Çankırı Karatekin University
Graduate School of Health Sciences

Master of Science Thesis

ASSESSMENT THE NURSES' KNOWLEDGE AND PRACTICES OF STANDARD PRECAUTIONS TOWARD INFECTION CONTROL IN NASIRIYAH CITY/ IRAQ

HUSSEIN ALI MOHAWAT AL-ABBOODI

Advisor

Asst. Prof. Dr. Songül ŞAHİN

Çankırı 2022

ASSESSMENT THE NURSES' KNOWLEDGE AND PRACTICES OF STANDARD PRECAUTIONS TOWARD INFECTION CONTROL IN NASIRIYAH CITY/ IRAQ

BY

Hussein Ali Mohawat AL-ABBOODI

The Institute of Health Sciences
The Department of Nursing

The Degree of Master of Science

SUPERVISOR
Asst. Prof. Dr. Songül ŞAHİN

2023

ACCEPTANCE AND APPROVAL

Hussein Ali Mohawat AL-ABBOODI, the graduate student of The Institute of Health Sciences with the student number 208205289, has successfully presented her thesis entitled Assessment the Nurses' knowledge and practices of standard precautions toward infection control in Nasiriyah city/ Iraq before the jury whose signatures are below, after fulfilling all of the requirements determined by the relevant regulations for the degree of Master of Science:

Advisor **:** Asst. Prof. Dr. Songül ŞAHİN

Examining Committee Members:

Chairman **:** Asst. Prof. Dr. Songül ŞAHİN
Faculty of Dentistry
Çankırı Karatekin University

Member **:** Assoc. Prof. Dr. Fatih KARAYÜREK
Faculty of Dentistry
Karabük University

Member **:** Asst. Prof. Dr. Başak KARASU
Faculty of Dentistry
Çankırı Karatekin University

Approved for the Graduate School of Health Sciences

Assoc. Prof. Dr. Nazan KAYTEZ
Director of Graduate School

ETHICS STATEMENT

The thesis entitled Assessment the nurses' knowledge and practices of standard precautıons toward infection control in Nasiriyah city/ Iraq which was prepared and presented as a thesis, was written by myself and in accordance with the scientific, academic rules and ethical conduct. The idea/hypothesis of my thesis solely belongs to my supervisor and to me. The research pertaining to the thesis was conducted by myself and therefore, all of the used sentences and interpretations within the work belongs to me.

I declare the aforementioned issues to be correct.

Signature

/ /

Hussein Ali Mohawat AL-ABBOODI

ABSTRACT

ASSESSMENT THE NURSES' KNOWLEDGE AND PRACTICES OF STANDARD PRECAUTIONS TOWARD INFECTION CONTROL IN NASIRIYAH CITY/ IRAQ

Husseın Alı Mohawat AL-ABBOODI

Master of Science in Nursing

Advisor: Asst. Prof. Dr. Songül ŞAHİN

February 2023

Objective: This research aims to assess nurses' knowledge and practices of standard precautions for infection control and to know the relationship between knowledge and practices of standard precautions toward infection control and demographic data such as age, gender, resident, educational level, workplace, years of experience and training course.

Study methodology: A descriptive cross-sectional study was conducted Al-Hussein teaching hospital in Nasiriyah city in Iraq between 01/05/2022 to 25/09/2022. The research scientist consists of nurses who work at Al-Hussein Teaching Hospital in the city of Nasiriyah in Iraq. The number of the sample was determined to be no less than 300 nurses through the method of calculating the sample in cases where the universe is unknown. Data was collected face to face. "Nurses' knowledge" and "Infection control practices" were used to collect the data.

Results: In the study, it was determined that the mean age was 5.58775 ± 29.0333 years and 57.3% of the women in the study group were between the ages of 20-30 years old.
A positive relationship was found between age, gender, experience, education level, work unit, infection control evidence receiving HBVV, the presence of any infection control nurse in the hospital, infection control training outside the hospital and in the hospital, and nursing knowledge and practices however knowledge was associated with positive practices.

Conclusion: It was determined that there is a strong relationship between nursing knowledge and practices and that knowledge positively affected practices towards infection control and infection.

2023, 75 pages

Keywords: nursing knowledge, nursing practices, infection control

ÖZET

HEMŞİRELERİN NASİRİYAH ŞEHRİNDE/IRAK'TA ENFEKSİYON KONTROLÜNE YÖNELİK STANDART ÖNLEMLER KONUSUNDAKİ BİLGİ VE UYGULAMALARININ DEĞERLENDİRİLMESİ

Husseiın Ali Mohawat AL-ABBOODI

Hemşirelik, Yüksek Lisans

Tez Danışmanı: Dr. Öğr. Üyesi Songül ŞAHİN

Şubat 2023

Amaç: Bu araştırma, hemşirelerin enfeksiyon kontrolüne yönelik standart önlemler hakkındaki bilgi ve uygulamalarını değerlendirmeyi ve enfeksiyon kontrolüne yönelik standart önlemlerin bilgi ve uygulamaları ile yaş, cinsiyet, ikametgah, eğitim düzeyi, işyeri, yılların deneyimi ve eğitim kursu gibi demografik veriler arasındaki ilişkiyi bilmeyi amaçlamaktadır.

Çalışma metodolojisi: 01/05/2022 - 25/09/2022 tarihleri arasında Irak'ın Nasiriye şehrinde bulunan Al-Hussein eğitim hastanesinde tanımlayıcı kesitsel bir çalışma yapılmıştır. Araştırma bilimcisi, Irak'ın Nasiriye kentindeki El-Hüseyin Eğitim Hastanesi'nde çalışan hemşirelerden oluşuyor. Evrenin bilinmediği durumlarda örneklemin hesaplanması yöntemiyle örneklem sayısının en az 300 hemşire olduğu belirlenmiştir. Veriler yüz yüze toplandı. Verilerin toplanmasında "Hemşirelerin bilgisi" ve "Enfeksiyon kontrol uygulamaları" kullanılmıştır.

Sonuç: Hemşirelik bilgi ve uygulamaları arasında güçlü bir ilişki olduğu ve bilginin enfeksiyon kontrolü ve enfeksiyonuna yönelik uygulamaları olumlu yönde etkilediği belirlenmiştir.

2023, 75 Sayfa

Anahtar Kelimeler: Hemşirelik Bilgisi, Hemşirelik Uygulamaları, Enfeksiyon Kontrolü

PREFACE AND ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to Assoc. Prof. Dr. Songül ŞAHİN for his directives to finish this work. This study was funded by the Husseiın Ali Mohawat AL-ABBOODI, under the project …….

Husseiın Ali Mohawat AL-ABBOODI

Çankırı-2023

CONTENTS

INDEX OF ABBREVIATIONS AND SYMBOLS

n	Number
%	Percentages
SD	Standard deviation
F	The value of the variance between the group
M	Mean

LIST OF ABBREVIATIONS

ACW	acute care ward
AMR	Antimicrobial resistance
AMs	Misuse of antimicrobials
AS	Antimicrobials
ASCs	Active surveillance cultures
CDC	Centers for Disease Control and Prevention
COPD	chronic obstructive pulmonary disease
CVC	central venous catheter
ECDC	European Center for Disease Control
ER	emergency room
ESA	Enterobacteriaceae with extended-spectrum cephalosporin resistance
FUH	Ferrara University Hospital
HCAIs	Health-care-associated infections
HCAUTI	healthcare-associated urinary tract infection
HCWs	health care workers
HH	hand hygiene
ICU	intensive care unit
IPC	Infection prevention and control procedures
KISS	Krankenhaus Infections Surveillance System
MRSA	methicillin-resistant Staphylococcus aureus
MV	mechanical ventilation
PN	pneumonia
PPS	Point Prevalence Surveys
SSI	Skin and Soft Tissue Infection
UTI	urinary tract infection
UTIs	urinary tract infections
VAP	ventilator-associated pneumonia
VISA	vancomycin-resistant Staphylococcus aureus
VRE	Vancomycin-resistant enterococci
VRE	ancomycin-resistant enterococci
VRSA	vancomycin-resistant staphylococcus aureus
WHO	World Health Organization

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

Hospital-acquired infections are diseases that do not exist or are incubated this is done if the sick person is admitted to the hospital. Nearly nine percent of inpatients have a hospital infection at any given moment, which equates to at least 100,000 infections each year. Its effects range from patient pain to long-term or permanent impairment, and each year, a small portion of patient deaths are often attributed to hospital-acquired infections (John 2000).

The so-called standard precautions are a minimum that is used as a type of procedure in order to prevent all types of infections that apply in one way or another to all patients during their care, even if the patient is infected or not in places of care, because these precautions are a method In order to protect the person, whether he is an employee or accompanying the patient, in order to stop the spread of any and all diseases (CDC 2011).

Diseases produced by antibiotic resistant microbes put patients at risk of potentially fatal infections and cost the European Union €1.5 billion per year (the UK's five-year antimicrobial resistance policy). The cost of HCAI in US public hospitals is expected to range from $2,027 to $12,197. The total cost of healthcare-associated infections (HCAIs) in American acute-care hospitals, including lost income and other direct and indirect health expenditures, has been estimated to be US$96-147 billion each year (Gould *et al.* 2017).

These statistics reveal that HCAI preventive methods have been more successful in some nations and healthcare institutions than others, and for some pathogens than others, and that HCAI remains a substantial danger to patient safety and a drain on healthcare resources internationally (Gould *et al.* 2017)

Standard precautions aim to safeguard health personnel and patients by reducing the number of risks through the transmission of a number of microorganisms from all

sources separately, whether they are known or unknown sources. They are the infection prevention and control procedures (IPC) minimal requirements that all health care personnel must follow when caring for all patients, at all times and in all venues. When a person, whether a nurse or a health worker, performs an operation in order to follow the so-called standard precautions on an ongoing basis, it is also possible to prevent or reduce the spread of a large number of pathogens between patients, their nursing contacts and the environment (WHO 2022)

Risk assessment, continuously clean hands as well as use special etiquette for breathing and special etiquette for coughing, patient positioning, personal protective equipment, aseptic technique, safe injection and acute injury prevention, environmental cleaning, laundry and linen handling, waste management, disinfection and retreatment of the reusable patient are all important components of standard precautions. As a result, the use of care materials and equipment should promote a safe environment, develop policies that facilitate the implementation of IPC practise, provide resources for IPC programmes, implement standard precautions for risk assessment, and then train health workers in the early identification a special process for assessing a number of risks through exposure to blood and also exposure to body fluids - including secretions, sprays and/or aerosols, and contaminated surfaces - by training health workers on procedure (WHO 2022).

Antimicrobial resistance is a major global health concern (AMR). Health and financial problems are both exacerbated by antimicrobial resistance. The primary challenges associated with antibiotic resistance include increased morbidity and mortality, protracted hospital stays, and expensive treatment costs (O'Neill 2016). Misuse or overuse of antibacterial drugs is a major contributor to the spread of bacteria that can cause infection and death in humans (Michael *et al.* 2014).

In response to this growing problem, the World Health Organization (WHO) has started developing preventative measures. Adopting antimicrobial stewardship to slow the spread of bacterial resistance in health care settings. Many other government agencies and colleges have sought to develop acceptable antibiotic control strategies. The World

Health Organization recommends developing nations to create a national antibiotic-reduction action plan (WHO 2015). Evaluation of the antibiotic prescription model is one of the supervisory action plans (Sommer *et al.* 2017)

In Iraq, infectious illnesses account for 19.1 percent of disease burden, noncommunicable diseases account for 61.6 percent, and infections account for 19.2 percent (2012). Expenditure is predicted to be 76.5 percent (2015), with a density of 9.4 physicians per 10,000 people (2017). Iraq has 18 governorates, three of which are in the semi-autonomous province of Kurdistan. For decades, the country has been in a state of emergency. Iraq is prone to both natural and man-made catastrophes, which result in enormous losses in lives, livelihoods, and infrastructure, as well as the reversal of development achievements. Natural catastrophes cause an average of 4.9 fatalities per 100,000 people per year (1997-2016) (WHO 2019) From here, The significance of the study lies in its demonstration of the high prevalence of infectious diseases in Iraq and the deficiency of preventative measures, despite the importance of that hospitals with comfortable temperatures and weak immunity are ideal bacterial incubators and hosts a first-class outbreak of pandemic infection. Errors in infection control as well as excessive and irrational the use of antibiotics produces new bacteria that are resistant to antibiotics. The new ones superbugs - stronger, more elusive and deadly - have multiplied in thousands of hospitals (Hussein *et al.* 2019)

Many studies have been conducted in infection control and precautionary measures, including a study (Qader and Muhamad, 2010) According to the study, wound infections are a major concern in burn units and are caused mostly by hospital contamination. Infections in burn patients are harmful because they affect the course of the disease and the patient's fate. Many patients with burn injuries die while in the hospital. Burns are quite common in impoverished nations. For these reasons, over the course of a year, we analysed bacteriological profiles and compared antibiotic resistance patterns of the dominating bacteria. The research was carried out over a 12-month period (May 2008 to April 2009) at Sulaymaniyah Hospital for Burns Sulaymaniyah, Iraq, Reconstruction and Plastic Surgery The study collected 1126 swabs and blood samples from 760 hospitalised patients (505 females and 255 males). Bacterial isolates

were discovered in 935 of the 935 samples (83 percent), with just 180 wound swabs being sterile (16 percent). Others were polluted in the laboratory, and no tests were conducted (1 percent). 1402 bacteria were isolated in total (average number of organisms per sample, 1.5). Staphylococcus aureus was the most prevalent cause of bacterial burn wound invasion, accounting for 34% of cases, followed by Pseudomonas aeruginos (18%). The overall percentage of MDR organisms was 51% (715/1402) of all species MRSA was found in 87.1 percent of all cases (176/202), the proportion of non-fermenting bacteria in all forms of non-fermenting bacteria was 28.8 percent (Hussein *et al.* 2019)

Among order to evaluate the frequency of MRSA in hospital workers, a research was undertaken in Iraq in a district, and the study indicated that MRSA bacteria are ubiquitous in hospitals and the population in Dohuk, Iraq. PVL was related with the greatest risk of community-acquired MSSA (CA- MRSA). More genetic research is needed, but immediate action is needed to prevent MRSA reproduction and spread, create breeding partnerships, and undertake epidemiological studies (Hussein *et al.* 2019)

The goals of this study were to (1) identify the most common types of hospital-acquired infections in the region of Baqubah, Iraq, and (2) identify the most common risk factors associated with these infections. It was found that the incidence of hospital types (NI) was higher with urinary tract infections. Urinary tract infections forty percent, followed by surgical site infections thirty-five and eight percent and respiratory tract infections twenty-three percent (Al-Kharkhi *et al.* 2016).

Compliance rates for hand hygiene among health care workers in a trauma hospital in Iraqi Kurdistan were evaluated using the Activities and Health Score study. This study aimed to compare ER, ICU, and acute care ward compliance rates (ACW). Research indicates that only 6.8% of people actually do what they're supposed to when it comes to hand hygiene (95% confidence interval: 5.0-9.1). The Emergency Room had the lowest compliance (1.0%) compared to the Intensive Care Unit (8.1%, $p = 0.0012$) and the Ambulatory Care Setting (11.1%, $p < 0.0001$). There wasn't enough hand sanitizer

or sinks with alcohol to properly care for the patients in all three units. Overall, we found that compliance with hand hygiene was low, with the lowest level of compliance being in the ER, and the study recommends better allocation of resources and improved hand hygiene procedures. In already strained health care systems, these relatively simple measures can reduce the prevalence of healthcare-associated infections and improve patients' chances of survival and recovery (Moued *et al.* 2021)

1.1 Objective of the study

- To test the nurses' familiarity with basic infection-prevention measures.
- This study aimed to assess the nurses' adherence to infection-prevention best practices.
- To examine the association between age, gender, residency, education, place of employment, years of experience, and training course participation in relation to participants' knowledge and practice of standard precautions toward infection control.

