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Application of Infection Control Guidelines Among Nurses Working in Selective Hemodialysis Centers in Khartoum City

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بسم الله الرحمن الرحيم

الآيـــــة

قال تعالي :

﴿ قُل لَّوۡ كَانَ ٱلۡبَحۡرُ مِدَادٗا لِّكَلِمَٰتِ رَبِّي لَنَفِدَ ٱلۡبَحۡرُ قَبۡلَ أَن تَنفَدَ كَلِمَٰتُ رَبِّي وَلَوۡ جِئۡنَا بِمِثۡلِهِۦ مَدَدٗا ﴾

صدق الله العظيم

سورة الكهف الاية ﴿١٠٩﴾

DEDICATION

To the most wonderful parents in the world my parents

for their endless love, support and encouragement

To my brother and sisters

To my friends

I am trying to say thank you

Acknowledgement

Thanks to Allah firstly and lastly.
Thanks to my dear teacher Dr. Higazi Mohammed..
Thanks to Dr. Salma Center for Hemodialysis and Kidney Transplant
Thanks to Sudanese Transplanted Association Hospital
Managers for afford me this chance to do my research
and all the staff whose give me their information's.

Abstract

Infection is the most common cause of hospitalization and the second most common cause of mortality among hemodialysis (HD) patients, after cardiovascular disease. Research shows that outbreaks of infections have occurred because of found of many obstacles to apply infection control, inadequate disinfection, performance of recapping, exposed to needle stick injury, not wear personal protective equipment and inadequate hand washing by dialysis staff. The objective of this study is to identify the application of infection control guideline in selective hemodialysis unit in Khartoum city.

This is a descriptive, cross sectional, hospital based study. Involved 50 nurses in 2 centers of hemodialysis in Khartoum city. Selected as total coverage method.

The data were collected using Self administered questionnaire Observational chick list then data analyzed by SPSS version 18.

Regarding needle recapping 56% perform recapping comparing with other study done in Nigeria December 2011 45% perform recapping and develop needle stick injury . from this result nurses ignore the danger of needle recapping .the similar study done in Nigeria show that 24.5% had suffered needle stick injury.

It is important to apply infection control guideline when dealing with patients especially in hemodialysis unit because the contact with blood. Wearing personal protective equipment and good hand hygiene, Also the responsibility of hemodialysis unit to provide routine test and vaccines.

المستخلص

العدوى هي السبب الأكثر شيوعًا للدخول إلى المستشفى وثاني سبب أكثر شيوعًا للوفيات بين مرضى غسيل الكلى (HD) ، بعد مرض القلب والأوعية الدموية. تظهر الأبحاث أن تفشي العدوى قد حدث بسبب وجود العديد من العوائق لتطبيق مكافحة العدوى ، والتطهير غير الملائم ، وأداء الخلاصة ، وعرضة لإصابات عصا الإبرة ، وعدم ارتداء معدات الوقاية الشخصية وعدم كفاية غسل اليدين عن طريق العاملين في غسيل الكلى. الهدف من هذه الدراسة هو تحديد تطبيق إرشادات مكافحة العدوى في وحدة التحاليل الدموي الانتقائي في مدينة الخرطوم

هذه دراسة وصفية مستعرضة للمستشفى. شاركت 50 ممرضة في مركزين لتصفية الدم في مدينة الخرطوم. يتم اختياره كطريقة التغطية الكاملة
وقد تم جمع البيانات باستخدام استبيان تدار ذاتياً ثم تحليل البيانات بواسطة SPSS الإصدار 18

فيما يتعلق بإعادة غطاء الإبرة 56٪ القيام بالتسجيل مقارنة مع دراسة أخرى أجريت في نيجيريا في ديسمبر 2011 45٪ القيام بالتعدين وتطوير إصابة غطاء الإبرة. من هذه النتيجة ، يتجاهل الممرضون خطر إعادة استخدام الإبرة. وتبين الدراسة المماثلة التي أجريت في نيجيريا أن 24.5٪ عانوا من إصابات في الإبرة.

من المهم تطبيق إرشادات مكافحة العدوى عند التعامل مع المرضى خاصة في وحدة غسيل الكلى بسبب التلامس مع الدم. ارتداء معدات الوقاية الشخصية والنظافة الجيدة للأيدي ، وكذلك مسؤولية وحدة غسيل الكلى لتوفير الاختبار واللقاحات الروتينية.

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Abbreviations

Abbreviations	Meaning
CDC	Centers for disease control and prevention
CVC	Central venous catheter
ESKD	End stage kidney disease
APIC	Association of professionals in infection control
K-DOQI	Kidney disease outcomes quality initiative
KDIGO	Kidney disease improving global outcome
EBPG	European best practice guidelines
ERBP	European renal best practice
HD	Hemodialysis
ABHR	Alcohol based hand rubs
HCW	Health care worker
PPE	Personal protective equipment
TST	Tuberculin skin test
IIV	Influenza –inactivated vaccine

Chapter One

Introduction & Literature Review

1.1 Introduction

Patients with end stage renal disease (ESKD) treated with hemodialysis (HD) are at substantially increased risk of life - threatening infections {immunosuppressed}.[1]

The process of heamodialysis requires direct vascular access for prolonged periods so a majority of BSI is related to vascular access, of which 70% are associated with the use of a central venous catheter (CVC). Multiple events occur during dialysis concurrently, so multiple opportunities exist for person –to- person transmission of infectious agent, directly or indirectly.[1]

High risk of contaminated devices, equipment ,supplies, environmental surfaces ,or hands of personnel so (BSIs) remain a major cause of morbidity and mortality in hemodialysis patients, lead to severe complications of endocarditic, septic, emboli, metastatic infections, readmissions and death. [1]

Lapses in infection control practices, such as hand hygiene and environmental cleaning, have been associated with bloodstream infections and HCV outbreaks. The CDC has specific audit tools and checklists for dialysis station disinfection, which should be performed. The CDC strongly recommends several infection control procedures including hand hygiene, appropriate catheter exit site care, hemodialysis injectable medication preparation, dialysis station routine disinfection and environmental facilities.[1]

1.2 Problem Statement

Infection is the most common cause of hospitalization and the second most common cause of mortality among hemodialysis (HD) patients, after cardiovascular disease**.** [2]

Therefore nurses play an important role in the use of infection control guideline so they should have adequate knowledge of infection control and incorporate in their practice to limit the negative consequences.[3]

1.3 Justification of the study:

There has been increase in numbers of hemodialysis patients every year. This increases the workload of the hemodialysis nurses as nursing accounts for 80% of the direct care in providing care and fulfilling their needs.

The Nurses act as a role model for both the patients and the rest of the staff in the ward in prevention of infection. They also take part in educating Patient about proper hand hygiene practices both in and out of the ward. Since nurses act as a "middlemen" between the physician and the patient, it is important that they adhere to proper hygiene practices to prevent cross infection between patient, nurses and also physicians microorganisms are spread from one patient to another directly or indirectly. In hospitals the most common infection mode is cross infection or patient- nurse- patient infection especially due to poor hand hygiene after being in contact with one patient .

Hemodialysis allows microorganisms to have a higher probability of blood stream invasion due to the access to the circulation. Infections are the most important causes of the loss of vascular for dialysis.

The interesting for me to identify the application of infection control guideline among nurses working in HD unit.

1.4 Research Questions:

The following research questions will be addressed in this research:

1. What is the level of nurse's knowledge regarding application control in hemodialysis unit?

2. What are nurse practice regarding application control in hemodialysis unit?
3. Is there a significant relationship between a nurse practice and knowledge regarding application control in hemodialysis unit?

1.5 Objectives:

General objective:

To study application of infection control guidelines among nurse working in hemodialysis (HD) unit

Specific objective:

1. To assess nurses level of knowledge about guideline of infection control
2. To determine common barrier prevent nurse to apply the infection control guideline
3. To assess level of nursing performance regarding infection control guideline
4. To identify the strategies used to control infection
5. to identify the risk of environmental contamination in HD unit.

1.6 Literature Review:

Infection is the most common cause of hospitalization and the second most common cause of mortality among hemodialysis (HD) patients, after cardiovascular disease. [1]

HD patient vulnerable to contracting health-care-associated infections (HAIs) due to frequent and prolonged exposure to many possible contaminants in the dialysis environment. The extracorporeal associated common environmental conditions and the immune compromised status of HD patients are major predisposing factors.

