T.C.

ÇANKIRI KARATEKIN UNIVERSITY

INSTITUTE OF HEALTH SCIENCES

DEPARTMENT OF NURSING

ASSESSMENTS OF KNOWLEDGE OF NURSES WORKING IN HEMODIALYSIS UNITS IN AL-NAJAF ON TOWARD INFECTION CONTROL MEASURES

Master's Thesis

Hussein Abdulzahra Hassooni HASSOONI

Çankırı 2022

ASSESSMENTS OF KNOWLEDGE OF NURSES WORKING IN HEMODIALYSIS UNITS IN AL-NAJAF ON TOWARD INFECTION CONTROL MEASURES

By

Hussein Abdulzahra Hassooni HASSOONI

The Institute of Health Sciences

The Department of Nursing

Internal Medicine Nursing Master's Program with Thesis

The Degree of Master of Science

ADVISOR

Asst. Prof. Dr. Müjgan ONARICI

Çankırı 2022

ACCEPTANCE AND APPROVAL

Hussein Abdulzahra Hassooni HASSOONI, the graduate student of ÇAKU The Institute of Health Sciences with the student number of 208210226, has successfully presented his thesis entitled "Assessments of Knowledge of Nurses Working in Hemodialysis Units in Al-Najaf on Toward Infection Control Measures." before the jury whose signatures are below, after fulfilling all of the requirements determined by the relevant regulations for the degree of Master of Nursing:

Thesis Exam Date / 13/ 12/ 2022

Advisor **:** Asst. Prof. Dr. Müjgan ONARICI

Examination Committee Members:

Chairman **:** Asst. Prof. Dr. Müjgan ONARICI
Department of Nursing
Çankırı Karatekin University

Member **:** Asst. Prof. Dr. Özlem BULANTEKİN DÜZALAN
Department of Nursing
Çankırı Karatekin University

Member **:** Asst. Prof. Dr. Filiz SELEN
Department of Nursing
Hitit University

Approved for the Graduate School of Health Sciences

Assoc. Prof. Dr. Nazan KAYTEZ

Director of Graduate School

ETHICS STATEMENT

The thesis entitled “Assessments of Knowledge of Nurses Working in Hemodialysis Units in Al-Najaf on Toward Infection Control Measures” which was prepared and presented as a thesis, was written by myself and in accordance with the scientific, academic rules and code of ethical conducts. The idea/hypothesis of my thesis solely belongs to my supervisor and me. I conducted the study pertaining to the thesis and therefore, all of the used sentences and interpretations within the study belong to me.

I declare that the aforementioned issues are correct.

Signature

13 / 12 / 2022

Hussein Abdulzahra Hassooni HASSOONI

PREFACE AND ACKNOWLEDGEMENTS

First, many thanks to Allah Almighty, Most Gracious, Most Merciful, for his kindness to me, and to the Holy Prophet Muhammad (God's peace and blessing be upon him), the first teacher who guides us to the right path.

My special thanks to my supervisor Asst. Prof. Dr. Müjgan ONARICI for her kind treatment, excellent ideas, confidence in my abilities, firm guidance to my work, and mediating role in providing valuable advice on the thesis and for the knowledge and support she has provided me over the two years.

I would also like to thank my family (my father, mother, brothers, and sisters) for helping me throughout my study. I would also like to thank my dear wife, who stood with me and encouraged me during my study journey.

Furthermore, I would also like to thank the hemodialysis nurses' in Al-Najaf Al-Ashraf Governorate hospitals for their positive efforts and invaluable assistance.

I would also like to thank the experts and teaching staff at the University of Kufa/Nursing Faculty, who expressed their scientific opinions in the questionnaire and research and shared their valuable scientific observations.

Finally, I express my eternal gratitude to all my friends for their encouragement and continued support.

Hussein Abdulzahra Hassooni HASSOONI

Çankırı-2022

LIST OF CONTENTS

ABBREVIATIONS AND SYMBOLS

AIDS	Acquired Immunodeficiency Syndrome
AV	Arteriovenous
AVF	Arteriovenous fistula
BBV	Blood-borne virus
CDC	Center for Disease Control and Prevention
CHP	Center for Health Protection
COVID-19	Coronavirus disease 2019
Df	Degrees of freedom
EPA	Environmental Protection Agency
ESRD	End-Stage Renal Disease
FDA	The United States Food and Drug Administration
HAIs	Healthcare-acquired infections
HbsAg	Hepatitis B surface antigen
HBV	Hepatitis B Virus
HCPs	Healthcare Professionals
HCV	Hepatitis C Virus
HCWs	Healthcare Workers
HIV	Human Immunodeficiency Virus
ICRC	International Committee of the Red Cross
IPC	Infection Prevention and Control
MOH	Iraqi Ministry of Health
MRSA	Methicillin-Resistant Staphylococcus Aureus
N	Frequency or Number
NCDC	National Center for Disease Control
NGIPCHF	National Guidelines for Infection Prevention and Control in Healthcare Facilities
NIPCG	National Infection Prevention and Control Guidelines
OSHA	Occupational Safety and Health Administration
P	P-value

PPE	Personal Protective Equipment
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences
VAI	Vascular Access Infection
VRE	Vancomycin-Resistant Enterococci
WHO	World Health Organization
%	Percentage
<=	Less than or equal to
±	Plus minus
$\chi 2$	Chi-square

LIST OF FIGURES

LIST OF TABLES

ASSESSMENTS OF KNOWLEDGE OF NURSES WORKING IN HEMODIALYSIS UNITS IN AL-NAJAF ON TOWARD INFECTION CONTROL MEASURES

ABSTRACT

HASSOONI, Hussein Abdulzahra. Assessments of Knowledge of Nurses Working in Hemodialysis Units in Al-Najaf on Toward Infection Control Measures, (Master of Science), Çankırı, 2022.

Background: Renal failure patients undergoing hemodialysis treatment and nursing staff working in hemodialysis units are at a significantly increased risk of healthcare-acquired infections, for example, blood-borne infections such as hepatitis B virus, hepatitis C virus, human immunodeficiency virus, and bacterial and fungal infections due to repeated and prolonged exposure to many potential pollutants in the hemodialysis setting. Healthcare-acquired infections are the most common reason for hospitalization and mortality rates among hemodialysis patients after cardiovascular disease. Nursing staff's compliance with infection control and prevention measures reduces transmission, therefore standard precautions must be adhered to in hemodialysis units. **Objective:** The aims of the study is to assess knowledge of nurses working in hemodialysis units towards infection control measures. **Materials and Method:** Quantitative design (the descriptive cross-sectional study) was used to achieve the objectives of this study. This study was conducted in the hemodialysis units at Al-Najaf city hospitals in Iraq between March 2022 and April 2022 based on a non-probability sampling (purposive sampling). The sample consisted of 100 nurses including 59 nurses working in Al-Sadr Medical City Hospital and 41 nurses working in Al-Hakim General Hospital. A questionnaire was prepared as a data collection tool and consists of two parts. The first part includes the socio-demographic information of the nursing staff (age, gender, level of education, residence, marital status, workplace, years of experience in hospitals, years of experience in hemodialysis unit, participation in training courses related to hemodialysis units, participation in training courses related to infection control measures, and doses of the hepatitis vaccine they got). The second part includes 39 multiple-choice questions aiming to assess knowledge of nurses working in hemodialysis units about infection control measures. The number of correct answers was used to measure each nurse's knowledge level. They were rated as two points for correct answer and one point for incorrect answer. Descriptive and inferential statistics were used to analyze the results. **Results:** The findings of the study showed that the majority of the participants were female and aged between 25 and 29 years, had a bachelor of nursing, lived in urban cities, were married and were well-experienced in working in hospitals and hemodialysis units, and a great majority of them got the hepatitis vaccine, most of them also received training courses on hemodialysis and infection control measures. The results revealed that the nurses'

knowledge of the infection control measures was average (moderate). 74,95% had a statistical mean score of 1,499. The findings also showed a high level of statistical significant correlation between nurses' knowledge of working in hemodialysis units and socio-demographic information in line with the critical and unique nature of hemodialysis units, such as the educational level of socio-demographic information, participation in training courses on hemodialysis units inside and outside Iraq, and participation in training courses on infection control measures training inside and outside Iraq, the number of infection control training courses, and duration of infection control training courses. The probability value were ($p < = 0,05$). **Conclusions:** The study concluded that most of the participants had knowledge about infection control measures and there was a highly statistically significant correlation between nurses' knowledge levels and their socio-demographic information, but because of the critical and unique nature of hemodialysis units, very strict procedures must be imposed in those units and nursing staff must be trained on infection control measures for hemodialysis units.

Keywords: Hemodialysis, Infection Control Measures, Knowledge, Nurse.

NECEF'TE HEMODİYALİZ ÜNİTELERİNDE ÇALIŞAN HEMŞİRELERİN ENFEKSİYON KONTROL ÖNLEMLERİNE YÖNELİK BİLGİLERİNİN DEĞERLENDİRİLMESİ

ÖZET

HASSOONI, Hussein Abdulzahra. Necef'te Hemodiyaliz Ünitelerinde Çalışan Hemşirelerin Enfeksiyon Kontrol Önlemlerine Yönelik Bilgilerinin Değerlendirilmesi, (Yüksek Lisans Tezi), Çankırı, 2022.

Giriş: Hemodiyaliz tedavisi gören böbrek yetmezliği hastaları ve hemodiyaliz ünitelerinde çalışan hemşirelik personeli hemodiyaliz ortamında birçok potansiyel kirleticiye tekrar tekrar ve uzun süreli maruz kaldıkları için hepatit B virüsü, hepatit C virüsü, insan immünyetmezlik virüsü gibi kan yoluyla bulaşan enfeksiyonlar ile bakteriyel ve mantar enfeksiyonları gibi hastane kaynaklı enfeksiyonlar açısından önemli ölçüde artmış risk altındadır. Hemodiyaliz hastalarında kardiyovasküler hastalıktan sonra en fazla hastaneye yatış ve ölüm oranlarından sorumlu olan hastane kaynaklı enfeksiyonlardır. Hemşirelik personelinin enfeksiyon kontrol ve önleme önlemlerine uyması bulaşmayı azaltır, bu nedenle hemodiyaliz ünitelerinde standart önlemlere uyulmalıdır. **Amaç:** Bu çalışmanın amacı, hemodiyaliz ünitelerinde çalışan hemşirelerin enfeksiyon kontrol önlemleri hakkındaki bilgisini değerlendirmektir. **Materyal ve Metot:** Bu çalışmanın amaçlarını gerçekleştirmek için nicel tasarım (tanımlayıcı kesitsel çalışma) kullanılmıştır. Bu çalışma, Irak Necef'te bulunan şehir hastanelerinin hemodiyaliz ünitelerinde Mart 2022 ile Nisan 2022 tarihleri arasında olasılıksız örnekleme (amaçlı örnekleme) esas alınarak yapılmıştır. Örneklem , Al-Sadr Medical City Hospital'da çalışan 59 hemşire ve Al-Hakim General Hospital'da çalışan 41 hemşire olmak üzere 100 hemşireden oluşmaktadır. Veri toplama aracı olarak iki bölümden oluşan bir soru formu hazırlanmıştır. Formun birinci bölümünde, hemşirelik personelinin sosyo-demografik özellikleri (yaş, cinsiyet, eğitim düzeyi, ikamet yeri, medeni durum, işyeri, hastanelerdeki deneyim yılı, hemodiyaliz ünitesindeki deneyim yılı, hemodiyaliz üniteleri ile ilgili eğitim kurslarına katılım, enfeksiyon kontrol önlemleri ile ilgili eğitim kurslarına katılım ve oldukları hepatit aşısı dozu) yer almaktadır. İkinci bölüm ise, hemodiyaliz ünitelerinde çalışan hemşirelerin enfeksiyon kontrol önlemleri hakkındaki bilgilerini değerlendirmeyi amaçlayan 39 çoktan seçmeli soru içermektedir. Her hemşirenin bilgi düzeyini ölçmek için doğru cevap sayısı kullanıldı. Cevaplar, doğru cevaba iki puan ve yanlış cevaba bir puan şekilde değerlendirildi. Bulguları tanımlayıcı ve çıkarımsal istatistikler kullanılarak analiz edilmiştir. **Bulgular:** Araştırmanın bulgularına göre, katılımcıların çoğunluğunun kadın ve 25-29 yaş aralığında olduğu, hemşirelik mezunu olduğu, kentlerde yaşadığı, evli olduğu ve hastane ve hemodiyaliz ünitelerinde uzun süreli çalışma tecrübesine

sahip olduğu, büyük bir çoğunluğunun hepatit aşısı olduğu ve çoğunun hemodiyaliz ve enfeksiyon kontrol önlemleri konusunda eğitimler aldığı tespit edilmiştir. Bulgular, hemşirelerin enfeksiyon kontrol önlemleri hakkındaki bilgilerinin orta düzeyde olduğunu ve %74,95'nin istatistiksel ortalama puanının 1,499 olduğunu ortaya koydu. Bulgular ayrıca, hemşirelerin hemodiyaliz ünitelerinde çalışmaya yönelik bilgileri ile sosyo-demografik bilgileri arasında hemodiyaliz ünitelerinin kritik ve benzersiz doğası doğrultusunda yüksek düzeyde istatistiksel olarak anlamlı bir ilişki olduğunu göstermiştir, bu sosyo-demografik bilgiler arasında eğitim düzeyi, Irak içinde ve dışında hemodiyaliz ünitelerine yönelik eğitim kurslarına katılım, Irak içinde ve dışında enfeksiyon kontrol önlemleri eğitim kurslarına katılım, enfeksiyon kontrol eğitim kurslarının sayısı ve enfeksiyon kontrol eğitim kurslarının süresi yer almaktadır. Olasılık değeri ($p <= 0,05$) idi. **Sonuç:** Çalışma, katılımcıların çoğunun enfeksiyon kontrol önlemleri hakkında orta düzeyde bilgiye sahip olduğu ve hemşirelerin bilgi düzeyleri ile sosyo-demografik özellikleri arasında yüksek düzeyde istatistiksel olarak anlamlı bir ilişki olduğu sonucuna varmıştır, ancak hemodiyaliz ünitelerinin kritik ve benzersiz niteliği nedeniyle, bu birimlerde çok sıkı prosedürler uygulanmalı ve hemşirelik personeline hemodiyaliz birimlerine yönelik enfeksiyon kontrol önlemleri hakkında eğitim verilmelidir.

Anahtar Kelimeler: Bilgi, Enfeksiyon kontrol önlemleri, Hemodiyaliz, Hemşire.

1. INTRODUCTION

1.1. General Background

Infection prevention and control measures constitute the central pillar to preventing the outbreak of infections and reducing the spread of infections in hospitals and healthcare centers as they cause serious harm to patients, healthcare workers, and the community. It is a reliable scientific method and a sound practical decision since they strengthen pathology, epidemiology, and health systems. Infection control occupies a privileged position in the global health system because it concerns the safety of both patients and healthcare personnel, prevents complications of infections, and reduces financial burdens over countries' health systems (Rajih, 2020). Healthcare-acquired infections detected after admission to hospitals or other healthcare settings, including hemodialysis units, also called as nosocomial or healthcare-acquired infections (Jabbar and Mohammed, 2021).

Hemodialysis units are considered highly epidemic areas in which viral, bacterial, fungi, parasites, and other serious diseases are common and affect patients and the medical staff working in those units. In order to prevent these infections, these units must have special areas or establish strict measures to control infection and prevent its transmission. Patients undergoing hemodialysis are exposed to transfusion-transmitted infections, as is the case for healthcare professionals (Jabbar and Mohammed, 2021). About 11 percent of people with End-Stage Renal Disease (ESRD) die every year due to the infection and the associated consequences. Hemodialysis patients are increasingly admitted to the hospitals to receive treatment due graft infection, a severe illness. Numerous studies have reported that five to fifteen percent of patients become infected due to their grafts. In the first year after the admission to hospital, patients' risk of infection may be higher (Himmelfarb and Sayegh, 2010).