1.2 Research questions

- Standard precautions for infection control: a survey of nurses' knowledge and practice in Nasiriyah, Iraq
- Using demographic data to evaluate the connection between nurses' knowledge and their practices (age, gender, resident, education level, place of work, years of experience and training course)

1.3 Limitations

Results are also limited by sample duration, the scale used specifically for this study, and the fact that the data were based on self-reports from the nurses in the study.

2 GENERAL INFORMATION

2.1 History

Before Louis Pasteur one thousand eight hundred twenty two to one thousand eight hundred and ninety-five and Robert Koch (1843-1910) identified the first microbes and demonstrated their causal link to illness, hospital infections were recognised. Ignaz Semmelweis (1818-1865) explained that midwifery fever and the high death rate of women in hospitals are caused by poor physician performancen (Taylor 2014, Murrell 2018).

Although the cause of midwifery fever was unknown at the time, it was Semmelweis the principles of combating the spread of midwifery fever were developed with great success. His requirements for doctors working in the hospital are the first example of not only detecting and recognizing infection in the hospital, but also the appropriate control of hospital infection. Unbeknownst to Semmelweiss, English surgeon Joseph Lister (1827-1912) noted that the high rate of patient mortality after surgery was caused by infection. As he understood Pasteur's interpretation of bacterial fermentation and the value of Koch's discoveries, he introduced disinfection into surgery and worked to solve it in detail. Its antiseptic procedures significantly reduced surgical wound infections and subsequently higher postoperative mortality (Hudson 2013).

Later, thanks to the introduction of new technological procedures in medicine, special principles of disinfectants were replaced by sterility, which remains the basis of the struggle to this day, infection in general and surgery in particular. With the strong development of bacteriology in the second in the middle of the nineteenth century it was possible to discover and prove the causes of infections and the fights against them by using chemical agents with antibacterial effect. At a time when drugs with strong antimicrobials were not used in medicine (sulfonamides, antibiotics), the most common cause was bacterial hospital infections, the causative agents of classic infectious diseases and thus did not differ significantly from the infections and diseases that occur in patients outside the hospital. The only difference was that nosocomial infections were

more severe because they occurred in patients, that is, in people who had already been depleted of some disease who came to a hospital. Also, the discovery of the causative factors was not difficult because it was manifested in the classic, well-known symptoms of the disease, which made it easier to identify and find them and the most appropriate methods of suppression and prevention. Easier to fight hospital infections in that time favors: relatively few hospital patients, simpler diagnostic and therapeutic procedures, strict adherence to disinfection and sterilization of all materials used in the hospital, adherence to strict hospital hygiene principles, isolation of highly infectious patients (Ogoina *et al.* 2015).

2.2 Definition of infection from hospital

It is a disease that can be acquired in places of hospitalization such as a hospital, health centers or medical clinics. The term "hospital infection" (from the Greek nosokomeion, "hospital") is used by some academics to describe this phenomenon (Rosenthal *et al.* 2012). It is often referred to as a special infection associated in one way or another with health care in order to emphasize the infection that occurs in hospital settings of various kinds such as hospitals and others (CDC 2022).

This type of infection can occur through the clinical context, which is spread by patients who are potentially infected and can spread to healthcare workers through, among other things, air droplets and through the coverings that he uses Patients in the family and sometimes it occurs after surgery as it may occur more often through the skin, but despite that it is considered this type of infection because of its occurrence in the environment in which health care is carried out (Monegro *et al.* 2020).

2.3 Infection's effects in the hospital

It is estimated in the USA, that there are about one million seven hundred thousand infections that scientists have linked to health care that microorganisms cause of all kinds, including fungi and bacteria, these organisms cause or may contribute to ninety-

nine thousand cases of infection that lead to death per year. Scientists also believe that Gram-negative infection is responsible for nearly two-thirds of the deaths, which amount to a total of twenty-five thousand cases in Europe only, where scientists conducted an investigative study in hospitals (Pollack 2010). Nosocomial infections can result in severe pneumonia as well as infections of the urinary system, bloodstream, and other organs. Many species have antibiotic resistance, which can make treatment more difficult. In the United Kingdom, around 300,000 people were impacted in 2017, at a cost to the NHS of up to £1 billion per year (Shetty *et al.* 2018).

In terms of patient safety and economic cost, HAIs are a rising public health issue (Gastmeier *et al.* 2012). The U.S. government's disease-prevention organization, or CDC (CDC) All people who are dependent in some way on health care are expected to spend at least seven days in the hospital on average. In other words, it ranges from one to four days for urinary tract infections (UTIs) and ranges from seven to thirty days. days of infection that causes pneumonia (PN). The additional sixteen days of hospitalization that occur in Europe annually, thirty-seven thousand deaths, and seven billion euros may result in these cases of additional expenses (WHO 2011). According to the Italian National Health Institute, 450,000-700,000 HAIs occur in Italian hospitals each year, 30 percent of which might be avoided, HAIs could be directly responsible for 1,350-2,100 preventable fatalities each year (Centro Nazionale di Epidemiologia 2016).

Misuse of antimicrobials (AMs) is a significant public health issue across the world, linked to a rise in drug-resistant bacteria and severe medication responses that result in massive economic consequences. Implementing monitoring systems for both HAI and AM use is an important subject in contemporary public health (Ntonioli *et al.* 2016).

Although there is a type of continuous monitoring that is still a type of standard that is considered golden because it is used in one way or another to combat infection, it may require some kind of large requirements of money and human cadres, but it is rarely used In multicenter investigations. despite these limitations, they are inherent in many respects to the accuracy of the data and in terms of the potential for bias, point prevalence surveys (PPS) An alternative that may be highly applicable, and that it is

easier in the process of implementation to carry out many investigations, which are considered numerous in centers but rather large, centers are very large in size, with somewhat less cost, and they are less time-requiring. PPSs have several advantages, including simple reproducibility and the potential to give relevant data for precise targeted therapies. Acute care hospitals can ensure uniformity and simple reproducibility of data through the implementation of specific procedures, such as the European Centre for Disease Prevention and Control (ECDC) protocol for the use of PPS for HAI and AM. A number of results from surveys in local areas can be used for comparisons made within the hospital or for comparison made at the regional and national level, or worldwide levels. Infection and AM management by PPS began in Ferrara University Hospital (FUH) ın the year one thousand nine hundred and ninety-two, through a protocol that is done locally through a form done in order to enter the data that is being modified after a period of time, after reviewing the literature (Ntonioli *et al.* 2016).

2.4 Susceptibility to infection related with healthcare

Everyone admitted to the hospital is at risk of developing a HAI. You are at a higher risk if you are very ill or have just undergone surgery. Some people are more vulnerable than others, and here are some examples: (Government of the state of Victoria, Australia, 2021).

- Preterm infants
- Youngsters who are very ill
- Senior citizens
- persons who are feeble

persons with specific medical disorders, such as diabetes, those with poor immunity, such as those with illnesses that impair their immune system or those receiving chemotherapy or steroids (Government of the state of Victoria Australia 2021).

2.5 Factors that increase the likelihood of contracting a HAI

Other risk factors may enhance your chances of contracting a HAI. These are some examples:

The significant increase in the long-term stay inside the hospital can be caused by the so-called risk of developing HAI, for example, in the case of admission for surgical operations, whether major or minor, this made the infection greater (Government of the state of Victoria Australia 2021).

The so-called invasive procedures because they carry out a process by which they bypass the protective layer that is naturally formed in the body, as burns or sores that go beyond the skin can cause infection(Government of the state of Victoria Australia 2021).

2.6 Types of hospital infcetion

2.6.1 Hospital acquired pneumonia

Nosocomial infections, like pneumonia contracted in a hospital, are extremely common (Magill *et al.* 2014, Torres *et al.* 2017). and it is linked with significant clinical and economic consequences, including prolonged hospitalisation, high medical expenses, and increased morbidity and death (Eber *et al.* 2010, Park *et al.* 2015, Ko *et al.* 2021). The incidence varies from 2.5 to more than 6.1 per 1000 non-ICU hospitalizations and from 5 to more than 20 per 1000 ICU admissions, according to global surveys (Sopena *et al.* 2014).

In addition, previous studies found that HAP risk was increased by advanced age, preexisting lung diseases like COPD, asthma, and interstitial lung disease, and various organ system abnormalities. Furthermore, HAP was associated with aspiration, intubation, and mechanical ventilation (MV) (Kim *et al.* 2022).

Since HAP is a type of infection that occurs externally and is caused by a number of microorganisms present in the hospital and is considered acquired from it, a number of measures must be taken in order to take into account the variables of these risks that are related in one way or another in the environment The hospital environment is called such as a type called the facility, in addition to the ratio of bed to staff, whether it is a nurse or others. A number of scientific research has been carried out on the so-called risk factors that are related in one way or another to the environment in hospitals for HAP, but these studies were few. It also did not take the variable of physical condition or poverty, which is an important and major factor for various infectious diseases (Iannella and Luna 2016). We used national health insurance claims data to conduct a comprehensive risk assessment, which included sociodemographic, clinical, and hospital environmental characteristics linked with the incidence of HAP as shown in figure 2.1 (Kim *et al.* 2022).

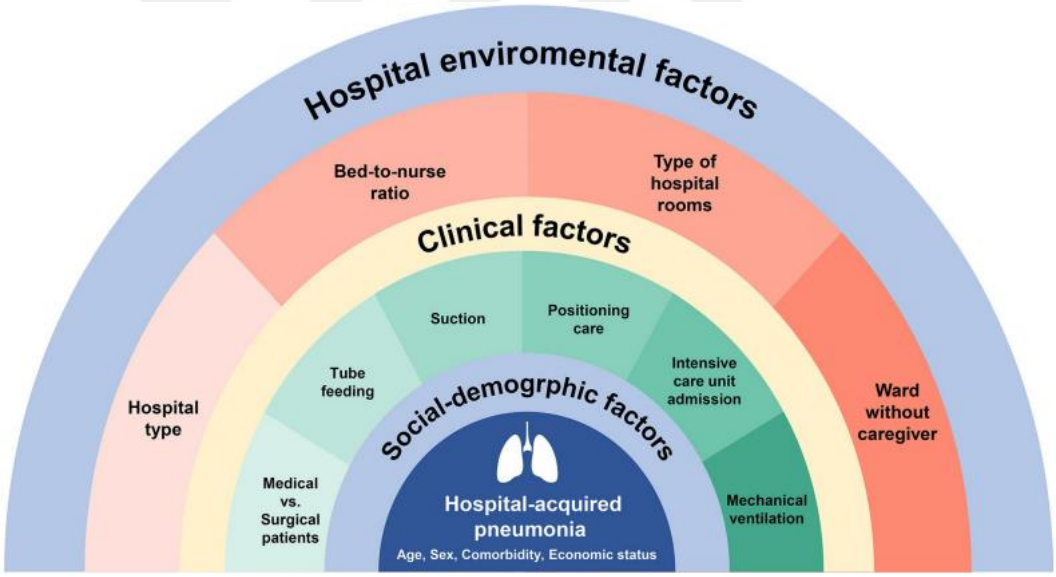

Figure 2.1 Hospital-acquired pneumonia and its risks (Kim *et al.* 2022).

2.6.2 Ventilator-associated pneumonia

Patients in hospitals who require the use of mechanical ventilation devices are at risk for developing ventilator-associated pneumonia (VAP). Patients in the intensive care unit

(ICU) who have been using a mechanical ventilator for longer than 48 hours are particularly vulnerable to VAP (Cooper 2021).

The incidence of VAP is high, making it a major contributor to health problems and deaths. People with VAP had longer ICU stays and a fatality rate of up to 30 percent (Alp and Voss 2006) VAP diagnosis varies by hospital and clinician, but typically involves two or more additional indicators beyond just a fresh infiltration on a chest x-ray. Temperature greater than thirty-eight degrees Celsius or thirty-six degrees Celsius, a certain number of white blood cells >12109/ml, purulent secretions through the bronchial tubes into the lung, and/or a decrease in the mode of gas exchange is Examples of these reasons (Michetti *et al.* 2012)

Ventilator-associated tracheobronchitis is a separate, less characterised infection prevalent in mechanically ventilated patients (VAT). VAP is just one type of infection that can colonize the trachea and spread to the bronchi. VAT could pose a threat to VAP (Craven *et al.* 2009)

2.6.3 Urinary tract infection

An infection of the urinary system is known as a urinary tract infection (UTI) (CDC 2015). A type of infection that affects the bladder (cystitis) is known when the lower urinary tract is affected as well as kidney inflammation when the upper urinary tract is affected (pyelonephritis) (Lane an Takhar 2011)

Although Escherichia coli is the most common bacterial pathogen, other bacteria and fungi can also contribute to health problems. Feminine physiology, sexual activity, diabetes, obesity, and family history all contribute to the possibility of developing type 2 diabetes (Flores-Mireles *et al.* 2015). Urinary tract infections (UTIs) are not considered STDs, despite the fact that sexual activity is a risk factor (STIs) (Copstead-Kirkhorn and Banasik 2013).Kidney infection, if it happens, is generally the outcome of a bladder infection, although a blood-borne infection is a possible cause as well (Linton

2015). Diagnosis can be made based on symptoms alone in young, healthy women (Nicolle 2008). Diagnosis might be challenging in persons with unclear symptoms since bacteria can be present without an illness (Jarvis 2007). A urine culture may be effective in difficult conditions or if therapy fails (Colgan *et al.* 2011).

In mild cases, UTIs are treated with nitrofurantoin or trimethoprim/sulfamethoxazole (Salvatore *et al.* 2011). Antibiotic resistance is increasing in a number of drugs used to treat this sickness (CDC 2015). In severe infections, a longer course of antibiotics or antibiotics administered intravenously may be required (Salvatore *et al.* 2011). Additional diagnostic testing may be required if symptoms persist beyond two or three days (Colgan *et al.* 2011) The anti-inflammatory drug phenazopyridine might alleviate symptoms (CDC 2015). People who have bacteria or white blood cells in their urine but no other symptoms rarely require antibiotics, with the exception of pregnant women (Ferroni and Taylor 2015, Glaser and Schaeffer, 2015). Antibiotics can be used in one of two ways to treat chronic infection: either by administering a short course of antibiotics as soon as symptoms appear, or by using long-term antibiotics (Glaser and Schaeffer 2015). Those who are prone to infections can benefit from either prompt treatment with a short course of antibiotics whenever symptoms appear or continuous use of antibiotics for infection prevention (Ferroni and Taylor 2015, Glaser and Schaeffer 2015).