The evident increased potential for transmission of infections in the creation and implementation of specific and stricter infection prevention and control measures in addition to the usual standard precautions. [1]

Different international organizations have generated guidelines and recommendations on infection prevention and control for implementation in the HD settings. These include the Centers for Disease Control and Prevention (CDC), the Association of professionals in infection control (APIC), the Kidney Disease Outcomes Quality Initiative (K/DOQI),

The European Best Practice Guidelines/European Renal Best Practice (EBPG/ERBP) and the Kidney Disease: Improving Global outcome (KDIGO) however, these guidelines are extensive and sometimes vary among different guideline-producing bodies. Our aim in this research is to facilitate the access, increase the awareness and encourage implementation among dialysis providers by reviewing, extracting and comparing the essential elements of guidelines and recommendations on infection prevention and control in HD units.[4]

Definitions:

- **Infection Control:** The process by which health care facilities develop and implement specific policies and procedures to prevent the spread of infections among health care staff and patients
- **Nosocomial Infection:** An infection contracted by a patient or staff member while in a hospital or health care facility (and not present or incubating on admission)
- **Disinfection:** The process of microbial inactivation that eliminates virtually all recognized pathogenic microorganisms, but not necessarily all microbial forms (e.g., spores)
- **Sterilization:** The use of physical or chemical procedures to destroy all microbial life, including large numbers of highly resistant bacterial endspores. Procedures include:
    - Steam sterilization
    - Heat sterilization
    - Chemical sterilization[1]

Infection control Committee:

Membership:

- Doctors
    - General physician
    - Infectious disease specialist
    - Surgeon
    - Clinical microbiologist
- Infection control nurse
- Representatives from other relevant departments
    - Laboratory
    - Housekeeping
    - Pharmacy and central supply
    - Administration

Principles of infection Control:

Hospitalized patients are more prone to develop infection as a result of surgery, invasive procedures and devices, immunosuppressive drugs, organ transplants Etc. In addition, microorganisms flourish in health care setting and with breaks in infection control procedures and practices, along with patient's weakened defense Mechanisms, help set the stage for nosocomial infections. Nosocomial infections lengthen patients' hospital stays and increase both morbidity and mortality. In addition, diagnosing and treating these infections puts intense pressure on the health services and health care budget.[5]

Chain of infection:

In order to control or prevent infection it is essential to understand that transmission of a pathogen resulting in colonization or infection requires the following six vital links:

1. Causative agent
2. Infectious reservoir
3. Portal of exit from the reservoir
4. Mode of transmission
5. Portal of entry into the host
6. Susceptible host

Each link must be present for infection or colonization to proceed, and breaking any of the links can prevent the infection. The aim of isolation precautions is to interrupt these links. [6]

1. Causative agent:

The causative agent for infection is any microorganism capable of producing disease.

Microorganisms responsible for infectious diseases include bacteria, viruses[6]

2. Reservoir of infection:

The second link in the chain of infection is the reservoir, i.e. the environment or object in or on which a microorganism can survive and, in some cases, multiply.

Inanimate objects, human beings, and animals can all serve as reservoirs, providing the essential requirements for a microorganism to survive at specific stages in its life cycle. Pseudomonas spp. Survive and multiply in nebulizers and the hepatitis B virus (HBV) survives but does not multiply on the surface of haemodialysis machines.

Infectious reservoirs abound in health care settings, and may include everything from patients, visitors, and staff members to furniture, medical equipment, medications, food, water, and blood.

A human reservoir may be either a case or a carrier. A case is a patient with an acute clinical infection while a carrier is a person who is colonized with a specific pathogenic microorganism but shows no signs or symptoms of infection. A carrier may have a subclinical or asymptomatic infection, e.g. Hepatitis B virus.[5]

Carriers fall into four categories: An incubatory carrier is one who has acquired the infection and has been incubating the illness but does not yet show symptoms. [5]

Incubation periods vary from one infectious disease to other. A convalescent carrier is in the recovery stage of an illness but continues to shed the pathogenic microorganism for an indefinite period, e.g. a patient who has had a Salmonella infection commonly sheds the organism in his faces even after symptoms disappear. [5]

An intermittent carrier occasionally sheds the pathogenic

Microorganism from time to time, e.g. some people is intermittent carriers of Staphylococcus aurous. A chronic carrier always has the

infectious organism in his system, e.g. chronic carriers of hepatitis B virus. [5]

Carriers (especially when asymptomatic) may present a risk of transmission to susceptible patients in health care facilities because their illnesses go unrecognized and they and those around them are unlikely to take appropriate precautions against infection. [5]

3. Portal of exit

The portal of exit is the path by which an infectious agent leaves its reservoir. Usually, this portal is the site where the microorganism grows. Common portals of exit associated with human reservoirs include the respiratory, genitourinary, and gastrointestinal tracts, the skin and mucous membranes and the placenta (transmission from mother to fetus). [5]

4. Mode of transmission

The microorganism can be acquired by inhalation (through respiratory tract), ingestion (through gastrointestinal tract), inoculation (through accidental sharp injury or bites), contact (during sexual intercourse) and Trans placental transmission (microbes may cross placenta from the mother to fetus). It is important to remember that **some microorganisms use more than one transmission route** to get from the reservoir to a new host.

Of the six links in the chain of infection, the mode of transmission is the easiest link to break and is key to control of cross-infection in hospitals. [5]

Contact transmission:

Contact is the most common mode of transmission of infection in the health care settings. Contact transmission may be subdivided into direct contact, indirect contact, and contact with droplets that enter the environment. [5]

Direct contact: Direct contact refers to person-to-person spread of microorganisms through actual physical contact. Microorganisms with a direct mode of transmission can be transferred during such patient care activities as bathing, dressing changes, and insertion of invasive devices if the hands or gloves of health care worker (HCW) are contaminated. Diseases that spread by direct contact include scabies and herpes simplex (if direct contact with infected oral lesions or secretions occurs).

Hand washing is the most effective way to prevent transmission by the contact route.

Indirect contact: Indirect contact occurs when a susceptible person comes in contact with a contaminated object. In health care settings, virtually any item could be contaminated with certain microorganisms, e.g. endoscopes, respiratory equipment, etc. Thorough cleaning, disinfection, and sterilization are essential in the health care setting to prevent nosocomial infection acquired from contaminated items and equipment.[14]

Droplet transmission:

Droplet transmission results from contact with contaminated respiratory secretions. A person with a droplet-spread infection coughs, sneezes, or talks, releasing infected secretions that spread through the air to the oral or nasal mucous membranes of a person nearby. Microbes in droplet nuclei (mucus droplets) can travel up to about 3 ft (1 m). Droplet transmission differs from airborne transmission in that the droplets don't remain suspended in the air but settle on surfaces. Examples of diseases spread by droplets include influenza, whooping cough, etc. [14]

Airborne transmission:

Airborne transmission occurs when fine microbial particles or dust particles containing pathogens remain suspended in the air for a prolonged period, and then are spread widely by air currents and inhaled. The tiny particles remain suspended in the air for several hours and may cause infection when a susceptible person inhales them. Examples of diseases spread by the airborne include pulmonary tuberculosis, varicella , and measles.[7]

5. Portal of entry:

The portal of entry is the path by which an infectious agent invades a susceptible host. Usually, this path is the same as the portal of exit. For example, the portal of entry for tuberculosis and diphtheria is through the respiratory tract, hepatitis B and Human Immunodeficiency Virus enter through the bloodstream or body fluids and Salmonella enters through the gastrointestinal tract. In addition, each invasive device, e.g. intravenous line, creates an additional portal of entry into a patient's body thus increasing the chance of developing an infection. [7]

6. Susceptible host:

The final link in the chain of infection is the susceptible host. The human body has many defense mechanisms for resisting the entry and multiplication of pathogens. [7]

When these mechanisms function normally, infection does not occur. However, in immune compromised patients, where the body defenses are weakened, infectious agents are more likely to invade the body and cause an infectious disease. In addition, the very young and the very old are at higher risk for infection because in the very young the immune system does not fully develop until about age 6 months, while old age is

associated with declining immune system function as well as with chronic diseases that weaken host defenses.[1]