The World Health Organization (WHO) defines healthcare-acquired infections (HAIs) as infections acquired by patients in hospital. Infections that begin

to show symptoms after discharge of patients and those that infect healthcare workers (HCWs) from infected patients are also included in this category. According to the WHO, more than 1,4 million people globally are infected with HAIs. Hepatitis B virus (HBV), Human immunodeficiency virus (HIV), and other viral diseases are the most common blood-borne infections. These infections pose a significant danger to healthcare professionals, particularly surgeons. Even if healthcare professionals are not infected, they may transmit infection to patients with weak immune systems or open wounds and other healthcare workers. Many of HAIs are caused by the reuse of needles and the failure to use personal protective equipment (PPE) properly. Both are significant causes of needle-stick injuries. Healthcare workers have a 1,2–10% chance of developing Hepatitis C virus (HCV) infection if they get pricked by a needle that was used on patient with HCV. Additionally, healthcare professionals (HCPs) who treat asymptomatic patients and thus may be infected but do not follow the established procedures run the risk of contracting these illnesses (Ashraf, Dhedhi and Jiwani, 2021).

In the United States, more than 425,000 people are receiving maintenance hemodialysis. To undergo hemodialysis, patients must have vascular access, which may be a catheter, an expanded blood artery, or a graft. Infections entering the bloodstream and the vascular access site in hemodialysis patients cause significantly morbidity and death. Arteriovenous fistulas (AVFs), synthetic arteriovenous grafts, tunneled central lines, and non-tunneled central lines are four forms of hemodialysis vascular access that increase risk of infection. Other catheter-graft hybrid devices may be used to get access to the body. Hemodialysis patients are particularly vulnerable to antibiotic-resistant bacterial infections because of both how frequent they are admitted to the hospital and how many medications they have to take. Keeping track of infection rates is essential for preventing diseases (Center for Disease Control and Prevention [CDC], 2022).

1.2. Importance of The Study

Patients with ESRD receiving hemodialysis treatment are at high risk of developing life-threatening infections. The infection leads to a significant morbidity rate and is second only after cardiovascular disease as a cause of death in patients with ESRD. Most of bloodstream infections are associated with vascular access,

mainly the use of a central venous catheter. In addition to bacterial infections, patients undergoing hemodialysis are also susceptible to viral infections, including HBV, HCV, HIV, and influenza. Outbreaks of HCV infection in hemodialysis units continue to occur at an alarming frequency mostly due to poor infection control practices (Boyce and Vijayan, 2018).

Healthcare-acquired infections are a serious problem worldwide, including Iraq. They lead to many deaths and infectious diseases among patients, nursing staff, and healthcare providers and incur high health care costs. There are numerous reasons why nosocomial infections are a more significant concern in the 21st century. Healthcare-acquired infections are those acquired in a primary care unit that first appear two or more days after hospitalization or within a month after discharge from the hospital. These include hospitals that host many patients whose immune systems are often very weak and those who receive treatment in outpatient clinics and then turn to those hospitals. This means that hospitalized patients are more prone to chronic diseases. Because of carrying out many medical procedures that go beyond the barriers of health protection, including transferring medical staff from one patient to another, thus providing a means for the spread of pathogens, and insufficient sanitation protocols regarding sterilization of medical uniform equipment, hand washing, and other preventive measures that hospital staff may not take into account or are too negligent in isolating patients from infectious agents, and routine use of antimicrobial agents in hospitals create selective pressure for the emergence of resistant strains of microorganisms. Necessary infection control precautions that are easy to apply, inexpensive, and widely accessible techniques must be taken to reduce the risk of infection and its spread (Iraqi MOH and USAID, 2011; Revelas, 2012).

"The importance of infection control and prevention measure programs in Iraqi health care facilities" was emphasized by the Ministry of Health based on its 2020 research plan, which cited the WHO and CDC guidelines in this field as well as the importance of these programs in protecting HCWs, patients, and the community from HAIs (Jabbar and Mohammed, 2021).

Patients undergoing hemodialysis and nursing staff are at risk for HAIs caused by invasive therapeutic procedures. Most of these patients need at least one hospitalization annually to be protected against these infections. Deficient immune

status, invasive hemodialysis treatment involving prolonged exposure to blood by reaching vessels and extracorporeal circuit, placing patients next to each other and between the hemodialysis machines during sessions, repeated hospitalization and surgery with immunosuppressive therapy, poor nutrition, and hyperparathyroidism and most importantly non-compliance of healthcare providers to follow standard precautions are all risk factors for patients that may increase the incidence of HAIs (Ahmed, Bayoumi and Hassan, 2019).

Nurses have a critical role in extending the useful life of AVF and minimizing side effects. Before hemodialysis, the needling of AVF is critical. Hemodialysis via an AVF requires successful needling. An improper procedure can cause complications like stenosis and aneurysm growth, infections, hematoma, pseudoaneurysm, bleeding, and discomfort. AVFs may be maintained for a long time if the proper methodology is followed (Gharib Sabaq, Mohammed, Raafat Mahdy and Soliman Bahgat, 2022).

Number of patients treated with maintenance hemodialysis in Iraq's Al-Diwaniyah Teaching Hospital has increased significantly. The rate of patients with hepatitis virus infection is significantly higher than total number of patients, indicating that infection control measures in these facilities have been breached. Infection prevention and control procedures may be improved and increased by training of nursing staff. Infection control education programs aiming to increase or improve knowledge of hemodialysis nursing staff should be implemented in order to reduce the prevalence of infections, as shown by the outbreak of this disease (Jabbar and Mohammed, 2021).

1.3. Statement of The Problem

Assessments of knowledge of nurses working in hemodialysis units in Al-Najaf on towards infection control measures.

1.4. The Objective of The Study

The aims of the study to assess knowledge of nurses working in hemodialysis units towards infection control measures.

1.5. Assumptions of The Study

Nursing staff, healthcare providers, patients, their relatives, and other employees working in hemodialysis units adhere to infection prevention and control standards and measures. Nursing staff, employees, and patients should be trained on infection prevention and control measures to prevent and reduce infection in hemodialysis units.

1.6. Limitations of The Study

The study faces a number of limitations. The first limitation is that there was a lack of sources and previous studies on the subject of the study in Iraq. No study was found on infection prevention and control in hemodialysis unit abundance. The second limitation is that there was the lack of updated evidence or guides about infection prevention and control in Iraqi hospitals and health institutions, bearing in mind that the latest update dates back to 2009 and was issued by the Iraqi Ministry of Health. Another limitation is that some of the nurses were less cooperative than others or were not cooperative at all.

2. LITERATURE REVIEW

2.1. General Overview

Infections in hospitals were common in antiquity, as indicated by Herodotus' reports on conditions in Roman and Greek hospitals between 1000 and 600 B.C. and according to Hipocrates' paper circa 400 B.C., the infection was known to exist. An "Egyptian sedge recorded circa 3000 before Birth Christ (B.C.)" may have been among the first to report hospital infections. Ayurvedic records on hospital infections date back to about 600 B.C. in India. The Indian sage Sushruta, who lived around 400 B.C., emphasized the need to take steps to avoid the spread of infectious diseases (Rajih, 2020).

Modern infection prevention can be dated to 1847 when the Hungarian physician and scientist Ignaz Semmelweis realized that a great number of mothers were dying of puerperal fever in his hospital because doctors were going straight from performing autopsies to delivering babies. The death rate dropped dramatically when he instructed doctors to wash their hands between the two procedures (Nield, 2020). Although Semmelweis' discovery was considerably successful, he directly confronted the science and medicine at the time (Ataman, Vatanoğlu-Lutz and Yıldırım, 2013).

The Center for Disease Control and Prevention [CDC] has been using hemodialysis units to check for hepatitis-related infections since the 1970s. In hemodialysis units, controlling the transmission of HBV has been a crucial aspect of infection prevention for decades. Rates of HBV infection in dialysis patients and healthcare workers dropped significantly after the CDC established infection prevention recommendations in 1977. Hepatitis B immunization was advised for chronic hemodialysis patients and hemodialysis workers as early as 1982 to lower the risk of transmission. Due to these activities, the prevalence of HBV in hemodialysis units dropped from 6,2% in 1974 to 0,12% in 2002 (Arduino, Kallen and Patel, 2010).

A nosocomial infection, often referred to as a healthcare-acquired infection, is contracted in hospitals or other healthcare settings. Any healthcare professional can experience HCAIs. The leading causes of HCAIs include bacterial, fungal, and viral agents. HCWs may spread germs and contaminated tools, towels, and air droplets. HCAIs can develop from externally polluted surroundings, other sick patients, and potentially infected hospital employees (CDC, 2018a).

The patient's immunological status as well as infection control procedures, and the spread of infectious agents in society affect the risk of HCAIs (Martin-Loeches, Rodriguez and Torres, 2018).

Prolonged hospital stays, increased antimicrobial resistance, higher financial burdens for healthcare institutions, and higher costs for patients and their families, including the death of loved ones, are health-care-related consequences that must be addressed. Healthcare-acquired infections significantly increases mortality and morbidity rates and boost treatment costs. It is essential for healthcare organizations to improve patient care monitor and protect them from healthcare-acquired infections (Boyle, Donlon, Einarsdottir, McCann and Redmond, 2011).

Patients with end-stage renal failure are more vulnerable to infection because of the increased exposure to infectious microorganisms caused by uremia. Infectious agents might be also transmitted since the technique requires extended durations of vascular access in the same setting and at the same time as other patients undergoing treatment. A higher risk of healthcare-acquired infections like blood-borne virus (BBV) or multi-resistant bacteria exists for dialysis patients who are often hospitalized and operated (Arduino, Nguyen and Patel, 2019).

2.2. The Sources of Infection

Healthcare-acquired infections can be classified as either endogenous (also known as self-infection) or exogenous (also known as cross-infection) infections (WHO, 2013a).

2.2.1. Endogenous infection

Endogenous contagion or self-contagion, pathogens are identified in the patient when they arrive at the health care facility, but without any symptoms of the illness. The illness progresses over time (WHO, 2013a).

2.2.2. Exogenous infection

People contract exogenous infections only after they are admitted to hospital, and come in contact with contaminated equipment - upon which symptoms later develop (WHO, 2013b).

2.3. The Chain of Infection

The chain of infection refers to the process for infectious agents to spread from an infected person or a contaminated environment to another person. It consists of six links, one of which is complementary to the other. Infection does not occur if one or more of these links are out of action. Infection occurs when a pathogen moves from a tank and exits through an exit gate to move through one of the transmission routes, and a person at risk of infection enters through the entry gate. Infection control measures focus on understanding this chain to prevent its cycle from completing the six links; the essential link working on it is the mode of transmission loop to prevent transmission of pathogens to others (Ministry of Health Singapore, 2017; Smith and Timby, 2014).

According to the Ministry of Health Singapore, 2017, the infection chain consists of six links, including:

1. Infectious agent or pathogens
2. Reservoir
3. Portal of exit
4. Modes of transmission
5. Portal of entry
6. Susceptible host

2.4. Infection Prevention and Control

Infection prevention and control (IPC) is a scientific approach and a practical decision to eliminate risks of healthcare-acquired infections by implementing infection control strategies and measures in all healthcare organizations to prevent and control transmission of healthcare-acquired infections to patients and healthcare providers as the community. Infection prevention and control is based on strengthening of pathology, epidemiology, and health system to create an optimally healthy environment for infection control (WHO, 2020b).

The most effective infection control process is prevention, which is achieved by breaking the series of contagions. Epidemiologists, physicians, and nurses should form an infection control committee to monitor and report infections, develop necessary infection control plans, prepare health programs for HCWs, improve their knowledge and practices, and implement measures for clients' sponsorship in all hospitals and health centers (Caroline and Mary, 2012; WHO, 2011).

2.5. Infection Prevention and Control Measures

Infection prevention and control measures are the significant cornerstones in establishing healthcare-acquired infection prevention. They act as barriers to stop or lessen the spread of infections to patients, healthcare workers, and the public. They protect healthcare workers from being infected with blood or body fluids potentially contaminated with infectious agents. Moreover, they provide a good healthcare environment to prevent complications and diseases for inpatients and shorten their length of hospital stay and reduce the financial burdens on both patients and the healthcare institutions (Center for Health Protection [CHP], 2018, Last update: June 2020; Lemass, Mcdonnell, O ’connor and Rochford, 2014).

Infection control measures refer to the lowest preventative measures stratified to each patient, in situation of confirmed or suspected contagious illnesses, in every healthcare area. These measures have been put in place to protect HCWs and prevent the spread of infections among patients. They include Medical waste management, safe injection techniques, hand hygiene, use of personal protective equipment (PPE),

respiratory hygiene and cough etiquette, as well as cleaning, disinfection, and sterilization of medical instruments and equipment (CDC, 2018b; WHO, 2019).

2.5.1. Hand hygiene

Hand hygiene is an essential aspect of infection control and preventive measures, if not the most important, as it reduces and prevents transmission of infectious agents through the hands of medical, healthcare, and nursing staff to patients. It is the most cost-effective method and infection control measure and should be performed before and after any medical procedure or patient intervention or after contact with contaminated objects or surfaces (CDC, 2020a; Hogston and Marjoram, 2011).

The hands of nursing staff are one of the most common avenues for spreading HAIs. There are five steps in the hand hygiene process, including the transmission of germs via contaminated hands in healthcare settings. This includes the pathogens produced by infected patients, contaminated hands of HCWs, the length of time the pathogen may live on contaminated hands, not using materials to remove contaminants from the hands, and transmission of the disease by contaminated hands to another patient (Karkar, 2016).

To prevent the spread of infectious agents in healthcare settings, hand hygiene has long been recognized as an essential component among infection control measures. Alcohol-containing disinfectants that do not require water as a part of hand hygiene is another alternative to washing hands with soap and water or antimicrobials. Hand hygiene habits are critical to reducing MRSA and VRE infections (CDC, 2019a).

The type of procedure, level of contamination, and desired duration of antimicrobial action on the skin affect the optimum way to wash hands. If hands of healthcare providers are dirty from different contaminants (e.g. blood or body fluids), they must wash them with normal or anti-bacterial soap and warm water before they conduct non-surgical procedures or do routine checks. However, sterilized alcohol or hand gel are still employed (CHP, 2018, Last update: June 2020).

Five moments for hand hygiene

The World Health Organization has identified five key points or moments related to hand hygiene that should be followed by all healthcare workers (figure 2.1), which include:

1. Before touching the patients.
2. Before clean/ aseptic procedures.
3. After body fluid or blood exposure.
4. After touching the patients.
5. After touching the patients' surrounding and equipment (WHO, 2020c).