High morbidity and mortality rates, longer hospital stays, and higher therapeutic costs make health-care-associated infections (HCAIs) one of the most pressing health problems today (Ozer *et al.* 2011). Most of these infections are contracted in hospitals, particularly in intensive care units. One setting where HCAIs are acquired at a higher rate and with a higher mortality is in intensive care units (European Centre for Disease Prevention and Control 2016). Poor countries have a much higher rate of intensive care unit-acquired infections (ICUAI) than developed countries. The World Health Organization reports that the incidence of ICUAI is two to three times higher in developing countries than in developed ones (WHO 2016 factsheet) (Bizuayehu *et al.* 2022)

Healthcare-associated urinary tract infection (HCAUTI) is one of the six main HCAIs (Cassini *et al.* 2016) and one of the most common health concerns in patients referred to critical care units (Galiczewski and Shurpin 2017, Kumar *et al.* 2018). This syndrome contributes for up to 40% of the 2 million HCAIs annually (Bizuayehu *et al.* 2022)

2.6.4 Gastroenteritis

Inflammation of the intestines and stomach is called gastroenteritis. It is also known as infectious diarrhoea and gastro (Schlossberg,2015). Diarrhea, vomiting, and stomach discomfort are possible symptoms. Other symptoms include fever, fatigue, and dehydration (Ciccarelli *et al.* 2013, Ferri 2015). This usually lasts no more than two weeks (Schlossberg 2015). While many Americans call what they're experiencing "the flu," it's actually just a stomach bug (Shors 2013)

Gastroenteritis is primarily caused by viruses, although it can also be caused by bacteria, parasites, or fungus (Glaser and Schaeffer 2015). Rotavirus is the most prevalent cause of serious illness in children (Tate *et al.* 2012). As for adults, the most common causes of diarrhoea, Norovirus and Campylobacter are the culprits (Marshall and Bruggink 2011, Man 2011) The disease can be spread by inadequately cooked food, polluted water, or intimate contact with an affected individual (Glaser and Schaeffer 2015). Treatment is often the same whether a clear diagnosis is present or not, thus testing to confirm is usually unnecessary (Glaser and Schaeffer 2015).

Washing hands with soap, drinking clean water, breastfeeding infants instead of giving them formula (Ciccarelli *et al.* 2013), and proper waste disposal are all important preventative measures for young children in developing countries. The rotavirus vaccination is advised for children as a preventative measure (Tate *et al.* 2012, Ciccarelli *et al.* 2013). Treatment include drinking adequate water (Ciccarelli *et al.* 2013). In mild or severe instances, this is usually accomplished by consuming an oral

rehydration solution (a combination of water, salts and sugar). (Ciccarelli *et al.* 2013). Breastfeeding should be continued in people who have been nursed. (Ciccarelli *et al.* 2013). Intravenous fluids may be required in more severe situations (Ciccarelli *et al.* 2013). Fluids can also be administered using a nasogastric tube. Zinc supplementation is advised for youngsters (Ciccarelli *et al.* 2013). Antibiotics are rarely required .Antibiotics, on the other hand, are advised for small infants who have a fever and bloody diarrhoea (Zollner-Schwetz and Krause 2015).

Gastroenteritis is an extremely frequent and sometimes dangerous condition in children. It is responsible for roughly 10% of all child mortality and an estimated 70 million deaths each year worldwide, making it the second greatest cause of death. Rotavirus is the most prevalent cause in babies under 24 months of age, after 24 months, Shigella becomes the second most common cause (Yang *et al.* 2019, Muhsen *et al.* 2019, Koutri and Papadopoulou 2018).

2.6.5 Postpartum infections

Postpartum infection, which may sometimes be referred to as puerperal fever, is called an infection of bacteria that takes place in the reproductive system after childbirth or after a female abortion. Typical symptoms include a temperature of up to thirty-eight degrees Celsius, in addition to Chills occur, in addition to discomfort in the lower abdomen, and he also expressed a vaginal discharge with a foul-smelling relief (Gary 2014). This typically happens within the first 10 days after birth, though it can happen as early as 24 hours after (Konar 2014).

Postpartum peripartum sepsis, peritoneal inflammation, and endometriosis are the most typical forms of infection in the postpartum period (Gary 2014, WHO 2015) Factors that increase the likelihood of a bacterial vaginosis include having a cesarean section, having vaginal bacteria like group B streptococcus, and having a prolonged labor (Gary 2014).Most illnesses are caused by a variety of microorganisms. Culturing the vagina or blood seldom aids in diagnosis. Medical imaging may be necessary in people who do

not improve. Breast engorgement, the occurrence of so-called urinary tract infections, and other symptoms that occur after childbirth (Gary 2014).

Some people may advise antibiotics like ampicillin for all pregnant women just before they have cesarean sections due to the risks involved. Antibiotics are used to treat existing infections, with most patients recovering in two to three days. Oral antibiotics may be administered in patients with moderate illness, Otherwise, a process in which a number of antibiotics are administered through intravenous administration is recommended otherwise, a process is recommended in which a number of antibiotics are used through intravenous administration in order to detect other problems inside the body (Gary 2014).

Maternal infection may be a major cause of maternal mortality and in the case of severe maternal morbidity (Bonet *et al.* 2020). Considering that abortion-related infections and indirect (non-obstetric) illnesses that aren't caused by pregnancy but are exacerbated by it aren't accounted for here, the actual ratio of infections to maternal mortality may be higher than reported here. Mother sepsis, which is characterized by organ failure due to infection during pregnancy, delivery, post-abortion, or the post-partum period, is the leading cause of maternal infection-related mortality worldwide (Global Maternal and Neonatal Sepsis Initiative Working Group 2017).

It is in accordance with the most recent Sepsis-3 definition for adults that this definition be used, which includes both direct and indirect infections (WHO 2012, Singer *et al.* 2016, Bonet *et al.* 2017). It is challenging to estimate the burden of maternal infections and their consequences, especially sepsis, due to differences in case definitions and populations investigated. Pregnant women are more likely to contract infections, and their reactions to infections during pregnancy are more severe, but the pregnancy itself complicates the diagnosis and treatment of infections (Plante 2016).

Infections acquired by mothers during pregnancy, delivery, and the postpartum period have been the subject of relatively few studies (Bonet *et al.* 2020). In 2017, there were 119 million cases of direct maternal infections, as reported by the Global Burden of

Disease Study (Vos *et al.* 2018).In general, data on maternal sepsis are sparse in LMICs. According to the most recent estimates on the worldwide burden of sepsis, there were 57 million instances of maternal illnesses exacerbated by sepsis in 2017. Based on data from the 1990s, the incidence was estimated to be 1-2 instances per 1000 livebirths. In the early 2000s, studies mostly from HICs revealed reduced frequencies of 01-006 per 1000 births per year (Bonet *et al.* 2020).

2.6.6 Central venous catheter

The term "central venous catheter" (CVC) refers to a specific kind of catheter that is placed inside of a large vein. As a form of venous access, this allows for blood to be drawn from a vein. As it is often these large catheters that are placed in the veins, which are considered the most central, are not required in order to access a number of blood vessels in some way in order to reach patients whose injury is considered serious and certain administration of fluids or blood products is done for Resuscitation in large quantities, the measurement of which is considered central venous pressure. Where the length of the catheter is about fifteen to thirty centimeters, it may consist of a type of silicone or a type of polyurethane, and it may be characterized by the type of lamps that leak multiple or single (McKean *et al.* 2012, Ge *et al.* 2012).

2.6.7 Skin and soft tissue infection (SSI)

Approximately 2-5% of patients undergo surgery, and most make an appearance within 30 days of surgery or 90 days after the devices have been implanted. The severity and location of an SSI are key factors in classifying the condition: Depending on the type of surgery being performed, the patient's skin, gastrointestinal tract, and female reproductive system serve as a reservoir for the good flora that may infect the surgical site (superficial SSI affects only the skin and subcutaneous tissue; deep SSI affects the muscle or face); the device or SSI space occupies the anatomical surgical area; and so on (Sikora and Zahra 2022).

Hypothermia, prolonged surgical time, and the severity of the patient's wounds are just some of the potential complications that could arise during such an operation. The length of the procedure is the most important risk factor because it increases the likelihood of contamination by exposing the tissue to the environment for a longer period of time (Mukagendaneza *et al.* 2019).

It's also important to think about the type of wound, as dirty, contaminated, or even partially clean wounds pose more danger than their clean counterparts. Postoperative risk factors include the need for drains, a lack of attention to wound cleanliness, and an extended hospital stay (Sikora and Zahra 2022). Risk factors for patients include immunosuppression, cigarette use, obesity, hyperglycemia, malnutrition, joint disease, and advanced age (Mukagendaneza *et al.* 2019, Sikora and Zahra 2022).

E.coli, S. aureus, Klebsiella species, Enterobacter species, Enterococcus species, Streptococcus species, and Coagulase-negative Staphylococcus are common SSI pathogens (Magill *et al.* 2018, Mukagendaneza *et al.* 2019). Exogenous bacteria from surgical instruments, the environment, and the operator are less prevalent and typically arise in clusters of infections (Sikora and Zahra 2022).

2.7 Organisms that cause hospital infections

Bacteria, viruses, and fungus are pathogens that cause hospital infections. Certain microbes have distinct properties that encourage specific forms of infection in vulnerable hosts. Different types of bacteria cause infections at different rates depending on factors like the location of the healthcare facility, the type of healthcare setting, and the patient population. Overall, bacteria are extremely common pathogens, followed by fungi and viruses (Sikora and Zahra 2022).

2.7.1 Bacteria

Bacteria can come from either an external or internal source as part of the regular flora. When the functions of the host's immune system fail, an opportunistic bacterial infection arises. Among the most common Gram-positive bacteria are coagulase-negative Staphylococcus, Staphylococcus aureus, Streptococcus species, and Enterococcus species (eg, faeces and faeces). Clostridium difficile is the most frequent pathogen linked with HCV in US hospitals (15 percent of all reported pathogen infections) (Magill *et al.* 2018).

Common Gram-negative bacteria include members of the Enterobacteriaceae family like Klebsiella pneumoniae and Klebsiella oxytoca as well as Escherichia coli, Proteus mirabilis, and Enterobacter. Gram-negative rods, such as Burkholderia cepacia, Pseudomonas aeruginosa, and Acinetobacter baumanii Acinetobacter baumanii is associated with high mortality in intensive care units due to the antibiotic resistance it harbors by design (Jernigan *et al.* 2020).

In HAI, multidrug-resistant bacteria are common and are associated with high mortality rates. One study found that more than 20% of all pathogens tested showed signs of being multidrug resistant. Methicillin-resistant Staphylococcus aureus (MRSA), vancomycin-resistant Staphylococcus aureus (VISA) and VRSA, and extended-spectrum cephalosporin-resistant Enterobacteriaceae are just some of the pathogens that have been discovered (ESA). Examples of bacteria that are resistant to multiple antibiotics include vancomycin-resistant enterococci (VRE), carbapenem-resistant enterococci and acini bacterium species, and multidrug-resistant Pseudomonas aeruginosa (Sikora and Zahra 2022).

2.7.2 Fungi

It is well known that fungal pathogens are associated with opportunistic infections in immunocompromised patients who have indwelling devices like central lines or urinary

catheters. According to (Magill *et al.* 2018). The most common fungal organisms associated with HCV are members of the genus Candida, particularly the species Candida albicans, Candida parapsilosis, and Candida glabrata (Spivak and Hanson 2018). Candida auris is an emerging and dangerous multidrug-resistant organism that causes significant morbidity and mortality due to its difficult diagnosis and high treatment failure rates. Candida species are the fourth most prevalent pathogen among all categories of healthcare-associated pathogens. (Weiner *et al.* 2016). Airborne environmental contamination in health care building settings can result in fumigated Aspergillus (Lemaire *et al.* 2018, Park *et al.* 2019). However, hospitalised infected individuals might be a significant source (Sikora and Zahra 2022).

2.7.3 Viruses

1–5% of all HAIs are caused by viruses, making them the rarest type of HAI to be reported. Harmful needle practices have been linked to the spread of HIV, hepatitis B, and C among healthcare workers. The majority of the world's poor countries bear the brunt of the 5,4 percent of HIV infections that are healthcare-related. Some other examples of known viral pathogens are the rhinovirus, cytomegalovirus, herpes simplex virus, rotavirus, and influenza (Sikora and Zahra 2022).

2.8 Epidemiology

Many people around the world contract nosocomial infections, which increase mortality and drain healthcare budgets. The true global burden of healthcare-associated infections (HAIs) is unknown because of a lack of reliable data and monitoring systems, but epidemiologic studies in both Europe and the United States show reasonably consistent results in surveillance programs. Therefore, the United States and Europe are the primary sources for epidemiological studies (Sikora and Zahra 2022).

The percentage of patients who experienced at least one HAI ranged from 4.4% in primary care hospitals to 7.1% in tertiary care hospitals to 19.2% in intensive care units

to 3.7% in long-term care facilities across Europe (Suetens *et al.* 2018). About 8.9 million HAI events per year occur in acute care and long-term health care facilities across the European Union. Research from 1995 by the European Prevalence of Infection in Intensive Care (EPIC) found that 20.6% of intensive care unit patients contracted an infection while in the unit (Sikora and Zahra 2022).

The prevalence of HAI among hospitalized patients in the United States was 3.2% in 2015, significantly lower than the 4% prevalence seen in 2011 research (Magill *et al.* 2018). Critical care units were responsible for 36.4% of HAI in US hospitals, general wards and nurseries for 57.5%, and step-down and specialty care units for 6.1% (different levels of acute care) were also involved (Sikora and Zahra 2022).

Previous research has shown that high-risk neonatal wards, well-baby wards, and wards caring for adults and children who are not in the intensive care unit have the highest rates of healthcare-associated infection (HAI). Six hundred and eighty-seven thousand patients were affected by healthcare-associated infections (HAIs) in the United States in 2015. (Magill *et al.* 2018). When compared to 2002, when an estimated 1.7 million HAIs occurred annually in US hospitals, these findings are encouraging (Sikora and Zahra 2022).

As far as we can tell, HAI is more common in developing countries. The majority of HAIs in intensive care units are due to ventilator-associated pneumonia (VAP) and infections in newborns, according to a pooled analysis of data from developing countries. The overall prevalence of HAI across the countries of Southeast Asia was found to be 9.1% in a recent systematic study. In 2015, Ling *et al.*

2.9 The main ways of transmission of infection

Infections are transmitted in hospitals through direct contact, droplet transmission according to table 2.1

Transportation	The description

method	
Transmission through contact	The vast majority of nosocomial infections are spread through personal contact (Sikora and Zahra 2022).
Common vehicle transmission	The same holds true for bacteria and viruses that enter a host through contaminated objects (CDC 2012)
Transmission of droplets	Droplets carrying microorganisms are pushed a short distance through the air and deposited on the patient's body; droplets are formed from the source person primarily by coughing, sneezing, talking, and during specific procedures, such as bronchoscopy (Li 2021).
Transmission through air	Dissemination can be accomplished through the use of dust particles or airborne droplet nuclei (the small-particle remnant 5 m or less in size of evaporated droplets containing microorganisms that stay suspended in the air for lengthy periods of time). Special air-handling and ventilation are necessary to prevent airborne transmission because microorganisms carried in this way can be widely dispersed by air currents and may be inhaled by a susceptible host within the same room or at a greater distance from the source patient, depending on environmental factors. Aerosol transmission can be used to spread a wide variety of microorganisms, including Legionella, Mycobacterium tuberculosis, and the rubeola and varicella viruses (Atkinson *et al.* 2009)

2.9.1 Sections for communication transmission

There are two main ways that messages can be transmitted: directly and indirectly.

2.9.1.1 Link made directly

Infectious infections are frequently transmitted through direct touch. Direct interaction can take the following forms: (Higuera 2017).

- Talking to someone face-to-face Human-to-human contact is the most common route for the transmission of infectious diseases. Transmission takes place when an infected person comes into contact with another person or when bodily fluids are exchanged between the two. This often occurs before the patient even realizes they have a health problem. This is a potential vector for the transmission of sexually transmitted diseases.
- Droplet dispersion Droplets produced by coughing and sneezing can transmit an infectious illness (Higuera 2017).

