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Master of Science Thesis

ASSESSMENT OF KNOWLEDGE AND ATTITUDES ABOUT INFECTION PREVENTION AMONG HEALTH CARE WORKERS IN KIRKUK CITY HOSPITALS

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Assessment of Knowledge and Attitudes About Infection Prevention Among Health Care Workers in Kirkuk City Hospitals

BY

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The Degree of Master of Science

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ETHICS STATEMENT

The thesis entitled "**Assessment of Knowledge and Attitudes About Infection Prevention Among Health Care Workers in Kirkuk City Hospitals**" 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

2023

Basim Hameed Ahmed AHMED

ABSTRACT

ASSESSMENT OF KNOWLEDGE AND ATTITUDES ABOUT INFECTION PREVENTION AMONG HEALTH CARE WORKERS IN KIRKUK CITY HOSPITALS

Basim Hameed Ahmed AHMED
Master of Science in Nursing
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Hospital-acquired infections (HAIs) are a factor in longer hospital stays, higher mortality, and more expensive medical care. HAI prevention and its management are crucial public health issues. Safety is essential in any work, but especially in healthcare settings. This study evaluated the knowledge and attitude of healthcare workers professionals toward routine infection control Practices. The aim of this study is to assess the levels of knowledge, and practicis, of the healthcare workers toward safety in Kirkuk city hospitals. Quantitative research was used in the design of the study. A descriptive study was carried out over the course of October 10th, 2021 until May 10th, 2022 to assess healthcare workers' knowledge and attitude about infection prevention. The study was carried out on a sample of (200) healthcare workers selected non-probability sampling (convenience sample) from 2 hospitals in Kirkuk city (Kirkuk general hospital, gynecological and pediatric hospital)

For the assessments about knowledge, and attitudes, standard infection control precautions, using a self-administered structured questionnaire, the researcher developed the questions on infection control standard precautions. This questionnaire was presented to a group of 10 experts from different university professors in the field of community health, and they made some modifications to it. The questionnaire was divided into three parts: the first part included questions on demographic and professional information of the HCWs; the second, and third, parts respectively focused on the knowledge, and

attitudes. Evaluation was made with percentage analysis, regarding infection control standard precautions. The finding in the current study shows that 67% of health care workers were at the age of 20-29 years, 56% of them were females, 55.5% of them were married, 71% of them had years of service 1-5 years, 63.5% of them had bachelor degree, 57% of them participate in 2 training sessions, and 55% of the health workers were nurses. When we look at the results of the knowledge level of healthcare professionals about hospital infections; It was seen that 85% of the health workers knew that there was a guide in a hospital to prevent nosocomial infections, 88.5% of the health workers knew that the hospital infection was carried with the materials used in the hospital, but 78% of the health workers did not know that the needles should be closed after using them. In the results of the attitudes of healthcare professionals towards hospital infections; Results showed that 91.5% agreed that hospital infections could be avoided with the right working method, but 29% of the healthcare workers did not agree with the wearing of a new glove for each patient. Considering all the results, although it is seen that the level of knowledge and attitude of healthcare professionals about nosocomial infections is good, regular training programs are recommended for healthcare professionals.

Keywords: attitudes, healthcare, infection , knowledge, prevention .

ÖZET

KERKÜK ŞEHİR HASTANELERİNDE ÇALIŞAN SAĞLIK ÇALIŞANLARININ ENFEKSİYON ÖNLEME KONUSUNDAKİ BİLGİ VE TUTUMLARININ DEĞERLENDİRİLMESİ

Basim Hameed Ahmed AHMED
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Şubat 2023

Hastane kaynaklı enfeksiyonlar (HKE), hastanede daha uzun süre kalma, daha yüksek ölüm oranı ve daha pahalı tıbbi bakım için bir faktördür. HKE önleme ve yönetimi çok önemli halk sağlığı sorunlarıdır. Her türlü işte güvenlik esastır, ancak özellikle sağlık hizmetleri ortamlarında daha da önemlidir. Bu çalışmanın amacı, sağlık çalışanlarının rutin enfeksiyon kontrol uygulamalarına yönelik bilgi ve tutumlarını değerlendirmekti. Çalışmanın tasarımında nicel araştırma kullanıldı. Tanımlayıcı ve kesitsel tipte bir araştırma yapıldı. Araştırma, Kerkük ilindeki 2 hastaneden (Kerkük Genel Hastanesi, Kadın Doğum ve Çocuk Hastanesi) olasılıksız örnekleme (kolayda örnekleme) yöntemiyle seçilen 200 sağlık çalışanı ile gerçekleştirildi. Kendi kendine uygulanan yapılandırılmış bir anket kullanarak çalışma yapıldı. Bu anket önce toplum sağlığı alanında farklı üniversite profesörlerinden 10 kişilik bir uzman grubuna sunuldu ve üzerinde bazı değişiklikler yapıldı. Çalışmada kullanılan anket üç bölümden oluştu. İlk bölüm, sağlık çalışanlarının demografik ve mesleki bilgilerine ilişkin sorular içermekte olup, ikinci ve üçüncü bölümler sırasıyla enfeksiyon kontrol standart önlemlerine ilişkin bilgi ve tutuma odaklandı. Yüzdelik analizlerle değerlendirme yapıldı. Çalışma sonuçlarına göre, sağlık çalışanlarının %67'sinin 20-29 yaş aralığında, %56'sinin kadın, %55,5'inin evli, %71'inin 1-5 hizmet yılına sahip, %63,5'inin lisans mezunu, %57'sinin hastane enfeksiyonları ile ilgili 2 eğitime katıldığı ve sağlık çalışanlarının %55'nin hemşire olduğu görüldü. Sağlık çalışanların hastane enfeksiyonları ile ilgili bilgi düzeyi sonuçlarına baktığımızda ise; hastane enfeksiyonlarından korunmak için bir hastanede bir

rehber olduğunu sağlık çalışanlarının %85'nin bildiği, hastande kullanılan malzemelerle hastane enfeksiyonun taşındığını %88.5 sağlık çalışanının bildiği ancak sağlık çalışanlarının iğneleri kullandıktan sonra atarken kapatılması gerektiğini %78'nin bilmediği görüldü. Sağlık çalışanlarının hastane enfeksiyonlarına karşı tutum sonuçlarında ise; %91.5'nin doğru çalışma yöntemi ile hastane enfeksiyonlarından kurtulabileceğine katıldığı ancak her hastada yeni bir eldiven giyilmesine %29 oranında sağlık çalışanının katılmadığı gibi sonuçlar ortaya çıktı. Tüm sonuçlara bakıldığında sağlık çalışanlarının hastane enfeksiyonları konusunda bilgi ve tutum düzeylerinin iyi olduğu görülmesine rağmen sağlık çalışanlarına bu konuda düzenli eğitim programlarının uygulanması önerilir.

Anahtar Kelimeler: Bilgi, davranış, enfeksiyon önleme, sağlık hizmeti.

PREFACE AND ACKNOWLEDGEMENTS

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To everyone who taught me letters in this mortal world. -

To the soul of my pure father, may God have mercy on him. -

I dedicate this fruit of my effort to the dearest and most precious person in my life who has enlightened my path by advising her to my dearest heart (my mother).

To my beloved wife who was with me throughout my studies abroad and my beautiful daughter.

To my brothers, sisters, and classmates, wishing them success.

To all the people for whom we bear love and appreciation, we ask God to make him a beacon for every student of knowledge.

Basim Hameed Ahmed AHMED

Çankırı-2023

CONTENTS

INDEX OF ABBREVIATIONS AND SYMBOLS

(ICU) **:** Intensive care unit

(HAIs) **:** Hospital-aquired infection

(WHO) **:**World health organization

(UTI) **:** Urinary tract infection

(CVC) **:**Central Venous Catheter

(AMR) **:** Antimicrobial resistance

(CAUTI) **:** Catheter associated Urinary tract infection

(CRBSI) **:** Catheter related blood stream infection

(VAP) **:** Ventilator Associated Pneumonia

(SSIs) **:** Surgical site inflections

(HAI) **:** Healthcare-associated infections

(IPC) **:** Infection prevention and control

(PPE) **:** Personal protective equipment

(SARS) **:** Severe acute respiratory syndrome

(NHSN) **:** National Healthcare Safety Network

(CDC) **:** Center for Disease Control and Prevention

(CLABSI) **:** Central line-associated bloodstream infections

(HAP) **:** Hospital-acquired Pneumonia

(CDI) **:** Clostridium difficile infections

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

1.1. What Is Hospital Infection?

At a time when there is less interest in knowledge and behaviors related to infection control, a problem arises which is a hospital-acquired infection, also known as healthcare-associated infection, which is an infection acquired from within hospitals that are not usually present or may be incubated at the time of infection. The person usually acquires this infection entering the hospital and it appears about 2 days after entering a hospital, infection must be closely monitored by the infection control units in hospitals, its spread and the improvement of patient safety (Monegro *et al*. 2021).

Hospital-acquired infections are illnesses that a patient contracts while being treated there but for a different reason than the illness itself, sometimes known as nosocomial infections. World Health Organization (WHO) states that HCAIs are significant public health issues that raise the burden on the healthcare system, result in longer hospital admissions, adversely affect patients, and increase death rates. Regardless of the degree of national development, HCAIs happen all across the world. HCAIs are frequently connected with catheter-related bloodstream infectious, pneumonia brought on by a ventilator, bloodstream infections brought on by central lines, and surgical site infections (Gebregiorgis *et al*. 2020).

Healthcare-associated infections are common and have detrimental effects, which have been extensively reported in the literature for decades. Infections associated with healthcare are occurring more frequently and alarmingly more frequently (Bonilla 2020). Historically, the term "health associated infection" referred to illnesses contracted while being admitted to an acute-care hospital (once recognized as a nosocomial infection), although Those words have since been extended to cover diseases acquired throughout the spectrum of healthcare (such include ambulatory care, home care, and long-term care) (Jones 2021). These unanticipated infections arise from medical treatment and result in severe patient illnesses and deaths (morbidity and mortality), prolong hospital stays, and

necessitate extra diagnostic and therapeutic procedures, which raise the expense of the patient's underlying ailment (Di Giambenedetto 2022).

Healthcare-associated infections are illnesses contracted while receiving medical attention, developed in a hospital or other healthcare facility, and first manifesting 48 hours or more after hospital admission or within 30 days of obtaining medical care. The most frequent types of adverse events affecting hospitalized patients include hazardous medication responses, and surgical complications, according to many research. Over 98,000 people (one in 17) die as a result of HCAIs, which affect roughly 1.7 million hospitalized patients' year while they are receiving treatment for other medical conditions, according to the US Centers for Disease Control and Prevention. According to several studies, simple infection management measures like hand washing and using an alcohol-based hand rub can prevent HCAIs, save lives, and reduce morbidity and death (Haque *et al*. 2018).