Body's defense mechanisms:

The body's defense mechanisms fall into two general categories:

First line of defense:

External and mechanical barriers such as the skin, other body organs, and secretions serve as the body's first line of defense. Intact skin, mucous membranes, certain chemical substances, specialized structures such as cilia, and normal flora can stop pathogens from establishing themselves in the body. The gag and cough reflexes and gastrointestinal tract peristalsis work to remove pathogens before they can establish a foothold. Chemical substances that help prevent infection or inhibit microbial growth include secretions such as saliva, perspiration, and gastrointestinal and vaginal secretions as well as interferon (a naturally occurring glycoprotein with antiviral properties). Normal microbial flora controls the growth of potential pathogens through a mechanism called microbial antagonism. In this mechanism, they use nutrients that pathogens need for growth, compete with pathogens for sites on tissue receptors and secrete naturally occurring antibiotics to kill the pathogens. [1]

When microbial antagonism is disturbed, such as by prolonged antibiotic therapy, an infection may develop; for example, antibiotic therapy may destroy the normal flora of the mouth, leading to overgrowth of Candida albicans and consequent thrush.[1]

Second line of defense:

If a microorganism gets past the first line of defense by entering the body through a break in the skin, white blood cells and the inflammatory response come into play. Because these components respond to any type

of injury,Their response is termed non-specific. The main function of the inflammatory response is to bring phagocyte cells (neutrophils and monocytes) to the inflamed area to destroy microorganisms. (1)

If a pathogen gets past non-specific defenses, it confronts specific immune responses, cell-mediated immunity or humeral immunity. Cell-mediated immunity involves

T cells. Some T cells synthesize and secrete lymphocytes. Others become killer (cytotoxic) cells, setting out to track down infected body cells. Once the infection is under control, suppresser T cells bring the immune response to a close. Humeral immunity, mediated by antibodies, involves the action of B lymphocytes in conjunction with helper T cells. Antibodies produced in response to the infectious agent help fight the infection. In response to the effects of suppressor T cell activity antibody production then wanes. Impaired host defenses make patients more susceptible to infection. (1)

Conditions that may weaken a person's defenses include malnutrition, extremes of age, inherited and acquired immune deficiencies, chronic disease, immunosuppressive therapy, surgery and inadequate immunization.(2)

Strategies to control health care associated infection:

Strategies to control and prevent nosocomial infection fall into three main categories:

• Control *or* elimination of infectious agents

Control of transmission

• Reservoir control(2)

Control or elimination of the infectious agent:

This is achieved by placing patients with suspected or proven infectious diseases under source isolation and applying barrier precautions. Infectious agents can be controlled or eliminated by effective disinfection and sterilization of items and equipments and thorough cleaning of the environment.

This helps reduce the bioburden of microorganisms in health care facilities. [(1)]

Control of transmission:

This can be effectively achieved by hand washing, aseptic techniques and control of the health care environment. Proper hand washing has been shown to be effective in preventing the spread of infection. Basic a septic technique must be practiced for sterile procedures e.g. insertion of intravenous lines and urinary catheters. Effective decontamination and control of the environment (E.g. mechanical ventilation) is essential to control transmission of microorganisms. [(1)]

Reservoir control:

Almost any piece of equipment used in health care facilities may harbor microorganisms and therefore act as a reservoir (e.g. respiratory therapy equipment and ventilator circuits, bedpans, urinals, bed linen etc). Interventions directed at controlling or destroying infectious reservoirs in health care facilities include using either disposable equipment or decontaminating equipment as soon as possible after use. In addition, both patients and health care workers may also act as reservoirs of infection. Identifying and treating these individuals will reduce their servers and help prevent cross-infection.[(1)]

Prevention and Control of Infections in Hemodialysis Units:

Hand hygiene:

The main route of transmission of HAIs is via the transiently contaminated hands of the HCW. Therefore, hand hygiene is singled out as the most important infection prevention intervention. However, the compliance rates of HCWs in hand hygiene is very poor, with an overall average of only 40%. Based on hand hygiene indications as per recommendations from the APIC, CDC and World Health Organization (WHO) , we estimated the number of times a single dialysis staff is required to perform hand hygiene per HD session per patient . The estimated number is a minimum of 60-100-times when multiplied by the number of patients assigned per staff (e.g., two to three patients). The large number of times an HD staff is required to perform hand hygiene could be a reason for lack of compliance. However, compliance can be improved by continuous education and supervision, and by providing, in convenient locations, a sufficient number of sinks with soap dispensers, paper towels, hand lotions (e.g., one for every two to four dialysis stations) and alcohol-based hand rubs (ABHRs) placed at each patient station. Because of the proven superior efficacy in decontamination, better skin tolerability and ease of use, ABHR is recommended to be used in all clinical situations if hands are not visibly soiled. If exposure to bacterial spores (i.e., Bacillus anthraces and/or Clostridium difficult) is suspected or proven, hand washing with soap and water is recommended because spores are resistant to most antiseptic agents and require physical removal by washing and rinsing. Other preventive measures include restriction of having long nails and wearing of artificial fingernails or extenders by health-care personnel who provide direct patient care, as artificial nails could harbor gram negative bacilli and yeasts.[8]

Monitoring hand hygiene compliance is crucial, and direct observation is the current gold standard method. However, direct observation has several limitations, including being labor intensive, small sample size (may cover only 1% of total hand hygiene activity) and not standardized.[8]

Personal protective equipment:

Personal protective equipment (PPE) refers to a variety of barriers and respirators used alone or in combination to protect mucous membranes, airways, skin and clothing from contact with infectious agents. They include gloves, gowns, masks, eye goggles, face shields and respirators. In the HD setting, gloves are recommended to be worn whenever caring for a dialysis patient, whether touching patient's intact skin (e.g., taking blood pressure) or patient's equipment at the dialysis station. Gloves should be removed and followed by hand hygiene between patients or stations. [11] The recommended practice of glove use for every contact with the patient(s) and equipment(s) at the dialysis station requires an enormous amount of glove supply, which is not always realistic in many HD units. However, when visible soiling is present and/or contact precautions are indicated, wearing gloves is a must. Sterile gloves must be used during procedures requiring a sterile aseptic technique, such as during catheter insertion or at any time a dialysis catheter is handled/ manipulated. Wearing gowns (fluid-resistant with full coverage of the arms and body front and preferably disposable ones) over the uniform and use of a face mask and eye goggles or face shield is recommended when performing procedures wherein splashes of blood can be anticipated, especially during initiation and discontinuation of dialysis. If a face shield is used during catheter handling, a surgical mask should be worn underneath to protect the patient from the HCW's

respiratory droplets. [9] Equally important is the fact that the patient should also wear a mask and be asked to turn his/her faces away from the catheter site to reduce contamination from infectious droplets. Furthermore, wearing a mask is important when a staff member, a patient or a visitor is experiencing cold or cough. A respirator should be used by HCWs only when taking care of a patient with an airborne infection. HCWs uniforms can be colonized with potentially pathogenic bacteria in up to 60% of the situations,] and, therefore, should be washed and changed daily in order to decrease the bacterial load. (9)

Cleaning and disinfection of environmental surfaces:

In the health-care setting, contamination of environmental surfaces with various pathogens and the persistence of these pathogens on surfaces can be an important and frequent source of transmission of infectious agents through the frequent hand touching of HCWs. The environment in HD units is particularly prone for contamination with blood-borne pathogens such as HBV, HCV and HIV, and other infectious agents such as methicillin-resistant Staphylococcus aurous (MRSA), vancomycin-resistant Enterococci (VRE) and Clostridium difficult. Microorganisms can survive on environmental surfaces for varying periods of time, ranging from few hours to days and months. Low temperature, high humidity and high inoculums favor the long persistence of pathogens on inanimate surfaces. In order to prevent and control the spread of environmentally transmitted pathogens, cleaning and disinfection of the external surfaces of equipment (i.e., HD machine, dialysis chair or bed, procedure trolley) and other environmental surfaces inside the HD units, especially those that are frequently touched by patients and staff, should be performed between all patient treatments (irrespective of the patient diagnosis). The application of friction during cleaning is emphasized as

some organisms like C. difficult are not easily inactivated by most surface disinfectants (except bleach) and require removal by friction. [4]

Cleaning and disinfection of external surfaces of HD machines:

It is recommended to clean and disinfect the external surfaces of the HD machine after each dialysis session. A low-level disinfectant or any EPA-registered disinfectant solution labeled for use in a health-care setting is recommended to be used on non-critical items (including HD machines), and should also be in accordance with the machine manufacturer's recommendations. [4]

The presence of bio-burden will reduce the killing/inactivating effect of disinfectants. Therefore, if visible blood spills or other infectious material is present on the external surface of an HD machine, it should be cleaned separately (not to spread) before applying the disinfectant solution. In such cases, it is recommended to use an intermediate-level disinfectant or tuberculocidal agent (with specific label claims for HBV and HIV) or a 1:100 dilution of a hypochlorite solution (500-600 ppm free chlorine). If using disinfectant wipes, one wipe should be used to exclusively clean the blood stain followed by another wipe(s) for disinfection. All external surfaces of the machine, especially the frequently touched front panel, including the intravenous pole, the side, back and base, should be thoroughly cleaned and disinfected using friction and be allowed to air dry. All used towels or wipes and gloves that are contaminated with blood should be discarded in a biohazard waste container, and hand hygiene performed after glove removal. [4]

Disinfection of the internal fluid pathway of hemodialysis machines

The CDC and APIC guidelines do not suggest the disinfection of internal fluid pathways of "single-pass" HD machines between patient uses, except when a blood leak event occurs. Routine disinfection and

rinsing is recommended at the beginning or end of the day (or as recommended by the machine's manufacturer).The EBPG recommends routine disinfection of the HD-proportioning machine after each dialysis session either by heat or a chemical agent. [53] Chemical disinfection prior to patient use is recommended for standby machines, which could be inactive for variable periods of time and potentially develop bacterial growth. The chemical disinfection protocol should be according to the machine manufacturer's recommendation, including the concentration and dwell time. [4]

Cleaning and disinfection of auxiliary equipment:

Auxiliary equipment used in HD may include reusable jugs for mixing bicarbonate solution, reusable priming buckets and external pressure transducers. As per recommendation, any re-usable item should be cleaned and disinfected prior to being used on another patient, and external pressure transducers should be changed between patients' uses. Nowadays, many units have shifted to using the more hygienic automated process of mixing bicarbonate powder in cartridge on the individual machines, eliminating the use of reusable bicarbonate jugs. If bicarbonate solution in a jug is used, any "leftover" solution must be discarded and opened jugs should not be used after 24 h because sodium bicarbonate solution constitutes a good media for bacterial growth. Reusable priming buckets are now seldom used as most dialysis companies include a disposable prime collection bag in each pack of sterile bloodline set and also with pre-attached external pressure transducers. With improved and better technology in some of the newer models of HD machines, prime collection bags or transducer protectors are not even required, because drainage of priming solutions can be done by connecting the bloodline to a drainage port in the machine and blood pressure sensors are completely

non-invasive without using transducer connections and protectors. [4]

Handling of disposable supplies and reusable items in HD units:

Both CDC and APIC have recommended specific measures that include the following: (a) items taken into an individual patient's HD station should be used only for that patient and be disposed off after use, (b) unused item(s) should be cleaned and disinfected before returning to a common clean area or used on another patient, or be disposed off if it cannot be disinfected and (c) non-disposable items that cannot be comprehensively cleaned and disinfected (e.g., adhesive tape, cloth-covered blood pressure cuffs) should be dedicated for use on a single patient. In reality, allocating a blood pressure cuff for each patient may not be practical as too frequent detachment and re-attachment of the cuff can cause imminent damage to the line connections. Reusable blood pressure cuffs that are covered with waterproof material with a smooth surface (instead of cloth-covered cuffs) can be an attractive alternative as they can be comprehensively cleaned and disinfected between patient uses. There should also be a clear separation for storage and handling of clean supplies and medications from contaminated items (i.e., used supplies/equipment, blood samples, biohazard containers). [4]

Water treatment: Purity and testing:

Water quality is an essential component in the provision of good HD and in ensuring patient safety. This is especially the case in the settings of high-flux HD, hemofiltration and/or hemodiafiltration due to possible entrance of contaminants from the dialysis fluid into the blood by either convective transfer (back-filtration) or movements down the concentration gradient (back-diffusion) or the direct infusion of substitution fluid into the circulation. Failure to meet water quality standards has major consequences and may lead to increased patient

morbidity and mortality. Studies have demonstrated that ultrapure dialysis fluid is associated with a reduction in inflammatory markers, reduced chronic inflammation, decreased erythropoietin resistance, preservation of residual renal function, a reduction in cardiovascular morbidity, a reduction in β2-microglobulin amyloidosis and decreased levels of advanced glycation end-products. Both CDC and APIC recommend adherence to the standards set by the Association for the Advancement of Medical Instrumentation (AAMI) for the quality of water used in dialysis. Fluids used for dialysis can be divided into three levels according to microbiological quality: Standard, ultrapure and sterile. The maximum allowable levels of microbiological contaminants and endotoxin in each level are summarized in prepared solutions that are used as substitution fluids and priming solutions (intravenous infusion) during hemofiltration and hemodiafiltration are considered as drugs and, therefore, should be sterile and non-pyrogenic. The quality of the fluid before the final filter (from the first bacteria- and endotoxin-retentive filter) and the functioning of this filter both determine whether the final fluid can be referred to as sterile and non-pyrogenic. In this case, the fluid sample for micro-biologic testing should be taken from the dialysate sampling port (fluid that has passed only from the first filter). If the dialysate sample meets the standard for ultrapure water, then the substitution fluid (fluid that passed the second filter) can be assumed as sterile. Others insist that one other condition must be fulfilled in order to achieve a sterile fluid: A sterile, single-use filter must be used for the final filtration step, which is according to the definition in pharmacopoeias. Frequent heat disinfection of the distribution loop is the preferable method to prevent formation of bio-film. Testing of product water of in-center reverse osmosis (RO) for bacteria and endotoxin assay are required at least monthly, and on a

quarterly basis for portable RO or in a home setting. To avoid false-negative results, fluid sampling for microbiological testing should be performed no sooner than 24 h after disinfection and, when disinfection is performed on consecutive days (or more frequently), samples should be taken before and as close as practicable to a disinfection procedure. Analysis results from poor cultivation technique used by the laboratory can be misleading and may expose patients to high risks of adverse reactions.[10]

Safe injection practices:

Aside from the basic principles of aseptic technique, there are specific complementary recommendations for HD published by the CDC and APIC, which include the following: (a) all single-use injectable medications and solutions should be dedicated for use on a single patient and be used one time only, (b) medications packaged as multi-dose should be assigned to a single patient whenever possible, (c) medication preparation should occur in a clean area away from the patient treatment area, and be delivered separately for each patient, (d) to not carry multi-dose vials from station to station or carry medication vials, syringes, alcohol swabs or supplies in pockets, (e) unused medications or supplies taken to the patient's station should be used only for that patient and should not be returned to a common clean area or used on other patients, (f) to not use common medication carts to deliver medications to patients and, if trays are used to deliver medications to individual patients, they must be cleaned between patients.[10]

Vascular access: Care and prevention of infection:

Infection rates with tunneled dialysis catheters has been estimated to be 10-times higher than that of arteriovenous fistula (AVF) or AV graft, and is found to be the leading risk factor of bacteremia in chronic

HD patients. The international bodies are in concert with the guidelines that vascular access should be a native AV fistula whenever possible, AV graft as the next preferred option and the use of catheters to be avoided as much as possible. Vascular access infection prevention measures unanimously recommended by the international bodies are The relevance of "rubbing and soaking the catheter hub with the cap on with a povidone iodine swab for 3-5 minutes before the cap is removed" (as recommended by KDOQI) is understandably to disinfect the outside surface, thereby preventing inadvertent contamination of the inner hub and the resultant bloodstream contamination. In the 2011 update of the CDC Guidelines for the Prevention of Catheter-Related Infections, scrubbing of the access port with an appropriate antiseptic (chlorhexidine, povidone iodine, an iodophor or 70% alcohol) was recommended for needleless intravascular catheter systems. The routine scrubbing of dialysis catheter hubs (after cap removal before accessing and before replacing a new cap) with an appropriate antiseptic was included as part of a recent CDC's core interventions for dialysis bloodstream infection (BSI) prevention. Dialysis providers are cautioned to avoid inadvertent introduction of the used antiseptic solution into the bloodstream. [11]

The potential for the antiseptic used in cleaning the open catheter hub as well as few strands of cotton fibers to enter the blood-stream (simulated) and the effectiveness of normal saline solution (used as control) to reduce the microbial load at a level greater than 99% of the total number of microorganisms (suggesting mechanical removal) was demonstrated.