2.9.1.2 Inadvertent contact

Many infectious diseases can also spread from person to person through casual contact or through the air. I'll give you an illustration: (Higuera 2017).

- It's possible for some infectious agents to travel great distances via air and linger in the atmosphere for days at a time. It's possible to contract a disease like measles.
- Contaminated items Some species can survive for a short period on items. You may be wounded if you contact something, such as a door handle, immediately after hitting an infected individual. Infection is spread when a person does not thoroughly wash their hands before touching their face, especially their mouth, nose, or eyes.

- Food and water supplies There is a correlation between the contamination of food and water sources and the spread of infectious diseases. Vegetables and meat that have not been properly cooked are the most common sources of E. coli infection.

- Human-animal relationships The transmission of some infectious diseases from animals to humans is known to occur. Bite or scratch from an infected animal, or contact with animal feces, can cause this. Toxoplasma gondii, a parasite, may be discovered in cat faeces.

- Containment of animals, the spread of diseases like anthrax (from sheep), rabies (from rodents and other mammals), West Nile virus (from birds), and the plague, and zoos and aquariums (of rodents)

- Insect bites (vector-borne illnesses), insects, particularly those that suck blood, transmit several infectious pathogens of animal origin. Mosquitoes, fleas, and ticks are examples.

- Tanks for the environment, infectious organisms can be transmitted to people through soil, water, and plants. Hookworms are spread by polluted soil, for example (Higuera 2017).

2.10 Prevention of Healthcare-Associated Infections

Healthcare-associated infections (and the prevention and control of them) are a major public health burden that has piqued the interest of everyone involved in the healthcare system (Esfandiari *et al.* 2016, Esfandiari *et al.* 2017). Pathogenic bacteria have become much more dangerous as multidrug-resistant strains have emerged (Kanerva *et al.* 2012). Almost all known antimicrobials are currently resistant (Ventola 2015, Prestinaci *et al.* 2015), and relatively few antimicrobials are being developed for general use (Sukkar 2013, Paton and Kresge 2018). Among these bacteria, Klebsiella pneumoniae, the most prevalent resistant pathogen, is a major issue, particularly in ICU settings (Ripabelli *et al.* 2018 , Di Tella *et al.* 2019) The prevention and control of HCAIs is thus extremely challenging, necessitating a multifaceted strategy and measures to address this major public health risk (WHO 2009, Rosenthal *et al.* 2012, Haque *et al.* 2018)

The following are the main approaches to addressing the impact of HCAIs

2.10.1 Hand Sanitation

Labarraque, Semmelweis, and Wendell Holmes were among many researchers in Europe and the United States working to reduce the prevalence of HCAI in hospitals in the middle of the 19th century (McLaws 2015, Haque *et al.* 2020).

They have conducted their own research, but their findings have led to the same kind of hypothesis being advanced: that healthcare workers (HCWs) were unwittingly transporting disease-causing microorganisms. It spreads from infected person to infected person, and those infected people are responsible for spreading the disease to

other susceptible people. You do the transfer through the hands of health care workers (Di Muzio *et al.* 2015)

The importance of hand hygiene (HH) in preventing the spread of disease is widely attributed to Dr. Ignaz Semmelweis (Markel 2015). Florence Nightingale, often called the "mother of modern nursing," (Karimi and Alavi 2015) wrote that all nurses should be very careful to wash their hands very frequently throughout the day (Markel 2015) with soap and soft water (Nightingale 2018) in response to the implementation of handwashing and other hygiene practices in war hospitals during the Crimean War (1853–1856). Slow adoption of HH practices may explain why it took until the 1980s foodborne disease outbreak in the United States for the CDC to recognize HH as an essential technique for controlling widespread infection (Haque *et al.* 2020).

In response, the Centers for Disease Control and Prevention (CDC) developed and disseminated guidelines for hand hygiene in hospitals, stressing the importance of washing hands with non-antimicrobial soaps before and after procedures that could spread pathogens, especially those involving high-risk patients who could die quickly if they were exposed (Toney-Butler and Carver 2018).

Patient safety in hospitals and other healthcare institutions is a major international public health challenge due to the high prevalence of HCAIs in healthcare systems worldwide, both in high- and low-income countries (Khan *et al.* 2017) Hundreds of millions of hospitalized patients are affected by HCAIs annually, with devastating effects on their health and on the health of their communities and the public healthcare budget as a whole (Maliwan 2018).

The identification and modification of behavior that is carried out individually is the most important as it is possible for health care professionals to carry out this process by which infection control, and specifically everything related to HCAIs, is identified as HH. For example, it has been proven that doing HH practice strictly and strictly reduces infections that occur inside hospitals by forty to seventy percent (Haque *et al.* 2020).

Nevertheless, a number of techniques, namely strict hand washing, have been observed in hospitals that are ineffective, as a number of research papers have revealed that there are a number of rewards within hospitals globally, usually the regular HH rate is reduced by a number of care staff health by forty percent (Schiffers *et al.* 2015, Geberemariyam *et al.* 2018, Longembe and Kitronza 2020). Thus, when employees do not comply with the guidelines in the family, they represent a concern or even a source of this concern that occurs globally for public health, which requires a number of standard regulations and more, in addition to monitoring and monitoring is done on a regular basis until there is study increase (Haque *et al.* 2020).

There are twenty-four reasons given by HCWs for not practicing effective HH, as reported in the Joint Commission Journal on Quality and Patient Safety. A large number of reasons for transmission are due to a process of lack of knowledge or some consider a lack of training regarding the need for a tight family, which leads to a process that leads to malpractice in the so-called family guarantee and strengthening which is considered a top priority, as it may express a lack of In the awareness of nurses or health workers of how to protect and safety all individuals and all patients. Some believe, for example, that some health workers wear sterile jumpsuits and consider this to compensate greatly for the use of sterile beds (Haque *et al.* 2020).

The lack of evidence regarding the impact of HH on infection rates in many hospitals contributed to this perspective. Overworked and burned-out HCWs, as well as a perceived lack of time to properly wash hands or change gloves between rooms/patients, were cited as major concerns. HCWs also reported difficulties with gloving and gowning in isolation areas and believed that HH could not be performed adequately in certain clinical scenarios like emergency situations (Haque *et al.* 2020).

Logistics and room design were found to influence noncompliance, such as the location of a hand rub slot machine or basin being inconvenient or out of reach, damaged hand washing facilities, a lack of hand rub or cleanser, or an irritancy or allergy to the cleansing agent provided. Noncompliance with frequent hand washing to prevent cross-infection was attributed to a variety of logistical issues, including the mobility of

colleagues and relatives between rooms, sharing of equipment, and a lack of locations to work or store equipment and documentation (Chassin *et al.* 2015)

2.10.2 Hygiene of the Environment

Infections, especially HCAIs, can be prevented and controlled by keeping the surrounding area clean (Brian *et al.* 2015, Moffa *et al.* 2017). Clostridium difficile, methicillin-resistant staphylococcus aureus, and vancomycin-resistant enterococci (VRE) are all examples of bacteria that can be fatal if they enter a patient's body through contaminated hospital surfaces (Rupp *et al.* 2017, Kenters *et al.* 2018). High-risk bacteria can easily colonize hospital surfaces, including porous ones like beds and mattresses and nonporous ones like bed rails, door handles, call bells, and light switches (Brian *et al.* 2015, Ling *et al.* 2015).

Thus, keeping hospitals clean is essential for preventing HCAIs (Brian *et al.* 2015, Ling *et al.* 2015). Pathogen reduction limits the likelihood of infectious germ transmission from object to person, thereby minimizing cross-infection, which is why environmental hygiene is so important (Yousif *et al.* 2016) Cleaning a hospital is a complex process that involves the physical removal of sputum, urine, blood, secretions, excretions, bacteria, and dust that can promote the growth of microorganisms from a wide variety of surfaces (Government of South Africa 2019, Carling 2016, Allen *et al.* 2018, Shillabeer *et al.* 2016).

Infection prevention and control is the most pressing and critical issue wherever medical care is provided to individuals or communities, according to the Centers for Disease Control and Prevention (CDC) and the Healthcare Infection Control Practices Advisory Committee. All areas of the hospital, both those used by patients and those used by visitors, should undergo a thorough cleaning on a regular basis as part of the necessary precautions to prevent the spread of infectious diseases (Haque *et al.* 2020).

Cleaning products in hospitals often have antimicrobials in them to prevent the spread of disease-causing microorganisms like bacteria, viruses, and fungi. Cleaning products for hospitals can include anywhere from one to two hundred and seventy-five different ingredients, and can be found in a wide range of delivery systems, from sprays and liquids to concentrated powders and gases. Users must understand the amount and kind of cleaning, as well as its purpose and restrictions, as well as the many phrases, definitions, and classifications used (sterilisation, disinfection, cleaning), along with the classification of surfaces and gadgets that call for specialized treatments (Haque *et al.* 2020).

For sterilisation, ethylene oxide gas is utilised to eliminate all bacteria except for microbial spores, disinfection can destroy practically all metabolically active microorganisms. A popular agent used for high-level disinfection is hydrogen peroxide (7.5 percent). At 70% to 90% strength, isopropyl alcohols provide a moderate level of disinfection by killing all visible microorganisms and some bacterial spores. To disinfect at a low level, use a quaternary ammonium microbial detergent solution, which is effective against most metabolically active bacteria, fungi, and viruses but ineffective against metabolically inactive spores (Haque *et al.* 2020).

Water cleaning removes numerous contagious germs from hospital surfaces, reducing the bacterial burden on such surfaces, and cleaning is defined as the removal of soil, dust, earth, or biological contamination from a physical instrument or hospital surface using detergent, surfactant, or emulsifying chemicals that lower surface tension. In order to ensure the efficacy of subsequent disinfection processes, cleaning is the first step in maintaining hospital hygiene, particularly for surfaces with obvious pollution (Quinn *et al.* 2015).

2.10.3 Patient Screening and Cohorting

High morbidity and mortality from AMR infections acquired during hospital stays has prompted rising political and societal concern, but many efforts to curb their spread have failed or stalled (Irek *et al.* 2018, Li *et al.* 2017, Hamdy *et al.* 2017) Strategies for

preventing and treating HCAIs include active surveillance cultures (ASCs), contact isolation of patients colonized with epidemiologically relevant pathogens, and preemptive isolation of high-risk patients (Haque *et al.* 2020).

In light of these factors, a number of studies have concluded that the implementation of ASCs should be based on realistic estimates of the impact on public health, as well as the costs and benefits compared to existing preventative and control methods. 158 Although ASCs have been advocated for many hospitals as a means of combating the rising prevalence of infections caused by multidrug-resistant organisms, a systematic review of twenty articles found that neither their efficacy nor their cost-effectiveness had been established. 159 Another prospective study found that ASCs performed on intensive care unit patients did not detect the bacteria causing the most severe bacteriological disorders, suggesting that ASCs may not be related to bloodstream infections (Haque *et al.* 2020).

Once again, in the intensive care unit setting, a four-year study found that ASCs are unnecessary for providing MRSA care in the ICU. Several nations have effectively lowered MRSA infection intensities by implementing national control tactics such as seek and destroy (SandD). segregation of a number of patients considered infected with a type of MRSA, The separation that is considered prior and through which work is done to evaluate and through a process through which a number of cases that are considered very dangerous for MRSA are evaluated, for the evaluation of nurses working in healthcare as they may be described as potential carriers, for the purification to be carried out completely when required, And stop the spread of infection in the areas through which it may be spread (Haque *et al.* 2020).

In healthcare facilities, multidrug-resistant pathogens (MDRs) like methicillin-resistant Staphylococcus aureus (MRSA), vancomycin-resistant Enterococcus (VRE), and multidrug-resistant Gram-negative bacilli (MDR-GNB) are common. One study suggests that contact isolation, cohorting treatment, maintaining adequate staffing ratios, employing active microbiologic surveillance, and reducing hospital stays are all effective means of preventing the spread of healthcare-associated infections. Multiple

studies have demonstrated that ASCs, staff screening, and patient isolation can effectively curb the spread of MDR diseases. Last but not least, another study found that anticipatory use of sterile gloves, with or without a gown, was highly beneficial in managing an MDR outbreak, especially among individuals at high risk of transmitting dangerous infections (Haque *et al.* 2020).

2.10.4 Surveillance

Refers to the process by which a number of data relating to a health-related event are systematically collected, analyzed, interpreted, and then disseminated, in order to work on using them in a process through which public health measures are taken to Reducing mortality and morbidity (Ridelberg and Nilsen 2015).

One study found that the detection time for HCAIs in Scotland was higher than the international standard because the country's monitoring system was not as well-organized. Increased monitoring participation from hospitals or more strategic selection of hospitals for inclusion in a surveillance system were also found to decrease HCAI detection times in this study (Van Bunnik *et al.* 2015). Two other Scottish studies found that an improved surveillance system might have avoided a significant proportion of Staphylococcus aureus bacteremia (SAB) events (Morris and Russell 2016, Murdoch *et al.* 2017).

This system is built similarly to the United States' National Nosocomial Surveillance System, as defined by the Centers for Disease Control and Prevention (CDC), because of the widespread implementation of active monitoring, especially in the neurosurgery unit. The frequency of HCAIs may have been overestimated by the Krankenhaus Infections Surveillance System (KISS), a monitoring system, according to a second German study. A second German study found that more than 35% of German intensive care units (ICUs) never use individual or group isolation for patients with MRSA (Haque *et al.* 2020).

One of the key priorities in avoiding or managing an HCAIs pandemic is the isolation of MDRs-infected individuals (Alp and Damani 2015). The prompt identification of novel variations of HCAIs, particularly MDR pathogenic bacteria, is critical, however surveillance tactics are typically limited due to budgetary and practical constraints. As a result, while there may be some type of monitoring in order to have an effective role in the process by which HCAIs are prevented and then managed, there may not be a type of information that would be sufficient about how to perform a number of one of the mechanisms through which individual monitoring is carried out and focuses on health care that is considered good (Ciccolini *et al.* 2014)

2.10.5 Stewardship of Antibiotics

Scientists McGowan and Girding coined a term called Supervision of All Kinds of Antimicrobials (AS) in the year 1996, and they stressed the importance of the presence of doctors and nurses, who are viewed through antimicrobials as a type of important resource in order to be health care for one time (Ciccolini *et al.* 2014)

2.10.6 Antibiotic Stewardship

The American Epidemiological Society defines antibiotic oversight as a coordinated set of measures to improve patient health outcomes, decrease antibiotic resistance, and cut down on wasteful costs associated with the use of antibiotics. (2019, The American Society for Healthcare Epidemiology).

Antimicrobial stewardship (AS) refers to the practice of selecting, dosing, and timing antimicrobial therapy to achieve the best therapeutic outcome in the treatment or prevention of infection while minimizing adverse effects on the patient and the development of resistance. Because it promotes prudent antibiotic use and helps prevent unnecessary or excessive dosing (Dyar *et al.* 2017).

A report by the International Association for Surgical Emergencies (WSES), the prevention of infection must be done by surgeons first, through planning, then a number of policies, and then implementation infected (Sartelli *et al.* 2015, Sartelli *et al.* 2017, Sartelli *et al.* 2020) According to a number of researchers at Tufts Medical Center, while a number of resistance to these antimicrobials is spreading globally, it may be stopped by developing a number of antibiotics that are new, which may make preserving them as antimicrobials important. The Centers for Disease Control and Prevention list the following as the seven main components of AS: drug expertise; leadership commitment; education; accountability; tracking; action; and reporting (CDC 2015).