1.2. Why Hospital Infection is Important?

Over the years, infectious diseases have wreaked havoc on societies. At the present time, infectious diseases are racing to emerge and develop. According to the World Health Organization (WHO), diseases and epidemics that are caused by many infectious agents continue to come earlie (Balkhair 2020).

Health care-associated infections are a serious problem in the healthcare industry since they are common causes of illness and mortality in hospitalized patients. Currently, between 5% - 10% of patients admitted to acute care hospitals have at least one infection, and both in the United States and Europe, the frequency has increased over the past several decades. All healthcare facilities should establish and maintain a HCAI surveillance system, according to health officials. The Centers for Disease Control and Prevention have created particular recommendations targeted at limiting the spread of viruses inside the hospital context. Several efficient evidence-based strategies for lowering the incidence of HAIs have also been presented. The potential danger is especially pressing in the emergency care scenario for the spread of HAIs from healthcare

workers (HCWs) who treat patients to patients themselves. Indeed, these HCWs are at the vanguard of helping critically ill, life-threatening patients before they have ever received a diagnosis. For this purpose, little focus has been placed on examining HCWs' attitudes, knowledge, and behavior regarding control policies in this context (Piret, J 2021).

1.3. What Are The Harms Of Hospital Infection? What Consequences Does It Cause?

Infection can occur for a variety of causes in hospital patients' infectious illness patients are regularly hospitalized in hospitals. Some of these individuals can disseminate their organisms to other patients, making them a source of infection. Infection among patients admitted to the hospital for various reasons, when such individuals require hospitalization, the other patients' risks must be assessed, and necessary actions must be made to manage the situation. Infection with varied degrees of stringent isolation methods depends on the illness infection. Invasive procedures are the most prevalent cause of hospital-acquired infection, surgical surgeries, intravenous treatment, intubation, and other procedures are performed on patients as well as catheterization. To manage such illnesses, a range of interventions is required, and many of them have various degrees of immune competence (Hassan *et al*. 2017).

Despite advancements in the prevention and control of nosocomial infections, healthcare-associated infections which significantly increase the risk of morbidity, mortality, and financial costs to the healthcare system remain a concern. Key knowledge gaps in the infection prevention strategies are highlighted in epidemiology, and the One Health (Human, Animal, and Environmental Health) model is used to examine how to reduce Gram-positive bacteria in a hospital context. We can see how interactions between patients, healthcare professionals, and the hospital environment can result in the spread of the three Gram-positive pathogens that are most frequently found in hospitals: Methicillin-resistant Staphylococcus aureus, Clostridium difficile, and vancomycin-resistant enterococci. We investigate the value of animals in healthcare settings and the gaps around their involvement in the transmission (Dalton *et al*. 2020).

Microorganisms and human existence are intricately intertwined. Through interaction with other people, food, water, the air, and in certain situations, vectors like insects, we may be exposed to potential infectious pathogens. Different bacterial species are present on the surfaces of our skin, stomach, and mucous membranes, Normally, microorganisms and humans coexist together. Indeed, there is evidence that humans and microbes co-evolved to the point that many features of typical mammalian physiology depend on proper host-microbe interactions. therefore, are the conditions that decide whether these agents coexist peacefully with us or if they cause local or widespread illness, may be even death (Chanda 2022).

1.4. What Should Be Done To Prevent Hospital Infection?

In order to prevent harm to the patients and make them live in a healthy environment, we must lessen the spread of infection-causing agents, and employ methods created to minimize the spread of infectious illnesses among health professionals and control or eliminate the source of infection in the healthcare industry, the home, or communities (Houghton 2020).

Much of the current nosocomial infection Research has emphasized the requirement for novel medicines, enhanced antibiotic control, and enhanced diagnostic techniques lead to detect infections early, improved pharmaceutical treatment and earlier infection detection can undoubtedly contribute to a decrease in hospital-acquired infection, morbidity, and mortality (Lin C 2020).

Contrarily, non-pharmacological treatments can significantly reduce the occurrence of HCAIs, despite the fact that they are routinely overlooked in actual practice. This review won't be exhaustive, and no attempt will be made to analyze quantitative data, but it will look at recent studies that examine non-pharmacological methods for reducing HCAIs. Along with a discussion of the HCAIs transmission mechanisms, it will also give a brief summary of the morbidity, mortality, and medical costs related to nosocomial infections (Wall 2019).

Most hospital infections are transmitted by healthcare workers who do not apply standard infection prevention measures, as these measures protect not only the patient, but also other healthcare workers and the community as well, following standard preventive measures such as isolation procedures, safe injections, antibiotics administration contexts, supervision, vaccination, disinfection, sterilization, cleaning the environment in which community members live, and preparing comprehensive follow-up safety programs is the main step for infection prevention (Alhumaid *et al*. 2021).

The patient's immune system, the facility's infection control procedures and the frequency of different pathogens in the neighborhood all affect the risk of hospital-acquired diseases. Immunosuppression, advanced age, duration of hospital stays, several underlying comorbidities, frequent trips to medical institutions, mechanical ventilation assistance, recent invasive surgeries, indwelling devices, and hospitalization in an intensive care unit are risk factors for HCAIs. The use of intravenous antibiotics during the last 90 days is one of the key risk factors for the development of antimicrobial resistance to different drugs, hospital stays are essential for treating acute illnesses, Nevertheless, they also place patients at greater risk of contracting several nosocomial bacteria that are frequently resistant to antibiotics. You can get these infections from other patients, hospital personnel, or the medical center itself. Patients in the (ICU) are more in danger. A point prevalence analysis with 231,459 patients in 947 institutions found that 19.5% of patients in ICU had at least one (HCAIs). Organizations like the (NHSN) and the (CDC) and Prevention keep a careful eye on the illnesses (Monegro *et al*. 2022).

The majority of recent research on nosocomial infections has focused on the need for novel drugs, improved antibiotic therapy, and more precise diagnostic techniques to detect infections early on. Lowering the morbidity and mortality linked to hospital acquired infections can surely benefit from improved pharmaceutical care and earlier infection identification. On the other hand, non-pharmacological remedies can greatly lower the incidence of HAIs., despite the fact that they are routinely overlooked in actual practice (Friedrich 2019).

Many unorthodox treatments in integrative medicine employ non-pharmacological therapies. Non-pharmacological therapies must be used since they are a viable choice when used as a preventative or curative approach. There are no substantial environmental repercussions, health expenditures are reduced, and drug side effects are avoided. The usage of medications has brought about significant transformations in humanity. Nobody disputes the advantages of individual medications for each health issue, vaccinations, anti-inflammatories, analgesics, and poor therapy. The discovery of anesthetics has made modern surgery feasible the methods used to prevent and treat illnesses include medication, ionizing or non-ionizing radiation, surgery, and rehabilitative medicine. Many unorthodox treatments in integrative medicine employ non-pharmacological therapies. Nonpharmacological therapies must be used since they are a viable choice when used as a preventative or curative approach. There are no substantial environmental repercussions, health expenditures are reduced, and drug side effects are avoided (Herguedas 2020).

Due to their significant correlation with diseases that are multidrug-resistant, hospital-acquired infections almost immediately have an impact on the whole community as well as the patient in question. It is crucial to take patients with hospital-acquired and multi-drug resistant infections risk factors into account when preventing and decreasing these infections (Al-Gethamyet *et al*.2017).

1.5. What is The Knowledge of Health Workers on this Subject?

According to reports, standard precautions are effective in preventing occupational exposure accidents and associated infections because they act as a barrier between the host and other microorganisms and encompass all strategies, actions, and initiatives designed to lower the risk of infectious disease transmission in healthcare settings (Hussen 2017).

It also seeks to shield patients and healthcare workers from preventable infections, which is a useful, evidence-based approach. Prevention of healthcare-associated infections saves money, slows the spread of antibiotic resistance, prevents needless injury and

occasionally even death, and promotes the provision of high-quality, integrated, patient-centered healthcare services., Even in the most established and advanced healthcare systems, no nation or healthcare facility can claim to be free from an infectious problem associated to healthcare (Parsonage *et al*. 2017).

1.6. Literature Review

In this part of the research, we will address the theoretical informational framework related to the current study and its variables, in addition to previous studies related to the findings of the present study and the connection between them, the results of the current study and the relationship comparing the current study with related studies.

1.6.1. Historical aspects of infection prevention

The beginnings of the discovery of infection and the foundations for the prevention of modern infection go back to the year 1847 when the Hungarian doctor and scientist Ignaz Semmelweis realized that the death of many mothers was caused by puerperal fever in that hospital at the time, and the reason was that the doctors there were heading directly from performing the autopsy to giving birth children. Later, when he was ordered to wash his hands between one operation and another, the death rate decreased dramatically. It was the first spark for the infection control revolution and at the time it was proven that infection can be inadvertently caused by healthcare personnel and that there is a way we can prevent it (Nield 2020).

USA hospitals were inundated with scarlet fever at the beginning of the 20th century. Its reduction is attributable to the use of antibiotics and better cleanliness standards. Within three years of this incident, each hospital had a representative who collaborated with other employees and management to lower healthcare-associated infections (HCAIs) in general. The most prevalent HCAIs became negative bacilli, and broad-spectrum antibiotics were employed to treat it. Unfortunately, this resulted in highly resistant Pseudomonas strains (Altenbough 2018).

Prior to this, staff members did not put on gloves when starting an IV or changing a bandage. Safety needles and needleless IV setups weren't used at all. Furthermore, hand washing was not emphasized. Then hepatitis and the HIV/AIDS pandemic appeared. In a short amount of time, CDC, OSHA, and WHO all released fresh guidelines for enhancing IPC in the healthcare environment. OSHA's Blood-borne Pathogens Standard, which advises PPE whenever each patient has a potential of exposing you to their blood or bodily fluids., was one of the most significant recommendations. Measures to prevent needle sticks also became available (Siem j 2020).

The CDC began collecting information on infection prevention methods at 1970s. To be able to improve patient safety and quality, the Joint Commission published guidelines for data collection and surveillance. However, major initiatives weren't started until the 1980s (Alharbi 2019).

As for the beginnings of scientific studies of infection in hospitals, it began in the first decades of the year 1970, and since then until the beginning of the "bacteriological age", many attempts and experiments were made in Scotland. But a century later, in 1858, Florence Nightingale made the case for hospital reform, more than a century ago, Florence Nightingale was bringing evidence-based change to the medical profession. Using medical data, she discovered the type of infection that occurs in hospitals and on the battlefield. In addition, Nightingale developed recommendations for healthcare reform using facts and proof. Evidence-based medicine's origins may be linked to Florence Nightingale, highlighting how crucial this movement is to today's advancements in the caliber and effectiveness of patient care (McEnroe 2020).

