challenging to comply with all infection control measures due to workload.				

APPENDIX II

RELIABILTY OF INSTRUMENT (QUESTIONNAIRE) OF PRACTICE OF INFECTION CONTROL MEASURES AMONG NURSING STUDENTS IN A TERTIARY ACADEMIC INSTITUTION IN EDO STATE

A pilot study was conducted with 24 nursing students, representing 10% of the study population, at the University of Benin Teaching Hospital College of Nursing. The respondents had characteristics similar to the target population. Cronbach's alpha was calculated to assess internal consistency, with a value of 0.71 or higher considered acceptable. Identified gaps in the questionnaire were corrected, enhancing the reliability of the instrument.

Scale	Number of Items	Cronbach's Alpha	Cronbach's Alpha (Standardized Items)	Mean	Variance	Std. Deviation	Interpretation
Practice of Infection Control Measures	5	0.825	0.832	22.45	10.205	3.194	High internal consistency
Factors Influencin	5	0.839	0.845	23.15	11.224	3.350	High internal consistency

g Practice							
Barriers to Compliance	5	0.821	0.828	21.75	10.485	3.238	High internal consistency

APPENDIX III

RESEARCH ETHICS COMMITTEE

COLLEGE OF MEDICAL SCIENCES
UNIVERSITY OF BENIN, BENIN CITY, NIGERIA.

Chairman: Prof. F. A Imarhiagbe
MBChb, FMCP
Cert Clin Res and ethics (NIH), MD.
08603449092

P.M.B 1154, BENIN CITY
Email: researchethics.cms@gmail.com

Our Ref: CMS/REC/01/VOL.2/782

Date: 1st June, 2025

Re: PRACTICE OF INFECTION CONTROL MEASURES AMONG NURSING STUDENTS IN A TERTIARY ACADEMIC INSTITUTION IN EDO STATE

Name of Principal Investigator: **OKHAWERE OMOLEGHO RUTH**
Department Of Nursing Science,
School of Basic Medical Sciences,
University Of Benin,
Benin City.

REC Approval No: CMS/REC/2024/782

This is to inform you that the research described in the submitted proposal, the Informed Consent Forms and other participant information materials have been reviewed and approved by the College Research Ethics Committee, University of Benin.

This approval dates from **1st June, 2025 to 31st May, 2026.** In multi-year research, Endeavour to submit your annual report to the REC early in order to obtain renewal of your approval and avoid disruption of your research.

The National Code of Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the code including ensuring that all adverse events are reported promptly to the REC. No, changes are permitted in the research without prior approval by REC except in circumstances outlined in the code. REC reserves the right to conduct compliance visit to your research site without prior notice. Thank you.

PROF. F.A IMARHIAGBE
Chairman, REC

Promoting best ethical & scientific standard for research in Nigeria