A number of primary objectives of the three-pronged AS are in order to ensure a reasonable and sensible type of antimicrobial use with a precisely targeted type of dose of the appropriate antibiotic, and to reduce a number of escalations to the type of treatment that The second objective is to reduce the overuse of antimicrobials in general and the third to prevent or reduce the spread of resistance (Doron and Davidson 2011).

2.10.7 Adherence to Patient Safety Guidelines

The policies and the type of preparation that go into the guiding principles and through a number of checklists that are made for the review process as they are considered a rather critical component may be developed in order to become in order to improve practices and their effects (Carthey *et al.* 2011, Treadwell *et al.* 2013).

It is preferable to conduct an investigation of the control and prevention of HCAI of a type or an integrated and comprehensive approach for the process of cooperation between a number of health care facilities and educational facilities (Gastmeier 2010). Another research on enhancing patient safety discovered that the following strategies aided in increasing the program's impact: ensuring that the educational programme was effectively presented and accredited, publicly reporting programme outcomes, design through the process of preparing the type of care by taking into account the safety of patients (Gardam *et al.* 2009).

3 MATERIAL METHODS

3.1 Study design

Nasiriyah City, Iraq's Al-Hussein Teaching Hospital was the site of a descriptive cross-sectional study done between May 1, 2022, and September 25, 2022.

3.2 Sample and Setting

Registered nurses were recruited from Al-Hussein Teaching Hospital in Nasiriyah, Iraq, the purposeful sampling method was used to select nurses as participants in the study, the sample selected using an appropriate sample. The G power analysis was used in the power analysis. As a result of the ability analysis, it was found that the strength was 300 when the effect size was the total number of nurses in this hospital is 1350. The sample size was defined as 300 according to a 95% confidence interval and 50% response.

- The inclusion criteria

The study includes two nurses, one of whom is fluent in Arabic and works at Al-Hussein Teaching Hospital in Nasiriyah, Iraq.

- **Exclusion criteria**,

Refuse to participate in studies or work in a hospital other than the target in the study

3.3 Instrument

Data were collected using a questionnaire to determine the nurses' sociodemographic characteristics, nursing knowledge and nursing practices in infection control (Appendix1)

3.4 Data collection method

The average time it took to collect data was 15 minutes, and it was gathered face to face using a questionnaire and self-report.

3.4.1 Socio-demographic form

The first part consisted of 10 questions regarding the respondent's demographics (age, gender, employment status, education level, and whether or not they had received infection control training outside of the hospital), receiving training on infection control inside the hospital, and do they have an infection control unit guide for the participants.

3.4.2 Nurses' knowledge scale

This part consists of 18 questions (AL-Rawajfah and Tubaishat 2015). The answers consisted of true, false. The values on the scale ran from zero to eighteen. Out of a possible 18, correct answers were given a rating of 1, and incorrect answers received a rating of 0. Four items were specifically mentioned negatively to minimize bias. Jordanian Ministry of Health Infection Control Guide (Jordanian Ministry of Health — Department of Communicable Diseases 2011) answers were verified by an infection control specialist and an infectious disease consultant. Cronbach's alpha coefficients totaled 0.87 in our sample.

3.4.3 Infection control practices scale

This part consists of 29 questions by (Kim *et al.* 1995) Developed for the Arabic language by (AL-Rawajfah 2014) This part consists of 29 questions that will be answered on a five-point Likert scale (never, rare, sometime, most of the time, always). In this sample, the Arabic version had a reliability coefficient of 0.80. Ratings for each of the 29 items range from Never (0) to Always (5) on a 5-point Likert scale. The range of possible total practice scores is from 29 to 145, with higher total scores indicating

greater Compliance with accepted IC practices. Cronbach's alpha coefficients in our study sample were 0.84.

3.5 Data Analysis

The data was analyzed using SPSS for Windows version 26. Statistical Package for the Social Sciences. Statistics such as frequency, percentage, mean, and standard deviation were used to provide a summary of the sample's sociodemographic and clinical features. The results section had a normal Kolmogorov-Smirnov distribution. The ANOVA and t-test were also used, a significance level $p \leq 0.05$ was used for all data analyses.

3.6 The ethical dimension

On april 21, 2022, ethical approval was obtained from the Ethics Committee of Çankiri Karatekin University, in addition to approvals no. 248 obtained from Iraq on april 5, 2022 (Appendix 2), where the researcher provided a detailed description that includes the purpose and methodology of the study, and to obtain official permission, it was submitted to the Dhi Qar health directorate, whose approval facilitated the matter (Appendix 3). For hospital admission, participants were orally informed of the objectives of the study and were asked to participate voluntarily, and were assured of non-disclosure. To ensure the confidentiality of the participants, no names were written during data collection and reporting. Subjects were also made aware that they were under no obligation to participate in the study and could withdraw at any time if they so chose.

4 RESULTS

The research findings were broken down into several sections, first the descriptive characteristics of the research group (nurses group), then the nurses' knowledge and infection control practices. Al-Hussein teaching hospital, located in Nasiriyah, Iraq, provided the study's sample, and a purposeful sampling method was used to select nurses as participants in the study, and the sample was selected using the appropriate sample.

Table 4.1. Distribution of descriptive traits for the research group (n = 300)

Variables		M	SD
Age		29.0333	5.58775
		N	%
	20-30	172	57.3
	31-40	80	26.7
	41-50	42	14.0
	50 and more	6	2.0
Gender	Male	118	39.3
	Female	**182**	**60.7**
Experience	<2 years	53	17.7
	≥2 years and<5 years	**77**	**25.7**
	≥5 years and>10 years	170	56.7
Level of education	Nursing school	80	26.7
	Diploma	114	38.0
	Bachelor	90	30.0
	Master	16	5.3
Working unit	Intensive care unit	63	21.0
	Intermediate care unit	48	16.0
	Cardiac care unit	42	14.0
	Recovery unit	57	19.0
	Neonatal intensive care unit	36	12.0
	Cardiac catheterization	54	18.0
Received hepatitis B virus	No	57	19.0

vaccine (HBVV)	Yes	243	81.0
Is there any infection control nurse in the hospital	No	35	11.7
	Yes	210	70.0
	Not sure	55	18.3
Receiving infection control training outside the hospital	No	65	21.7
	Yes	235	78.3
Do you have an infection control manual in the unit	No	23	7.7
	Yes	258	86.0
	Not sure	19	6.3

Table 4.1 displays the study's demographic data, showing that the majority of participants were between the ages of 20 and 30 on average (29.0333 ± 5.58775), where they constituted 57.3% of females, where they constituted 60.7%, while for experience, the majority had 56.7% with experience up to ≥5 years and>10 years, and the educational level was the largest number of graduates of diploma, where they constituted 38%, and the largest number had worked Intensive care unit, where they constituted 21.0%, in addition, 81.0% had been exposed to HBVV, 70% of the study sample was provided with an infection control nurse while in the hospital, 78.3% was provided with infection control while outside the hospital, and 86% was provided with an infection control manual while in the unit.

Table 4.2 Comparison of infection control nurses' knowledge by age, experience and level of education, working unit, have infection control nurse in the hospital and have an infection control manual in the unit factor (n = 300)

Variables		n	Mean	SD	F	Sig.
Age	20-30	172	15.5291	2.10382	58.411	**0.000***
	31-40	80	18.0000	1.00000		
	41-50	42	18.3010	1.11000		
	50 and more	6	18.5500	1.20000		
Experience	<2 years	170	15.5000	2.09889	91.836	**0.000***
	≥2 years and<5 years	77	18.0000	1.00000		
	≥5 years and>10 years	53	18.51000	1.19000		
Level of	Nursing school	80	13.7625	1.62453	91.836	**0.000***

education	Diploma	114	10.200	0.71000		
	Bachelor	90	17.2456	0.92709		
	Master	16	18.0000	1.30500		
Working unit	Intensive care unit	63	13.3651	1.59941	309.500	**0.000***
	Intermediate care unit	48	15.7292	.44909		
	Cardiac care unit	42	17.4286	.76963		
	Recovery unit	57	18.0000	1.00000		
	Neonatal intensive care unit	36	19.0200	1.32000		
Is there any infection control nurse in the hospital	No	35	18.7600	1.31000	-52.615	**0.000***
	Yes	210	15.9762	2.12850		
	Not sure	55	13.4160	2.00830		
Do you have an infection control manual in the unit	No	23	18.9100	1.61000	13.149	**0.000***
	Yes	258	16.3527	2.07534		
	Not sure	19	18.0000	0.00000		

ANOVA analysis $p<0.05$

Table 4.2 displays the study's findings that indicate a positive direct relationship (p 0.05) between nurses' ages and their levels of knowledge about infection control, the more infection control nurses' knowledge and the higher the value for the age group 50 and more. In addition, this research discovered a positive direct relationship between experience and nfection control nurses' knowledge ($p<0.05$), with the highest value for those with experience being ≥5 years and>10 years.

In addition, the study found that the educational level of infection control nurses was positively related to their knowledge (p0.05), with the highest value of being assigned to nurses with master's degrees; similarly, the study found a significant relationship between the working unit variable and infection control nurses' knowledge ($p<0.05$).

Finally, this study's findings indicated that the presence of an infection control manual in the unit is positively associated with the knowledge of infection control nurses; that

is, the greater the presence of such a manual, the greater the knowledge of infection control nurses.

Table 4.3 Comparison of infection control nurses' knowledge by gender received HBVV and receiving infection control training outside the hospital factor (n = 300)

Variables		n	Mean	SD	t	Sig.
Gender	Male	118	20.9000	3.20000	11.950	**0.000***
	Female	182	15.6648	2.12139		
Received hepatitis B virus vaccine (HBVV)	No	57	19.5700	1.11000	-6.913	**0.000***
	Yes	243	16.1915	2.10655		
Receiving infection control training outside the hospital	No	65	17.8800	1.40000	-6.723	**0.000***
	Yes	235	16.3527	2.07534		

t-test analysis $p<0.05$

The results of this study are summarized in table 4.3, which demonstrates that male nurses have a higher level of knowledge in the field of infection control than their female counterparts ($p<0.05$), there is also a negative relationship between the non-reactive receiving HBVV and infection control nurses' knowledge $p<0.05$ the less receiving HBVV the nurses' knowledge $p<0.05$

The study's findings, in the end, indicated a correlation between nurses' knowledge of infection control and the amount of time they spent receiving training in inflation control outside of the hospital.

Table 4.4 Comparison of infection control practices by age, experience and level of education, Working unit, have infection control nurse in the hospital and have an infection control manual in the unit factor (n = 300)

Variables		n	Mean	SD	F	Sig.
Age	20-30	172	10.13488	1.337211	195.056	**0.000***
	31-40	80	12.78500	3.33793		
	41-50	42	13.38810	2.97307		
	50 and more	6	13.80000	2.99000		

Experience	<2 years	170	10.11647	1.334153	296.183	**0.000***
	≥2 years and<5 years	77	12.73636	3.71310		
	≥5 years and>10 years	53	13.40755	3.11231		
Level of education	Nursing school	80	9.09625	1.167432	371.130	**0.000***
	Diploma	114	11.33596	1.78970		
	Bachelor	90	13.00333	2.11176		
	Master	16	13.80000	2.03000		
Working unit	Intensive care unit	63	8.81905	1.169899	424.273	**0.000***
	Intermediate care unit	48	10.22292	1.81295		
	Cardiac care unit	42	11.30000	1.93855		
	Recovery unit	57	12.31404	3.47866		
	Neonatal intensive care unit	36	12.90556	1.30809		
	Cardiac catheterization	54	13.40185	2.11109		
Is there any infection control nurse in the hospital	No	35	18.4000	100000	-55.615	**0.000***
	Yes	210	15.9762	0.92850		
	Not sure	55	14.8104	0.88810		
Do you have an infection control manual in the unit	No	23	13.80000	3.00000	45.565	**0.000***
	Yes	258	11.02558	1.678997		
	Not sure	19	13.23043	1.25896		

ANOVA analysis $p<0.05$

Table 4.4 displays the study's findings, which indicate that infection control practices are positively related to nurses' ages, years of experience, levels of education, working units, and the presence of an infection control manual within the unit; however, a lack of an infection control nurse in the hospital was found to be negatively related to these practices ($p < 0.05$).

Table 4.5 Comparison of infection control practices by gender received HBVV and receiving infection control training outside the hospital factor (n = 300)

Variables		n	Mean	SD	t	Sig.
Gender	Male	118	18.0000	1.00000	11.950	**0.000***
	Female	182	15.6648	0.92139		
Received hepatitis B virus vaccine (HBVV)	No	57	18.1700	1.10000	6.913	**0.000***
	Yes	243	16.1915	0.96655		
Receiving infection control	No	65	18.0300	1.08000	6.913	**0.000***

training outside the hospital	Yes	235	16.1915	0.10655		
Receiving infection control training inside the hospital	No	67	18.2100	1.14000	7.071	**0.000***
	Yes	233	16.1760	0.10887		

t-test analysis p<0.05

Table 4.5 displays the study's findings that males scored higher than females on measures of infection prevention and control. In other words, there is better infection control if there are more males by a factor of one. This study's findings also demonstrated a correlation between anti-infection practices and exposure to HBVV, as well as exposure to infection control training both inside and outside the hospital.

Table 4.6 Correlations between infection control nurses' knowledge and infection control nurses' practices (n = 300)

Variables		Infection control nurses' knowledge	Infection control practices
Infection control nurses' knowledge	Pearson Correlation	1	.924**
	Sig. (2-tailed)		.000
	N	300	300
Infection control practices	Pearson Correlation	.924**	1
	Sig. (2-tailed)	.000	
	N	300	300

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

Table 4.14 displays the correlation between infection control nurses' knowledge and the outcomes of their practices at the P <0.05 level.

5 DISCUSSION

Table 4.1 from the study shows that 57.3% of the sample fell into the 20-30 year age bracket. This finding is consistent with that of another study (Mahmud an Sahib, 2011) that found the largest proportion of its participants to be between the ages of 23 and 27. (Hussein *et al.* 2022, AL-Salih *et al.* 2018, Ayed *et al.* 2015).

This finding is consistent with the fact that women made up 60.7% of the study population. For the result of a study (Mahmud and Sahib 2011, Hussein *et al.* 2022, AL-Salih *et al.* 2018, Ayed *et al.* 2015). As for experience, the majority of 56.7% of those with experience up to <2 years, and the educational level was the largest number of diploma graduates where they made up 38% This result comes similar to the study (Mahmud and Sahib 2011, Ayed *et al.* 2015).

The largest number had worked in the intensive care unit where they made up 21.0% this result was similar to the study of (Mahmud and Sahib 2011, Ayed *et al.* 2015). Also, 78.3% received the hepatitis B virus and 70% of the study sample answer the hospital have infection control nurse (AL-Salih *et al.* 2018, Ayed *et al.* 2015).In addition, 78.3% of the study sample receive training out-of-hospital infection control this result similar of study (Mahmud and Sahib 2011, Ayed *et al.* 2015) Finally 86% receive the infection control guide in the unit this result comes similar to the study (Hussein *et al.* 2022, AL-Salih *et al.* 2018, Ayed *et al.* 2015).

Similar to previous studies (Ghadmgahi *et al.* 2011, Al-Jubouri 2014, Ayed *et al.* 2015, Johnson *et al.* 2013, Janjua *et al.* 2007, Reda *et al.* 2010), the results of this study showed a positive relationship between infection control practices, age, experience, level of education, working unit, and having an infection control manual in the unit ($p < 0.05$).