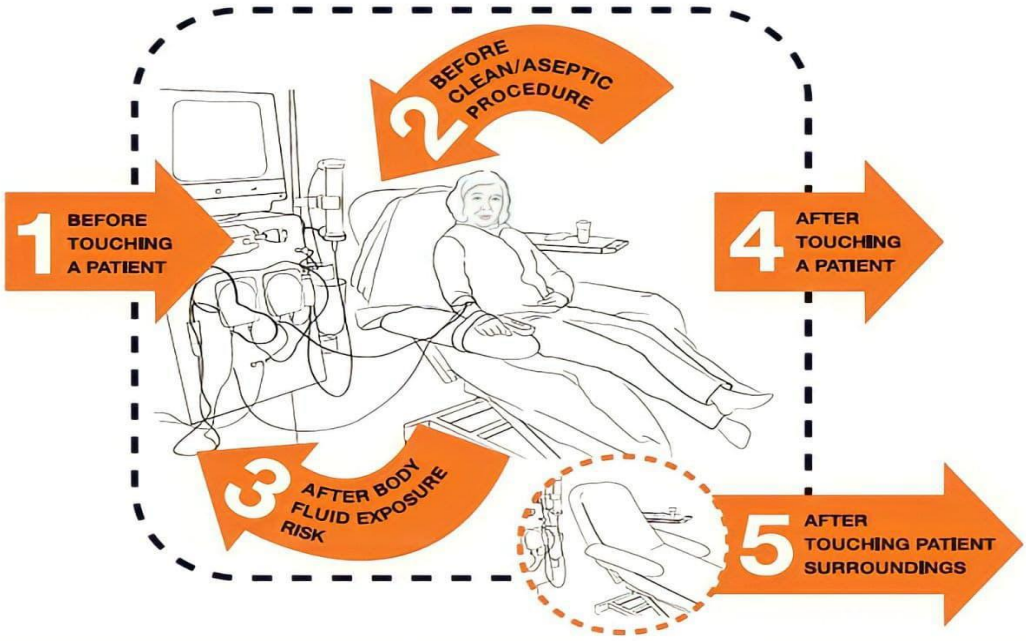

Figure 2.1 Five moments for hand hygiene (WHO, 2009).

Types of hand washing

A. Routine hand washing

Hands are usually cleaned to remove dirt and organic materials and reduce temporary germs using regular soap and warm water for 40 to 60 seconds (Ministry of Health (MOH) / World Health Organization [WHO], 2009).

B. Surgical hand washing

Surgical hand washing removes infectious agents, kills them, and gives a long-lasting effect, which is required before performing invasive or surgical procedures. The hands and forearms are washed with warm water and anti-bacterial soaps (such as chlorhexidine, iodine, iodophor, chloroxylenol, and triclosan) for 3-5 minutes. They are then dried with a sterile towel (MOH/ WHO, 2009).

C. Alcohol-based hand rub

Disinfecting and rubbing the hands to sterilize them with alcohol (ethanol 70%) for 15-30 seconds eliminates microorganisms when the hand is not visibly stained. This process has a long-lasting effect. Alcohol-based hand rub is considered the best standard for implementing hand hygiene in healthcare settings (MOH/ WHO, 2009). Long nails or artificial fingers are banned for HCWs because artificial nails can host gram-negative bacteria and yeasts (Ministry of Health Singapore, 2017).

Hand care

1. Normal skin is the primary means of defense against infection.
2. HCWs must coat whole injuries & scraping by a water-reluctant dressing.
3. Using appropriate cream to maintain the moisture of hands.
4. Avoiding to use personal hand creams because they may interact with sterilizers or disinfectants used for hand hygiene in the hospital (Ministry of Health Singapore, 2017).

2.5.2. Personal protective equipment

HCWs and patients may be protected from infectious agents by using barriers or equipment (gloves, apron, surgical mask, N95 respirator, goggle, and face shields). The use of personal protective equipment does not eliminate infectious agents, and protective gear does not dispense with hand hygiene. Hand hygiene and the use of protection tools complement each other in the fight against infection. Personal protective equipment (PPE) must be used by adhering to the following rules:

1. A vast number of protective equipment must be readily available.
2. Selection of protective equipment must be based on the evaluation of hazards.
3. Protective equipment must be stored in a temperature and moisture-controlled area, as recommended by the manufacturer, and the expiration date must also be checked (CHP, 2018, Last update: June 2020).

Gloves

Gloves are an essential component of PPE because they prevent hands from contacting contaminated sources such as the skin of colonized patients or contaminating with multi-resistant microorganisms, fluids, or blood. They also protect healthcare workers from microbes in hemodialysis units. Gloves can vary in the following characteristics: content (latex, nitrile, vinyl), sterility (sterile or non-sterile), length, and size (only for the wrist or covering the entire forearm) (Pan American Health Organization, 2018).

In hemodialysis centers, gloves are highly recommended since the nursing staff contacts the patient's skin or equipment. When HCWs begin to care for the next patient or move between stations, they should change their gloves and perform hand hygiene after each contact. If a sterile aseptic procedure such as vascular access insertion or catheter handling or manipulation is required, then HCWs should wear the sterile gloves (Adhikari and Attaulhaq, 2019).

Types of gloves

A. Non-sterile gloves

It is a disposable glove for non-invasive procedures, mucous membranes, draining injuries, non-intact skin, or working with materials contaminated with bodily fluids, blood, or secretions (Reid, 2013).

B. Sterile gloves

HCWs use sterile gloves when their hands come into contact with naturally sterile sites, during any surgical or medical intervention, or when they use sterile clinical devices (urinary catheters, wound dressings, central venous line insertion,

lumbar puncture, so on). They wear these gloves only once and preferably near the patient's area so as not to become contaminated; and they must take them off immediately after the end of procedure, and must change their gloves for each new patient, and most importantly, wash their hands after removing and disposing their gloves in the right place (National Health & Medical Research Council [NHMRC], 2019).

C. Reusable gloves (Thick)

Gloves that are reused after sterilization can be used for handling waste or hazardous tools or when cleaning in the hospital (Methods of disinfection of equipment and tools, handling of medical waste, handling of sharps, and use of disinfectants, detergents, and chemicals) (Ministry of Health / WHO, 2009).

Gown

Gowns are often used in combination with additional layers of protection. It is the first portion of the protective gear to be put on. The gown typically covers the whole lower half of the body, including the sides and arms, from the bottom of the neck to mid-thigh. All HCWs must have access to gowns in the correct sizes to protect their whole body. They must not wear their gowns outside of their work area. HCWs must take their gowns from the inside off first, and then carefully wrap them up in order to correctly remove the gown. It is disposed of in a container designed for infectious medical waste to avoid the spread of infection (CDC, 2007, Last update: July 2019).

Types of gown

A. Non-sterile gown

Plastic or single-use gowns are usually made of impermeable materials. The healthcare providers wear them during routine procedures to protect their clothing from potential contamination (MOH/ WHO, 2009; National Center for Disease Control [NCDC], 2020).

B. Sterile gown

Sterile gowns are used when medical interventions that could cause blood or body fluids to splatter require a sterile field. This type of gown is covered and made of materials impermeable to fluid, but an apron is used over it if it is permeable to fluid (NCDC, 2020).

Mask

It is a protective medical equipment used by healthcare workers, patients, and their relatives (visitors) to protect themselves from the spread of pathogenic organisms through sneezing or coughing. The mouth, nose, eyes, and mucous membranes are gateways for pathogens to enter the body. When a person can transmit infectious agents by coughing or sneezing through droplets or air, a respirator should be used to prevent the spread of infection by everyone, especially at close distances (Furrows and Rose, 2014).

Types of mask

A. Surgical mask

A surgical mask protects healthcare providers from inhaling droplet-borne respiratory pathogens. The mask has fluid-resistant properties, as it prevents the spread of pathogens such as chickenpox and meningococcal disease and is used when a person is in close contact with an infected person or within about three feet of this person (Occupational Safety and Health Administration [OSHA], 2009).

B. N95 mask

It is a protective mask for the respiratory system designed to filter out airborne pollutants. It eliminates at least 95% of tiny (0,3 microns) particles, when it is appropriately worn. However, this does not eliminate any possibility of the risk of infection transmission. This mask has specific measurements, and its edges are narrow. It is not used for children because it is large for them. It is not used for adults with a high density of facial hair (a thick beard) because it crosses microbes through the hair (The United State Food and Drug Administration [FDA], 2020).

C. N100 or P3 mask

It is utilized for skin and mucous membrane penetration and pulmonary excretion suction as well as working in laboratory, environments full of microorganisms, and with patients suffering from hemorrhagic fever. It is also employed for a variety of other operations. Due to its high cost, this filter only needs to be used once and can then be accessed at all times after being sterilized and used by the same person. HCWs use three or five surgical masks if they are not accessible for specific activities (CDC, 2020b).

Goggles and face shields

Healthcare providers use them to protect their eyes, noses, and mouths from blood and bodily fluid splashes, particularly during surgical operations such as removal of fluid from the throat and trachea and removal of the catheter. Traditional glasses cannot be used to prevent "blood or bodily fluids" from splattering because they were not intended for this use (James, 2014).

Head cap

The head cap is a protective barrier covering the head that healthcare providers use during surgical procedures to protect the hair from the risk of infection. Healthcare providers' scalps and hair are protected from blood, infectious fluids, and secretions while providing medical services (MOH/ WHO, 2009).

Footwear

Nursing staff and sanitation workers at healthcare institutions utilize these equipment to protect themselves from potentially dangerous sharps, bloodstains, and other potentially contaminated fluids. Impermeable soles are required for using in HD units. Shoe covers may keep shoe-borne pollutants at bay (National Guidelines for Infection Prevention and Control in Healthcare Facilities [NGIPCHF], 2020).

2.5.3. Respiratory hygiene and cough etiquette

Cough etiquette and respiratory hygiene are essential in infection control and prevention measures. They prevent the spread of infections through droplets or air,

so people must sneeze in a particular tissue paper and thrown into a container designated for infectious medical waste; or bend their elbow and sneeze in it by bearing in mind the importance of washing hands. They sterilize themselves after sneezing or coughing or contact with objects contaminated with respiratory secretions (CHP, 2018, Last update: June 2020).

Infection control measures in hemodialysis units must be followed very carefully for people, who cough due to several respiratory illnesses, including influenza and MRSA, or may be infected, in order to avoid the spread of all respiratory infections. Hemodialysis centers should have posters and resources to educate patients about the risks of hemodialysis in order to reinforce precautions (wipes, alcohol hand sanitizer) (Barnes et al., 2010).

2.5.4. Cleaning, disinfection, and sterilization

In healthcare institutions, cleaning, disinfection, and sterilization are key factors in preventing and minimizing the occurrence of healthcare-acquired with infections. There should be a committee of experts made up of people specialized in their fields as well as those specialized in infection control and prevention who take upon themselves the task of providing modern and essential instructions and directions regarding these necessary operations such as collecting, transporting, and storing tools and equipment, then cleaning, disinfecting or sterilizing them. HCWs then store these tools and equipment in designated places for later reuse. Incorrect cleaning, disinfection, and sterilization processes lead to healthcare-acquired infections, such as surgical and industrial ventilation (WHO & Pan American Health Organization [PAHO], 2016).

Hemodialysis is one of the most dangerous departments because of its high infection and blood-borne illness rates. As a result, the cleaning, disinfection, and sterilization techniques employed in other hospital departments are not appropriate. When patients contact with contaminated surfaces and equipment, they are more likely to get infected. The cleaning procedures at a dialysis center are similar to those used in other medical facilities, but the heightened danger of cross-contamination sets this one apart (Arduino et al., 2019; MOH/ WHO, 2009).

Cleaning

The concept of cleaning is a set of practices or processes used to remove foreign bodies such as dust and organic matter from tools and surfaces through water and detergents. Cleaning is a medical concept and is the first step before decontamination and disinfection of organic and inorganic matters. If disinfectants or sterilizers remain on surfaces, they will stick to tools or surfaces, lose effectiveness, and become harmful substances (CDC, 2008, update: May 2019).

Disinfection

Disinfection uses physical or chemical methods to remove pathogenic microorganisms from the body. When comparing disinfection with sterilization, it is considered less lethal because it removes the most prevalent pathogenic microorganisms, not all microbes (such as bacterial spores), by reducing the number of microorganisms to a rate that is neither harmful to health nor dangerous. Disinfection refers to the use of chemical products such as medium-level disinfectants to remove some bacterial spores and plant bacteria, in addition to low-level disinfectants that are used to remove fungi, plant bacteria, and several viruses for no more than 10 minutes (Feidjel, Laalaoui and Sahli, 2017; Pan American Health Organization, 2018).

A synergistic approach to disinfection guarantees that all of the germs on a surface are killed. The CDC recommends that an EPA-registered disinfectant be used for disinfection and sterilization of non-critical surfaces such as the outside of hemodialysis machines and their chairs and beds, as long as they are not contaminated with blood (Barnes et al., 2010).

Sterilization

Sterilization is a vital and necessary process used for surgical procedures and interventions, especially interventions that penetrate sterile sites of the body and kill all types of disease-causing infections, including infectious agents coated with germs. The evaluation process can be carried out by using either chemical or physical methods. Before performing the sterilization process for medical tools and devices, the following necessary instructions must be followed:

1. The instrument or device can withstand this process.
2. Follow the recommendations and guidelines of manufacturer.
3. It is not necessary to sterilize the medical instrument or device.
4. Keep records and dates of sterilization operations for devices or equipment and ensure that they are stored after sterilization (Adam, 2015; Iraqi MOH and USAID, 2011).

2.6. Safe Injection Techniques

Safe and effective injection techniques are essential for preventive measures in infection control and a series of procedures in order to perform safe injections optimally for both patients and healthcare professionals. Injection safety refers to actions intended to avoid spreading infection between patients or nursing staff and avoid damage such as needle-stick injuries. According to the World Health Organization, a safe injection does not injure the patient while also not exposing the nurse to hazards. Patients and nursing staff are at risk of developing dangerous infectious and non-communicable diseases due to unsafe injection procedures (Jabbar and Mohammed, 2021).

Viruses and other pathogens may continue to spread during routine medical procedures due to the primary causes, including incorrect injections, medication vial procedures, and intravenous infusions. Healthcare workers, nurses, and patients are often exposed to acute and chronic viral infections such as hepatitis B, hepatitis C, and human immunodeficiency virus (HIV) due to the incorrect use of unsafe injections. All healthcare providers should pay attention while administering the injection or handling its residue in order to protect patients from punctures or cuts and prevent the spread of infection. This includes the following actions:

1. Avoid using the same syringe to administer medication to many patients at once.
2. Change the needle only when using the same syringe if necessary.
3. Avoid using multiple medications in the same syringe at the same time.
4. Dispose of devices if their packaging is torn or punctured or the expiration date has been exceeded.

5. Preserve medication vials or intravenous bags.
6. Apply standard injection safety procedures when preparing intravenous drugs and administering them to patients.
7. Don't use injections if there are oral medications that have the same effect.
8. To ensure proper health management, and dispose of the used syringes, needles and sharps (CDC, 2019a; CDC, 2019b; Barnes et al., 2010; NCDC, 2020; WHO, 2020d).

2.7. Medical Waste Management

Medical wastes include all harmful and other materials as well as solid, liquid, or gaseous waste resulting from various medical care institutions, laboratories, drug stores, medical research centers, human and veterinary medicine factories and warehouses, veterinary clinics, and home nursing institutions. It is divided into:

a. **Non-hazardous medical waste:** More than 75% of the total waste generated in a hospital contains non-hazardous medical waste that looks like home trash and poses no danger to personnel, and is subjected to disposal process like household trash.

b. **Hazardous medical waste:** Hazardous medical waste constitutes 10%-25% of the total waste produced in hospitals, which can pose health risks because it contains one or more of the following properties (infectious/genotoxic/radioactive/acute) (Al-Hiyaly, Al-Nakkash, Faraj and Kasim, 2019; Garvin, Kuhn and Peters, 2009).

Medical wastes are classified into two main categories: a) biomedical waste, (regarded as infectious or harmful waste), and b) general medical waste. Dialysis membranes, needles, and lines are considered as biomedical waste and should be placed in a particular container. Since dialysis fluid does not directly contact the blood, it is not classified as biomedical waste (Jeon et al., 2018).