The actual knowledge of hospital infections was followed and in its time some of the achievements of Pasteur, Koch, and Lister, as well as the "bacteriological age" were made. The end of the nineteenth century witnessed hospital reform measures, and at first glance, it seemed as if the transmission of infection in hospitals would be completely eliminated. After that, the victory did not last long, as scientists and doctors realized that infection is not only transmitted through operations and obstetrics, but that it can also be

transmitted through the air, and that the air can also be a source of infection (Bookstaver P B 2017).

1.6.2. Infection as concept

Definition of an infection: An intrusion into or modification of the body's natural immune system that promotes the growth of pathogenic bacteria (Chen 2017).

Infection is a major cause of the spread of diseases nowadays. In order for infection to spread and cause disease, there must be certain conditions and a suitable atmosphere for this process called chain of infection, the most common causative agent are bacteria, viruses, fungi and parasites (Van 2017).

Infection, like an infectious illness, is the invasion and proliferation of microorganisms in bodily tissues. The infectious process resembles a circular chain, with each link standing in for one of the process's contributing elements. Only when each component is present and in the right order does an infectious illness develop. These connections include the causal agent, which must be numerous and sufficiently virulent to kill normal tissue; reservoirs for the organism's growth and reproduction, such as bodily tissues, animal, human, and insect wastes, tainted food, and water; a route via which the virus can depart the host, such as the digestive or respiratory systems; A gateway of entrance by which the pathogens can enter the body of a vulnerable host. A mechanism of transmission, such as hands, air currents, vectors, fomites, or other ways by which the pathogens can be transported from one area or person to another. Examples of ports of entrance include open wounds and the gastrointestinal, reproductive, and respiratory systems. The host must be vulnerable to the illness, not immune to it, or not have enough defenses to fend off the viruses' invasion. The production of antibodies and a sequence of physiological changes known as inflammation are the body's reactions to the invasion of the causative organisms (Zachary 2017).

1.6.3. Advantages and risks of healthcare facilities

Healthcare facilities differ from traditional buildings by the nature of the processes that take place within them. Due to the existence of such processes, there will be biological, chemical, and radiological hazards that negatively affect human health and sustainability. Even the water and air are different from other sites as they may be polluted and pose a threat to human health, and some sites within health facilities may represent a serious health threat to patients and staff because microbes may have grown in them. But the greatest danger is represented in pathogenic microorganisms that are spread through patients suffering from infectious diseases, as these patients represent the source of infection and many dangerous infectious diseases are spread through them in some cases, and healthcare facilities contain a greater concentration of these microorganisms Pathogenic than in other traditional buildings. Another characteristic that distinguishes people at risk, besides visitors and health care staff, is that these patients are more susceptible to infection because their immunity is low and infectious diseases spread among them faster (Manisalidis 2020).

1.6.4. Healthcare associated infections (HAIs)

Many studies have revealed disparities in infection control knowledge among healthcare workers based on their years of experience. Studies have revealed differences in how HCWs really comprehend infection prevention and transmission, as well as how they perceive and use this knowledge. Similar to this, numerous studies have demonstrated that the advantages of efficient infection control strategies range from improved morbidity and mortality, disease prevention, and cost-effective healthcare, to straightforward practical procedures that are part of standard precautions against healthcare-associated infection. Its efficiency in HCAI in reducing HCAIs has been shown, proper application of basic hand hygiene techniques may greatly lower the prevalence of HCAI, and greater hand hygiene compliance utilizing traditional alcohol-based rub can significantly lower the incidence of (HAIs). Using a daily alcohol-based rub to improve compliance with hand cleanliness can reduce nosocomial infections by up

to 40%. There is evidence that medical professionals adhere to hand hygiene rules (Iliyasu 2016).

In the nineteenth century, the core concepts of hospital infection prevention and control (IPC) were created and subsequently incorporated into practice, involving the use of personal protective equipment, fresh air, environmental hygiene, and hand washing. Standard and transmission-based precautions are now acknowledged as standard healthcare procedures in the twenty-first century, with the goal of lowering rates of avoidable healthcare-associated illness HAIs and antibiotic resistance transmission Despite this, HAIs continue to pose a threat to healthcare systems and jeopardize patient outcomes (Gilbert 2022).

Healthcare-associated infections are a serious issue in the healthcare industry since they are the primary cause of sickness and death among hospitalized patients. Between 5% to 10% of patients admitted to acute care hospitals get one or more infections, and during the past few decades, the rate has increased in both the USA and Europe. There have been several promising evidence-based HAIs prevention measures put forth, and the CDC has released specific recommendations aimed at preventing disease transmission inside the hospital setting. Health experts in Italy think that every hospital should create and maintain an HAIs surveillance system (Poolman J T 2017).

The most frequent adverse event that jeopardizes the safety of patients in healthcare is HAIs. They severely impair people's quality of life, result in mortality, and put a strain on healthcare systems financially. The spread of bacteria that are multidrug resistant is another problem brought on by HAIs. HAIs afflict 3.2 percent of all hospitalized patients in the USA, 6.5 percent in the European Union/European Economic Area, and it is probable that the incidence is far higher globally. The global impact of HAIs is uncertain. HAIs are linked with significant financial and operational costs for healthcare institutions HAIs are expected to affect nearly two million people in United States each year, resulting in $33 billion in yearly costs and 99,000 fatalities. The SENIC (Research for Efficacy of Nosocomial Infection Control) research estimated the cost of HAIs to be $4.5 billion in 1992 after accounting for inflation, and about $6.6 billion in 2007. HAIs' economic

impact in low- and middle-income nations has received little attention. CLABSI was linked to an additional hospital expenditure of US$ 11,591 and a 20% increase in attributable mortality in a study of Mexico City ICUs (Jaffar 2021).

The World Health Organization (WHO) estimates that out of every 100 hospitalized patients, 10 will come from poor nations and 7 from industrialized ones, respectively, and will contract at least one HAIs. Additionally, according to the CDC, 2 million patients have HAIs annually, with close to 100,000 of them passing away in the United States . In hospitals providing acute care in USA, Europe, the predominance of patients in one area with at least one HAI has reached 6%; the highest incidence was seen among patients admitted to intensive care units (ICU), where it was 19.5%. In contrast, the issue is three times more prevalent in underdeveloped nations than it is in adult intensive care units in the USA. Additionally, several regions of Asia, Latin America, and Africa are considered to have prevalence rates of above 40% (Geberemariyam 2018).

1.6.5. Types of healthcare-association infection

Diseases usually arise from various sources of etiology and the Centers for Disease Control and Prevention (CDC) categorizes them generally as the following categories of HAI:

1.6.5.1. Central line associated bloodstream infections (CLABSI)

CLABSIs are a primary reason for mortality among hospitalized patients. But, the likelihood of CLABSIs No research has been done in low-resource nations in depth. Similarly, the greatest techniques for preventing, limiting, and CLABSIshave not been sufficiently examined. In neonatal intensive care units (ICUs), the rate of CLABSI ranged from 2.6 to 60.0 cases per 1000 central line days, while in adult and pediatric ICUs, it ranged from 1.6 to 44.6 cases per 1000 central line days. CLABSI was linked to a significant increase in mortality, with an odds ratio between 2.8 and 9.5. In six successive prospective interventional trials, a significant decline in CLABSI rates was associated

with hand cleanliness and educational initiatives. CLABSI rates are higher in low-resource countries than the benchmark rates of the The USA National Healthcare Safety Network is a significant factor in mortality. There aren't many research that recommend practical methods for lowering CLABSIs. Further epidemiological research is also required to get a deeper knowledge of the effects of CLABSIs and to develop more precise measures for CLABSI prevention that may be used in low-resource countries. These tactics should be doable, inexpensive, and low-tech (Huerta L E 2018).

CLABSIs lead to longer hospital stays, higher mortality rates, and higher healthcare costs. An estimated 250,000 bloodstream infections occur annually, the majority of which are brought on by intravascular devices. In the United States, the rate of CLABSI in intensive care units (ICU) is estimated to be 0.8 per 1000 central line days. Monitoring data from the International Nosocomial Infection Control Consortium (INICC) comprising 703 critical care units across 50 countries from January 2010 to December 2015 revealed a CLABSI rate of 4.1 per 1000 central line days. Beyond the ICUs, Several center lines are present. In one study, central lines were used by 24% of patients outside of the intensive care unit and 55% of patients within. 70% of hospitalized patients with central venous catheters weren't in the intensive care unit. The usage of peripherally implanted central catheters (PICCs) has increased significantly over the past several years as a result of the inherent advantages that these devices offer. Trained nursing staff can swiftly establish central venous access by inserting PICC lines with ultrasound guidance at the patient's bedside in both ICUs and standard medical wards. Since PICCs are inserted into an arm's peripheral vein with the tip progressing into a central vein, they are central venous catheters by definition (cavoatrial junction or the right atrium). The incidence of CLABSI linked to PICCs in the hospital setting is statistically equivalent to that of traditional central venous catheters (CVCs). The main medical ward and the intensive care unit (ICU) both produced equivalent CLABSI outcomes for PICCs implanted in 27,289 study participants. However, the research had certain limitations, and there weren't many instances overall (Haddadin *et al*. 2022).

Medication, fluid, and blood product infusion, as well as hemodialysis, require central venous catheters (CVCs). Unfortunately, these intrusive devices can cause central line-

associated bloodstream infections, which should be avoided (CLABSI). CLABSIs can cause septic shock, bacterial seeding of organs, and increased length of stay and expenditures, all of which have an impacting mortality and prognosis. CLABSI rates are mainly influenced by the risk of exposure which is central line catheterization and length of stay. Other risk variables to consider while considering Catheter type, insertion site, and infection control measures are all exposed. Depending on the quality of the treatment and the observance of preventative hygiene practices, infection rates with non-tunneled short-term CVCs have been reported to be as high as 4.4 per 100 catheters, 2.7 per 1000 catheter days, and 1.6 per 10,000 patient days (Blot 2022).

1.6.5.2. Catheter-associated urinary tract infections (COTI)

Urinery tract infections brought on by the use of an indwelling urinary catheter are one of the most prevalent illnesses that patients in healthcare facilities contract. The duration of catheterization is the key element in the emergence of bacteriuria since biofilm ultimately develops on all of these devices. Despite the low proportion of bacteriuric individuals who have symptoms of disease, the high incidence of indwelling urinary catheters implies that these infections place a heavy strain on healthcare systems. Catheter-associated urinary infections account for around 20% of instances of healthcare-acquired bacteriemia in acute care facilities and more than 50% in long-term care institutions. Limiting the use of indwelling catheters and, when essential, using them only when absolutely necessary are the most crucial steps for minimizing bacteriuria and infection. The catheter has to be taken out as soon as medically feasible. To avoid catheter-acquired urinary infections, infection control systems in healthcare facilities must implement and monitor measures such catheter usage surveillance, catheter indications that are suitable, and difficulties. Finally, to prevent these infections, technical developments in catheter materials that prevent biofilm growth will be necessary (Saifullah M 2020).