According to the data, males have a greater familiarity with infection control nurses than females do. This difference is statistically significant ($p<0.05$), and there is also a negative relationship between non-reactive people receiving the HBVV vaccine and knowledge of infection control nurses $p<0.05$ and the less HBVV receives knowledge of pathogens $p<0.05$ This result comes similar to previous studies(Ghadmgahi *et al.* 2011, Al-Jubouri 2014, Ayed *et al.* 2015, Johnson *et al.* 2013, Janjua *et al.* 2007, Reda *et al.* 2010)

Results showed a significant gender difference in knowledge of infection control nurses (p0.05) with males knowing more nurses than females, and there is also a negative relationship between non-reactive people receiving the HBVV vaccine and knowledge

of infection control nurses p<0.05 and the less HBVV receives knowledge of pathogens p<0.05 This result comes similar to previous studies (Ghadmgahi *et al.* 2011, Al-Jubouri 2014, Ayed *et al.* 2015). The same evidence that demonstrated a positive correlation between gender and nurses' knowledge of infection control also demonstrated a negative correlation between HBVV vaccine recipients who did not develop antibodies and nurses' knowledge of infection control (both at the p0.05 level) (Hussein *et al.* 2022, AL-Salih *et al.* 2018, Ayed *et al.* 2015).

The study found a positive correlation between infection control practices and male gender; the higher the proportion of males, the better the infection control. Conversely, the study found a negative correlation between infection control practices and not contracting the hepatitis C virus, not receiving infection control training, and not having an infection control nurse on staff. Previous research has shown a correlation between gender and infection control practices (Fashafsheh *et al.* 2015; Ayed *et al.* 2015; Ghadmgahi *et al.* 2011); however, this study confirms that there is no infection control nurse on staff, and that he has not received any infection control training either inside or outside the hospital.

According to the findings of this study, there is a strong link between infection control nurses' knowledge and their actual infection control procedures. In addition, when there is a positive correlation between knowledge and the outcomes of the consolidated cases (P< 0.05), This finding is consistent with previous research showing a positive correlation between infection control nurse knowledge and practice (Darawad *et al.* 2012; Chan *et al.* 2007; Askarian *et al.* 2005; Vaz *et al.* 2010).

6 CONCLUSION

- The majority of the study sample is in the age groups between 20-30 ,majority of the study sample is female
- The largest number of people worked in the intensive care unit but did not receive any infection control nurse in the hospital
- There is a positive correlation between infection control practices, age, experience, level of education, unit of work and the presence of evidence of infection control in unit $p < 0.05$.
- There is a positive relationship between sex and knowledge of infection control nurses $P < 0.05$ where males had knowledge of higher nurses than females
- There is also a negative relationship between non-reactive people receiving the HBV vaccine and knowledge of infection.
- There is a positive correlation between infection control practices and sex, and it was most valuable in males
- A significant correlation between knowledge of infection control nurses and infection control practices

6.1 Recommendations

- Continuing in-service educational programmes are used to keep nurses' knowledge and compliance up to date.
- Provide job- or task-specific education and training in transmission prevention.
- Labels should be placed in operating rooms to remind nurses to follow standard precautions.
- Emphasising the importance of following the most recent evidence-based infection control practises in continuing education / training programmes
- Providing regular training programmes for newly graduated nurses on standard precautions.

REFERENCES

Al-Jubouri, MB. 2014. Assessment of nurse's knowledge about nosocomial ınfection at hospitals in baghdad city. *Kufa journal for nursing sciences*,4(1):198-203.

Al-Kharkhi, M. Zeiny, S. Ali, S. 2016.Nosocomial infections in a surgical floor of the general Ba'qubah Hospital, Iraq, *journal of the faculty of medicine baghdad* , 3,58(1):51-7.doi: https://doi.org/10.32007/jfacmedbagdad.581196

Allen, M. Hall, L. Halton, K. Graves, N. 2018. Improving hospital environmental hygiene with the use of a targeted multi-modal bundle strategy. *Infect Dis Health*,23(2):107–113. doi:10.1016/j.idh.2018.01.003

Alp, E. Damani, N. 2015. Healthcare-associated infections in intensive care units, epidemiology and infection control in low-to-middle income countries. J *Infect Dev Ctrie*,9(10):1040–1045. doi:10.3855/jidc.6832

Alp, E. and Voss, A. 2006. Annals of clinical microbiology and antimicrobials, 5(1), 7. doi:10.1186/1476-0711-5-7

AL-Rawajfah, O. 2014. Infection control practices among intensive care unit registered nurses a Jordanian national study, *Nursing in critical care*, pp-2-8. doi: 10.1111/nicc.12078

AL-Rawajfah, O. M. and Tubaishat, A. 2015. Nursing students' knowledge and practices of standard precautions, A Jordanian web-based survey. *Nurse Education Today*, 35(12), 1175–1180. doi:10.1016/j.nedt.2015.05.011

AL-Salih, S. Muhbes, F. and Hindi, N. 2018. Assessment of nurses' knowledge about nosocomial ınfection at burns units in the middle euphrates teaching hospitals, *International journal of pharmaceutical quality assurance*, 9(4), 389-394, doi: 10.25258/ijpqa.9.4.6

Ari Raheem Qader, A. and Muhamad, J. 2010. Nosocomial Infection in Sulaimani Burn Hospital, Iraq, *Research gate*, pp.1-10

Askarian M, Shiraly R, McLaws L. 2005. Knowledge, attitude, and practice of contact precautions among Iranian nurse American Journal of Infection Control 33: 486–488.

Atkinson, J. Chartier, Y. Pessoa-Silva, CL. *et al.* 2009. Annex CRespiratory droplets, atural Ventilation for Infection Control in Health-Care Settings, https://www.ncbi.nlm.nih.gov/books/NBK143281/

Ayed, A. Eqtait, M. and Fashafsheh, I. 2015.Knowledge and Compliance of Nursing Staff towards Standard Precautions in the Palestinian Hospitals , Advances in Life Science and Technology www.iiste.org , ISSN 2224-7181 (Paper) ISSN 2225-062X (Online) Vol.36

Bizuayehu ,H. Bitew,A. Abdeta, A. Ebrahim, S. 2022. Catheter-associated urinary tract infections in adult intensive care units at a selected tertiary hospital, Addis Ababa, Ethiopia, PLOSONE, https://doi.org/10.1371/journal.pone.0265102

Bonet M, Nogueira Pileggi V, Rijken MJ. 2017. Towards a consensus definition of maternal sepsis: results of a systematic review and expert consultation. Reprod Health. 2017,14:67

Bonet, M. Brizuela, V. Abalos, E. Cuesta, C. Baguiya, A. Chamillard, M. Lumbiganon, P. 2020. Frequency and management of maternal infection in health facilities in 52 countries (GLOSS): a 1-week inception cohort study. *The Lancet Global Health*, 8(5), e661–e671. doi:10.1016/s2214-109x(20)30109-1

Brian F, Leas BF, Nancy Sullivan N, *et al.* 2015. Environmental cleaning for the prevention of healthcare-associated infections. (Technical Briefs, No. 22.). Agency for Healthcare Research and Quality. U.S. Department of Health and Human Services. 540 Gaither Road, Rockville, MD 20850, USDA, 2015. Available from: https://www.ncbi.nlm.nih.gov/books/NBK311016/pdf/Bookshelf_NBK311016.pdf.

Carling PC. 2016.Optimizing health care environmental hygiene. Infect Dis Clin North Am. 2016,30(3):639–660. doi:10.1016/j.idc.2016.04.010

Carthey J, Walker S, Deelchand V, Vincent C, Griffiths WH. 2011. Breaking the rules: understanding non-compliance with policies and guidelines. BMJ. 2011,343:d5283. doi:10.1136/bmj.d5283

Cassini, A. Plachouras D. Eckmanns, T. Abu Sin M, Blank H-P, Tanja Ducomble T *et al.*2016. Burden of six healthcare-associated infections on European population health: estimating incidence-based disability-adjusted life years through a population prevalence-based modeling study. PLoS. Med. 2016, 13:1–16.

CDC, 2012. Lesson 1: Introduction to Epidemiology, https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section10.html#:~:text=Vehicles%20that%20may%20indirectly%20transmit,may%20carry%20hepatitis%20A%20virus.

CDC, 2015.Urinary Tract Infection. Centers for Disease Control and Prevention (CDC). 17 April 2015. Archived from the original on 22 February 2016. Retrieved 9 February 2016.

CDC, 2015.Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases (NCEZID), Division of Healthcare Quality Promotion (DHQP). Core elements of hospital antibiotic stewardship programs, 2015. Available from: https://www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements.html.

CDC, 2022. Healthcare-Associated Infections (HAIs), https://www.cdc.gov/hai/

CDC. 2011.Basic infection control and prevention plan for outpatient oncology setting. Pp2-13, https://www.cdc.gov/hai/pdfs/guidelines/basic-infection-control-prevention-plan-2011.pdf

Centro Nazionale di Epidemiologia, 2016. Sorveglianza e Promozione della Salute. Infezioni correlate all'assistenza, aspetti epidemiologici. Available at: http://www.epicentro.iss.it/problemi/infezioni_correlate/epid.asp.

Chan M, Ho A, Day MC. 2007. Investigating the knowledge, attitudes and practice patterns of operating room staff towards standard and transmission based

precautions: results of a cluster analysis. Journal of Clinical Nursing 17: 1051–1062

Chassin MR, Mayer C, Nether K.2015. Improving hand hygiene at eight hospitals in the United States by targeting specific causes of noncompliance. Jt Comm J Qual Patient Saf. 2015,41(1):4–12.

Ciccarelli, S, Stolfi, I, Caramia, G. 2013. Management strategies in the treatment of neonatal and pediatric gastroenteritis. Infection and Drug Resistance. 6: 133–61. doi:10.2147/IDR.S12718. PMC 3815002. PMID 24194646.

Ciccolini M, Donker T, Grundmann H, Bonten MJ, Woolhouse ME.2014. Efficient surveillance for healthcare-associated infections spreading between hospitals. Proc Natl Acad Sci USA. 2014,111(6):2271–2276. doi:10.1073/pnas.1308062111

Colgan R, Williams M, Johnson JR (2011). Diagnosis and treatment of acute pyelonephritis in women. American Family Physician. 84 (5): 519–26. PMID 21888302.

Cooper A.S. 2021, Oral hygiene care to prevent ventilator-associated pneumonia in critically ill patients. Crit. Care Nurs.. 2021,41(4):80-82. doi:10.4037/ccn2021314

Copstead-Kirkhorn, L. Banasik, J. 2013. Study Guide for Pathophysiology (5 ed.). Elsevier Health Sciences. 2013. p. 272. ISBN 9780323293181.

Craven DE, Chroneou A, Zias N, Hjalmarson KI .2009. Ventilator-associated tracheobronchitis: the impact of targeted antibiotic therapy on patient outcomes. Chest. 135 (2): 521–528. doi:10.1378/chest.08-1617.

Darawad MW, Al-Hussami M, Almhairat I, Al-Sutari M. 2012. Investigating Jordanian nurses' handwashing beliefs, attitudes, and compliance. American Journal of Infection Control 40: 643–647

Di Muzio M, Cammilletti V, Petrelli E, Di Simone E. 2015.Hand hygiene in preventing nosocomial infections: a nursing research. *Ann Ig*.,27(2):485–491

Di Tella, D. Tamburro, M. Guerrizio, G. Fanelli, I. Sammarco, ML. Ripabelli G.2019. Molecular epidemiological insights into colistin-resistant and carbapenemases-producing clinical Klebsiella pneumoniae isolates. Infect Drug Resist. 2019,12:3783–3795. doi:10.2147/IDR.S226416

Doron S, Davidson LE. 2011.Antimicrobial stewardship. Mayo Clin Proc. 2011,86(11):1113–1123. doi:10.4065/mcp.2011.0358

Dyar OJ, Huttner B, Schouten J, Pulcini C. 2017. ESGAP (ESCMID Study Group for Antimicrobial stewardship). What is antimicrobial stewardship? Clin Microbiol Infect. 2017,23(11):793–798. doi:10.1016/j.cmi.2017.08.026

Eber MR, Laxminarayan R, Perencevich EN, Malani A.2010. Clinical and economic outcomes attributable to health care-associated sepsis and pneumonia. Arch Intern Med. 2010,170(4):347–53.

Esfandiari A, Rashidian A, Masoumi Asl H, Rahimi Foroushani A, Salari H, Akbari Sari A. 2016.Prevention and control of healthcare-associated infections in Iran: a qualitative study to explore challenges and barriers. Am J Infect Control. 2016,44(10):1149–1153. doi:10.1016/j.ajic.2016.03.049

Esfandiari A, Salari H, Rashidian A, Masoumi Asl H, Rahimi Foroushani A, Akbari Sari A. 2017. Eliminating healthcare-associated infections in Iran: a qualitative study to explore stakeholders' views. Int J Health Policy Manag. 2017,7(1):27–34. doi:10.15171/ijhpm.2017.34

European Centre for Disease Prevention and Control. 2016.Surveillance Report- Annual Epidemiological Report for 2016—Healthcare-Associated Infections in Intensive Care Units. 2016:11. Available at: https://ecdc.europa.eu/sites/portal/files/documents/AER_for_2016-HAI_0.pdf.

Ferri, F. 2015. Ferri's Clinical Advisor 2015: 5 Books in 1. Elsevier Health Sciences. 2014. p. 479. ISBN 978-0-323-08430-7. Archived from the original on 2017-09-08.

Ferroni, M, Taylor, AK .2015. Asymptomatic Bacteriuria in Noncatheterized Adults. *The Urologic Clinics of North America*. 42 .4.: 537–45. doi:10.1016/j.ucl.2015.07.003. PMID 26475950

Flores-Mireles, AL. Walker, JN. Caparon, M. Hultgren, SJ .2015. Urinary tract infections: epidemiology, mechanisms of infection and treatment options. Nature Reviews. Microbiology. 13 .5.: 269–84. doi:10.1038/nrmicro3432. PMC 4457377. PMID 25853778.

Galiczewski, JM.Shurpin, KM. 2017.An intervention to improve the catheter-associated urinary tract infection rate in a medical intensive care unit: Direct observation of catheter insertion procedure. *Intensive Crit Care Nurs*. 2017, 40:26–34.?. pmid:28237090

Gardam, MA. Lemieux, C. Reason, P. van Dijk, M. Goel, V. 2009.Healthcare-associated infections as patient safety indicators. *Healthc Pap*. 2009,9.3.:8–24. doi:10.12927/hcpap.2009.20922

Gary, C. 2014. Williams Obstetrics .24th ed.. McGraw-Hill Professional. 2014. pp. Chapter 37. ISBN 978-0-07-179893-8.

Gastmeier, P. Behnke, M. Breier, AC. Piening, B. Schwab, F. Dettenkofer, M. Geffers, C. 2012.Healthcare-associated infection rates: measuring and comparing. Experiences from the German National Nosocomial Infection Surveillance System .KISS. and from other surveillance systems. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz. 2012,55:1363–1369. doi: 10.1007/s00103-012-1551-y.

Gastmeier, P. 2010. Healthcare-associated versus community-acquired infections: a new challenge for science and society. Int J Med Microbiol. 2010,300.6.:342–345. doi:10.1016/j.ijmm.2010.04.007

Ge, X. Cavallazzi, R. Li C. Pan, SM. Wang, YW. Wang, FL. 2012. Central venous access sites for the prevention of venous thrombosis, stenosis and infection. The Cochrane Database of Systematic Reviews .3.: CD004084. doi:10.1002/14651858.CD004084.pub3.