The cumulative effect of minute residues of toxic antiseptics and foreign substance that may get into the patient's bloodstream when applied repeatedly on open catheter hubs among chronic HD patients have not, and may not, be studied. Therefore, it is prudent to choose a safe and non-

toxic solution for cleaning open catheter hubs and to emphasize the application of friction while cleaning (scrubbing not just wiping).

Because HD patients are more immune compromised than other surgical patients, pre-surgical infection prevention measures are recommended, which include: (a) pre-surgical shower/bath with an antiseptic agent such as chlorhexidine, the night before and morning of surgery, (b) if hair removal is necessary, to use clippers instead of razors to prevent infection associated with micro-abrasions resulting from razor use and (c) avoiding intravenous placements and phlebotomy in the arm where access is to be placed (helps prevent infection and maintains vasculature integrity). Screening and decolonization for MRSA before an elective surgery may be used as an additional measure.[11]

Screening/routine serologic testing and patient placement:

The international bodies unanimously recommended that all HD patients should be screened for HBV and HCV infection on admission, and routinely tested thereafter. However, they differ with regard to testing for HIV infection. Testing for HBV is required for the purpose of isolating the HBV-infected patient and for vaccination and monitoring of susceptible patients. To avoid an erroneous diagnosis of acute HBV infection, which may put the patient at risk when inappropriately taken for treatment in an HBV isolation room, care should be taken to ensure that blood sample for HBs Ag testing is not drawn within two to three weeks after the administration of an HBV vaccine because, during this time, HBs Ag may be detected (known as "transient antigenemia"). The testing for HCV is to identify infected patients, who may be considered as treatment candidates, and to monitor any occurrence of seroconversion to HCV. Screening of all HD patients for tuberculosis (TB) is also recommended by the APIC, CDC, KDOQI and ERBP, which should be

done at baseline and whenever exposure is suspected, using the tuberculin skin test (TST) or blood test. [15]

Except for HBV isolation, the APIC, CDC and KDIGO did not recommend the segregation/isolation of HCV- and HIV-infected patients during HD treatments, due to the following reasons: (a) HCV and HIV are not transmitted as efficiently as HBV (viral titer in the infected patients' blood and the virus' viability on environmental surfaces are much less as compared with HBV) and (b) standard precautions and the specific measures of infection control recommended for HD units are considered to be sufficient to prevent their transmission. However, treatment of HCV-positive patients in separate areas with dedicated staff is recommended by the EBPG in 2002 in units with a high prevalence of HCV infection, which has been reiterated in the 2009 ERBP position statement. These viral diseases, however, remain a potential risk to both HD patients and staff for the following reasons: (a) there is no vaccine as yet to confer immunity for HCV and HIV, (b) the incidence of chronic persistent infection after an acute episode is high in both HCV (80-90%) and HIV (100%), (c) the prevalence of patients with chronic HCV is currently higher than that of HBV, and is much higher among the HD population, (d) the consequence of having a chronic infection with either HCV or HIV can be severe and/or fatal and (e) of utmost significance is the fact that implementation of standard precautions and stricter measures of infection control recommended for HD units cannot always be guaranteed to be consistently and reliably adhered to. Even in HD units with an "ideal set-up," unintentional breach of recommended infection control practices (i.e., as hand hygiene) do occur, especially at times when urgent interventions are required.[15]

Many studies have proven that segregating HD patients according to their virology status have resulted in a decrease in the incidence and prevalence of infections. By simple logic, this can be attributed to the physical barrier that prevents exposure of susceptible patients to patients who have identified infection/colonization with pathogenic patients will microorganisms. The staff movements between susceptible and infected definitely be prevented, as well as the sharing of possibly contaminated equipment and other items. Another strategy that can be used is the "temporal segregation," wherein patients who are suspected of being infectious are dialyzed in the last shift. This simple and low-cost strategy is effective in preventing the immediate exposure of other susceptible patient(s) to possibly contaminated environmental surfaces and equipment used by a source patient. Also, the time factor (allowing more time before reusing the equipment and treatment area for another susceptible patient) may add to the effect of disinfection in attenuating the level of contamination. [16]

Routine application of contact precautions in HD units has not been recommended by the CDC and APIC for patients infected or colonized with pathogenic bacteria for the following stated reasons: (a) transmission of pathogenic bacteria has not been well-documented in HD centers, (b) contamination of the patient's skin, bedclothes and environmental surfaces with pathogenic bacteria is likely to be less in outpatient HD units where patients spend less time (12 h/week) as compared with patients admitted in hospitals (24 h a day) and (c) the infection control practices recommended for HD units are more stringent than the standard precautions routinely used in hospitals, and should prevent transmission by the contact route. However, additional precautions are recommended for patients who are considered risky for transmitting pathogenic bacteria,

such as those with an infected skin wound with drainage (the drainage does not have to be culture positive for VRE, MRSA or other specific pathogen), incontinence or diarrhea. These include (a) dialyzing the patient at a station with as few adjacent stations as possible (e.g., at the end corner of the unit), (b) staff members treating the patient should wear a gown over their usual clothing, remove and dispose the gown properly when they finish caring for the patient and (c) staff should not care for other susceptible patients at the same time.[15]

As one component of standard precautions, respiratory hygiene/cough etiquette should be implemented all year round at the first point of contact with individual(s) who are coughing or potentially having any kind of respiratory infection. Outpatient facilities are recommended to post at the facility entrance visual alerts (clear and simple instructions, in appropriate languages) instructing patients and visitors to inform health-care personnel of symptoms of respiratory infection, and to follow recommended measures, which include (a) covering the mouth and nose with a tissue when coughing or sneezing, (b) to dispose used tissues in the nearest waste receptacle and (c) to perform hand hygiene (use of alcohol-based hand rub or hand washing) after contact with respiratory secretions and/or contaminated objects/materials. To promote compliance, the dialysis facilities should provide required materials in waiting areas as well as in treatment areas, which include supplies of tissues, pedal-operated waste receptacles, conveniently located alcohol-based hand rubs and supplies for hand washing where sinks are available. Symptomatic patients are offered face masks and segregated preferably in a single room, or as far as possible from others (at least 3 feet away) in common waiting areas. Based on the current recommendations, the patient is preferably dialyzed in a single room and instructed to observe respiratory

hygiene/cough etiquette. If not possible, then dialyze in an area with few adjacent stations with a spatial separation of 3-6 feet from other patients, and the curtain drawn around to separate and minimize contact with other patients. The health-care worker caring for the patient should wear a surgical mask and perform hand hygiene as indicated (droplet precautions). Only immune staff should care for patients with vaccine-preventable diseases such as mumps, rubella and diphtheria. The current belief is that influenza virus is spread by large particles that travel up to 3-6 feet from the infected person. However, several recent studies have indicated that a major part of emitted influenza virus from infected individuals are carried in smaller particles (<5 μm in diameter) during normal breathing and talking, which supports the idea of an airborne transmission. [15]

Patients identified with a suspected airborne disease should be made to wear a mask immediately on arrival and geographically separated from other patients, preferably in a single room with the door closed and the health-care worker assigned to care for the patient should wear a properly fitted respirator (airborne precautions). Arrangements should be made for HD treatments at a facility that have an airborne infection isolation room (AIIR), which is equipped with monitored negative air pressure . the patient may remove the mask once in an AIIR. If not on an AIIR, the mask should remain on; after the patient leaves, the room should remain vacant for at least one hour to allow for a full exchange of air. It is recommended to assign staff with documented immunity to care for patients with vaccine-preventable airborne diseases such as measles, chickenpox and smallpox. [15]

Immunization of patients and health-care personnel:

Recommended immunization of patients with chronic kidney disease (CKD), especially those that are dialysis-dependent, include at a minimum (a) hepatitis B vaccine, (b) pneumococcal vaccine and (c) influenza-inactivated vaccine (IIV). Other vaccines recommended for healthy individuals may be used if otherwise indicated, except for any live attenuated vaccines that are generally contraindicated in patients who are immune compromised. Recommended immunizations for dialysis personnel include: (a) Hepatitis B vaccine (b) Influenza vaccine, (c) Measles, mumps and rubella (MMR) vaccine, (d) Varicella vaccine and (e) tetanus, diphtheria with acellular pertussis vaccine Hepatitis B vaccination is specifically recommended for susceptible health-care workers at risk for exposure to blood and body fluids (e.g., hemodialysis personnel).[(2)]

Tracking infections:

Surveillance for infections (outcome measures) and monitoring adherence to recommended infection prevention practices (process measures) are important components of an infection prevention program. To enable accurate comparison and analyses of monthly rates within the same facility or meaningful benchmarking with other units/centers, it is important that a standardized and validated surveillance protocol be used uniformly by all dialysis facilities. A centralized surveillance system for health-care-associated infections like the CDC's national health-care safety network (NHSN), which requires all participating facilities to strictly follow every specific surveillance criteria, can provide accurate and reliable data that can be used to identify problem areas as well as measure progress of prevention efforts. Implementation of the CDC's NHSN Dialysis Event Protocol by other dialysis facilities outside the

United States have been demonstrated to be feasible. Dialysis events that should be reported include (a) intravenous antimicrobial starts, (b) positive blood cultures and (c) evidence of local access site infection (pus, redness or increased swelling at the vascular access site), and data collected from these three events can generate four other types of dialysis events: Blood-stream infection (BSI), local access site infection (LASI), access-related bloodstream infection (ARB) and vascular access infection (VAI). The number of maintenance HD out-patients who received HD in the unit/center during the first two working days of the month (including transient HD patients but excluding inpatients and PD patients) should be reported on a monthly basis and according to their vascular access type. This will serve as the denominators for rate calculation. Each patient is counted only once; if the patient has multiple vascular accesses, that patient is counted with the vascular access type of highest infection risk. Rates are calculated by dividing the number of events by the number of patient-months and multiplying the result by 100. [(1)]

As a means to reduce infection transmission, each dialysis facility should also monitor other parameters like dialysis water and dialysis fluid cultures and endotoxin results, incidence of drug-resistant infections, Hospitalizations, as well adherence to standard precautions (hand hygiene, glove use and other PPE, equipment and environmental cleaning, safe injection practices, etc.) and other recommended practices (screening for HBV, HCV, HIV and tuberculosis infections and immunizations). Regular feedback of surveillance results to everyone involved in the health-care delivery (especially the frontline staff) would help to stimulate and encourage active engagement and improve compliance with infection prevention efforts. At least one designated person with training in infection control and epidemiology (infection

preventionist) should be responsible for over-sight of the program as well as education of staff and patients related to infection prevention and control. [1]

Steps that should be taken to control spread of infection, especially if there is an incidence of a positive seroconversion or outbreak in the HD unit, include the following: (a) review of the laboratory test results of all patients dialyzing in the same unit to identify any additional case(s), (, (c) determination/tracking of potential sources for infection, which includes (i) revision of newly infected patients' recent history of blood transfusion, invasive procedure(s) and/or hospitalization and (ii) high-risk behavior such as history of injection drug use and sexual activity, and (d) revision of HD unit's practices and procedures of infection control.

Education and training in infection prevention and control should be provided to all health-care workers upon hire, and should be repeated regularly (at least on a yearly basis). Basic principles and practices for preventing the spread of infections should be covered and staff competencies should be assessed and documented upon orientation to the facility, and this should be repeated as appropriate for the specific staff and position [1]

Infection Prevention in Dialysis Settings

Patients who undergo hemodialysis have a higher risk of infection, due to the following factors:

Frequent use of catheters or insertion of needles to access the blood stream, weakened immune systems, frequent hospital stays and surgery

Infections in Dialysis Patients

Dialysis patients are at risk of getting **hepatitis B and C infections** and **bloodstream infections Hepatitis B and C** are blood borne viral infections that can cause chronic (life-long) disease involving

inflammation (swelling) of the liver , Hepatitis B and C viruses can live on surfaces and be spread without visible blood.

A **bloodstream infection** is a serious infection that can occur when bacteria or other germs get into the blood ,One way bacteria can enter the bloodstream is through a vascular access (catheter, fistula, or graft) Infections in Dialysis Patients.

Bloodstream infections are a dangerous complication of dialysis 1 in 4 patients who get a bloodstream infection caused by S. aurous (staph) bacteria can face complications such as:

Endocarditic (infected heart valve)

Osteomyelitis (infected bone)

Bloodstream infections can cause sepsis (a potentially deadly condition) Up to 1 in 5 patients with an infection die within 12 weeks.[11]

National Burden of Dialysis Infections:

In the US, there are about 370,000 people relying on hemodialysis About 75,000 people receive hemodialysis through a central

line Central lines have a higher risk of infection than a fistula or graft

CDC estimates 37,000 central line-associated bloodstream infections may have occurred in U.S. hemodialysis patients in 2008

How Do Infections Happen?

Three elements must be present for an infection to occur:

1. A **source** of germs (like bacteria or viruses)
2. A susceptible **host**, meaning a person who is at risk of getting an infection from the germs
3. A **way** for the germs to move from the source to the host

There are three ways in which germs move from the source to the host:

Contact, Droplet, and Airborne Transmission:

Role in Contact Transmission:

During dialysis, infections can be spread by Contact Transmission

Most commonly by **healthcare worker hands!**

Spread of Respiratory Infections

Certain infections are spread by certain routes:

Flu may be spread by Droplet Transmission

Tuberculosis is spread by Airborne Transmission

What Can You do to Prevent the Spread of Infections?

Understand and Follow the Basics of Infection Control

All healthcare workers are expected to follow **Standard Precautions** for infection control. [8]

Recommendations

Specific Infection Control Recommendations for Outpatient Hemodialysis Healthcare Workers

-Wear gloves and other personal protective equipment (PPE) for all patient care.

-Promote vascular access safety

-Separate clean areas from contaminated areas

-Use medication vials safely

-Clean and disinfect the dialysis station between patients

-Perform safe handling of dialyzers

-Wear gloves during patient care

-Wear disposable **gloves** when caring for the patient or touching equipment at the dialysis station

-Wear gloves when cleaning surfaces in the environment or medical equipment

-Remember to remove gloves and **perform hand hygiene** between each patient or station, and if moving from a contaminated to clean area of the same patient or within the same dialysis station

-Use Personal Protective Equipment (PPE)

In addition to **gloves**, you should wear **gowns** and **face protection** to protect yourself as needed:

During initiation and termination of dialysis

When cleaning dialyzers

When handling lab samples

-PPE should be changed if it becomes dirty

Basic Steps in Fistula/Graft Care:

Cannulation Procedure:

1. Wash the site
2. Perform hand hygiene
3. Put on a new, clean pair of gloves
4. Wear proper face protection
5. Apply skin antiseptic and allow it to dry
6. Insert needle using aseptic technique
7. Remove gloves and perform hand hygiene

Basic Steps in Fistula/Graft Care:

Decannulation Procedure:

1. Perform hand hygiene
2. Put on a new, clean pair of gloves
3. Wear proper face protection
4. Remove needles using aseptic technique
5. Apply clean gauze/bandage to site
6. Compress the site with clean gloves
7. Remove gloves and perform hand hygiene

Basic Steps in Catheter Care:

Catheter Connection Procedure:

1. Perform hand hygiene
2. Put on a new, clean pair of gloves
3. Wear proper face protection
4. Apply antiseptic to catheter hub and allow it to dry
5. Connect the catheter to blood lines using aseptic technique
6. Unclamp the catheter
7. Remove gloves and perform hand hygiene[7]

Basic Steps in Catheter Care:

Catheter Disconnection Procedure:

1. Perform hand hygiene
2. Put on a new, clean pair of gloves
3. Wear proper face protection
4. Disconnect the catheter from blood lines using aseptic technique
5. Apply antiseptic to catheter hub and allow it to dry
6. Replace caps using aseptic technique
7. Make sure the catheter remains clamped
8. Remove gloves and perform hand hygiene

Catheter Exit Site Care:

1. Perform hand hygiene
2. Put on a new, clean pair of gloves
3. Wear a face mask if required
4. Apply antiseptic to catheter exit site and allow it to dry
5. Apply antimicrobial ointment
6. Apply clean dressing to exit site
7. Remove gloves and perform hand hygiene

Separate Clean Areas from Contaminated Areas

Clean areas should be used for the **preparation, handling and storage** of medications and unused supplies and equipment

Your center should have **clean medication** and **clean supply** areas

Contaminated areas are where **used supplies and equipment** are handled

Do not handle or store medications or clean supplies in the same area as where used equipment or blood samples are handled

Remember: Treatment stations are contaminated areas!