1.6.5.3. Surgical site infections (SSI)

Surgical site infections (SSI), which can occur after surgery, are infections of the incision, organ, or space. The advent of germs resistant to antibiotics as well as surgical patients who are first evaluated with more severe comorbidities increase the cost and difficulty of treating SSIs. SSI prevention is becoming more and more important as surgical procedures are performed in the United States. Treatment reimbursements for SSIs are being reduced or discontinued, and now public reporting of procedures, outcomes, and other quality improvement indicators is necessary. It is predicted that using evidence-based interventions can help prevent around half of SSIs.

Both in terms of human and financial costs, surgical site infections (SSI) are becoming more and more expensive to treat. The number of surgical procedures carried out in the United States keeps rising, and patients who have surgery are increasingly being treated for complex comorbidities at the onset. Evidence-based interventions are believed to prevent about 50% of SSIs. (Berríos *et al*. 2017).

The most prevalent postoperative complication in the world is surgical site infection (SSI), which is very expensive for individuals and healthcare systems. Patients with SSI have increased risks of hernia and wound breakdown, slower healing, longer recovery times, and psychological problems, all of which increase resource demand. Patients in low- and middle-income countries experience higher rates of SSI than those in high-income ones, while taking patient and operation risk factors into consideration. The cost of this difference increases the likelihood of catastrophic expenditure, poverty, and other undesirable social effects (Adesojim 2021).

The number of surgical operations carried out in inpatient hospitals (46 million) and ambulatory hospital-affiliated or freestanding (32 million) institutions was 80 million in the United States in 2006. Between 2006 and 2009, surgical site infections (SSIs) complicated 1.9 percent of surgical procedures in the US. However, the number of SSIs is probably underestimated because over half of them only surface after discharge. The range of anticipated mean costs per infection for SSIs is $10 443 in 2005 to $25 546 in

2002. Costs can exceed $90 000 per infection when an SSI involves a prosthetic joint implant or an antimicrobial-resistant pathogen (Berríos 2017).

1.6.5.4. Ventilator-associated pneumonia (VAP)

To better identify people at risk of developing bacteria that are multidrug resistant, definitions of pneumonia have recently undergone some changes. In turn, this seeks to prevent the misuse of antibiotics. (Terreni 2022).

The phrase "hospital-acquired pneumonia" which was once often used, is now defined as "pneumonia that arises 2 days or more after hospitalization and does not appear to be incubating at the time of admission." The term "pneumonia that develops more than 48 to 72 hours following endotracheal intubation" refers to pneumonia brought on by a ventilator. Worldwide, this inflammation is linked to poorer results, considerable morbidity, and death (Alberto 2021).

Ventilator-associated pneumonia is the term for pneumonia brought on by intubation and mechanical ventilation that manifests more than 48 hours after the first event. A combination of bedside examination, radiographic review, and microbiologic investigation of respiratory secretions are used to diagnose VAP. Active observation is necessary to comprehend the local factors that affect VAP and the microbiologic environment of a specific unit. Careful antibiotic administration is essential since resistant bacteria continue to infest intensive care units and patients who are severely ill. As a preventive step, straight forward nursing and respiratory therapy treatments should be used. Over the past several decades, there has been a significant advancement in our understanding of VAP in terms of pathogenesis, risk factors, diagnostic procedures, treatments, and prevention through modification of risk variables. The target audience for this publication is doctors working with a diagnosis (Gragueb-Chatti I 2021).

Infections in the gastrointestinal tract, pneumonia, non-ventilator-associated human immunodeficiency syndrome (NV-HAP), other blood infections not related to the use of

a central catheter, and other urinary tract infections not related to a catheter are among the other forms. Lower respiratory tract infections (including bronchitis, bronchiolitis, CNS infection and bronchitis), genital tract infections, lung abscess or empysema without indication of other systems being impacted by HAI (pneumonia) Diseases affecting the skin, soft tissues, bones, and joints, as well as infections of the cardiovascular system (Sikora 2021).

1.6.6. Prevention of infection in hospitals

Basic Principles

There are principles that control the basic measures that are taken in hospitals to prevent the transmission of infection:

1- Identification and isolation of infected patients, patients who show symptoms, or patients who are likely to be infected through the surrounding environment (patients with open wounds or a compound with tuberculosis).

2- Elimination or limitation of the possible means of spreading infection by microbes, (such as the use of anti-contamination methods).

3- The correct methods of prevention must be followed so that it is possible to limit or reduce the transmission of bodies carrying the infectious disease from one patient to another, or from the patient provided to the health service, or from him to the patient.

4- It should be assumed that all patients will be infected without showing signs and symptoms of infection.

5- The phrase “separation of the source of infection” should be interpreted in its broadest sense, as it does not only include separating infected patients only, but also creating a

barrier between the infected tissues and their surroundings, including other patients and hospital staff.

But it is impossible to avoid full contact with infected tissues or body fluids and secretions carrying pathogens, so appropriate barriers such as gloves must be used when dealing with contaminated tools, containers, and linens. Then hands are cleaned after the gloves are taken off. In the event that the used tool is intended for one-time use, it must be disposed of after use. But if it is a reusable tool, then it must be properly cleaned, disinfected, and sterilized (according to its level of risk to prevent the transmission of infection by organisms carrying pathogens) (National Guide to Infection Control Egypt).

1.6.7. Recommendations & ways to prevent hospital infection

These recommendations that are given to both patients and healthcare providers to follow these precautions, to reduce the risk of contracting a hospital infection, include the following:

- Whether or not gloves are worn, wash hands thoroughly after coming into contact with bodily fluids, blood, and contaminated items., and not shaking hands with those in hospitals

- Use regular soap for regular hand washing and antimicrobial sanitizers.

- Wear gloves when in contact with bodily secretions, body fluids, and blood.

- Wear the appropriate gown during any medical examinations or procedures.

- Use a face shield, mask, and eye protection during examinations.

- Ensure the cleanliness of all reusable equipment.

- Ensure that surfaces are clean before touching your hand.

- Use caution while handling needles and other sharp things to prevent injury.

- Use of ventilators as an alternative to oral resuscitation.

- Isolation from patients who have a serious infection, or who do not care about the rules of public health. (WHO).

1.6.8. Infection prevention procedures

Breaking the epidemiological triangle is one of the most basic ideas for preventing HAIs. The most efficient strategy to prevent HAI is to create a barrier between the infectious organism and the vulnerable host. The majority of HAIs may be avoided by following simple, low-cost techniques such as adhering to suggest infection prevention procedures like:

- Personal hygiene

- Proper personal protective equipment usage (PPE)

- Adherence to strict aseptic procedures

- Following standard cleaning and decontamination procedures for dirty equipment, followed by sterilization or high-level disinfection

- Appropriate biomedical waste disposal

- Appropriate environmental cleansing and disinfection

- Improving patient operational and other high-risk environments' safety situations, therefore there is a considerable chance of infectious agent exposure

- Keeping a safe working environment and following safe work procedures.

1.6.9. Standard precautions

All patients get the same precautions regardless of the severity of their illness. Anytime there is a potential of coming into contact with blood, bodily fluids, excretions, or mucous membranes, whether or not there is obvious blood, certain safety precautions must be performed. The most effective strategy to prevent the spread of disease is to practice good hand hygiene, which includes wearing personal protective equipment (PPE). The skin, mucous membranes, airways, and clothes are all protected by personal protection equipment, which acts as a barrier. It features robes, goggles, gloves, masks, and face shields (Broussard 2022).

- Importance of Standard precautions

- Infection control begins with standard precautions, which consider that all blood and bodily fluids are potentially infectious Standard precautions are the bare minimum that must be taken when caring for a patient at any time and in any place

- Standard safety measures are intended to lessen the risk of the transmission of blood-borne and other infections from both known and unidentified sources.

- Hand hygiene is a crucial component of routine precautions and one of the best strategies to stop the spread of illness in hospitals and other healthcare facilities. The use of personal protective equipment should be determined by risk assessment and the anticipated level of contact with body fluids or pathogens in addition to hand hygiene.

- Safeguard patients, healthcare staff, and the healthcare system as a whole, a risk management strategy must be followed at all times.

The following are examples of standard precautions:

Hygiene of the Hands and Respiratory Hygiene (Cough Etiquette)

PPE stands for Personal Protective Equipment (PPE)

Aseptic Procedures

Injury Prevention from Needles and Sharps

Disinfection and cleaning

Waste Management (Clinical Excellence Commission 2020).

1.6.10. Sterilization and disinfection

Sterilization and disinfection are crucial elements of hospital infection control strategies. Every day, several hospitals execute a variety of surgical operations. An rising number of invasive procedures are being performed across various healthcare facilities. There is a higher risk of pathogen introduction into the patient's body when a surgical tool or piece of medical equipment comes into touch with the patient's mucous membrane or sterile tissue during certain procedures. In addition, the illness can spread via incorrectly cleaned or disinfected medical equipment from patient to patient, from patient to medical personnel, and from the environment to the patient. Therefore, in order to stop the spread of these infections, medical staff, laboratory staff, and healthcare providers should have enhanced abilities and understanding in these areas. (Mohapatra 2017).

Classification of Medical Devices and/or Equipment

The primary goal of cleaning, disinfecting, and sterilizing is to reduce the quantity of germs on the equipment to a level where there is no likelihood of illness transmission. There might be a transmission of infection, depending on how the device is made. For example, the skin-contact area of a blood pressure cuff has the lowest risk of disease transmission. On the other hand, there is a significant risk of infection when medical equipment comes into contact with Creutzfeldt-Jakob disease patient's brain tissue Edward H. reducing the potential risks of infection transmission using a variety of technologies (Mohapatra 2017).

1.6.11. Infection prevention during pandemic

At the end of 2019, a novel coronavirus was identified as the cause of an outbreak of pneumonia cases in Wuhan, a city in the Hubei Province of China. Due of its quick spread, the World Health Organization (WHO) declared a public health emergency in late January 2020 and categorized it as a pandemic in March 2020. Coronavirus sickness is brought on by the severe acute respiratory syndrome coronavirus 2 virus, commonly known as COVID-19 (SARS-CoV-2).