Geberemariyam BS, Donka GM, Wordofa B. 2018.Assessment of knowledge and practices of healthcare workers towards infection prevention and associated factors in healthcare facilities of West Arsi District, Southeast Ethiopia: a facility-based cross-sectional study. Arch Public Health. 2018,76:69. doi:10.1186/s13690-018-0314-0

Ghadmgahi F, Zighaimat F, Ebadi A, Houshmand A. Knowledge, attitude and self-efficacy of nursing staffs in hospital infections control. Journal Mil Med. 2011 Oct 15,13.3.:167-72.

Glaser, AP, Schaeffer, AJ .2015. Urinary Tract Infection and Bacteriuria in Pregnancy. The Urologic Clinics of North America. 42 .4.: 547–60. doi:10.1016/j.ucl.2015.05.004. PMID 26475951

Global Maternal and Neonatal Sepsis Initiative Working Group, 2017. The Global Maternal and Neonatal Sepsis Initiative: a call for collaboration and action by 2030. Lancet Glob Health. 2017,5:e390–e391

Gould, D. J., Moralejo, D., Drey, N., Chudleigh, J. H., and Taljaard, M. .2017. Interventions to improve hand hygiene compliance in patient care. Cochrane Database of Systematic Reviews. 1,9.9.:CD005186., doi:10.1002/14651858.cd005186.p

Government of South Africa. 2019. Environmental hygiene in healthcare. Available from: https://www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/clinical+resources/clinical+topics/healthcare+associated+infections/prevention+and+management+of+infections+in+healthcare+settings/environmental+hygiene+in+healthcare#main.

Government of the State of Victoria, Australia, 2021. Preventing healthcare associated infection .HAI., Better Health Channel, https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/infections-in-hospital-reduce-the-risk#bhc-content

Hamdy RF, Hsu AJ, Stockmann C, *et al.*2017. Epidemiology of methicillin-resistant Staphylococcus aureus bacteremia in children. Pediatrics. 2017,139.6.:e20170183. doi:10.1542/peds.2017-0183

Haque M, Sartelli M, McKimm J, Abu Bakar M. 2018.Healthcare-associated infections - an overview. Infect Drug Resist. 2018,11:2321–2333. doi:10.2147/IDR.S177247

Haque, M., McKimm, J., Sartelli, M., Dhingra, S., Labricciosa, F. M., Islam, S., … Charan, J. .2020. Strategies to Prevent Healthcare-Associated Infections: A Narrative Overview. Risk Management and Healthcare Policy, Volume 13, 1765–1780. doi:10.2147/rmhp.s269315

Higuera, V.2017. How Are Diseases Transmitted?, healthline,https://www.healthline.com/health/disease-transmission

Hussein, A. Awad, A. Hadi, B 2022.Nurses' Knowledge About Infection Control At Primary Health Care Centers In Al-Hilla City, Iraq, Wiad Lek . 2022,75.5 pt 2.:1305-1308. doi: 10.36740/WLek202205213.

Hussein, N.Salih, R. Rasheed, N. 2019.Prevalence of Methicillin-Resistant Staphylococcus aureus in Hospitals and Community in Duhok, Kurdistan Region of Iraq, International Journal of Infection: Vol.6, issue 2, e89636, DOI: 10.5812/iji.89636

Iannella HA, Luna CM. 2016.Community-acquired pneumonia in Latin America. Semin Respir Crit Care Med. 2016,37.6.:868–75.

Irek EO, Amupitan AA, Obadare TO, Aboderin AO. 2018.A systematic review of healthcare-associated infections in Africa: an antimicrobial resistance perspective. Afr J Lab Med. 2018,7.2.:796. doi:10.4102/ajlm.v7i2.796

Janjua NZ, Razaq M, Chandir S, Rozi S, Mahmood B .2007. Poor knowledge predictor of non adherence to universal precautions for blood borne pathogens at first level care facilities in Pakistan. BMC Infect Dis., 7: 81.

Jarvis, R. .2007. Bennett and Brachman's hospital infections .5th ed.. Philadelphia: Wolters Kluwer Health/Lippincott Williams and Wilkins. p. 474. ISBN 9780781763837.

Jernigan JA, Hatfield KM, Wolford H, Nelson RE, Olubajo B, Reddy SC, McCarthy N, Paul P, McDonald LC, Kallen A, Fiore A, Craig M, Baggs J. 2020.Multidrug-Resistant Bacterial Infections in U.S. Hospitalized Patients, 2012-2017. N Engl J Med. 2020 Apr 02,382.14.:1309-1319.

John B.2000 .The Management and Control of Hospital Acquired Infection in Acute NHS Trusts in England: National Audit office pp.2-13.ISBN: 0105566659

Johnson OE, Asuzu MC, Adebiyi AD .2013. Knowledge and practice of universal precautions among professionals in public and private health facilities in Uyo, Southern Nigeria- a comparative study. *Ibom Med*. J. 6.1.: 9-19

Jordanian Ministry of Health — Department of Communicable Diseases, 2011. Guidelines and Procedures for Infection Control in Hospitals .MOH_ICD1-11. Jordanian Ministry

Kanerva, M. Ollgren, J. Hakanen, AJ. Lyytikäinen, O.2012.Estimating the burden of healthcare-associated infections caused by selected multidrug-resistant bacteria Finland, 2010. *Antimicrob Resist Infect Control*. doi:10.1186/2047-2994-1-33

Karimi, H. Alavi, NM. 2015.Florence Nightingale: the mother of nursing. *Nurs Midwifery Stud*. 2015,4.2.:e29475. doi:10.17795/nmsjournal29475

Kenters, N. Gottlieb, T. Hopman, J. *et al.*2018. An international survey of cleaning and disinfection practices in the healthcare environment. J *Hosp Infect*.,100.2.:236–241. doi:10.1016/j.jhin.2018.05.008

Khan, HA. Baig, FK. Mehboob, R. 2017.Nosocomial infections: epidemiology, prevention, control, and surveillance. *Asian Pac J Trop Biomed*. 2017,7.5.:478. doi:10.1016/j.apjtb.2017.01.019

Kim HS, Schwartz-Barcott D, Holter IM, Lorensen M. .1995.Developing a translation of the McGill pain questionnaire for cross-cultural comparison: an example from Norway. Journal of Advanced Nursing, 21: 421–426.

Kim, B. Kang, M.Lim, J. Lee, J. Kang, D.Kim, M.Kim, J.Park, H. Min, K. Cho, J. and Jeon, K.2022. Comprehensive risk assessment for hospital-acquired pneumonia: sociodemographic, clinical, and hospital environmental factors associated with the incidence of hospital-acquired pneumonia, BMC Pulmonary Medicine, pp.22:21 ,https://doi.org/10.1186/s12890-021-01816-9

Ko RE, Min KH, Hong SB, Baek AR, Lee HK, Cho WH, *et al.* Characteristics, management, and clinical outcomes of patients with hospital-acquired and ventilator-associated pneumonia: a multicenter cohort study in Korea. Tuberc Respir Dis .Seoul. 2021,84:317–25

Konar , H. 2014. DC Dutta's Textbook of Obstetrics. JP Medical Ltd. p. 432. ISBN 978-93-5152-067-2.

Koutri, E. and Papadopoulou, A. 2018.Eosinophilic Gastrointestinal Diseases in Childhood. Ann Nutr Metab. 2018,73 Suppl 4:18-28.

Kumar N, Singh Y, Yadav G, Muthur Sk, Rhadani UK. 2018.Role of neomycin polymyxin sulfate solution bladder wash for prevention of catheter-associated urinary tract infection in traumatic brain injury patient admitted to Intensive Care Unit: a prospective randomized study. Int J Crit Illn Inj Sci 2018, 8:17–21. pmid:29619335

Lane, DR, Takhar, SS, 2011, Diagnosis and management of urinary tract infection and pyelonephritis. Emergency Medicine Clinics of North America. 29 .3.: 539–52. doi:10.1016/j.emc.2011.04.001. PMID 21782073.

Lemaire B, Normand AC, Forel JM, Cassir N, Piarroux R, Ranque S. 2018.Hospitalized Patient as Source of Aspergillus fumigatus, 2015. Emerg Infect Dis. 2018 Aug,24.8.:1524-1527.

Li B, Webster TJ, Zhao H. 2017.Bacteria antibiotic resistance: new challenges and opportunities for implant-associated orthopedic infections. J Orthop Res. 2017,36.1.:22–32. doi:10.1186/s13018-017-0520-4

Li, Y. 2021. Basic routes of transmission of respiratory pathogens—A new proposal for transmission categorization based on respiratory spray, inhalation, and touch. Indoor Air, 31.1., 3–6. doi:10.1111/ina.12786

Ling ML, Apisarnthanarak A, Madriaga G. 2015. The Burden of Healthcare-Associated Infections in Southeast Asia: A Systematic Literature Review and Meta-analysis. Clin Infect Dis. 2015 Jun 01,60.11.:1690-9.

Ling ML, Apisarnthanarak A, Thu le TA, Villanueva V, Pandjaitan C, Yusof MY. APSIC guidelines for environmental cleaning and decontamination. Antimicrob Resist Infect Control. 2015,4:58. doi:10.1186/s13756-015-0099-7

Linton, A. 2015.Introduction to Medical-Surgical Nursing. Elsevier Health Sciences. 2015. p. 909. ISBN 9781455776412.

Longembe EB, Kitronza PL. 2020.Compliance with hand-hygiene practice in the General Reference Hospitals of the city of Kisangani, Democratic Republic of the Congo [Observance de l'hygiène des mains dans les hôpitaux généraux de référence de la ville de Kisangani en République Démocratique du Congo]. Pan Afr Med J. 2020,35:57.

Magill SS, Edwards JR, Bamberg W, Beldavs ZG, Dumyati G, Kainer MA, *et al.*2014. Multistate point-prevalence survey of health care-associated infec- tions. N Engl J Med. 2014,370.13.:1198–208.

Magill SS, O'Leary E, Janelle SJ, Thompson DL, Dumyati G, Nadle J, Wilson LE, Kainer MA, Lynfield R, Greissman S, Ray SM, Beldavs Z, Gross C, Bamberg W, Sievers M, Concannon C, Buhr N, Warnke L, Maloney M, Ocampo V, Brooks J, Oyewumi T, Sharmin S, Richards K, Rainbow J, Samper M, Hancock EB, Leaptrot D, Scalise E, Badrun F, Phelps R, Edwards JR., 2018.Emerging Infections Program Hospital Prevalence Survey Team. Changes in Prevalence of

Health Care-Associated Infections in U.S. Hospitals. N Engl J Med. 2018 Nov 01,379.18.:1732-1744

Mahmud, N. and Sahib, s.2011.Assessment of Nurses' Practices Toward Infection Control Standardized Precautions in Azady Teaching Hospital in the City of Kirkuk, Iraqi National J. for Nursing Specialties, Vol. 24.1.

Maliwan H. 2018.Developing and Evaluating Effective Interventions to Reduce Healthcare-Associated Infection in A Resource-Limited Hospital in Thailand. Ph.D. Thesis. Mahidol Oxford Tropical Medicine Research Unit. The Open University, 2018. Available from: https://oro.open.ac.uk/55283/7/Thesis_Maliwan%20Hongsuwan%2C%20B6976542.pdf. Accessed February 21, 2019.

Man SM .2011. The clinical importance of emerging Campylobacter species. Nature Reviews Gastroenterology and Hepatology. 8 .12.: 669–85. doi:10.1038/nrgastro.2011.191. PMID 22025030. S2CID 24103030

Markel H. 2015.Wash your hands! Milbank Q. 2015,93.3.:447–454. doi:10.1111/1468-0009.12128

Markel H. 2015.Wash your hands! Milbank Q. 2015,93.3.:447–454. doi:10.1111/1468-0009.12128

Marshall JA, Bruggink LD .2011. The dynamics of norovirus outbreak epidemics: recent insights. International Journal of Environmental Research and Public Health. 8 .4.: 1141–9. doi:10.3390/ijerph8041141. PMC 3118882. PMID 21695033

McKean S, Ross J, Dressler D, Brotman D, Ginsburg J .2012. Principles and practice of hospital medicine. New York: McGraw-Hill. ISBN 978-0071603898.

McLaws ML. 2015.The relationship between hand hygiene and healthcare-associated infection: it's complicated. Infect Drug Resist. 2015,8:7–18.

Michael CA, Dominey-Howes D, Labbate M. 2014.The antimicrobial resistance crisis: causes, consequences, and management. Front Public Health. 2014,2:145.

Michetti CP, Fakhry SM, Ferguson PL, Cook A, Moore FO, Gross R .2012. Ventilator-associated pneumonia rates at major trauma centers compared with a national benchmark: a multi-institutional study of the AAST. The Journal of Trauma and Acute Care Surgery. 72 .5.: 1165–73. doi:10.1097/TA.0b013e31824d10fa. PMID 22673241

Moffa M, Guo W, Li T, Cronk R, Abebe LS, Bartram J. 2017.A systematic review of nosocomial waterborne infections in neonates and mothers. Int J Hyg Environ Health. 2017,220.8.:1199–1206. doi:10.1016/j.ijheh.2017.07.011

Monegro, Alberto F., Muppidi, Vijayadershan, Regunath, Hariharan .2020., Hospital Acquired Infections, StatPearls, Treasure Island .FL.: StatPearls Publishing, PMID 28722887, https://www.ncbi.nlm.nih.gov/books/NBK441857/

Morris AK, Russell CD.2016. Enhanced surveillance of Staphylococcus aureus bacteremia to identify targets for infection prevention. J Hosp Infect. 2016,93.2.:169–174. doi:10.1016/j.jhin.2016.03.003

Moued, I. Haweizy, R. Miran, L. Mohammed, M. Schreeb, J. 1 and Älgå, A. 2021.Observational Study of Hand Hygiene Compliance at a Trauma Hospital in Iraqi Kurdistan, MDPI, 4.4., 794-802, https://doi.org/10.3390/j4040054

Muhsen K, Kassem E, Rubenstein U, Goren S, Ephros M, Shulman LM, Cohen D. 2019.No evidence of an increase in the incidence of norovirus gastroenteritis hospitalizations in young children after the introduction of universal rotavirus immunization in Israel. Hum Vaccin Immunother. 2019,15.6.:1284-1293.

Mukagendaneza MJ, Munyaneza E, Muhawenayo E, Nyirasebura D, Abahuje E, Nyirigira J, Harelimana JD, Muvunyi TZ, Masaisa F, Byiringiro JC, Hategekimana T, Muvunyi CM. 2019. Incidence, root causes, and outcomes of surgical site infections in a tertiary care hospital in Rwanda: a prospective observational cohort study. Patient Saf Surg. 2019,13:10.

Mukagendaneza MJ, Munyaneza E, Muhawenayo E, Nyirasebura D, Abahuje E, Nyirigira J, Harelimana JD, Muvunyi TZ, Masaisa F, Byiringiro JC, Hategekimana T, Muvunyi CM. 2019. Incidence, root causes, and outcomes of

surgical site infections in a tertiary care hospital in Rwanda: a prospective observational cohort study. Patient Saf Surg. 2019,13:10.