Dedicate Supplies to a Single Patient[7]

Any item taken to a patient's dialysis station could become contaminated
Items taken into the dialysis station should either be:
Disposed of, or Cleaned and disinfected before being taken to a common clean area or used on another patient
Unused medications or supplies taken to the patient's station should not be returned to a common clean area (e.g., medication vials, syringes, alcohol swabs) [7]

Safe Use of Medication Vials:

Prepare all individual patient doses in a clean area away from dialysis stations Prepare doses as close as possible to the time of use

Do not carry medications from station to station

Do not prepare or store medications at patient stations

CDC recommends that dialysis facilities:

Use single-dose vials whenever possible and dispose of them immediately after use
Guidelines for Carrying Medications
Do not use the same medication cart to deliver medications to multiple patients
Do not carry medication vials, syringes, alcohol swabs, or supplies in pockets
Be sure to prepare the medication in a clean area away from the patient station and bring it to the patient station for that patient only at the time of use Cleaning and Disinfecting the Dialysis Station

Cleaning and **disinfection** reduce the risk of spreading an infection

Cleaning is done using cleaning detergent, water and friction, and is intended to remove blood, body fluids, and other contaminants from objects and surfaces[7]

Disinfection is a process that kills many or all remaining infection

-causing germs on clean objects and surfaces Use an EPA

-registered hospital disinfectant Follow label instructions for proper dilution

-Wear gloves during the cleaning/disinfection process

Disinfecting the Dialysis Station:

All equipment and surfaces are considered to be contaminated after a dialysis session and therefore must be disinfected

After the patient leaves the station,

disinfect the dialysis station (including chairs, trays, countertops, and machines) after each patient treatment

-Wipe all surfaces

-Surfaces should be wet with disinfectant and allowed to air dry

-Give special attention to cleaning control panels on the dialysis machines and other commonly touched surfaces

-Empty and disinfect all surfaces of prime waste containers

Safe Handling of Dialyzers and Blood Tubing:

-Before removing or transporting used dialyzers and blood tubing, cap dialyzer ports and clamp tubing

-Place all used dialyzers and tubing in leak-proof containers for transport from station to reprocessing or disposal area

-If dialyzers are reused, follow published methods (e.g., AAMI standards) for reprocessing

AAMI is the Association for the Advancement of Medical Instrumentation[(15)]

Policies and Practices:

Infection Control Policies and Practices for Outpatient Hemodialysis Facilities

-Vaccination of dialysis staff and patients

-Preventing the spread of hepatitis B

-Preventing the spread of bacterial infections[15]

Vaccine-Preventable Infections:

Influenza

Influenza or the "flu" is a respiratory infection that infects the nose, throat, and lungs

The flu is spread mainly by droplets that are made when people with flu cough, sneeze or talk

The single best way to prevent the flu is to get a flu vaccine each year.

Hepatitis B

Hepatitis B is a serious infection that affects the liver. It can cause acute (short-term) or chronic (long-term) infection and liver cancer

Hepatitis B virus is easily spread through contact with the blood or other body fluids of an infected person

Hepatitis B vaccine can prevent hepatitis B infection

****Take Care of Yourself Get Vaccinated**

Get the flu vaccine each year

Complete the hepatitis B vaccine series

Vaccination and Routine Testing of Hemodialysis Patients

Vaccinate all susceptible patients against:

Hepatitis B

Recommended vaccines for patients include:

Influenza (inactivated)

Pneumococcal

Conduct routine**s p** testing for:

Hepatitis B virus

Hepatitis C virus [2]

Preventing the read of Hepatitis B:

Dialyze hepatitis B (HBsAg+) patients in a separate room using separate machines, equipment, instruments, and supplies

Be sure to use a separate gown when treating these patients

Staff members caring for patients with hepatitis B (HBsAg+) should not care for HBV-susceptible patients at the same time (e.g., during the same shift or during patient changeover) [3]

Preventing the Spread of Bacterial Infections:

Hemodialysis patients who might be at increased risk for spreading germs to other patients include those with:

-An infected skin wound with drainage that is not contained by dressings

-Fecal incontinence or uncontrolled diarrhea

For these patients use the following precautions:

-Wear a gown and gloves when you are caring for the patient and remove the gown and gloves when you are finished caring for the patient

-Do not wear the same gown when caring for other patients

-Dialyze the patient at a station with as few adjacent stations as possible (e.g., at the end or corner of the room)

Patients with respiratory illness and a fever are at risk of spreading bacterial and viral respiratory infections

-These patients should be dialyzed at least 6 feet away from other patient stations or any shared supplies[2]

Education

Educating your Patients and their Caregivers

How to Recognize an Infection

-Advise patients to inform you if they notice any of the following possible signs of infection:

Fever[2]

The access site is:

Swollen (bulging),

red,

warm, or has pus

Severe pain at the access site

Remember: infections of the vascular access site can be life threatening

Training and Education of Patients and their Caregivers:

When a new patient starts dialysis and on an annual basis, review:

-Personal hygiene and hand hygiene technique

-Patient responsibility for proper care of the access site and recognition of signs of infection

-Recommended vaccinations (including hepatitis B, influenza, and pneumococcal)

-Reasons for selecting a fistula or graft over a catheter to lower the risk of infection[2]

Recap

Key Infection Prevention Practices

-Perform hand hygiene frequently and change gloves

-Maintain separate clean areas for supplies and medications and separate contaminated areas for used items

-Practice proper handling and delivery of patient supplies and medications

-Perform effective cleaning and disinfection of dialysis equipment and environmental surfaces

-Carefully handle medications and the patient's vascular access to avoid contamination [15]

Remember: Use aseptic technique every time!

Conclusion:

Infections that patients can get while receiving dialysis are serious and preventable!

Healthcare workers like you following infection control precautions and other safe care practices are the key to prevention.

Infection prevention is everyone's responsibility.(19)

100% utilization of recommended infection control guidelines is essential to prevent infections in this vulnerable population. Prevention efforts may require that HD organizations devote greater resources to ensure implementation of infection control practices.(20).

Evidence-based international guidelines are of great value and are instrumental in helping reduce health-care-associated infections. The cornerstone toward risk reduction is to be aware and abreast with the latest guidelines and be keen in implementing them reliably and consistently, as well as being conscientious and alert/active in engaging in quality improvement projects. The decision to follow any guideline statement must be made individually, by each HD unit at different locations with varying conditions, according to the incidence and prevalence of any type of infection. However, patient's safety and well-being deserves top priority in whatever decision is to be made.