Types of medical waste management

Medical waste management is divided into following types:

a. **Contagious waste:** It includes wastes produced as a result of laboratory procedures such as transplants and materials or devices contaminated with blood or other body fluids such as bandages and lab swabs.

b. **Morbid waste (pathological):** The term "anatomical waste" includes a wide range of materials, including skin scraps, organ fragments, and the remains of deceased animals.

c. **Sharp waste:** The term includes syringes, needles, disposable scalpels and blades, damaged vials and ampoules, and so forth...

d. **Chemical waste:** It includes solutions and reagents utilized for the laboratory analyses, purifier, sterilizer, ponderous minerals found in therapeutic tools (e.g., mercury in cracked thermometers), and battery...

e. **Pharmaceutical waste:** It includes unused and expired medical items such as medications, serum, and vaccinations.

f. **Toxic waste:** It includes wastes that cause mutations or genetic changes in patients exposed to them due to their toxic properties, such as chemotherapy wastes.

g. **Radiation waste:** Radionuclide-contaminated items, such as radioactive diagnostic or therapeutic compounds.

h. **Non-hazardous or ordinary waste:** Biological, chemical, radioactive, or physical waste does not pose a threat and they are treated like household waste (MOH/ WHO, 2009; WHO, 2020a).

Medical waste color coding

1. Red bag for highly infectious wastes (garbage).
2. Yellow bag for other contagious, anatomical, and sharp wastes (trash).
3. Brown bag for chemical wastes (medication).
4. Lead containers for radioactive wastes to avoid contamination.
5. Blue bag for chemotherapy wastes.

6. Black bag for non-hazardous medical wastes (household) (Iraqi MOH and USAID, 2011; MOH/ WHO, 2009).

2.8. Special Considerations for Infection Prevention and Control Measures in Hemodialysis Unit

2.8.1. Quality of water treatment and testing in hemodialysis

Water quality is critical to achieve an effective hemodialysis and enhance patient safety. Failure to reach the required water quality can cause profound effects, including increased morbidity and mortality rates among patients. Previous studies and empirical evidence have demonstrated that high-purity dialysis fluid is associated with lower inflammatory markers, reduced systemic inflammation, preservation of residual renal function, reduced tolerance to erythropoietin, and lower rates of cardiovascular disease. A quality system is required that takes into account the governance, planning, servicing, installation, commissioning, water monitoring, and repair of water treatment systems in dialysis centers (Bouhaha, Dammang and Karkar, 2014; HSE-Health Protection Surveillance Centre, 2015).

2.8.2. Vascular access infection

Skin breakdown, erythema, purulent exudates, and loculated fluid are all signs of vascular access infection. Bacteria may spread via the bloodstream if the access site is infected. Bacteremia rates vary based on access method; while catheters have the highest risk, fistulas have the lowest risk. S. aureus, gram-negative bacilli, coagulase-negative staphylococci, fungi, and gram-positive cocci are the most common pathogens that cause vascular access infections (Himmelfarb and Sayegh, 2010).

In hemodialysis patients, vascular access through central venous catheters is the primary risk factor for infection. In contrast to those in other units, hemodialysis patients cannot survive without vascular access. Permanent (tunneled, cuffed) catheters are preferred over temporary (non-tunneled, non-cuffed) catheters because of the decreased infection risk associated with the latter. Permanent catheters have a ten-fold increased risk of infection than catheters that are only used for short periods

(fistulas or grafts). On the other hand, fistulas have a lower risk of infection (Barnes et al., 2010).

2.8.3. Blood borne virus

Diagnostic and research findings in hepatitis infections associated with hemodialysis have demonstrated that transmission is possibly due to ineffective infection prevention measures. Patients undergoing hemodialysis are more likely to get blood-borne virus (BBV) infections such as HBV, HCV, and HIV. Hemodialysis units should have an established protocol for regularly monitoring BBV infections to prevent their spread (CHP, 2018, Last update: June 2020).

A. Hepatitis B virus

Nursing staff know the risk of catching the hepatitis B virus. An infectious risk occurs when biological fluids such as blood, tissue, and other body fluids come into touch with the mucous membranes or inappropriate skin. HBV is highly contagious, spreads rapidly, and can survive outside the body for seven days (NIPCG, Sierra Leone, 2015).

Prevention of hepatitis B virus transmission

Hemodialysis units should take into account these recommendations to avoid the spread of hepatitis B virus:

1. Adherence to all standard precautions is the most efficient strategy to prevent the spread of HBV.
2. Healthcare providers should avoid to use vials multiple times by discarding vials after a single usage.
3. Healthcare providers should clean the hemodialysis machine in for each patient's treatment accordance with the manufacturer's recommendations.
4. Treatment for HIV or HCV patients does not necessitate an isolated area if universal precautions and infection control measures are followed.
5. Nursing staff who are not immunized against HBV, especially those not infected with HBV, should not perform dialysis for patients infected with HBV (Douthwaite et al., 2019).

B. Hepatitis C virus

Direct percutaneous contact with infectious blood is the most efficient way to spread the hepatitis C virus. As in HBV, a chronically infected individual is the main target of HCV transmission. Transfusion history, dialysis time, and the number of transfusions a patient receives are risk factors for hepatitis C infection. Hepatitis B can cause hepatitis C. The incubation for HCV lasts for two to twenty-four weeks, typically symptomless, and slow (Alter, Arduino, Lyerla, Miller and Tokars, 2001; NHMRC, 2019).

Prevention of hepatitis C virus transmission

HCV spreads in hemodialysis units due to infection control violations. Healthcare providers should adhere to the following guidelines to prevent hepatitis C virus transmission:

a. They should evaluate infection control measures and make sure that standard precautions are followed.
b. Any deficiency in infection protection must be addressed as soon as possible.
c. It is ensured that the hemodialysis nursing staff is aware of infection prevention policies and adequately educated to follow such protocols.
d. Hemodialysis patients who test positive for HCV should be tested by following the CDC's recommendations.
e. Any new cases of HCV infection in hemodialysis patients should be reported as soon as possible (Arduino et al., 2019).

C. Human immunodeficiency virus

Between 1985 and 2002, the rate of dialysis facilities in the United States that provided hemodialysis therapy for HIV-infected patients rose; the incidence rate of HIV infection among patients increased from 0,3 percent to 1,5 percent over the same period. Even though the spread of the virus has remained stable over the last decade, the rate of HIV-infected people has increased due to increased number of facilities treating HIV-infected patients (Arduino et al., 2019).

Transmission of HIV occurs through the bloodstream and body fluids that contain blood. Transmission of immunodeficiency viruses can be prevented by various ways to protect against infection, including the following:

1. The proper (uninfected) hemodialysis machine and tools must be handled carefully by sterilizing them well and not using them for immunodeficiency patients.

2. Do not exchange injections between patients.

3. Non-sharing of hydrometers across many patients (Himmelfarb and Sayegh, 2010).

2.9. Training of Infection Prevention and Control Measures

2.9.1. Training of infection prevention and control measures for healthcare professionals

All healthcare professionals (HCPs) must receive training on standard precautions at least once or twice a year, and new ones must receive this training before beginning to work in dialysis facilities. In addition to the fundamental principles and processes for preventing the spread of diseases, such as aseptic procedures and access care, it is necessary to record and evaluate the competence of healthcare professionals (HCPs). There is a need for them to provide information on the following things:

1. Hands should be cleaned optimally.
2. In addition to the proper handling of pharmaceuticals provided to patients, it is essential to wear PPE safely.
3. Bacterial and other microorganism spread methods.
4. Hemodialysis infection control measures and their difference from procedures followed for other healthcare units.
5. It is essential to follow these protocols to keep HBsAg infected patients isolated from healthy ones.
6. Disinfecting and decontaminating surrounding surfaces and instruments according to recommended procedures.

7. Techniques for controlling infection in access site care (Adhikari and Attaulhaq, 2019; Fine and Nissenson, 2016).

2.9.2. Training of infection prevention and control measures for patients

Participation of patients in infection prevention and control programs is critical in making them aware of their role in infection control. Hemodialysis staff must ensure that patients participate in infection prevention programs and comprehend their responsibilities. This is supported with training on the patient's involvement in infection management, such as hand hygiene, respiratory etiquette, wound cleaning and access, awareness of infection signs and symptoms, and prescribed vaccinations. As a result, an informed patient can contribute to infection prevention efforts (Barnes et al., 2010).

Patients should also be trained about the proper management of their vascular access catheters:

1. Patients who have an AV graft or an AV fistula should be evaluated. It is essential to monitor for any signs of blood clots at the cannula sites during dialysis treatment. A patient's vascular access site might get infected or injured during everyday activities such as bathing. After 24 hours, the dressing pad may be removed if there is no soiling or bleeding.
2. When taking a shower in the bathroom, the catheter should be covered with gauze and plaster, and water should not touch it, and handle it with great care to prevent infection.
3. Bathing with temporary uncuffed catheters is not typically suggested for the danger of infection at the exit site and catheter dislocation. Sponges are the favored method (CHP, 2018, Last update: June 2020).

3. MATERIALS AND METHOD

This section describes the materials and method used in this study, including the objectıve of the study; the study design; the setting of the study; the sampling of the study; steps of the study; steps of data collection; statistical analysis and ethical considerations.

3.1. The Objectıve of The Study

The aims of the study to assess knowledge of nurses working in hemodialysis units towards infection control measures.

3.2. The Study Design

The quantitative design (descriptive cross-sectional study) was used to achieve the objectives of this study.

3.3. The Setting of The Study

The study was conducted in Al-Najaf Al-Ashraf City/Al-Najaf Al-Ashraf Health Directorate in Iraq. Hospitals were selected (Al-Sadr Medical City / Kidney Diseases and Transplant Center; Al-Hakim General Hospital / Artificial Kidney). The researcher had selected these hospitals because these hospitals are the only teaching hospitals that contain hemodialysis units in Al-Najaf Al-Ashraf Governorate.

3.4. Sampling of The Study

A non-probability (purposive) sampling was preferred to obtain representative and accurate data from 100 nurses working at hemodialysis units in Al-Najaf Al-Ashraf Governorate hospitals (59 nurses from Al-Sadr Medical City and 41 nurses from Al-Hakim General Hospital).

The sample size (Power analysis): The researcher used the power analysis approach (Cohen's method) to determine the study sample size. This method is applicable due to its variables, including indicators such as significance level, power, and effect size. For correlational or descriptive studies, power is critical in determining the appropriate size of the study's sample. Power is the ability to identify relationships between dependent and independent variables. The minimum acceptable power level for nursing studies is around 80%, and the greater the power, the larger the sample size needed. The effect size was determined based on three levels of effect size: large effect (0.10), moderate effect (0.30), and small effect (0.50). This study's significance level or alpha (α) was 0.05 because 0.05 means that the accepted chance of being wrong is only 5% of the time or less after infinite repeated sampling Grove et al. (2013). The total population size of nurses in the hospitals included in the study was 134 samples, distributed according to (Al-Sadr Medical City / Kidney Diseases and Transplant Center had 78 nurses; Al-Hakim General Hospital / Artificial Kidney had 56 nurses). Thus, according to the following criteria (α=0.05, effect size=0.30, confidence level 95% and power=0.90), a suitable size for the sample (n = 97) is required to conduct the current study. However, the researcher included 100 patients in this study, which improved the study's power to the maximum attainable level. Because as the sample size increases, the study's power increases proportionately.

3.4.1. Inclusion criteria

The researcher used the following criteria in determining the participants and mainly excluded nurses not meeting these criteria:

1. The consent of all nursing staff working in hemodialysis unit to participate in the study was obtained.

2. All nursing staff members working in hemodialysis unit who had an experience of at least one year were included.

3.4.2. Exclusion criteria

Some participants were excluded from the study for various reasons, including nurses with certain medical conditions, such as COVID-19, and long

vacations, such as study leave and maternity leave, and who did not respond to the study because they did not want to.

3.5. Steps of The Study

The study plan of the research was implemented as follows:

3.5.1. Assessment of nursing staff's knowledge about infection preventıon and control measures in the hemodialysis units

The present study was conducted to assess the nursing staff's knowledge of infection control measures in hemodialysis unit. The study included (100) nurses who were working in hemodialysis units (59 nurses working in Al-Sadr Medical City and 41 nurses working in Al-Hakim General Hospital).

3.5.2. Construction of the study

This study was designed and constructed according to the results of the assessment of the knowledge of nursing staff working in hemodialysis units about infection control measures and through a comprehensive literature review concerning the concept of infection control measures and guidelines for infection control and prevention and based on World Health Organization and Center for Diseases Control and Prevention.

3.5.3. Data collection form

After obtaining approval for the study, the researcher adopted and developed a data collection tool (Rajih Q., 2020) to achieve the study objectives. It consists of two following parts (Appendix A1, A2):

Part I: Socio-demographic Information of The Nurses.

This part (Appendix A1, A2) includes eleven questions about socio-demographic information of the nurses such as age, gender, level of education, residence, marital status, workplace, years of experience in hospitals, years of experience in hemodialysis unit, participation in training courses on hemodialysis units, participation in training courses on infection control measures, and doses of the hepatitis vaccine they got.

Part II: Knowledge of the Nurses Working in Hemodialysis Units about Infection Control Measures.

This part was prepared by the researcher (Rajih, 2020) to evaluate the knowledge of the nurses working in hemodialysis units about infection prevention and control measures. It consisted of 39 multiple-choice questions (Appendix A1, A2).

This data collection tool covered the relevant points about the main content of the study. The number of correct answers was used to measure the level of knowledge of each nurse. They were rated as 2 points for correct answer and 1 point for incorrect answer.

This scale was designed and developed by the researcher (Rajih, 2020), who conducted his study on it in the Republic of Iraq / Al-Diwaniyah Governorate / Al-Diwaniyah Teaching Hospital for his research entitled "Effectiveness of an education program on nursing staffs' knowledge about infection control measures at an intensive care unit in Al-Diwaniya teaching hospital", where the researcher Rajih, 2020 presented it to a committee of experts composed from eleven faculty members in Iraqi universities/faculties of nursing who have more than ten years of teaching experience in their field of specialization at Baghdad and Al-Ameed Universities. He determined that Cronbach's alpha coefficient was 0,91.

Reliability for the current study questionnaire: The concept of reliability refers to the consistency and dependability of a research instrument used to quantify a variable. The internal consistency reliability/alpha Cronbach approach is used to assess of knowledge of nurses working in hemodialysis units toward infection control measures. The reliability was calculated using Microsoft Excel; moreover, the results were validated using the SPSS Program version 20's reliability analysis. Additionally, the dependability of the data may be determined using Pearson's Correlation Formula (r):

$$r = \frac{n\sum XY - (\sum X)(\sum Y)}{\sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

n= (number of instances, x=a participant's rating of variable X), y= (a person's rating of variable, Y), r= (correlation value of the factors x and y), (∑) means summation.

In addition, the sample completed the scale twice over a two-week interval (test-retest). The ICC between the two administrations was 0.97 (95% CI = 0.88 – 0.99). The internal consistency of the 39-items Scale was Cronbach's alpha = 0.76. ICC: Intraclass Correlation Coefficient; CI: Confidence Interval.

3.6. Steps of Data Collection

The data collection process was carried out using the questionnaire between first of March 2022 and ended on the thirtieth of April 2022. The consent of all the participants (100 nurses) was obtained to participate in the study and complete the questionnaire. The researcher held interviews individually with the nurses through the structured interview method using the Arabic version of the questionnaire. It took approximately 15-30 minutes for each subject to complete the interview.

3.7. Statistical Analysis

The data were analyzed using Statistical Package for Social Sciences (SPSS) version 20 and Microsoft Office 2016 (Word and Excel). The following statistical analysis methods were used for analyzing the results of the study:

A. Tables (Numbers (N) and Percentages (%)).

B. Summary statistic tables including (Mean and Standard Deviation (SD)).

C. Scoring Study (Mean of Scores): In nurse levels of knowledge: the assessment was done using the cutoff point equal to 0,33, and the knowledge levels were determined as follows: Poor knowledge (mean 1-1,33), Moderate knowledge (mean 1,34-1,67), and Good knowledge (mean 1,68-2).

D. T-test (paired sample T-test) to determine the mean difference between the nursing staffs' knowledge responses at two levels of measurements of the study.

E. A Chi-Square test for measuring the association between the study variables according to their type.

F. Pearson's Correlation Coefficients to determine the reliability of the study instrument by finding the value of Cronbach's alpha coefficient.