Utilizing suitable personal protective equipment (PPE), recognizing and isolating patients with suspected diseases as soon as possible, and, vaccination, quarantine following exposure, and environmental disinfection are some of the infection prevention measures that have been used to reduce the spread of SARS-CoV-2. The use of appropriate personal protective equipment (PPE), early identification and isolation of patients with suspected disease, vaccination, quarantine following exposure, and environmental disinfection are some of the infection prevention measures that have been used to reduce the spread of SARS-CoV-2. This subject will go over general infection prevention guidelines for treating patients in locations where SARS-CoV-2 is being spread by the local community. There are several places where comprehensive details on community prevention and policies and practices for treating people with suspected or confirmed COVID-19 in hospitals and at home are offered. For further information (Verbeek 2020).

During the start of the coronavirus disease 2019 (COVID-19) pandemic, hospitals were a major site for viral transmission. Hospital acquired infections accounted for 44% of the 179 cases of severe acute respiratory syndrome coronavirus 2 in two early case series from China, according to the research (SARS-CoV-2). 1 St. Augustine's Hospital in Durban, South Africa, which has 469 beds, 18 wards, 6 critical care units, and 735 clinical staff, served as an excellent example of the horrific potential for SARS-CoV-2 to spread throughout the healthcare system. 2 Researchers described how a single suspected SARS-CoV-2 case led to six significant clusters encompassing five hospital wards, a nursing facility outside, and a dialysis unit. Infection was subsequently verified among these clusters by an extensive epidemiologic analysis that was backed by dataPhylogenetic evaluations 39 patients and 80 employees, including 15 fatalities, were present. Worldwide, people and healthcare professionals started to worry about the risk of routinely treating COVID-19 patients, especially in light of the unknown routes of SARS-CoV-2 transmission. As a way to lessen the weight of the medical industry and potential exposure, several settings purposefully reduced or stopped elective visits and treatments. Additionally, there have been notable decreases in cases of myocardial infarction, stroke, TB, and hyperglycemia as well as other urgent or emergency conditions. Given that these illnesses cause tens of thousands of fatalities per year in the US, and it is projected that these reductions will help offset the extra mortality associated with the COVID- 19 pandemic (Richterman 2020).

A Summary of Transmission

Numerous experts concur that transmission happens through droplets (when the virus released in an infected person's respiratory secretions comes into direct contact with mucous membranes) and through inhalation of aerosolized secretions, which can travel further, hang around in the air longer, and contain smaller infectious particles than typical respiratory droplets. Uncertainty surrounds the relative importance of each transmission method. However, it is not believed to be a primary route of transmission. Indirect (secondary) transmission happens when a vulnerable individual contacts a contaminated surface before touching their eyes, nose, or mouth. More information on the possibility of asymptomatic transmission of SARS-CoV-2, the severe acute respiratory syndrome

coronavirus is needed. In different subject review, danger of asymptomatic transmission, among other things, is covered. (See the "Transmission" in "COVID-19: Epidemiology, Virology, and Preventio (Tara 2022).

During the pandemic, preventing infectious disease transmission to patients and healthcare workers is a high responsibility. Workers in the healthcare field must be aware of the importance of bioburden, sterilization, and other concepts Asepsis, cleansing, and disinfection are all terms used to describe the process of cleaning a disinfecting a space Compatibility testing Sterilization and disinfection procedures using the (as recommended by the manufacturer) equipment Ensures the equipment's life by preventing damage. Environmental A crucial technique is surface decontamination. Wherever feasible, single-use PPE like as N95 FFRs and disposable face shields should be reused. Anything is possible if the rules are rigorously followed. Sterilized three-ply surgical mask and single-use (PPE) suit. Because heat-sensitive material is present, it should be avoided. And a paucity of data indicating that sterilization is necessary/decontamination (Amol 2020).

Creating and maintaining a sanitary clinical setting One of the elements that may lead to HCAIs is an unclean or polluted clinical setting. One instance where the environment has a role in the development of illness is when people have exposed to C. difficile spores in the environment. Many microorganisms can be found in the settings of patients, and these germs are frequently carried by patients or workers (for example as with S. aureus). Staff contact with the immediate patient or a contaminated environment might potentially be a pathway for microorganism transmission. Cleaning standards that are both visually acceptable to patients and the general public will help reduce the risk of cross-infection. Buildings, fixtures, and fittings should all be well-designed to aid in the efficacy and efficiency of cleaning (Kim 2020).

HCWs treat and care for patients directly who have coronavirus disease 2019 (COVID-19) as well as those who need continuous care for conditions unrelated to COVID-19. As a result of their job, they are more likely to experience burnout, stigma, and greater exposure to the coronavirus-2 that causes severe acute respiratory syndrome. A top

concern maintaining the mental health and physical well-being of HCWs. Supporting people willing to offer medical treatment in a public health emergency is not only morally right, but it is also essential for maintaining enough numbers of trained personnel and the continuous operation of medical facilities both during and after the COVID-19 epidemic. It is significant to note that the precise quantity of support required varies based on factors like the location or kind of healthcare facility as well as the personal traits of HCWs, such as seniority, work function, or gender. Increased indications of depression, anxiety, sleeplessness, and distress among HCWs were noted in studies released when the COVID-19 outbreak first began, with a distinct impact on women. When examining the effects of the COVID-19 pandemic, United Nations Women emphasized the significance of paying attention to any possible gender inequalities because this knowledge is required to guide policy responses (Van *et al*. 2022).

Aggressive Infection Prevention and Control procedures there have implemented in the present COVID-19 pandemic to stop the COVID-19 spread in healthcare settings. A new pathogen's unprecedented threat served as the catalyst for the hospital-wide implementation of a number of IPC methods, including universal masking, visitation limitations, as well as the application of droplet and contact safety measures for people with respiratory symptoms. Before the pandemic, these strategies were only employed in high-risk units because to concerns about their durability and cost-effectiveness. Thus, the present pandemic offers a chance assessing the effects of multimodal bundles when used widely. However, putting COVID-19 ahead of other issues may have required concessions, which might have increased the prevalence of additional infections picked up in hospitals. There have been reports of increases in the rates of acquisition of additional HAIs, such as methicillin-resistant Staphylococcus aureus, during the SARS pandemic in 2003. Similar circumstances during the COVID-19 pandemic are projected, along with a higher frequency of central-line-associated bloodstream infections (CLABSI) and other device-associated disorders. The COVID-19 pandemic's challenges might potentially impact how well-resourced healthcare systems are able to continue HAI surveillance (Liang 2021).

1.6.12. Patient-related risk factors for infections in healthcare settings

Three components are necessary for infection transmission in a medical setting: a supply of infectious germs, a vulnerable host, and a method of transmitting the pathogen to the host.

1.6.12.1. An organism's source

During the delivery of healthcare, patients may come into contact with a variety of exogenous microorganisms (bacteria, viruses, fungi, and protozoa) from other patients, healthcare providers, or visitors. Other reservoirs include inanimate environmental surfaces or objects that have become contaminated, as well as the patient's endogenous flora, which can be challenging to suppress. These include leftover germs on the patient's skin, mucous membranes, gastrointestinal system, or respiratory tract (e.g., patient room touch surfaces, equipment, medications). According to a scientific study of 1,022 outbreak investigations, the patient, medical equipment or devices, the hospital environment, the staff, contaminated pharmaceuticals, contaminated food, and contaminated patient care equipment are the most frequent sources of infectious agents causing HAI (Baghbani T 2020).

1.6.12.2. Host susceptibility

In natural populations, there is a lot of genetic diversity in susceptibility to infection. By examining whether host populations have more genetic variation in their susceptibility to diseases they encounter naturally than pathogens they first come into contact with, we investigated whether natural selection improves this variability. In a significant cross-infection experiment involving four species of Drosophila and four host-specific viruses, we discovered enhanced genetic variation in susceptibility to viruses that had persisted with their host. The genetic architecture of resistance in one host species was then examined, and it was shown that host-pathogen interactions that had survived had more major-effect genetic variants. We draw the conclusion that host sensitivity genetic

diversity has been increased through pathogen selection, with a large part of this impact due to the incidence of major-effect mutations (Elizabeth et al.2019).

1.6.12.3. Transmitting mechanisms

Microorganisms are disseminated to others among patients and health-care workers by four primary channels of transmission: direct and indirect contact, respiratory droplets, airborne dissemination, and shared vehicle. Transmissions through vectors (from mosquitoes, fleas, and other vermin) (Fernstrom and Goldblatt 2013).

1.6.13. A risk assessment for vaccinating health-care workers

A number of occupational biological hazards, like as dealing with infectious patients and handling contaminated objects and fluids, are daily exposures for 59 million HCWs. The previous century has seen the elimination or management of a number of dangerous diseases that may have been prevented by vaccination. Vaccines are one of the most efficient and cost-effective public health strategies. By preventing the spread of infectious organisms, vaccinations not only save the recipient from a potentially fatal illness but also safeguard whole communities (herd protection). Due to their frequent professional interaction, susceptible HCWs are more likely than the general public to get hazardous infections that may be prevented by vaccination and spread them to gullible patients and coworkers. Furthermore, according to the European Center for Disease Prevention and Control, HCWs are frequently referred to as the most trusted source of vaccine-related information for their patients and colleagues. It is, therefore, critical to improving their knowledge and confidence in vaccination programs, and in particular vaccines, and to engage them in activities aimed at combating the emerging phenomenon of so-called "vaccine hesitancy." Vaccine-apprehensive HCWs can have a significant impact on vaccination decisions, as they may recommend vaccinations less frequently to their patients and/or weaken their trust in various ways, adding to vaccine apprehension among the general public. HCWs can play a critical role in the introduction of novel vaccinations in national immunization programs (for example, HPV vaccination for adolescent girls) and new patient target groups (e.g., influenza and pertussis vaccination for pregnant

women) Furthermore, HCWs are typically cited as the most dependable source of information about vaccines for their patients and coworkers, according to the European Center for Disease Prevention and Control. Therefore, it is essential to increase their understanding of and trust in vaccination programs, in particular vaccines, and to include them in activities aimed at preventing the so-called "vaccine hesitancy" phenomena, which is a new occurrence. Because they may suggest immunizations less often to their patients and/or erode their trust in different ways, vaccine-apprehensive HCWs can have a big influence on vaccination decisions. This increases vaccine anxiety among the general population. HCWs have a crucial role to play in the introduction of innovative vaccines into national immunization programs, such as the HPV vaccine for teenage girls (for pregnant women, the influenza and pertussis vaccine, for example) (Venerando 2019).