Murdoch F, Danial J, Morris AK, *et al.*2017. The Scottish enhanced Staphylococcus aureus bacteremia surveillance program: the first 18 months of data in adults. J Hosp Infect. 2017,97.2.:133–139. doi:10.1016/j.jhin.2017.06.008

Murrell, D. 2018. What is modern medicine?, Medical news today, https://www.medicalnewstoday.com/articles/323538

Nicolle LE .2008. Uncomplicated urinary tract infection in adults including uncomplicated pyelonephritis. Urol Clin North Am. 35 .1.: 1–12, v. doi:10.1016/j.ucl.2007.09.004. PMID 18061019

Nightingale F. 2018.Notes on Nursing. Chapter 11. Personal Cleanliness. 1st ed. Germany: Reproduction of the Original, Outlook Verlag, GmBH, Deutschland, Frankfurt am Main, 2018.

Ntonioli, P. Manzalini, M. Stefanati, A. Bonato, B. Verzola, A. Formaglio, A. and GABUTTI, G. 2016. Temporal trends of healthcare associated infections and antimicrobial use in 2011-2013, observed with annual point prevalence surveys in Ferrara University Hospital, Italy*, J Prev Med Hyg*, v.57.3., PMC5139608

O'Neill J. 2016.The Review on Antimicrobial Resistance. Tackling drug-resistant infections globally: final report and recommendations Government of the United Kingdom. 2016 of Health.

Ozer B, Akkurt CO, Duran N, Onlen Y, Savas L, Turhanoglu S. Evaluation of nosocomial infections and risk factors in critically ill patients. Medical science monitor: international medical journal of experimental and clinical research. 2011,17.3.:PH17. pmid:21358613

Park H, Adeyemi AO, Rascati KL.2015. Direct Medical costs and utilization of health care services to treat pneumonia in the United States: an analysis of the 2007–2011 medical expenditure panel survey. Clin Ther. 2015,37.7.:1466-76.e1.

Park JH, Ryu SH, Lee JY, Kim HJ, Kwak SH, Jung J, Lee J, Sung H, Kim SH. 2019. Airborne fungal spores and invasive aspergillosis in hematologic units in a tertiary hospital during construction: a prospective cohort study. Antimicrob Resist Infect Control. 2019,8:88.

Paton J, Kresge N, 2018.GlaxoSmithKline. Big Pharma is leaving the field of antibiotic research in droves, 2018. Available from: https://www.businesslive.co.za/bd/companies/2018-07-13-big-pharma-is-leaving-the-field-of-antibiotic-research-in-droves/.

Plante LA. 2016. Management of sepsis and septic shock for the obstetrician-gynecologist. Obstet Gynecol Clin North Am. 2016,43:659–678

Pollack, A.2010. Doctors struggle to treat gram-negative bacterial ınfections. The New York Times. ISSN 0362-4331.

Prestinaci F, Pezzotti P, Pantosti A. 2015. Antimicrobial resistance: a global, multifaceted phenomenon. Pathog Glob Health.,109.7.:309–318. doi:10.1179/2047773215Y.0000000030

Quinn MM, Henneberger PK, Braun B, *et al.* 2015.Cleaning and disinfecting environmental surfaces in health care: toward an integrated framework for infection and occupational illness prevention. National Institute for Occupational Safety and Health .NIOSH., Am J Infect Control. 2015,43.5.:424–434. doi:10.1016/j.ajic.2015.01.029.

Reda AA, Frisseha S, Mengistie B, Vanderweerd J .2010. Standard precautions: occupational exposure and behavior of health care workers in Ethiopia. Plos One, 5 .12.: e14420

Ridelberg M, Nilsen P.2015. Using surveillance data to reduce healthcare-associated infection: a qualitative study in Sweden. J Infect Prev. 2015,16.5.:208–214. doi:10.1177/1757177415588380

Ripabelli G, Tamburro M, Guerrizio G, *et al.*2018.Tracking multidrug-resistant Klebsiella pneumoniae from an Italian hospital: molecular epidemiology and

surveillance by PFGE, RAPD, and PCR-based resistance genes prevalence. Curr Microbiol. 2018,75.8.:977–987. doi:10.1007/s00284-018-1475-3

Rosenthal VD, *et al.* .2012. International Nosocomial Infection Control Consortium report, data summary of 36 countries, for 2004-2009. In: American Journal of Infection Control, 40.5.:396-407. https://doi.org/10.1016/j.ajic.2011.05.020

Rosenthal VD, Ramachandran B, Villamil-Gómez W, *et al.*2012. Impact of a multidimensional infection control strategy on central line-associated bloodstream infection rates in pediatric intensive care units of five developing countries: findings of the International Nosocomial Infection Control Consortium .INICC. Infection. 2012,40.4.:415–423. doi:10.1007/s15010-012-0246-5

Rupp ME, Fitzgerald T, Hayes K, *et al.* 2017. Effect of cessation of contact isolation for endemic methicillin-resistant Staphylococcus aureus and vancomycin-resistant enterococci. Infect Control Hosp Epidemiol. 2017,38.8.:1005–1007. doi:10.1017/ice.2017.122

Salvatore S, Salvatore S, Cattoni E, Siesto G, Serati M, Sorice P, Torella M .June 2011. Urinary tract infections in women. European Journal of Obstetrics, Gynecology, and Reproductive Biology. 156 .2.: 131–6. doi:10.1016/j.ejogrb.2011.01.028. PMID 21349630.

Salvatore S, Salvatore S, Cattoni E, Siesto G, Serati M, Sorice P, Torella M ,2011. Urinary tract infections in women. European Journal of Obstetrics, Gynecology, and Reproductive Biology. 156 .2.: 131–6. doi:10.1016/j.ejogrb.2011.01.028. PMID 21349630.

Sartelli M, Chichom-Mefire A, Labricciosa FM, *et al.* 2017.The management of intra-abdominal infections from a global perspective: 2017 WSES guidelines for management of intra-abdominal infections. World J Emerg Surg. 2017,12:29. doi:10.1186/s13017-017-0141-6

Sartelli M, Coccolini F, Abu-Zidan FM, *et al.* 2020.Hey surgeons! It is time to lead and be a champion in preventing and managing surgical infections! World J Emerg Surg. 2020,15.1.:28. doi:10.1186/s13017-020-00308-1

Sartelli M, Malangoni MA, Abu-Zidan FM, *et al.* 2015.WSES guidelines for management of Clostridium difficile infection in surgical patients. World J Emerg Surg. 2015,10:38. doi:10.1186/s13017-015-0033-6

Schiffers H, Zaatreh S, Mittelmeier W, Bader R. 2015.Potential infection control risks associated with roaming healthcare industry representatives. J Infect Prev. 2015,17.1.:22–28. doi:10.1177/1757177415605658

Schlossberg, D.2015. Clinical infectious disease .Second ed.. pp. 334. ISBN 978-1-107-03891-2.

Shetty, K. Tang, M. Yamaguchi, L. Sheikhan, N. Vaghefi, R. Burke A Cunha .2018. John L Brusch .ed.. Hospital-Acquired Pneumonia .Nosocomial Pneumonia. and Ventilator-Associated Pneumonia: Overview, Pathophysiology, Etiology. Webscape. https://emedicine.medscape.com/article/234753-overview

Shillabeer AG. Current Status. In: Shillabeer AG . 2016.Eds. The health of Vietnam. 57–90, Singapore: Springer, 2016. doi:10.1007/978-981-287-709-3_5

Shors, T. .2013. The microbial challenge : a public health perspective .3rd ed.. Burlington, MA: Jones and Bartlett Learning. p. 457. ISBN 978-1-4496-7333-8.

Sikora, A. and Zahra, F. 2022. Nosocomial Infections, Treasure Island .FL.: StatPearls Publishing, https://www.ncbi.nlm.nih.gov/books/NBK559312/#:~:text=Causative%20Organisms,bacteria%2C%20viruses%2C%20and%20fungi.

Singer M, Deutschman CS, Seymour CW. 2016.The third international consensus definitions for sepsis and septic shock .Sepsis-3. JAMA. 2016,315:801–810

Sommer MOA, Munck C, Toft-Kehler RV, Andersson DI. Prediction of antibiotic resistance: time for a new preclinical paradigm? Nat Rev Microbiol. 2017,15:689-96

Sopena N, Heras E, Casas I, Bechini J, Guasch I, Pedro-Botet ML, *et al.* 2014. Risk factors for hospital-acquired pneumonia outside the intensive care unit: a case-control study. Am J Infect Control. 2014,42.1.:38–42

Spivak ES, Hanson KE.2018. Candida auris: an Emerging Fungal Pathogen. J Clin Microbiol. 2018 Feb,56.2.

Suetens C, Latour K, Kärki T, Ricchizzi E, Kinross P, Moro ML, Jans B, Hopkins S, Hansen S, Lyytikäinen O, Reilly J, Deptula A, Zingg W, Plachouras D, Monnet DL., 2018. The Healthcare-Associated Infections Prevalence Study Group. Prevalence of healthcare-associated infections, estimated incidence and composite antimicrobial resistance index in acute care hospitals and long-term care facilities: results from two European point prevalence surveys, 2016 to 2017. Euro Surveill. 2018 Nov,23.46.

Sukkar E 2013. Why are there so few antibiotics in the research and development pipeline? The pharmaceutical journal. A Royal Pharmaceutical Society Publication, 2013. Available from: https://www.pharmaceutical-journal.com/news-and-analysis/features/why-are-there-so-few-antibiotics-in-the-research-and-development-pipeline/11130209.article?firstPass=false.

Tate JE, Burton AH, Boschi-Pinto C, Steele AD, Duque J, Parashar UD .2012. 2008 estimate of worldwide rotavirus-associated mortality in children younger than 5 years before the introduction of universal rotavirus vaccination programmes: a systematic review and meta-analysis. The Lancet Infectious Diseases. 12 .2.: 136–41. doi:10.1016/S1473-3099.11.70253-5. PMID 22030330.

Taylor, M. W. .2014. Introduction: A Short History of Virology. Viruses and Man: A History of Interactions, 1–22. doi:10.1007/978-3-319-07758-1_1

The Society for Healthcare Epidemiology of America.2019. Antimicrobial Stewardship, 2019. 1300 Wilson Boulevard, Suite 300, Arlington, VA 22209, USA. Available from https://www.shea-online.org/index.php/practice-resources/priority-topics/antimicrobial-stewardship.

Toney-Butler TJ, Carver N. 2018.Hand Washing .Hand Hygiene. In: StatPearls [Internet]. Treasure Island .FL.: StatPearls Publishing, 2018. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470254/

Torres A, Niederman MS, Chastre J, Ewig S, Fernandez-Vandellos P, Hanberger H, *et al.* 2017. International ERS/ESICM/ESCMID/ALAT guidelines for the management of hospital-acquired pneumonia and ventilatorassociated pneumonia: guidelines for the management of hospitalacquired pneumonia .HAP./ventilator-associated pneumonia .VAP. of the European Respiratory Society .ERS., European Society of Intensive Care Medicine .ESICM., European Society of Clinical Microbiology and Infectious Diseases .ESCMID. and Asociación Latinoamericana del Tórax .ALAT. Eur Respir J. 2017,50.3.:1700582.

Treadwell JR, Lucas S, Tsou AY. 2013.Surgical checklists: a systematic review of impacts and implementation. BMJ Qual Saf. 2013,23.4.:299–318. doi:10.1136/bmjqs-2012-0017974

United Nations. 2017. Not enough new antibiotics in the pipeline, UN report warns. Sustainable Development, GOALS, 2017. Available from: https://www.un.org/sustainabledevelopment/blog/2017/09/not-enough-new-antibiotics-in-the-pipeline-un-report-warns/. Accessed February 12, 2019.

van Bunnik BA, Ciccolini M, Gibbons CL, *et al.* 2015. Efficient national surveillance for health-care-associated infections. BMC Public Health. 2015,15:832. doi:10.1186/s12889-015-2172-9

Vaz K, McGrowder D, Alexander-Lindo R, Gordon L, Brown P, Irving R. .2010. Knowledge, awareness and compliance with universal precautions among healthcare workers at the University of West Indies, Jamaica. International Journal of Occupational and Environmental Medicine 1: 171–181.

Ventola CL. 2015. The antibiotic resistance crisis: part 1: causes and threats. Pharm Ther. 2015,40.4.:277–283.

Vos T, Abajobir A, Abate K. 2018.Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2018,392:1789–1858.

Weiner LM, Webb AK, Limbago B, Dudeck MA, Patel J, Kallen AJ, Edwards JR, Sievert DM. 2016. Antimicrobial-Resistant Pathogens Associated With Healthcare-Associated Infections: Summary of Data Reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2011-2014. Infect Control Hosp Epidemiol. 2016 Nov,37.11.:1288-1301.

WHO . 2012. Geneva, Switzerland: 2012. The WHO application of ICD-10 to deaths during pregnancy, childbirth and puerperium: ICD MM.https://apps.who.int/iris/bitstream/handle/10665/70929/9789241548458_eng.jsessionid=141094E2EBE05E4C9EBFEDD5EF7E506B?sequence=1

WHO, 2009. Guidelines on hand hygiene in health care: first global patient safety challenge clean care is safer care. Geneva: World Health Organization, 2009. The burden of healthcare-associated infection. Available from: https://www.ncbi.nlm.nih.gov/books/NBK144030/.

WHO, 2015. recommendations for prevention and treatment of maternal peripartum infections .PDF. World Health Organization. 2015. p. 1. ISBN 978-9241549363.

WHO, 2016. Healthcare-associated infections fact sheet. Available at: http://www.who.int/gpsc/country_work/gpsc_ccisc_fact_sheet_en.pdf, 2016.

WHO, 2022. Standard precautions for the prevention and control of infections: aide-memoire, https://www.who.int/publications/i/item/WHO-UHL-IHS-IPC-2022.1

WO, 2011. Report on the burden of endemic health care-associated infection worldwide. Geneva: WHO Document Production Services, 2011. Available at: http://apps.who.int/iris/bitstream/10665/80135/1/9789241501507_eng.pdf?ua=1.

Woodford, HJ, George, J .2011. Diagnosis and management of urinary infections in older people. Clinical Medicine. 11 .1.: 80–3. doi:10.7861/clinmedicine.11-1-80. PMC 5873814. PMID 21404794.

World Health Organization .WHO. Global Action Plan on Antimicrobial Resistance. Geneva: World Health Organization, 2015.

Yang WC, Chang YJ, Lin YC, Chen CY, Peng YC, Wu HP.2019. Survey of nil per os duration of patients admitted to the emergency department due to vomiting. Medicine .Baltimore. 2019 Apr,98.14.:e15087.00A0

Yousif SA, Alenazi TH, Arabi Y. 2016.Taming the beast: hospital management of a nosocomial middle east respiratory syndrome outbreak. J Infect Public Health.,9.4.:386–388. doi:10.1016/j.jiph.2016.03.002

Zollner-Schwetz, I, Krause, R .2015. Therapy of acute gastroenteritis: role of antibiotics. Clinical Microbiology and Infection. 21 .8.: 744–9. doi:10.1016/j.cmi.2015.03.002. PMID 25769427.

APPENDIX

APPENDIX 1. Questionnaire

APPENDIX 2. Ethics committee in Dhi Qar health department in Iraq approval

APPENDIX 3. Ethics committee in Çankiri Karatekin approval

APPENDIX 1. Questionnaire

EK 1. Soru Formu

Sayın Katılımcı
LÜTFEN BU DÖKÜMANI DİKKATLİCE OKUMAK İÇİN ZAMAN AYIRINIZ

APPENDIX 2 Ethics committee in Dhi Qar health department in Iraq approval

APPENDIX 3 Ethics committee in Çankiri Karatekin approval

CURRICULUM VITAE

Personal Information

Name and Surname : Hussein Ali Mohawt AL-ABBOODI

Education

Master

Bachelor's