3.8. Ethical Considerations

An approval (dated 28.12.2021) was obtained from the Ethics Committee of Çankırı Karatekin University (Appendix B). Another approval (dated 9.2.2022) was obtained from the Ethical Committee for Scientific Research Al-Najaf Health Directorate in the Iraqi Ministry of Health in Al-Najaf city after obtaining the permissions of the hemodialysis units in the hospitals of Al-Najaf city (Al-Sadr Medical City and Al-Hakim General Hospital) (Appendix C). In order to obtain official approval for conducting the study, the researcher provided the Ministry of Health in Iraq with a complete study description that included the aims and methods. Respecting the participant's values and dignity is one of the essential rules to follow when acquiring data.

On 7.2.2022, the researcher's approval (Appendix E) (Rajih, 2020) was obtained to use his research scale entitled "Effectiveness of an education program on nursing staffs' knowledge about infection control measures at an intensive care unit in Al-Diwaniyah teaching hospital," which was conducted in the Republic of Iraq / Al-Diwaniyah Governorate / Al-Diwaniyah Teaching Hospital.

The researcher obtained written informed consent from each nurse. The researcher informed the participants that their participation in the study was entirely voluntary and their information would be used solely for scientific objectives. He assured them that he would keep their data confidential during and after the study (Appendix D).

4. RESULTS

This section explains the analysis of statistical information after processing and tabulation. It then presents the results according to the study's objectives to assess the nurse's knowledge of infection control measures at the hemodialysis units. And to identify the relationship between the nurse's levels of knowledge and socio-demographic characteristics of age, gender, level of education, residence, marital status, workplace, years of experience in hospitals, years of experience in hemodialysis unit, participation in training courses related to hemodialysis units, participation in training courses related to infection control measures, and you took doses of the hepatitis vaccine.

Table 4.1 shows the socio-demographic information of the participants. According to the table, the most of the participants were aged between 25 and 29 years, a great majority (62%) of them were female, and 93% were living in urban areas. When examining educational level, the study's findings revealed that most of the participants (48%) had a bachelor's degree in nursing. Regarding the years of experience in hospitals, it was found that most of the nurses (45%) had an experience of 4 to 6 years in hospitals. In terms of participating training courses on hemodialysis units and infection control measures, the study's findings revealed that the majority (68%) of the nurses participated in training courses, and the majority (56%) of these courses were located in Iraq.

Table 4.1: The statistical distribution of the participants' socio-demographic information.

Socio-demographic information	Rating and Intervals	N	%
Age groups (Years)	<= 24	17	17
	25-29	47	47
	30-34	13	13
	35-39	12	12
	40 and more	11	11
	Mean ± SD	30,21 ± 7,6	
Gender	Male	38	38
	Female	62	62
Residence	Urban	93	93
	Rural	7	7
Marital Status	Single	32	32
	Married	68	68
Level of education	Nursing school	17	17
	Nursing Institute	26	26
	Nursing Bachelor	48	48
	Postgraduate in Nursing	9	9
Workplace	Al-Sadr Medical City / Kidney Diseases and Transplant Center.	59	59
	Al-Hakim General Hospital / Artificial kidney.	41	41
Experience in hospitals (Years)	<= 3	26	26
	4 - 6	45	45
	7 - 9	5	5
	10 - 12	5	5
	13 and More	19	19
	Mean ± SD	6,9 ± 6,3	
Experience in hemodialysis unit (Years)	<= 3	42	42
	4 - 6	36	36
	7 - 9	4	4
	10 - 12	9	9
	13 and More	9	9
	Mean ± SD	5,15 ± 5,1	
You took the full doses of the hepatitis vaccine	I took it	76	76
	I didn't take it	19	19
	I don't want to take the vaccine	5	5
Participate in training courses related to hemodialysis units	Yes	68	68
	No	32	32
Where Participate in training courses related to hemodialysis units	No	32	32
	Inside Iraq	56	56
	Outside Iraq	0	0
	Inside and Outside Iraq	12	12
Number of training courses in hemodialysis units	<= 2	84	84
	3 - 4	14	14
	5 and More	2	2
	Mean ± SD	1,27 ± 1,3	
Duration of training courses in hemodialysis units (Days)	<= 10	72	72
	11 - 25	16	16
	26 - 40	8	8
	41 and More	4	4
	Mean ± SD	9,87 ± 12,85	

Table 4.1: The statistical distribution of the participants' socio-demographic information (continuing).

Socio-demographic information	Rating and Intervals	N	%
Participate in training courses related to infection control measures	Yes	71	71
	No	29	29
Where Participate in training courses related to infection control measures	No	29	29
	Inside Iraq	63	63
	Outside Iraq	0	0
	Inside and Outside Iraq	8	8
Number of training courses in infection control measures	<= 2	86	86
	3 - 4	11	11
	5 and More	3	3
	Mean ± SD	1,26 ± 1,28	
Duration of training courses in infection control measures (Days)	<= 10	81	81
	11 - 25	11	11
	26 - 40	5	5
	41 and More	3	3
	Mean ± SD	8,68 ± 11,8	
Total		100	100%

Table 4.2 shows the assessment of the study sample responses according to questionnaire items. The responses were poor for items number 6, 10, 15, 16, 31, 32, and 37, moderate for items number 1, 2, 4, 5, 7, 8, 9, 11, 12, 13, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30, 33, 34, 36, and 38 and good for items number 3, 14, 24, 25, 35, and 39.

Table 4.2: Assessment of nurses' levels of knowledge regarding infection control measures in a hemodialysis unit according to questionnaire items.

Items	Result classes	N	%	Mean ± SD	Ranting
Q1: Nosocomial Infection or (Healthcare-associated Infection) is an infection that a patient acquires while entering a hospital or primary health care center and appears after the passage of …….	Correct Incorrect	62 38	62 38	1,62 ± 0,49	81%
Q2: The primary purpose of infection control measures is to …	Correct Incorrect	65 35	65 35	1,65 ± 0,48	82,5%
Q3: What is the first element for fighting an infection?	Correct Incorrect	77 23	77 23	1,77 ± 0,42	88,5%
Q4: Chain of Infection is a method for describing how the infection is transmitted, and the most critical link is ……	Correct Incorrect	59 41	59 41	1,59 ± 0,49	79,5%
Q5: An example of indirect contact with a pathogen is ……	Correct Incorrect	36 64	36 64	1,36 ± 0,48	68%
Q6: ..... is the pathway for pathogenic microbes to enter the body of people exposed to infection?	Correct Incorrect	31 69	31 69	1,31 ± 0,46	65,5%
Q7: It is considered one of the most common methods of spreading infection in hospitals ……	Correct Incorrect	36 64	36 64	1,36 ± 0,48	68%

Table 4.2: Assessment of nurses' levels of knowledge regarding infection control measures in a hemodialysis unit according to questionnaire items. (Continuing).

Items	Result classes	N	%	Mean ± SD	Ranting
Q8: ..... is the most effective strategy for reducing healthcare-associated infections.	Correct Incorrect	36 64	36 64	1,36 ± 0,48	68%
Q9: The most important step in the hand washing process is ……	Correct Incorrect	64 36	64 36	1,64 ± 0,48	82%
Q10: Harmful organisms are removed from the hands with antiseptic substances (alcoholic solution) …….	Correct Incorrect	15 85	15 85	1,15 ± 0,36	57.5%
Q11: Surgical hand washing takes time …….	Correct Incorrect	52 48	52 48	1,52 ± 0,50	76%
Q12: Routine handwashing with soap and water takes time …….	Correct Incorrect	34 66	34 66	1,34 ± 0,48	67%
Q13: The "first moment" in the "five moments of hand hygiene" occurs when?	Correct Incorrect	48 52	48 52	1,48 ± 0,50	74%
Q14: ……..... are disposable gloves used for deep interventions and penetration of the body's defenses such as the skin, mucous membranes, and various tissues.	Correct Incorrect	69 31	69 31	1,69 ± 0,46	84,5%
Q15: ..... used during routine procedures that may lead to clothing contamination.	Correct Incorrect	25 75	25 75	1,25 ± 0,44	62,5%
Q16: Etiquette of coughing / respiratory hygiene include ……	Correct Incorrect	28 72	28 72	1,28 ± 0,45	64%
Q17: The mask used to protect health care providers from inhaling airborne pathogens is …	Correct Incorrect	51 49	51 49	1,51 ± 0,50	75,5%
Q18: The surgical mask is used when the nurse is in contact and close to the patient with a distance	Correct Incorrect	35 65	35 65	1,35 ± 0,48	67,5%
Q19: The correct arrangement for removing personal protective equipment is ……	Correct Incorrect	43 57	43 57	1,43 ± 0,50	71,5%
Q20: The best way to repack the needle after using it is ……	Correct Incorrect	48 52	48 52	1,48 ± 0,50	74%
Q21: Firstly, upon exposure to a needle stick injury or injury with any sharp object …….	Correct Incorrect	50 50	50 50	1,5 ± 0,50	75%
Q22: Vaccinations are available to prevent …….	Correct Incorrect	66 34	66 34	1,66 ± 0,48	83%
Q23: Tetanus vaccination is in the form of ……	Correct Incorrect	49 51	49 51	1,49 ± 0,50	74,5%
Q24: Highly contaminated waste is placed in a color bag or plastic container …	Correct Incorrect	75 25	75 25	1,75 ± 0,44	87,5%
Q25: Infectious and sharp wastes are placed in a colorful plastic container or bag …….	Correct Incorrect	82 18	82 18	1,82 ± 0,39	91%
Q26: In the event of an error in placing hazardous medical waste in the bag or the packaging not designated for it, it must ……	Correct Incorrect	58 42	58 42	1,58 ± 0,50	79%
Q27: Routine cleaning of tools and surfaces should be carried out, with wearing an apron and gloves, using …….	Correct Incorrect	57 43	57 43	1,57 ± 0,50	78,5%
Q28: ..... is the process of removing and destroying harmful organisms to a minimum so that tools and equipment are safe to use	Correct Incorrect	60 40	60 40	1,6 ± 0,49	80%

Table 4.2: Assessment of nurses' levels of knowledge regarding infection control measures in a hemodialysis unit according to questionnaire items. (Continuing).

Items	Result classes	N	%	Mean ± SD	Ranting
Q29: Medical sterilization refers to……	Correct Incorrect	65 35	65 35	1,65 ± 0,48	82,5%
Q30: ..... is one of the most common infections associated with health care in intensive care units.	Correct Incorrect	61 39	61 39	1,61 ± 0,49	80,5%
Q31: Pulmonary Tuberculosis is transmitted by ……	Correct Incorrect	28 72	28 72	1,28 ± 0,45	64%
Q32: Meningitis is transmitted by	Correct Incorrect	22 78	22 78	1,22 ± 0,42	61%
Q33: The bed should be raised from the patient's head at an angle of ..... to reduce the respiratory infection of a patient connected to the artificial ventilation system unless there are medical contraindications.	Correct Incorrect	63 37	63 37	1,63 ± 0,49	81,5%
Q34: The peripheral venous catheter (Cannula) is removed in a state that no signs of intravenous infection appear after	Correct Incorrect	37 63	37 63	1,37 ± 0,49	68,5%
Q35: Gloves should be worn before placing the patient's urinary catheter from a type …	Correct Incorrect	70 30	70 30	1,7 ± 0,46	85%
Q36: Intestinal, gallbladder, mouth, and esophageal wounds are considered …	Correct Incorrect	44 56	44 56	1,44 ± 0,50	72%
Q37: The humidifier of the artificial ventilation device must be replaced after ..... from use it.	Correct Incorrect	33 67	33 67	1,33 ± 0,47	66,5%
Q38: The same hoses can be used for the patient's artificial ventilation device for a period ranging from ..... provided it is kept in good condition.	Correct Incorrect	37 63	37 63	1,37 ± 0,49	68,5%
Q39: The contents of the Vacuum Drain collection device should be replaced or emptied every ……	Correct Incorrect	77 23	77 23	1,77 ± 0,42	88,5%
Total				1,499 ± 0,15	74,95%

*** Abbreviations: SD=Standard Deviation; poor (mean of scores 1-1,33), moderate (1,34-1,67), good (1,68 and more), cutoff point (0,33), n= number, %= percentage.

Table 4.3 shows the assessment of the nurses' levels of knowledge of infection prevention measures in hemodialysis units. Responses for all the participants were average (moderate) with a rate of 74,95% with a statistical (Mean± Standard Deviation) of scores (1,499±0,15).

Table 4.3: Assessment of nurses' levels of knowledge concerning infection control measures in hemodialysis unit according to overall questionnaire items.

Overall Items	Level	Frequency (N)	%	Mean	SD	Rating
Nurses' levels of knowledge regarding infection control measures	Poor	9	9%	1,499	0,15	74,95%
	Moderate	77	77%			
	Good	14	14%			
Total		100	100%			

***Abbreviations: SD=Standard Deviation; poor (mean of scores 1-1,33), moderate (1,34-1,67), good (1,68 and more), cutoff point (0,33).

Table 4.4 shows a statistically significant correlation between the nurses' levels of knowledge and socio-demographic information. Their level of knowledge was highly correlated with the level of education, the number of training courses on infection control measures, and the duration of training courses on infection control measures (Mean scores= 1,54, 1,51, and 1,57, respectively) (P<0,001). Their level of knowledge was highly correlated with the participation in training courses on hemodialysis units with mean score of 1,48 (P=0,017). Their level of knowledge was highly correlated with the participation in training courses on hemodialysis units inside and outside Iraq (the increased participation affected the correlation with the knowledge of the nurses) with mean score of 1,51 (P=0,046). Their level of knowledge had a high correlation with participation in training courses on infection control measures (the increased participation affected the correlation with the knowledge of the nurses) with mean score of 1,51, (P = 0,036). The nurses' levels of knowledge had a high correlation with participation in training courses on infection control measures inside and outside Iraq (the increased participation affected the relationship with the knowledge of the nurses) with mean score of 1,56 (P = 0,007).

Table 4.4: Relationship between socio-demographic data and nurses' levels of knowledge according to socio-demographic categories in hemodialysis units.

Socio-demographic Information	Variables Classes	N	%	Nurses' levels of knowledge			Mean	SD	Chi-square ($\chi 2$)	df	P
				Poor	Moderate	Good					
Age Groups (Years)	<= 24	17	17	0	17	0	1,5	1,14	11,74	8	0,163
	25 - 29	47	47	4	36	7					
	30 - 34	13	13	1	9	3					
	35 - 39	12	12	1	8	3					
	40 and More	11	11	3	7	1					
Gender											
	Male	38	38	5	28	5	1,5	1,16	1,296	2	0,523
	Female	62	62	4	49	9					
Residence											
	Urban	93	93	8	72	13	1,49	1,16	0,264	2	0,876
	Rural	7	7	1	5	1					
Marital Status											
	Single	32	32	3	26	3	1,49	1,15	0,837	2	0,658
	Married	68	68	6	51	11					
Level of education	Nursing school	17	17	4	13	0	1,54	0,08	66	6	<0,001
	Nursing Institute	26	26	2	23	1					
	Nursing Bachelor	48	48	3	41	4					
	Postgraduate in Nursing	9	9	0	0	9					
You took the full doses of the hepatitis vaccine	I took it	76	76	6	57	13	1,46	0,14	3,258	4	0,516
	I didn't take it	19	19	2	16	1					
	I don't want to take the vaccine	5	5	1	4	0					

Table 4.4: Relationship between socio-demographic data and nurses' levels of knowledge according to socio-demographic categories in hemodialysis units.