1.6.14. Hand hygiene

Nowadays, it is commonly acknowledged that one of the most important parts of infection prevention is good hand cleanliness. In response to the rising burden of healthcare-associated infections (HCAIs), the escalating severity of illness, and the complexity of treatment imposed by multi-drug-resistant pathogen infections, healthcare practitioners are returning to the fundamentals of infection prevention through straightforward practices like hand hygiene. This is due to the fact that there is enough scientific evidence to demonstrate that hand hygiene alone might significantly reduce the risk of infection cross-transmission in healthcare facilities when properly implemented (Vermeil T 2019).

The resident flora, which inhabits the topmost layers of the skin and is more readily eliminated by consistent hand cleanliness, and other forms of microorganisms are the two types of germs that colonize hands. Transient bacteria may survive on the skin, but they seldom multiply. They are often acquired by healthcare workers (HCWs) through intimate contact with patients or their nearby contaminated environmental surfaces. They are the organisms most frequently connected to HCAIs (Robert C 2022).

1.6.15. Objective of Study

The study aims at assessment of healthcare workers' knowledge and attitudes towards infection prevention in Kirkuk city hospitals

Hypothesis

H0: Healthcare workers' knowledge and attitudes had no association factors with healthcare setting.

H1: There is a link between healthcare workers knowledge, attitudes and healthcare setting.

Research questions

1. What is the amount of health workers' knowledge about the infection prevention in the hospital?

2. What is the attitude of health workers regarding infection prevention in the hospital?

2. MATERIAL AND METHODS

2.1. Design of Research

Quantitative design, descriptive study is carried out over the course of the October 10th, 2021 until May 10th, 2022 to assess healthcare workers knowledge and attitudes about infection prevention.

The research sample:

The study was carried out on a sample of 200 healthcare workers selected by non probability sampling (convenience sample) from 2 hospitals in Kirkuk city (Kirkuk General Hospital and Alnasr Hospital).

The questionnaire was collected by a group of healthcare workers, and it took about a month to collect samples from (1-29. 3. 2022).

2.2. The Instrument of Study

An instrument questionnaire format developed by the investigator to measure knowledge and attitudes about infection prevention composed of 3 parts:

Part 1: Type of demographic data:

The demographic data sheet comprised several items listed as gender and age of the general information.

Part 2: Knowledge scale.

This scale consisted of 19 items used to measure HCWs' knowledge about infection prevention, the items are responded with yes and no (Alhumaid 2021).

Part 3: Attitude scale

This scale consisted of 14 items used to measure healthcare workers attitudes about infection prevention, the items are responded with agree, neutral, and disagree (Suliman 2018).

2.3. Research Pilot

A pilot study was performed on a sample of 20 healthcare workers, before the first study and omitted from the study sample, had been chosen for healthcare workers in Kirkuk city hospitals. The pilot study was carried out between (10 October 2021 and 25 October 2021).

2.4. Ethics Committee Approval

Ethical approval of the ethics committee of the Kirkuk Health Directorate was obtained and directed to 2 chosen hospitals to facilitate the data gathering in the hospitals.

The research was performed at the Kirkuk Health Department /Training and Human Development. At the outset, written permission from the Kirkuk Health Directorate / Iraq, where the study was conducted, was obtained.

2.5. Methods of Data Collection

Written permission is obtained by explaining the purpose of the study from the Kirkuk Health Directorate and then the researcher explained the study and the goal of the research to the sample and then took their agreement to participate in the study. The self-report method was used to gather data from the sample.

2.7. Statistical Data Analysis

To analysis and evaluate study results, the following statistical analytical methods were employed (SPSS-ver. 20).

❖ Table statistics

-Frequencies and

-Percentages

3. RESULTS

In this chapter, we will learn about the results that we concluded through the questionnaire and explain them in detail.

Table 3.1 The Distribution of Socio-demographic Characteristics.

Variables	n	%
Age		
20-29	134	67.0
30-39	40	20.0
40-49	20	10.0
50-59	6	3.0
Gender		
Male	88	44.0
Female	112	56
Marital status		
Single	85	42.5
Married	111	55.5
Divorced	4	2.0
Years of service		
1-5	142	71.0
6-10	24	12.0
11-15	15	7.5
16-20	12	6.0
20 and more	7	3.5
Education		
Nursing school	11	5.5
Institute	53	26.5
University	127	63.5
Master	3	1.5
Doctorate degree	6	3.0
Number of training session		
1	83	41.5
2	114	57.0
3 and more	3	1.5
Occupation		
Nurse	110	55
Doctor	39	19.5
Pharmacist	31	15.5
Laboratory	20	10
Total	200	100

The finding in this table shows that 134 (67%) of healthcare workers are aged 20-29 years, 112 (56%) of them are females, 111 (55.5%) of them are married, 142 (71%) of them had years of service 1-5 years, 127 (63.5%) of them had bachelor degree, 114 (57%) of them participate in 2 training sessions, and 110 (55%) of healthcare workers were nurses.

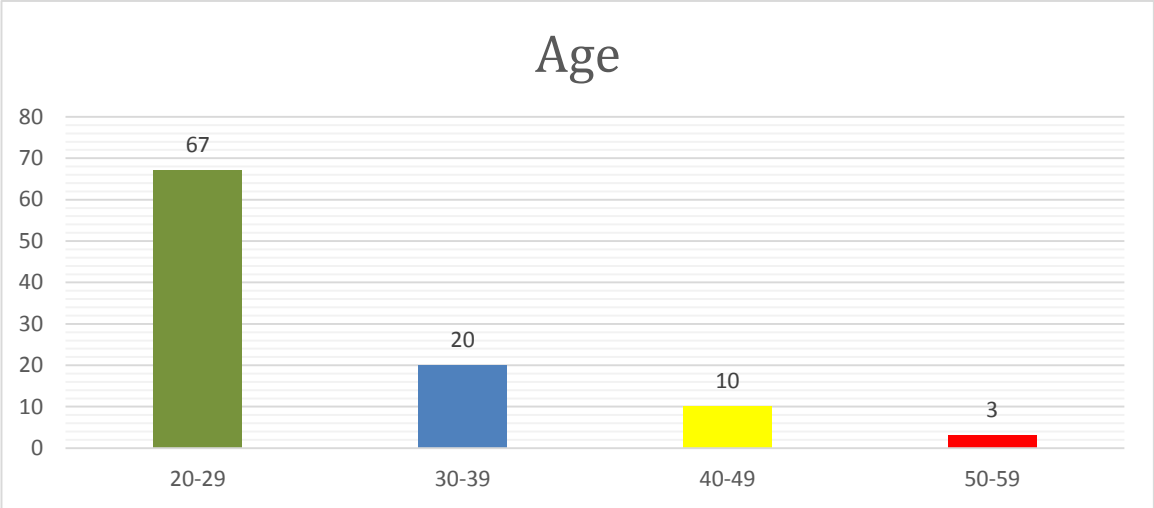

Figure 3.1 Distribution of Sample Age.

According to Figure 3.1 It turns out that the majority of the sample taken for the study are between the ages of 20-29 years.

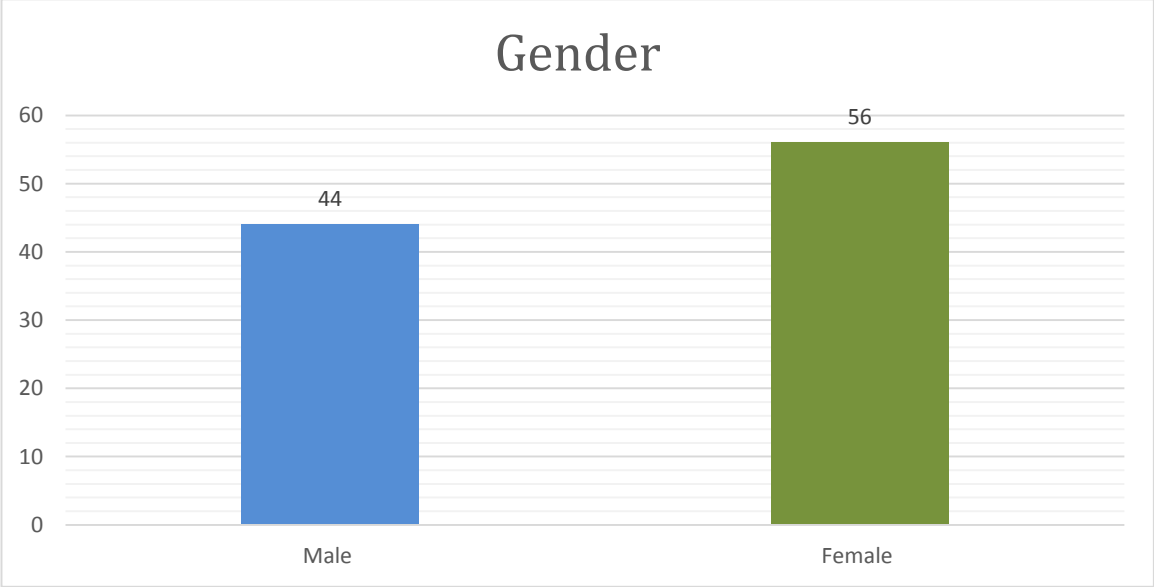

Figure 3.2 Distribution of Sample Gender.

According to this figure we can see that the results are close, with a slight increase for the female category over the males.

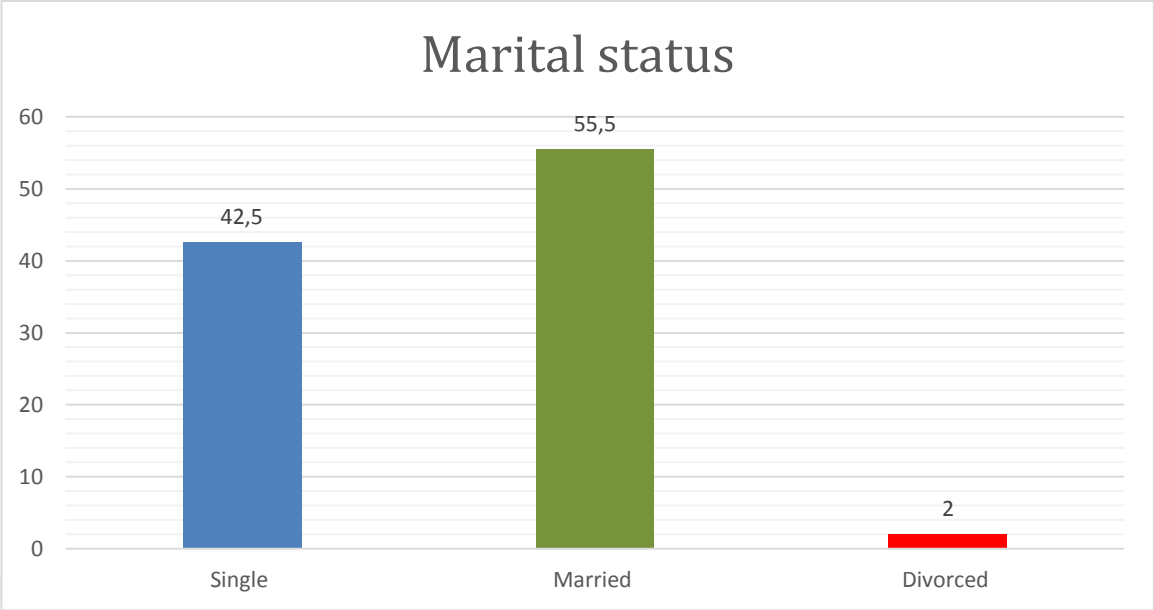

Figure 3.3 Distribution of Sample Marital Status.