(Continuing)

Socio-demographic Information	Variables Classes	N	%	Nurses' levels of knowledge			Mean	SD	Chi-square ($\chi 2$)	df	P
				Poor	Moderate	Good					
Workplace	Al-Sadr Medical City / Kidney Diseases and Transplant Center	59	59	4	43	12	1,49	0,13	5,23	2	0,073
	Al-Hakim General Hospital / Artificial kidney	41	41	5	34	2					
Experience in hospitals (Years)	<= 3	26	26	2	23	1	1,52	0,15	9,98	8	0,266
	4 - 6	45	45	3	35	7					
	7 - 9	5	5	0	4	1					
	10 - 12	5	5	0	3	2					
	13 and More	19	19	4	12	3					
Years of experience in hemodialysis unit	<= 3	42	42	5	36	1	1,52	0,16	13,58	8	0,093
	4 - 6	36	36	1	28	7					
	7 - 9	4	4	0	3	1					
	10 - 12	9	9	2	5	2					
	13 and More	9	9	1	5	3					
Participate in training courses related to hemodialysis units	Yes	68	68	5	48	14	1,48	0,13	8,18	2	0,017
	No	32	32	4	29	0					
Participants in training courses related to hemodialysis inside and outside Iraq	No	32	32	3	29	0	1,51	0,19	9,7	4	0,046
	Inside Iraq	56	56	5	41	10					
	Outside Iraq	0	0	0	0	0					
	Inside and Outside Iraq	12	12	1	7	4					

Table 4.4: Relationship between socio-demographic data and nurses' levels of knowledge according to socio-demographic categories in hemodialysis units.

(Continuing)

Socio-demographic Information	Variables Classes	N	%	Nurses' levels of knowledge			Mean	SD	Chi-square ($\chi 2$)	df	P
				Poor	Moderate	Good					
The number of hemodialysis courses	<= 2	84	84	6	69	9	1,57	0,19	9,331	4	0,06
	3 - 4	14	14	3	7	4					
	5 and More	2	2	0	1	1					
The duration of hemodialysis courses	<= 10	72	72	6	59	7	1,53	0,19	9,4	6	0,148
	11 - 25	16	16	2	11	3					
	26 - 40	8	8	0	6	2					
	41 and More	4	4	1	1	2					
Participate in training courses related to infection control measures	Yes	71	71	6	51	14	1,51	0,18	6,6	2	0,036
	No	29	29	3	26	0					
Participants in training courses related to infection control measures inside and outside Iraq	No	29	29	3	26	0	1,56	1,14	14,09	4	0,007
	Inside Iraq	63	63	5	48	10					
	Outside Iraq	0	0	0	0	0					
	Inside and Outside Iraq	8	8	1	3	4					
The number of infection control measures courses	<= 2	86	86	7	72	7	1,51	0,13	20,8	4	<0,001
	3 - 4	11	11	2	4	5					
	5 and More	3	3	0	1	2					

Table 4.4: Relationship between socio-demographic data and nurses' levels of knowledge according to socio-demographic categories in hemodialysis units. (Continuing)

Socio-demographic Information	Variables Classes	N	%	Nurses' levels of knowledge			Mean	SD	Chi-square ($\chi 2$)	df	P
				Poor	Moderate	Good					
The duration of infection control measures courses	<= 10	81	81	7	70	4	1,57	0,20	31,9	6	<0,001
	11 - 25	11	11	1	4	6					
	26 - 40	5	5	1	2	2					
	41 and More	3	3	0	1	2					
Total		100	100%	9	77	14					

***Abbreviations: P-value=probability value was calculated by using Chi-square ($\chi 2$); *= Significant if the p-value <=0,05, **= High Significant if the p-value <=0,01; and there is no significant difference if the letters are the same.

5. DISCUSSION

The current study aims to assess the knowledge of nurses working in hemodialysis units toward infection control measures.

During this section, the study's results will be discussed based on the main objectives of the research and according to the available literature and relevant studies, and thus will be systematically organized excellently.

First Part. Discussion of the socio-demographic information of the nurses.

The results of the current study showed that the majority of the nurses ranged mostly from 25 to 29 years. This result was supported by the studies of Rajih (2020) and Ayenew et al. (2018), who reported that the majority of the participants were similar in age range. On the other hand, in the study by Jabbar and Mohammed (2021), age of most of participants was different from the age range in the present study. The researcher demonstrated that the hemodialysis unit needs 25 to 29-year-old nurses since they are more mature than other age groups.

When the gender of the nurses, it was found that a great part of the participants was female (62%). This result was confirmed by the study by Gharib et al. (2022), which found that most of the participants were female. Unlike, Athbi and Mohammad (2012), determined that the participants were mostly male. Moreover, in the study of Uoda (2019), it was determined that all participants were male. The researcher indicated that females are the dominant in each study, as he explained that females would need to work in hemodialysis units where they can perform jobs that require hard work because of the large number of female patients in those units.

Concerning the nurses' residence place, it was found that a high percentage of the participants (93%) were residing in the urban areas like city. This finding is not compatible with the study by Ibrahim, Salem and Soliman (2021), who found that the majority of the participants were living in rural cities. In hemodialysis units in cities, the majority of their nursing staff were residing in urban cities due to the possibility

of emergency cases requiring nursing staff throughout the day. In addition, when examining nurses' marital status, it was found that most of the participants were married (68%). This study is compatible with the study by Hassan and Faris (2016), which showed that the percentage of married nurses was high. Regarding the workplace of the participants, the results of the study showed that participants from dialysis units in Al-Sadr Medical City Hospital (59%) were more than participants from hemodialysis units in Al-Hakim General Hospital (41%). These results are compatible with the study of Hassan and Fares (2016), where they indicated that the percentage of nursing staff working in Al-Sadr Medical City Hospital was more than in those working in Al-Hakim General Hospital. Al-Sadr Medical City Hospital is considered as one of the most critical health institutions in Al-Najaf city and contains 434 beds, followed by Al-Hakim General Hospital with 230 beds.

When it comes to the educational level, the findings of the study revealed that most of the participants had a bachelor's degree from the Nursing Faculty (48%). It is compatible with the study by Akhere, Alice, Grace and Ikponwonsa (2013), in which most of the participants graduated from the faculty of nursing. In the study conducted by Abozead, Azer and Morkes (2018), in Egypt, more than two-thirds of nurses had a diploma of nursing institute. The rate of participants in the study was high among those with bachelor and postgraduate degrees in nursing. This has led to increased knowledge due to these groups' higher theoretical and practical aspects of infection control measures.

When examining duration of working in the hospitals, it was determined that the majority of the participants (45%) were working in the hospitals for 4 to 6 years. A similar study by Bakey (2012) reported that most of the participating nurses had an experience of 1 to 5 years in working in hospitals. Regarding duration of working in hemodialysis units, the majority of the nurses included in the current study (42%) had an experience of less than or equal to three years in working in hemodialysis units. The study's findings are compatible with Albaghdadi et al., (2020), which determined that most of nurses had an experience of 1 to 3 years in hemodialysis units. Durations of working in hospitals and hemodialysis units play an important role in improving the knowledge and practices of the nursing staff; and because the majority of the participants were between the ages of twenty-five and twenty-nine

years old. Most had an average experience of four to six years, so they required more time and practical and theoretical training in the fields of hemodialysis and infection control measures.

When analyzing the hepatitis vaccinations of the nurses, it was found in the present study that 76% of them were vaccinated, which indicates their excellent knowledge of vaccines. It is compatible with the study by Hasandokht, Joukar, Mansour-Ghanaei, and Naghipour (2017), which found that most of nurses were vaccinated with full doses of hepatitis vaccines. It differs from the study by Aarah-Bapuah, Kombat, Konlan, and Wuffele (2017) and Shalal, Hameed and Eidan (2021), which reported that most of the nursing staff did not get the hepatitis vaccine in all of doses. This is due to the nursing staff's lack of knowledge about the importance of vaccination against hepatitis virus and its prevention.

Concerning the participation of the nursing staff in training courses on hemodialysis units, the study's findings indicated that 68% of the nursing staff participated in training courses on hemodialysis units, 56% participated in training courses on hemodialysis units within Iraq, 84% participated in several courses less than or equal to two courses, and 72% of them participated in the training courses of ten days. The results of the study are not compatible with those of Ibrahim, Ismail and Ouda (2019), who found that most of the nursing staff did not participate in training courses on hemodialysis units. The researcher indicated that the nursing staff's active participation in dialysis training courses improved their specific knowledge and provided the best practices and skills for the patients regarding implementing preventative measures.

Regarding the participation of the nurses in training courses on infection prevention and control measures, the study revealed that the great majority of them (71%) participated in training courses on infection prevention and control measures, and 63% participated in training courses inside Iraq. 86% of the nurses participated in training courses of less than or equal to two courses. 81% of the nurses received training courses in a period of≤ ten days. The results of the study are different from those of Jabbar and Mohammed (2021)'s study, who reported that most of the nurses did not receive training courses in this field; in addition, another study conducted by Ayed, Eqtait, Fashafsheh, and Harazneh, (2015) in Palestine to evaluate the level of

knowledge and practices on infection control among nurses in Palestine Governmental Hospital revealed that the majority of nurses did not participate in training courses on infection control measures. This is due to how weak nursing training is, and nurses overlooking the importance of learning about infection control measures. Participation of nursing staff in infection control training courses in hemodialysis units is critical to prevent infection transmission between hemodialysis staff and patients including blood-borne infection and virus transmission. Nursing staff must be trained by participating in infection control training courses and implementing in the function of the infection control nurse in these units.

Second Part. Discussion of the study sample's assessment of nurses' levels of knowledge about infection control measures at a hemodialysis unit, according to the study sample.

The study mainly consisted of one study to assess the knowledge of infection prevention and control measures among nurses working in hemodialysis units.

The study's findings showed that the participants had average (moderate) knowledge about infection control measures, 74,95%, which means that the nurses did not have a very high level of knowledge regarding infection prevention measures in the hemodialysis units. The large majority of the nursing staff didn't participate in training courses on infection control measures in hemodialysis units.

These findings are compatible with those of studies conducted by Athbi and Mohammed (2012) and Jabbar and Mohammed (2021), reporting that the education program effectively improved the knowledge of the participating nurses. Another study by Elashir, Maghraby, Mahmoud and Yousef (2019) indicated that implementing education programs significantly improved the nurse's knowledge about infection control measures. The researcher indicated that health and education officials should improve the knowledge and practices of training activities about infection control measures for healthcare workers, especially nursing staff working in hemodialysis units, by activating preventive infection control programs and adhering to World Health Organization and Center for Disease Control guidelines.

Another study performed in the Republic of Korea by Chun, Kim, and Park (2012) confirmed that the program developed for hemodialysis nurses positively

affected the knowledge and practices of hemodialysis nurses. This means that theoretical and practical training programs on infection control procedures in hemodialysis units are of primary importance in improving the skills of nursing staff through the application of infection control guidelines such as washing hands, wearing protective equipment, isolating medical waste, sterilization, and cleaning to reduce the risk of infection for the patient and the staff working in those units and the community.

Third Part. Discussion of the relationship between socio-demographic information and nurses' knowledge levels according to hemodialysis units' socio-demographic categories.

The study revealed a high statistically significant correlation between the level of knowledge of the nurses and their socio-demographic information.

The study indicated a statistically significant correlation between the nurses' knowledge level and education level (p-value: < 0,001). The study also showed a high correlation between nurses who had postgraduate studies in nursing (Masters' and Doctorate in Nursing), as they had good knowledge. This finding is compatible with the study by Jabbar and Mohammed (2021), which found a highly statistically significant correlation between the education level and the knowledge of the nursing staff. The findings contradicted with Bayoumi and Mahmoud (2017), who discovered a high-level positive correlation between nurses' total practice and their data. The study found no statistical correlation between nurses' knowledge and personal data after applying for the educational program.

The study's results also showed a statistically significant correlation between the knowledge of the nurses and the variable of participating in training courses on hemodialysis unit ($p<0,05$). A statistically significant correlation was found between the knowledge of the nurses and the training courses on hemodialysis unit inside and outside Iraq ($p<0,05$). This indicated that participation in training courses on hemodialysis units improved nurses' knowledge of infection prevention and control measures. These results are not compatible with the study by Ibrahim et al., (2019) who revealed that two-thirds of the nursing staff did not participate in training courses specialized in hemodialysis. The researcher explains a significant correlation

between the hemodialysis training courses and infection control procedures and their positive effect on the knowledge of the nursing staff working in those units.

When it comes to participation in training courses on infection control and prevention measures, it was found that there was a statistically significant correlation between the knowledge of nurses and this variable ($p<0,05$). The study also showed a statistically significant correlation between the knowledge of the nurses and the participation in training courses on infection control measures inside and outside Iraq ($p<0,05$). The knowledge of the nurses was statistically significantly correlated with the number of courses and the duration of those training courses ($p<0,05$). This study is compatible with the study entitled "Knowledge, Attitude, and Practice of Standard Infection Control Precautions by Hospital Staff in Two Class III Hospitals in Nigeria" conducted by Adetunji et al., (2015) in the Nigeria Republic which indicated that most of the nursing staff attended training courses on infection control. These results contradict with the results of the study by AL-Kerity and Naji (2017), who revealed that most of the participants did not attend training courses on infection control because the majority of the participants were newly appointed to the job, they were not well experienced, and there was lack of educational activities in these institutions.

When examining age groups, gender, residence, marital status, getting the hepatitis vaccine, workplace, years of experience in hospitals, and years of experience in hemodialysis units, the results showed no statistical significance correlation between the nurses' socio-demographic information and level of knowledge. But logically, years of experience in hospitals and hemodialysis units should have an essential role in infection control and prevention measures; this result may be because the nursing staff was participating in the study in the hemodialysis unit, 64% of newly hired employees with an average age of fewer than 29 years may not rely on evidence-based practices or updated references in their practices. These results are compatible with the study conducted by Gijare (2012) in India, which showed the effectiveness of teaching procedures for infection control among healthcare workers. There were no significant differences in the levels of knowledge and practices between age and years of experience. Also, this study is not compatible with the study by Al-Mawsheki, Ibrahim and Taha (2016), who reported a

statistically significant correlation between years of experience and nurses' performance in hemodialysis units, half of the nurses had one to less than ten years of experience, and the most of the nurses received training courses on patient care in the hemodialysis unit. In comparison, 95% of those who attended the training courses benefited from them.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions of The Study

The researcher reached the following conclusions in the light of the findings:

1. Most hemodialysis nurses' study participants were females between the ages of 25 and 29 years, residing in urban cities and married.
2. The majority of hemodialysis nurses that participated in the study have a bachelor's in nursing.
3. Most of the participants had experience of <= three years in hemodialysis.
4. Most of the hemodialysis nurses had taken the full dose of the hepatitis vaccine.
5. Most nurses had a high percentage of participation in training courses in hemodialysis (68%) and training courses in infection control measures (71%).
6. The nurses' levels of knowledge were satisfactory (average knowledge) commensurate with the critical and unique nature of the hemodialysis units, where the percentage of knowledge reached about (74,95%).
7. Nursing staff working in hemodialysis units in Al-Najaf city hospitals lacked access to available manuals or written protocols and resources to update the information to improve their knowledge and practices of infection prevention and control measures.
8. There was a highly significant relationship between the nurses' levels of knowledge and socio-demographic information (level of educational, participation in training courses related to hemodialysis units inside and outside Iraq, participation in training courses related to infection control measures inside and outside Iraq, number of infection control courses, and duration of infection control courses).

6.2. Recommendations of The Study

Based on the results of the current study, it is recommended to

1. Giving training courses on infection control measures in the proper way by activating the continuous education unit in hemodialysis centers.
2. Execute the national guidance for infection prevention and control measures in Iraqi health facilities produced in 2009 in collaboration with the World Health Organization, as well as to update it in collaboration with World Health Organization and Centers for Disease Control and Prevention updates.
3. Establish a unique department of infection control and prevention procedures in the health facilities, which will undertake continuous monitoring of the implementation of all modern infection control and prevention procedures.
4. Activating the media's role concerning infection control and prevention measures to disseminate information to everybody.
5. Activating the role of the nurse specialized in infection control and prevention measures in health institutions, especially in hemodialysis units.
6. Healthcare workers in hemodialysis units and patients must be vaccinated with the required vaccines to protect them from microorganisms, viruses, and other chronic diseases.
7. Working to construct and develop an infection control and prevention measures curriculum as part of the primary study curriculum in nursing faculties and medical institutions and establishing a branch for studying infection control and prevention measures in postgraduate studies.
8. Activate research initiatives and programs between educational and health institutions to improve nursing staff's knowledge and practices in infection prevention and control measures for all health institutions, particularly hemodialysis centers.