According to Figure 3.3, it turns out that the number of married people is slightly more.

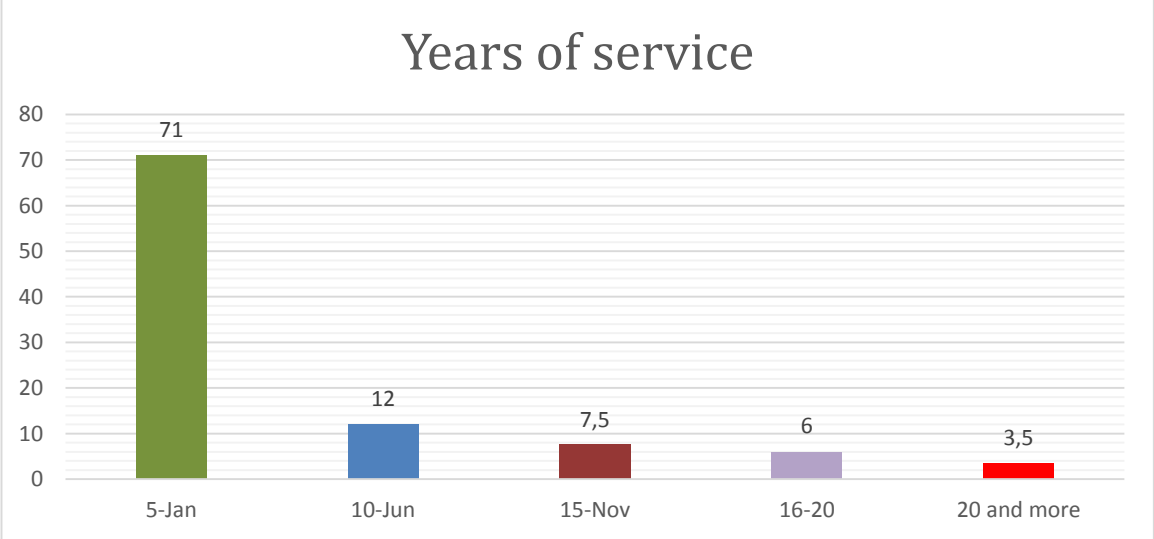

Figure 3.4 Distribution of Sample Years of Service.

we can see that the vast majority of the sample have years of service of 5 years or less.

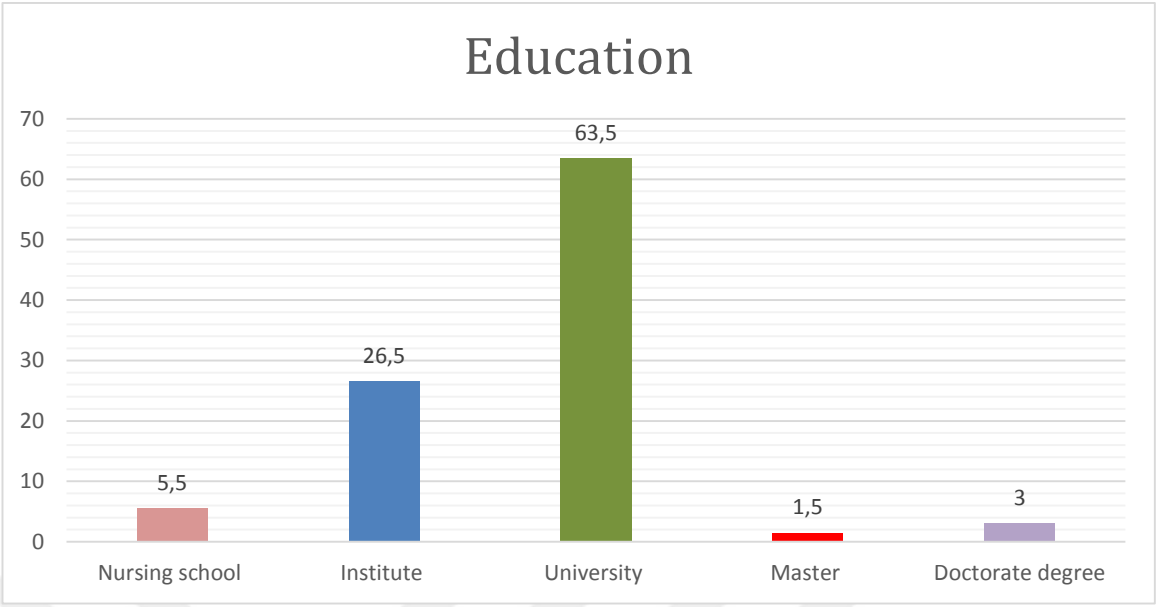

Figure 3.5 Distribution of Sample Education.

In Figure 3.5, we can see that the vast majority of the sample hold a university degree.

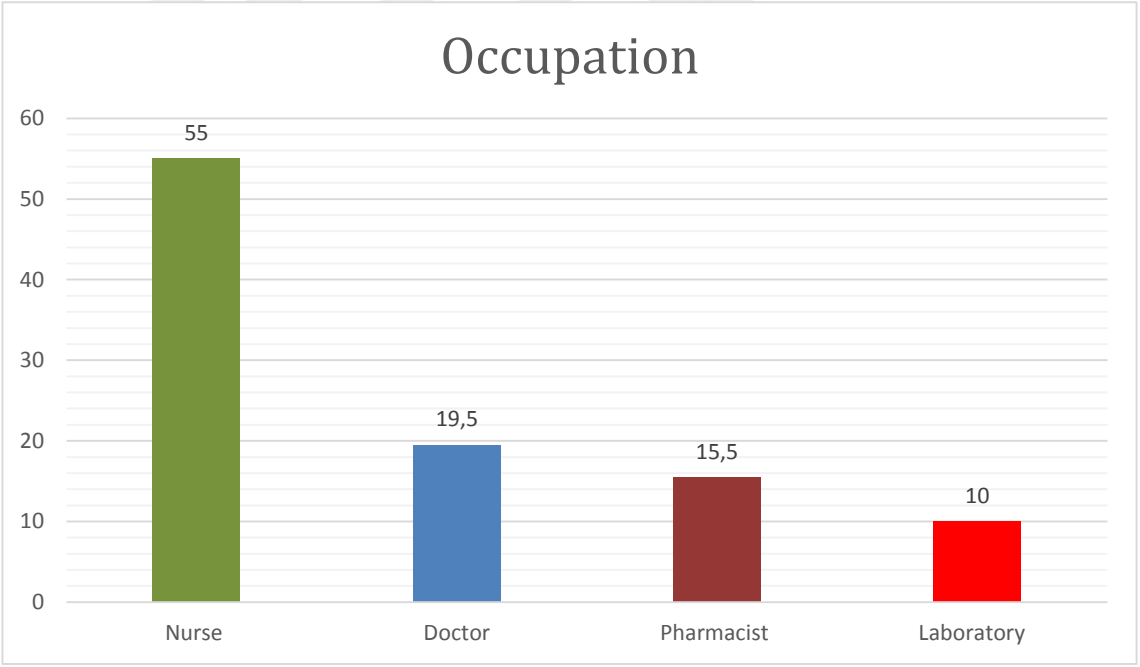

Figure 3.6 Distribution of Sample Occupation.

In Figure 3.6, we can see that the majority of the sample are nurses.

Table 3.2 The Distribution of Healthcare Workers' Knowledge About Infection Control

Items	Response	n	%
There is a guide to infection prevention in Kirkuk city hospitals	No	30	15.0
	Yes	170	85.0
Acquired infection in the hospital is transmitted through medical equipment (such as syringes, medical devices, stethoscopes) and so on.	No	23	11.5
	Yes	177	88.5
There is an infection control unit in the hospital.	No	28	14.0
	Yes	172	86.0
The shortage of health and personal protective materials cause danger and infection for health care workers	No	92	46.0
	Yes	108	54.0
An Acquired infection is an infection acquired by a patient during hospitalization.	No	91	45.5
	Yes	109	54.5
In normal cases, we should consider all patients to be contagious.	No	118	59.0
	Yes	82	41.0
Gloves must be worn when handling bodily fluids.	No	83	41.5
	Yes	117	58.5
We cannot admit patients with infectious diseases in the same ward with other patients, if there is a limited number of beds.	No	63	31.5
	Yes	137	68.5
Using clean water cannot kill germs.	No	78	39.0
	Yes	122	61.0
Among the contraindications for hospital-acquired infections is disinfection and sterilization	No	51	25.5
	Yes	149	74.5
Sterilization with chemicals is used for some medical equipment.	No	108	54.0
	Yes	92	46.0
Physical sterilization techniques (heat and rays) are used for some equipment?	No	111	55.5
	Yes	89	44.5
Not all microorganisms, including germs, are destroyed by sterilization	No	118	59.0
	Yes	82	41.0
All equipment need to remove dirt before sterilization	No	48	24.0
	Yes	152	76.0
Protective clothing reduces hospital-acquired infections	No	47	23.5
	Yes	153	76.5
Is there a post-exposure prophylactic treatment for HIV	No	63	31.5
	Yes	137	68.5
I wash my hands before and after caring for patients.	No	47	23.5
	Yes	153	76.5
I have to wash my hands even if I use gloves.	No	81	40.5
	Yes	119	59.5
Needles should not be recapped after use and before disposal	No	157	78.5
	Yes	43	21.5

Regarding healthcare workers knowledge, the finding shows that 170 (85%) of healthcare workers know that there are a guide to infection prevention for health workers in Kirkuk city hospitals, 177 (88.5%) of them know that acquired infection in the hospital is transmitted through medical equipment (such as syringes, medical devices, stethoscopes) and so on, 172 (86%) aware that the hospital has an infection control unit, 108 (54%) know the shortage of health and personal protective materials cause danger and infection for health care workers, 109 (54.5%) know acquired infection is an infection acquired by a patient during hospitalization, 82 (41%) know in normal cases, we should consider all patients to be contagious, 117 (58.5%) know gloves must be worn when handling bodily fluids, 137 (68.5%) know that they cannot admit patients with infectious diseases in the same ward with other patients, if there is a limited number of beds, 122 (61%) know using clean water cannot kill germs, 149 (74.5%) know Among the contraindications for hospital-acquired infections is disinfection and sterilization, 92 (46%) know sterilization with chemicals is used for some medical equipment, 89 (44.5%) know physical sterilization techniques (heat and rays) are used for some equipment, 82 (41%) know not all microorganisms, including germs, are destroyed by sterilization, 152 (76%) know all equipment need to remove dirt before sterilization, 153 (76.5%) know protective clothing reduces hospital-acquired infections, 137 (68.5%) know there is a post-exposure prophylactic treatment for HIV, 153 (76.5%) wash my hands before and after caring for patients, 119 (59.5% even if I'm wearing gloves, I have to wash my hands), 43 (21.5%) know needles should not be recapped after use and before disposal.