REFERENCES

Aarah-Bapuah, M., Kombat, J. M., Konlan, K. D., & Wuffele, G. M. (2017). The level of nurses' knowledge on occupational post exposure to hepatitis B infection in the Tamale metropolis, Ghana. *BMC health services research, vol (17) issue (1), P.p: 1-7.* https://doi.org/10.1186/s12913-017-2182-7. https://link.springer.com/article/10.1186/s12913-017-2182-7

Abozead, S. E. S., Azer, S. Z., & Morkes, S. M. (2018). Effect of educational program on nurse's performance about infection control for patients undergoing hemodialysis. *Assiut Scientific Nursing Journal, Volume 6, Issue 15, P.p:162-168.* DOI: 10.21608/ASNJ.2018.59669 https://asnj.journals.ekb.eg/article_59669.html

Adam, M. A. A. (2015). Nurses' Knowledge Regarding Infection Control in Intensive Care Unit (ICU) in Omdurman Military Hospital in Khartoum State, Sudan. Doctoral dissertation, Gezira University, (39 - 47 page), Khartoum city. URI: http://repo.uofg.edu.sd/handle/123456789/2337 Date of access: 27/08/2022

Adetunji, B., Chima, G., Gidado, S., Isichei, C., Ogoina, D., & Pondei, K. (2015). Knowledge, attitude and practice of standard precautions of infection control by hospital workers in two tertiary hospitals in Nigeria. *Journal of infection prevention, Vol (16) No (1), P.p: 16-22.* DOI: 10.1177/1757177414558957. https://journals.sagepub.com/doi/abs/10.1177/1757177414558957

Adhikari, K., & Attaulhaq, A. (2019). Hemodialysis Access Sites (HAS) and infection prevention: A literature review of infection risk factors and its prevention for hemodialysis patient. *International Journal of Innovative Science and Research Technology. Volume (4), Issue (5),* P.p: 32, 37, 38, 39, 40, 44, 48. ISSN No: -2456-2165. https://urn.fi/URN:NBN:fi:amk-2019092619282. https://www.theseus.fi/handle/10024/248824

Ahmed, A., Bayoumi, M., & Hassan, H. (2019). Nurses' Practices Toward Applying Infection Control Measures Using Notice Checklists at a Dialysis Unit. *Health Science Journal. Vol. 13 No. 6: 683, P.p: 1-10.* ISSN 1791-809X. DOI: 10.36648/1791-809X.13.678. https://www.itmedicalteam.pl/articles/nurses-practices-toward-applying-of-infection-control-measures-using-notice-checklists-at-dialysis-unit-106127.html

Akhere, A. D., Alice, T. E., Grace, E., & Ikponwonsa, O. (2013). Knowledge and practice of infection control among health workers in a tertiary hospital in Edo state, Nigeria. *Direct Research Journal of Health and Pharmacology (DRJHP) Vol.1 (2), P.p:20-27.* Available online at directresearchpublisher.org/drjhp ©2013 Direct Research Journals

Publisher
https://citeseerx.ist.psu.edu/messages/downloadsexceeded.html

Albaghdadi, D. S., Alshemari, B. A., Hindi, N. K., Mohammed, H. S., Radhi, M. M., …& Shlash, A. M. (2020). Infection Control Measures for Nurses Staff Concerning with Hepatitis B and C at Hemodialysis Unit in Hilla Hospitals. *Medico Legal Update, Vol.20, No. (1), P.p: 733-738.* http://www.medicolegalupdate.org. https://ijop.net/index.php/mlu/article/view/454

Al-Hiyaly A. K., Al-Nakkash A. H., Faraj H. B., & Kasim S. A. (2019). Assessment of Health Care Waste Management (HCWM) in Iraq; Effects and Control. *International Journal of Innovative Science and Research Technology. ISSN No: -2456-2165, Volume 4, Issue 5. P.p: 861-862.* Google Scholar : https://goo.gl/DF9R4u . Scribd : https://bit.ly/2INyv9b https://www.ijisrt.com/assessment-of-health-care-waste-management-hcwm-in-iraq-effects-and-control

AL-Kerity, S. H. F., & Naji, A. B. (2017). Evaluation of Healthcare Workers' Practices Concerning Infection Control Measures at Primary Health Care Centers. *Scientific Journal of Medical Research. Vol. 1, Issue 2, P.p: 63 - 68.* DOI: https://doi.org/.

Alter, M. J., Arduino, M. J., Lyerla, H. C., Miller, E. R., & Tokars, J. I. (2001). Recommendations for preventing transmission of infections among chronic hemodialysis patients. *The Morbidity and Mortality Weekly Report (MMWR), Vol. (50), No. (RR-5), P.p: 1-43.* PubMed ID: 11349873. Retrieved from https://stacks.cdc.gov/view/cdc/13528

Al-Mawsheki, E., Ibrahim, M. H., & Taha, N. M. (2016). Nurses' knowledge and practice regarding care for the patients during hemodialysis. *Medical Journal of Cairo University, Vol (84) Issue (1), P.p: 1135-41.* https://www.medicaljournalofcairouniversity.net/images/pdf/2016/September/092.pdf

Arduino, M. J., Kallen, A. J., & Patel, P. R. (2010). Preventing infections in patients undergoing hemodialysis. *Expert review of anti-infective therapy, Volume (8) Issue (6), P.p: 643-655.* https://doi.org/10.1586/eri.10.47. https://www.tandfonline.com/doi/abs/10.1586/eri.10.47

Arduino, M. J., Nguyen, D. B., & Patel, P. R. (2019). Hemodialysis-associated infections. Chronic Kidney Disease, Dialysis, and Transplantation. *National Center for Biotechnology Information (NCBI). P.p: 389–410.e8.* Epub 2018 Nov 29. PMCID: PMC7152337. Published online 2018 Nov 29. doi: 10.1016/B978-0-323-52978-5.00025-2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7152337/pdf/main.pdf

Ashraf, H., Dhedhi, N. A., & Jiwani, A. (2021). Knowledge of standard precautions among healthcare professionals at a Teaching Hospital in Karachi, Pakistan. *Journal of Family Medicine and Primary Care, Volume (10) Issue (1), P.p: 249-253.* PMCID: PMC8132834. PMID: 34017735. doi: 10.4103/jfmpc.jfmpc_1622_20. https://pubmed.ncbi.nlm.nih.gov/34017735/

Ataman, A. D., Vatanoğlu-Lutz, E. E., & Yıldırım, G. (2013). Medicine in Stamps-Ignaz Semmelweis and puerperal fever. *Journal of The Turkish German Gynecological Association, 14(1), P.p: (35 -39).* Published online 2013 Mar 1. doi: 10.5152/jtgga.2013.08 PMID: 24592068;

PMCID: PMC3881728. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3881728/pdf/jtgga-14-01-35.pdf

Athbi, H. A. A., & Mohammed, W. K. (2012). Effect of Infection Control Education Program on Nurses Staff's Knowledge in Hemodialysis Units in Baghdad Teaching Hospitals. Tenth National Scientific Conference. MSc. Thesis, Baghdad University, P.p: 529-550 page, Baghdad city. https://www.researchgate.net/profile/Widad-Mohammed-4/publication/328734029_Effect_of_Infection_Control_Education_Program_on_Nurses_Staff's_Knowledge_in_Hemodialysis_Units_in_Baghdad_Teaching_Hospitals/links/5f6e3478458515b7cf4f3347/Effect-of-Infection-Control-Education-Program-on-Nurses-Staffs-Knowledge-in-Hemodialysis-Units-in-Baghdad-Teaching-Hospitals.pdf

Ayed, A., Eqtait, F., Fashafsheh, I., & Harazneh, L. (2015). Knowledge and practice of nursing staff towards infection control measures in the Palestinian hospitals. *Journal of Education and Practice, Vol.6, No.4, P.p: 79-90.* http://repository.aaup.edu/jspui/handle/123456789/1238

Ayenew, T., Desta, M., Dires, M., Getie, M., Sitotaw, N., & Tegegne, N. (2018). Knowledge, practice and associated factors of infection prevention among healthcare workers in Debre Markos referral hospital, Northwest Ethiopia. *BMC health services research, 18(1), P.p:1-10.* https://doi.org/10.1186/s12913-018-3277-5 https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-018-3277-5

Bakey, S. (2012). Evaluation of Nurses' Practices throughout Hemodialysis Treatment for Patients in hemodialysis unit at Baghdad teaching hospitals. *Kufa Journal for Nursing Sciences, VOL. 2 NO. 2, P.p:23-38.* www. journal.uokufa.edu.iq. https://journal.uokufa.edu.iq/index.php/kjns/article/view/2985

Barnes, S., Concepcion, D., Felizardo, G., Moran, J., Yu, M., Peters, V., and Yu, M. (2010). Guide to the Elimination of Infections in Hemodialysis. Washington: Association for Professionals in Infection Control and Epidemiology (APIC). ISBN: 1-933013-46-X. https://www.his.org.uk/media/1684/apic-hemodialysis.pdf http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.705.1725&rep=rep1&type=pdf

Bayoumi, M. H., & Mahmoud, N. F. (2017). Effect of education program on nurses' knowledge and practice regarding care of central venous line in pediatric hemodialysis: evidence-based practice guidelines. *Egyptian Nursing Journal, Volume (14) Issue (2), P.p: 87-99.* DOI: 10.4103/ENJ.ENJ_16_17. https://www.enj.eg.net/temp/EgyptNursJ14287-5364888_145408.pdf

Bouhaha, B. M., Dammang, M. L., & Karkar, A. (2014). Infection control in hemodialysis units: a quick access to essential elements. *Saudi journal of kidney diseases and transplantation, Volume (25) Issue (3), P.p: 496-519.* DOI: 10.4103/1319-2442.132150. https://www.sjkdt.org/article.asp?issn=1319-2442;year=2014;volume=25;issue=3;spage=496;epage=519;aulast=Karkar

Boyce, J. M. & Vijayan, A., (2018). 100% use of infection control procedures in hemodialysis facilities: Call to action. *Clinical Journal of the American Society of Nephrology, Volume (13) Issue (4), P.p: 671-673.* CJASN April 2018, 13 (4) 671-673; DOI: https://doi.org/10.2215/CJN.11341017. https://cjasn.asnjournals.org/content/13/4/671

Boyle, G., Donlon, S., Einarsdottir, H., McCann, M., & Redmond, A., (2011). Prevention of infection in patients with chronic kidney disease Part II: Healthcare associated infections. *Journal of Renal Care, Volume (37) Issue (1), P.p: 52-62.* https://doi.org/10.1111/j.1755-6686.2011.00216.x. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1755-6686.2011.00216.x

Caroline, B.R. and Mary, T.K. (2012). Safety in the healthcare facility. In E., E. Nieginski, H. Kogut, S. Evans, & D. Schiff (Eds.), Textbook of Basic Nursing. (10th ed., P.p: 460,464, 465,468). Wolters Kluwer Health Lippincott Williams & Wilkins, China. https://www.amazon.com/Textbook-Basic-Nursing-Lippincotts-Practical/dp/1605477729

Centers for Disease Control and Prevention. (2007, Last update: July 2019). Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. Pp: 52, 53, 55, 206. Retrieved from https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines-H.pdf

Center for Diseases Control and Prevention. (2008, Last update: May 2019). Guideline for Disinfection and Sterilization in Healthcare Facilities. Pp: 37, 38, 59. https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html

Center for Diseases Control and Prevention. (2018a). Healthcare Associated Infections (HAI). https://www.cdc.gov/hai/data/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fhai%2Fsurveillance%2Findex.html

Centers for Disease Control and Prevention. (2018b). Standard Precautions. Retrieved from https://www.cdc.gov/oralhealth/infectioncontrol/summary-infection-prevention-practices/standard-precautions.html

Centers for Disease Control and Prevention. (2019a). Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. Retrieved from https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html

Centers for Disease Control and Prevention. (2019b). Guidelines for environmental infection control in health-care facilities; recommendations of CDC and Healthcare Infection Control Practices Advisory Committee (HICPAC). Retrieved from https://www.cdc.gov/infectioncontrol/guidelines/environmental/index.html.

Centers for Disease Control and Prevention. (2020a). Hand Hygiene in Healthcare Settings, Hand Hygiene Guidance. Retrieved from. https://www.cdc.gov/handhygiene/providers/guideline.html

Center for Diseases Control and Prevention. (2020b). Niosh-approved n100 particulate filtering face piece respirators. Retrieved from https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/n100list1.html

Center for Disease Control and Prevention (2022). National healthcare safety network (NHSN). Dialysis Event Surveillance Protocol. Infection prevention information is located at: https://www.cdc.gov/nhsn/dialysis/event/index.html

Centre for Health Protection (CHP). (2018, Last update: June 2020). Guide to infection control in clinic setting, Hong Kong Special Administrative Region.), P.p: 9, 13, 16, 171. https://www.chp.gov.hk/en/resources/346/index.html

Chun, I. S., Kim, Y., & Park, Y. M. (2012). Development of a hemodialysis nurse educational program and its effects. *Journal of the Korea Academia-Industrial Cooperation Society, Volume (13) Issue (12), P.p: 5839-5848.* https://doi.org/10.5762/KAIS.2012.13.12.5839. https://koreascience.kr/article/JAKO201205759632566.page

Douthwaite, S., Eccles, J., Garthwaite, E., Lines, S., Reddy, V., Tyerman, K. (2019). Clinical practice guideline management of blood borne viruses within the haemodialysis unit. *BMC nephrology, Volume (20) Issue (1), P.p: 1-22.* https://doi.org/10.1186/s12882-019-1529-1 https://link.springer.com/article/10.1186/s12882-019-1529-1

Elashir, U. M., Maghraby, N., Mahmoud, S. R., & Yousef, Y. E. (2019). The effect of nursing educational program on knowledge and practice of nurses regarding infection control measures for children under hemodialysis. *Egyptian Nursing Journal, Vol (16) Issue (1), P.p: 1-9.* DOI: 10.4103/2090-6021.257964. https://www.enj.eg.net/temp/EgyptNursJ1611-5331203_144832.pdf

Feidjel, R., Laalaoui, R., & Sahli, F. (2017). Hemodialysis catheter-related infection: rates, risk factors and pathogens. *Journal of infection and public health, Volume (10) Issue (4), P.p: 403-408.* https://doi.org/10.1016/j.jiph.2016.06.008. https://www.sciencedirect.com/science/article/pii/S1876034116300971

Fine, R. E., & Nissenson, A. R. (2016). Infectious Complications from Vascular Access. In R. E. Fine & A. R. Nissenson (Eds.), Handbook of Dialysis Therapy E-Book (5th Ed., P.p: 34- 56). Elsevier Health Sciences. e-Book ISBN: 9780323445504. Paperback ISBN: 9780323391542. https://www.elsevier.com/books/handbook-of-dialysis-therapy/9780323391542

Furrows, S., and Rose, S. (2014). The Essentials. In W. Blackwell (Eds.), Rapid Infection Control Nursing, (1st ed., P.p: 2-13). ISBN: 978-1-118-34246-6. https://www.worldcat.org/title/rapid-infection-control-nursing/oclc/869367866

Garvin, M. L., Kuhn, H. B., & Peters, E. (2009). International Committee of the Red Cross [ICRC]. Medical waste. Handbook of Modern Hospital Safety, Second Edition, P.p: 12, 13, 16. https://doi.org/10.2307/30147063.