Table 3.3 Distribution of HealthCare Workers Attitude About Infection Control

Items	Response	n	%
By following the correct work procedures the risks of contamination will be reduced	Disagree	2	1.0
	Neutral	15	7.5
	Agree	183	91.5
Caution should be exercised and standards about infection control applied to all patients, regardless of their diagnosis.	Disagree	12	6.0
	Neutral	21	10.5
	Agree	167	83.5
Is it necessary to adhere to standard infection control policies and procedures at all times	Disagree	78	39.0
	Neutral	24	12.0
	Agree	98	49.0
Vaccines Reduce Hospital-Acquired Infections.	Disagree	75	37.5
	Neutral	42	21.0
	Agree	83	41.5
Protection reduces hospital-acquired infections	Disagree	26	13.0
	Neutral	18	9.0
	Agree	156	78.0
You should attend infection prevention and control training regularly.	Disagree	27	13.5
	Neutral	20	10.0
	Agree	153	76.5
Following standard procedures reduces hospital-acquired infections	Disagree	75	37.5
	Neutral	29	14.5
	Agree	96	48.0
Is it necessary to use new pair of gloves for every patient visit the hospital	Disagree	58	29.0
	Neutral	24	12.0
	Agree	118	59.0
Maintaining personal hygiene reduce the risk of infection?	Disagree	59	29.5
	Neutral	19	9.5
	Agree	122	61.0
Overcrowding in the workplace increases the chances of transmission of diseases	Disagree	38	19.0
	Neutral	13	6.5
	Agree	149	74.5
Increased workload increases risks of acquiring infection in hospitals.	Disagree	21	10.5
	Neutral	34	17.0
	Agree	145	72.5
A patient's knowledge of transmission routes reduces the risk of hospital-acquired infections	Disagree	26	13.0
	Neutral	25	12.5
	Agree	149	74.5
Is it necessary to wear a mask while caring for patients	Disagree	68	34.0
	Neutral	23	11.5
	Agree	109	54.5
Nosocomial infections can lead to dangerous outcomes	Disagree	16	8.0
	Neutral	16	8.0
	Agree	168	84.0

Regarding healthcare workers' attitudes, the findings indicated that 183 (91.5%) agree about "by following the correct work procedures the risks of contamination will be reduced". 167 (83.5%) agree that "Caution should be exercised and standards about infection control applied to all patients, regardless of their diagnosis". 98 (49%) agree that "Is it necessary to adhere to standard infection control policies and procedures at all times". 83 (41.5%) agree that "Vaccines Reduce Hospital-Acquired Infections". 156 (78%) agree that "Protection reduces hospital-acquired infections". 153 (76.5%) agree that "You should attend infection prevention and control training regularly." 96 (48%) agree that "Following standard procedures reduces hospital-acquired infections". 118 (59%) agree that "Is it necessary to use new pair of gloves for every patient visiting the hospital?". 122 (61%) agree that "Maintaining personal hygiene reduces the risk of infection". 149 (74.5%) agree that "Overcrowding in the workplace increases the chances of transmission of diseases". 145 (72.5%) agree that "Increased workload increases risks of acquiring infection in hospitals". 149 (74.5%) agree that "A patient's knowledge of transmission routes reduces the risk of hospital-acquired infections. 109 (54.5%) agree that "Is it necessary to wear a mask while caring for patients?". 168 (84%) agree that "Nosocomial infections can lead to dangerous outcomes."

4. DISCUSSION

Hospital acquired infections are a major and serious problem for all countries of the world. From this point of view, medical care is essential and the use of high skills is important to prevent infection. Infection control is central to healthcare daily work and an integral part of providing medical care to patients. Therefore, this current study was conducted. In this study, the result shows an important point, from the total sample of 200 healthcare workers more than half of them average age of 25 years, 75% of them had years of service 1-5 years, more than half of them had bachelor degree, 57% of them participated in 2 training sessions, more than half of health care workers were nurses, that 53.5% of healthcare workers have a moderate level of knowledge, this represents a good percentage for their age, years of service, and the number of infection control courses are exposed to professional risks throughout their regular job activities. As a result they require the instruction to improve their adherence to the recommended protections. This is similar to study found in Jordan, a cross-sectional, descriptive design (Intensive Care Nurses' Knowledge & Practices regarding Infection Control Standard Precautions at a Selected Egyptian Cancer Hospital) show that most nurses (90%) have good knowledge of isolation precautions (Suliman 2018). Additionally, a cross-sectional study on Oyo State Health Care's Attitude and Practice Regarding Corona Virus Disease 2019 (COVID-19) revealed that the respondents' average level of awareness of COVID-19 was 78.6% (Ayinde 2020). Likewise, the descriptive study (The Knowledge, Attitudes, and Practices of Nurses Toward Management of Hospital-acquired Infections in the University Clinical Center of Kosovo), whose findings indicated that the general level of knowledge of nurses about the spread of hospital-acquired infections was 90%. According to the study, there is a strong correlation between education level and knowledge, which increases the likelihood of having adequate clinical performance in practice. In one study, it was determined that patients in the surgical clinic had better outcomes when they were treated by nurses with higher education (university degrees). This was done by examining the relationship between nursing education and patient outcomes. A 10% increase in nurses with college degrees decreased mortality risk by 5% and 9%. In this situation, nursing education should act as a foundation for lifelong learning (Salameh 2022).

Whose study revealed that HCWs' knowledge of COVID-19 was positively correlated with having a positive attitude and good practice toward COVID-19 and its prevention technique. In addition, HCWs with good knowledge of COVID-19 were significantly associated with confidence in treating confirmed cases of COVID-19 and maintaining self-isolation, if they manifest symptoms of the disease. Three hundred ninety-seven healthcare workers participated in the study, with a response rate of 94%. Among these, 88.2% and 94.7% of respondents had good knowledge and attitudes the practice was relatively low, and similar to a study in Saudi Arabia, by Abalkhail's study (2021). With regard to the attitude and pracitice found that the majority proportions of HCWs with a positive attitude (≥80% score) were 61.5%. Bayleyegn and Mehari (2021) discovered that 236 individuals in total were included in the survey, with a 100% response rate; 90% and 57.2% of the participants had strong knowledge and a favorable attitude toward HAI prevention only 36% of the study participants had good practice towards HAI prevention, respectively. On the other hand, this finding was far lower than the study finding by study of Ayinde (2020) who found that the level of positive attitude was 64% among the respondents Majority of respondents practice safe measures in the prevention of COVID-19 including washing of hands (95.3%), routine cleaning (82.7%) and high-level disinfection (83.9%). However, use of personal protective equipment (PPE) was low (56.8%). Gruda and Sopjani (2017) found that the nurses' attitudes about hospital-acquired infection were 84.4%, while for the nurses' practices it was 76.2%. Unquestionably, preventing HAIs requires adopting good practic toward infection prevention. Therefore, it is crucial that healthcare institutions set up frequent training sessions on infection control best practices for HCWs to update and refresh their knowledge as well as encourage a good practic and high-quality treatment. The lack of a validated instrument to assess knowledge and practice of isolation precautions is a study drawback. This necessitates additional testing and refinement of our created questionnaire. Our failure to examine additional variables that could influence HCWs adherence to isolation protocols is another shortcoming. Finally, the fact that only iraq HCWs were included in this study may restrict the applicability of the findings to other contexts and populations. Pathogen samples from other nations may be collected for future investigations.

5. CONCLUSION

Study results concluded that:

We can see that the vast majority of the sample hold a university degree .We can see that the results are close, with a slight increase for the female category over the males.

Most healthcare workers are at the age of 20-29 years are female, married, have 1-5 years of service, and have a bachelor's education.

The healthcare workers have a knowledge toward infection control.

The healthcare workers have a good attitude toward infection control.

Recommendation

The study recommends that:

Training and educational programs to increase healthcare workers' knowledge about the chain of infection and methods of transmission within the hospital.

Teaching healthcare workers dealing with health and medical waste and how to handle needles.

Encouraging healthcare workers about hand washing and sterilization techniques for hospitals and health centers.

Encouraging healthcare workers to take important vaccinations for the purpose of preventing the spread of infectious disorders like Covid 19 and viral hepatitis.

Follow up on the work of the healthcare workers and ensure that personal protective equipment is constantly worn.

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APPENDICES

APPENDIX 1. Questionnaire form

I put in your hands a master's research questionnaire form, which is among the requirements of my study in order to assess your knowledge and Attitude about infection control in Kirkuk hospitals. You can participate or not in this questionnaire, knowing that your personal information and your answers are kept confidential and will only be used for scientific research purposes. We thank you for sharing our research The tagged (**ASSESSMENT OF KNOWLEDGE AND NURSING PRACTICES REGARDING THE CONTROL OF INFECTION IN ISOLATION UNITE IN KIRKUK CITY**) and enriching us with your valuable information. Thank you very much.

master's student

Basim Hameed Ahmed

" ASSESSMENT OF KNOWLEDGE AND NURSING PRACTICES REGARDING THE CONTROL OF INFECTION IN ISOLATION UNITE IN KIRKUK CITY "

Resolution:

Demographic and social information among Nurses sector:

1-Age in years

2- Gender:

Part Two: Knowledge Assessment:

Part Three: Nursing practises Assessment:

APPENDIX 2. Research Committee Decision

APPENDIX 3. Facilitate the Task in Hospitals.

APPENDİX 4 : The list of Experts

Names of those who Edited, Checked and Agreed to the Questions of the Questionnaire (ASSESSMENT OF KNOWLEDGE AND NURSING PRACTICES REGARDING THE CONTROL OF INFECTION IN ISOLATION UNITE IN KIRKUK CITY).

APPENDİX 5: Editin Certificate.

CURRICULUM VITAE

Personal Information

Name and Surname : Basim AHMED

Education

MSc

Undergraduate

Work Experience

Year

2010-Present