https://www.icrc.org/en/doc/assets/files/publications/icrc-002-4032.pdf

Gharib Sabaq, A., Mohammed, A. E. G., Raafat Mahdy, R., and Soliman Bahgat, R. (2022). Effect of educational guidelines on nurses' performance related to care of arteriovenous fistula puncture for children undergoing hemodialysis. *Journal of Nursing Science Benha University, Volume (3) Issue (1), P.p: 36-50.* ISSN 2682 – 3934. DOI: 10.21608/jnsbu.2022.212336. https://journals.ekb.eg/article_212336.html

Gijare, M. (2012). Effectiveness of teaching on infection control practices among health care professionals. *Sinhgad e Journal of Nursing, Vol. II, Issue II, P.p: 5-9.* http://www.sinhgad.edu/SinhgadNursingCollege-eJournal/Vol_II_Issue_II/Author_2.pdf

Hassan, H. B., & Faris, H. I. (2016). Evaluation of nurses practices concerning sterile techniques critical care units in Al-Najaf AL-Ashraff city hospitals. *International Journal of Scientific and Research Publications*, Volume 6, Issue 6, June 2016 ISSN 2250-3153. MSc. Thesis, Baghdad University, P.p: 50-51 page, Al-Najaf city. https://d1wqtxts1xzle7.cloudfront.net/47374741/ijsrp-p5495-with-cover-page-v2.pdf?Expires=1661699711&Signature=NZ9vzt6Pt69Sxx9WT6LxbHvGpZrBkG1EzH~m4RNNQVDNCRgMnyM1f1-pjtgpzYyRv5k3hYfv13zzkO9eAMaGTfRVqcAIIKp0roMpcbrsK60yxfKX7CB0aB4IqUDiujnuzO-1tlt8dnJ8u6teAjim~gSVsu6oP6Gk8xCyHiTyy3RTNj-hmUexEIcgxRgZ0roaMyGPGAvauIfos3Y5RLsnb0MM7haQphI8s736RPPkJGKOVqu9wl6Lz5tu81qscvDEWfV9ZvW7K2XTT4FJUiv69~PksHL9kF4Akbn5Qlfjpax8uvDVYdtiMdrCRktrhEzeimTo2MQ6bkt2cQ5mQcqXtg__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA

Hasandokht, T., Joukar, F., Mansour-Ghanaei, F., & Naghipour, M. R. (2017). Nurses' knowledge toward hepatitis B and hepatitis C in Guilan, Iran. *The open nursing journal, Vol (11), P.p:34 -42.* PMCID: PMC5420166. PMID: 28567168. doi: 10.2174/1874434601711010034. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5420166/

Himmelfarb, J., & Sayegh, M. H. (2010). Hemodialysis-Associated Infections. In K. Dimock & T. Ball (Eds.), Chronic Kidney Disease, Dialysis, and Transplantation E-Book: A Companion to Brenner and Rector's The Kidney (3rd ed., P.p: 335, 344, 345, 349). ISBN: 978-4377-0987-2. Saunders Elsevier Health Sciences. https://books.google.com.tr/books?id=Ge1OmykAaNwC&printsec=copyright&source=gbs_pub_info_r#v=onepage&q&f=false

Hogston, R., & Marjoram, B. (2011). Nursing Interventions. In P., Tee, S. Russell, M. Jasper, S. Parboteeah, S.M. Green, ..., J. Dean (Eds.), Foundations of nursing practice: themes, concepts and frameworks. (4th ed., P.p: 95,97). Macmillan International Higher Education. ISBN: 9780230232747. https://www.bloomsbury.com/us/foundations-of-nursing-practice-9780230232747/

HSE-Health Protection Surveillance Centre. (2015). Guidelines for the Prevention and Control of Infection from Water Systems in Healthcare Facilities.

P.p: 48. http://www.hpsc.ie/abouthpsc/scientificcommittees/publications/Water%20systems%20in%20healthcare%20facilities%20FINAL%20amended%20May%202017.pdf

Ibrahim, M. A. E., Ismail, S. S., & Ouda, W. E. S. (2019). Assessment of nurses' performance regarding care of children undergoing hemodialysis therapy. Egyptian Journal of Health Care, Vol (10) No (3), P.p: 113-125. DOI: 10.21608/EJHC.2019.48125. https://ejhc.journals.ekb.eg/jufile?ar_sfile=97872

Ibrahim, S., Salem, N., & Soliman, S. (2021). ASSESSMENT OF SAFE INJECTION PRACTICES AND NEEDLESTICK INJURY AMONG NURSING STUDENTS AT MANSOURA UNIVERSITY. *Mansoura Nursing Journal, Vol (8) No (1), P.p: 59-76.* DOI: 10.21608/MNJ.2021.179797 https://journals.ekb.eg/article_179797_0a732dd18c4bec19c05e043507c349ed.pdf

Iraqi MOH and USAID. (2011). Baseline Assessment Report 2011: USAID Primary Health Care Project in Iraq (PHCPI). December. http://phciraq.org/sites/phciraq.org/files/Baseline_Assessment_Report_2011.pdf https://pdf.usaid.gov/pdf_docs/PA00J3BS.pdf Date of access: 21/08/2022.

Jabbar, H. M., & Mohammed, W. K. (2021). Effectiveness of Education Program on Nursing Staff Knowledge toward Infection Control Measures at Hemodialysis Unit in Al-Dewaniya Teaching Hospital. *Annals of the Romanian Society for Cell Biology, Volume (25) Issue (6), P.p: 11696-11702.* ISSN:1583-6258. https://www.annalsofrscb.ro/index.php/journal/article/view/7686

James, T. T. (2014). Healthcare Hazard Control. In J.T. Tweedy (Eds.), Healthcare Hazard Control and Safety Management (3rd Ed., P.p:16-17,18). CRC Press Taylor and Francis Group, New York. ISBN: 9781482206555. International Standard Book Number-13: 978-1-4822-0656-2 (eBook - PDF). https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Healthcare+Hazard+Control+and+Safety+Management&btnG=

Jeon, H. J., Kim, S. J., Lee, S. O., Lee, Y. K., Park, H. C., ... & Yoo, K. D., (2018). Korean clinical practice guidelines for preventing the transmission of infections in hemodialysis facilities. *Kidney research and clinical practice, Volume (37) Issue (1), P.p: 8-19.* PMCID: PMC5875572. PMID: 29629273. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5875572/pdf/krcp-37-008.pdf doi: 10.23876/j.krcp.2018.37.1.8.

Karkar, A. (2016). Hand hygiene in hemodialysis units. *Open Access Library Journal, Volume (3) Issue (08), P.p: 1-15.* doi: 10.4236/oalib.1102953. https://www.scirp.org/html/69949_69949.htm

Lemass, H., Mcdonnell, N., O 'connor, N., & Rochford, S., (2014). Infection prevention and control for primary care in Ireland: a guide for general practice. P.p: 3 - 98. https://www.lenus.ie/bitstream/handle/10147/321285/InfectionPrimarycare.pdf?sequence=1

Martin-Loeches, I., Rodriguez, A. H., & Torres, A. (2018). New guidelines for hospital-acquired pneumonia/ventilator-associated pneumonia: *USA vs. Europe. Current opinion in critical care, Volume (24) Issue (5) - P.p: 347-352.* doi: 10.1097/MCC.0000000000000535. https://journals.lww.com/co-criticalcare/Abstract/2018/10000/New_guidelines_for_hospital_acquired.6.aspx

Ministry of Health and World Health Organization (MOH / WHO). (2009). National Guideline for Infection Control in Health Facilities. Ministry of Health (MOH) Collaborative with WHO, Iraq. P.p:15-32,38,39,40, 52,53, 56-61, 100. http://www.emro.who.int/irq/publications-other/other-publications.htmlpdf

Ministry of Health Singapore. (2017). The national infection prevention and control guidelines for acute healthcare facilities [NIPCG]. National Infection Prevention and Control Guidelines for Acute Healthcare Facilities, P.p: 131–141. https://www.moh.gov.sg/docs/librariesprovider4/default-document-library/the-national-infection-prevention-and-control-guidelines-for-acute-healthcare-facilities---2017.pdf

National Centre for Disease Control (NCDC). (2020). National Infection Control Guidelines. Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India. P.p: 32, 47, 48. https://www.mohfw.gov.in/pdf/National%20Guidelines%20for%20IPC%20in%20HCF%20-%20final%281%29.pdf

National Guidelines for Infection Prevention and Control in Healthcare Facilities (NGIPCHF). (2020). Infection Prevention and Control Programmes, Ministry of Health and Family Welfare, Government of India. Retrieved from https://ncdc.gov.in/showfile.php?lid=431. https://www.mohfw.gov.in/pdf/National%20Guidelines%20for%20IPC%20in%20HCF%20-%20final%281%29.pdf

National Health & Medical Research Council (NHMRC). (2019). Australian Guidelines for the Prevention and Control Infection in Healthcare. P.p: 29, 111, 132, 90, 85,164, 165. ISBN: 978-1-86496-028-0. https://www.nhmrc.gov.au/about-us/publications/australian-guidelines-prevention-and-control-infection-healthcare-2019

National Infection Prevention and Control Guidelines [NIPCG]. (2015). Sierra Leone. P.p: 7, 45-47. https://www.idealclinic.org.za/docs/National-Priority-Health-Conditions/Nationl IPC Guideline 2015.pdf

Nield, H. (2020). A short history of infection control in dentistry. *BDJ Team, Volume (7) Issue (8), P.p: 12-15.* https://doi.org/10.1038/s41407-020-0402-1. https://www.nature.com/articles/s41407-020-0402-1

Occupational Safety and Health Administration (OSHA). (2009). Respiratory Infection Control: Respirators Versus Surgical Masks, https://www.osha.gov/Publications/respirators-vs-surgicalmasks-factsheet.html. https://books.google.com.tr/books/about/Respiratory_Infection_Control.html?id=6VpiugEACAAJ&redir_esc=y

Pan American Health Organization. (2018). Prevention and control of health care-associated infections. Basic Recommendations. Washington. DC: PAHO. P.p: 63, 65, 100. ISBN: 978-92-75-31954-9.

www.paho.org/permissions. https://iris.paho.org. URI: https://iris.paho.org/handle/10665.2/34570. https://iris.paho.org/bitstream/handle/10665.2/34570/9789275119549-eng.pdf?sequence=1&isAllowed=y

Rajih, Q. (2020). Effectiveness of an education program on nursing staffs' knowledge about infection control measures at intensive care unit in Al-Diwaniya teaching hospital. *Iraqi National Journal of Nursing Specialties, Volume (33) Issue (1), P.p: 85-92. https://injns.uobaghdad.edu.iq/index.php/INJNS/issue/view/31*

Reid, U. V. (2013). National Infection Prevention and Control Guidelines. Ministry of Health and Child Care. National Infection Prevention and Control Guidelines in Zimbabwe. P.p: 8, 10, 23, 29. URI: http://zdhr.uz.ac.zw/xmlui/handle/123456789/701

Revelas, A. (2012). Healthcare–associated infections: A public health problem. *Nigerian medical journal: Journal of the Nigeria Medical Association, Volume (53) Issue (2), P.p: 59-64.* PMCID: PMC3530249. PMID: 23271847. Doi: 10.4103/0300-1652.103543. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3530249/

Shalal, A.A., Hameed, D.M., and Eidan, A.J. (2021). Assessment of nurses' knowledge toward hepatitis disease in the hemodialysis units. MSc. Thesis, Kufa University, 66 page, Al-Najaf city.

Smith, N.E. & Timby, B.K. (2014). Infection. In C. Richardson, H. Kogut, & Z. Shapiro (Eds.), Introductory Medical-Surgical Nursing. (11th ed., P.p:127-128, 129, 130,133). Lippincott Williams and Wilkins, London. ISBN-13: 978-1451177329. ISBN-10: 1451177321.

The United States Food and Drug Administration. (2020). Masks and N95 Respirators. Retrieved from https://www.fda.gov/medical-devices/personal-protective-equipment-infection-control/n95-respirators-surgical-masks-face-masks-and-barrier-face-coverings

Uoda, B. (2019). Knowledge, attitudes and practices for dialysis nursing staff regarding personal protection means from hospital acquired in Mousl hospital. *Mosul Journal of Nursing, Vol. (7), No. (2), P.p: 91-99.* DOI: 10.33899/mjn.2019.163661. https://mjn.mosuljournals.com/article_163661_12560.html

World Health Organization. (2009). WHO guidelines on hand hygiene in health care (No. WHO/IER/PSP/2009/01). P.p: 9. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906_eng.pdf

World Health Organization. (2011). Core components of Infection Prevention and Control Programs in Health Care Standard Principles of Infection Prevention and Control. Geneva. P.p: 27, Switzerl. https://apps.who.int/iris/handle/10665/69982

World Health Organization. (2013a). Hospital Hygiene and infection Control. Retrieved from https://www.who.int/docstore/water_sanitation_health/wastemanag/ch16.htm

World Health Organization. (2013b). Hospital Hygiene and infection Control. Retrieved from https://www.who.int/docstore/water_sanitation_health/wastemanag/ch16.htm

World Health Organization. (2019). Infection Prevention and Control During Health Care for Probable or Confirmed Cases of Middle East Respiratory Syndrome Coronavirus (MERS-CoV). Infection Interim guidance. WHO/MERS/IPC/15.1 RV1. Updated 4 June 2015. P.p: 3. Retrieved from https://www.who.int/csr/disease/coronavirus_infections/ipc-mers-cov/en/

World Health Organization. (2020a). Health-care waste. Retrieved from https://www.who.int/news-room/fact-sheets/detail/health-care-waste.

World Health Organization. (2020b). Infection Prevention and Control. Retrieved from https://www.who.int/infection-prevention/about/ipc/en/.

World Health Organization. (2020c). About SAVE LIVES: Clean Your Hands. Retrieved from https://www.who.int/gpsc/5may/background/5moments/en/

World Health Organization. (2020d). Infection Prevention and Control: About Injection Safety. Retrieved from https://www.who.int/infection-prevention/about/injection-safety_about/en/

World Health Organization & Pan American Health Organization (PAHO). (2016). Decontamination and reprocessing of medical devices for health-care facilities. P.p: 11, 22. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/250232/9789241549851eng.pdf;jsessionid=8DD567AD400BA42EF6FFAC4760C065D?sequence=1.

APPENDICES

APPENDIX A1. Questionnaire of the study - English Language.

APPENDIX A2. Questionnaire of the study - Arabic Language.

APPENDIX B. The ethics committee's approval at Çankırı Karatekin university.

APPENDIX C. The ethics committee's approval at Scientific Research from the Al-Najaf Al-Ashraf Health Directorate in the Iraqi Ministry of Health.

APPENDIX D. The researcher's approval to use the Questionnaire Form (by E-mail).

APPENDIX E. Written informed consent of the participants.

APPENDIX A1. Questionnaire of the study - English Language.

PART TWO

APPENDIX A2. Questionnaire of the study - Arabic Language.

الجزء الثاني

Appendix B. The ethics committee's approval at Çankırı Karatekin university.

APPENDIX C. The ethics committee's approval at Scientific Research from the Al-Najaf Al-Ashraf Health Directorate in the Iraqi Ministry of Health.

(Appendix C. Arabic Language)

(Appendix C. Turkish Language)

(Appendix C. English Language)

APPENDIX D. The researcher's approval to use the Questionnaire Form (by E-mail).

APPENDIX E. Written informed consent of the participants.

CURRICULUM VITAE

1. My personal information:

Name	Hussein Abdulzahra Hassooni HASSOONI
Date of Birth	
Nationality	
Residence	
Academic achievement	
Tel No.	
E-Posta:	

2. Educational Status:

3. Academic and professional experience:

	Year