Previous study

1. The cross-sectional study was carried out in four dialysis units in Lagos Nigeria between October and December 2011 The study population included 38 (37.3%) doctors, 42 nurses (41.2%), 14 (13.7%) dialysis technicians and 8 (7.8%) ancillary staff. There were 39 (38.2%) males. The mean±SD age of the study population was 34.4±8.3 years. 25 (24.5%) staff had suffered NSI in the last 12 months and 41 (40.2%) in their entire working career. The most common activity leading to NSI was recapping of needles (45%), improper disposal of needles (30%), and venous cannulation and setting of drips (27.5%). NSI was significantly (p=0.016) higher among those with work experience between 6 and 10 years than others. Hollow bore needles were responsible for 82.9% of the NSIs. Only 15 (37%) respondents reported their NSI to their unit head or designated officer in order to get medical advice. [15]

2- The cross-sectional survey was conducted from December 2011 to match 2012 in Calabria region (Italy)

90% of the nurses working in HDU participated in the study. Correct answers about HCV pattern of transmission ranged from 73.7% to 99.3% and were significantly higher in respondents who knew that isolation of HCV-infected patients is not recommended and among those who knew that previous bloodstream infections should be included in medical record and among nurses with fewer years of practice. Most correctly thought that evidence-based infection control measures provide adequate protection against transmission of blood borne pathogens among healthcare workers. Positive attitude was significantly higher among more knowledgeable nurses. Self-reporting of appropriate hand washing procedures were significantly more likely in nurses who were aware that transmission of blood borne pathogens among healthcare workers may be prevented through adoption of evidence-based practices and with a correct knowledge about HCV and HBV transmission patterns .[11]

Chapter Two

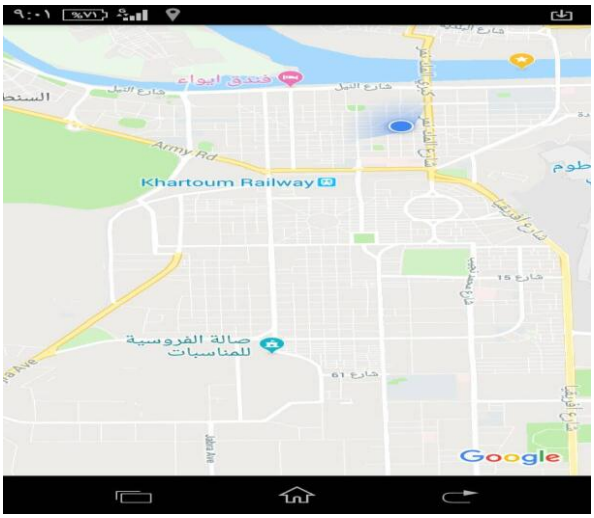
Methodology

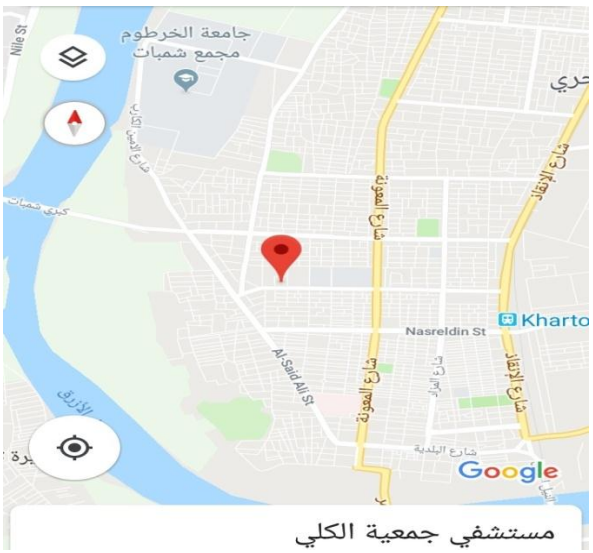
2. Research Methodology

2.1 Study design:

This cross sectional study done in D Selma Center for kidney diseases and transplantation and Sudanese kidney transplanted association hospital (20- October to 1- November 2018)

2.2 Study setting & area:





Dr. Salma Center for kidney diseases and transplant located north to Alemam Almahadi Street north to AL Giada Mosque, bordered by 21 October street in the north, 10th street in the west, Altijani Elamhi Street in the south, Othman Digna avenue in the east, and Alnijumi street in the north – west.

Sudanese kidney transplanted association hospital located in Bahri city west the University of Al Zaeem al azhari , east Alsied Almergany Street

This study conducted at hemodialysis center .Dr. Slama Center was established since 1985, it provides hemodialysis for all patients, the average number of patients receiving hemodialysis per day is about patients, there is 25 registered nurses deliver hemodialyses for patient at this center, and have 10 doctors and fife consultants.

Sudanese kidney transplanted association hospital established in 2000, provides health services in urology and renal , the dialysis center organize 3 sessions per day , more than 20 patients in each session, sessions set in all week days except Friday.

2.3 Study duration:

20- October to 1- November 2018

2.4 Study Population:

The study population covers all nurses working in hemodialysis unit (Dr. Salma center for kidney diseases and transplant and Sudanese kidney transplanted association hospital) .

2.5 Sampling /Sample size:

A- sampling technique

All nurses were enrolled in the study

B- Sample size:

(50) Nurses were participated in the study

2.6 Data collection:

2.6.1 Data collection techniques:

The data was collected in a week in all shifts after taking permission from the staff and discus the important of research, during their rest time every nurse were allowed to fill the questionnaire then observation was done while perfuming infection control measures.

2.6.2 Data collection tools:

A- Self administered questionnaire :-

Which is close ended questionnaire include seven questions demographic data, the next section regarding infection control (five questions), the third section regarding PPE(two questions), the fourth section regarding hand washing, present of infection control and barrier(three questions) the

last eight questions regarding recapping, sharp instrument, screening and needle stick injury.

B- Observational chick list about infection control guideline rated by done and not done

2.6.3 Data analysis:

Data were analysis by using the Statistical Package for Social Sciences program (SPSS) version 18.

Deferent statistical measure was used (frequency _ percentage _ mean _ chi test-).

2.7 Ethical consideration:

- permission from university of shandi faculty of medical and health science.

-Permission from Dr. Salma center for kidney diseases.

-permission from Sudanese kidney transplanted association hospital.

-Verbal consent from participants after explaining of research objectives.

Chapter Three

Results

3. Result

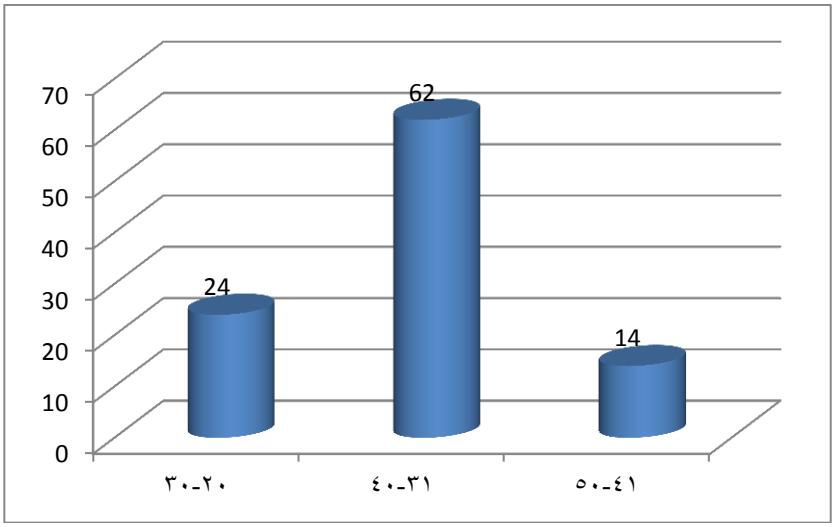


Figure (1) age of study group

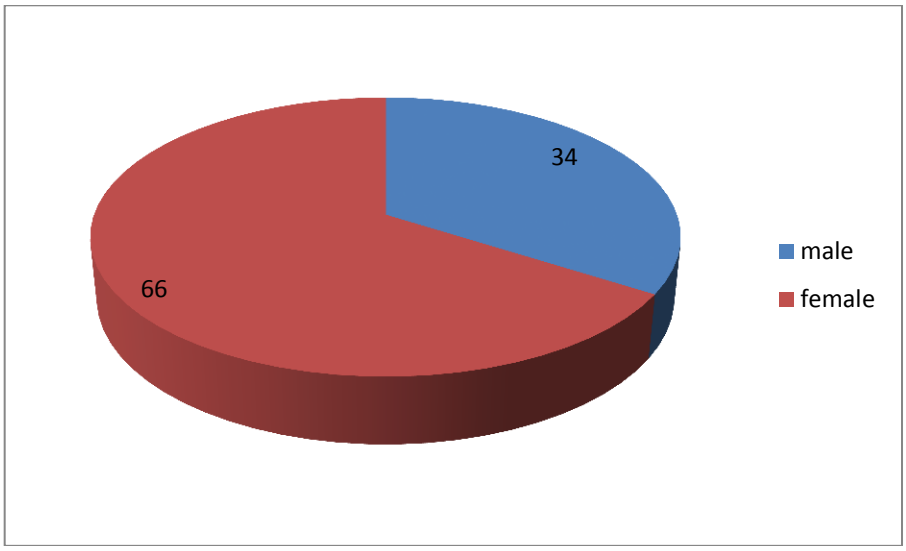


Figure (2) the gender of study group

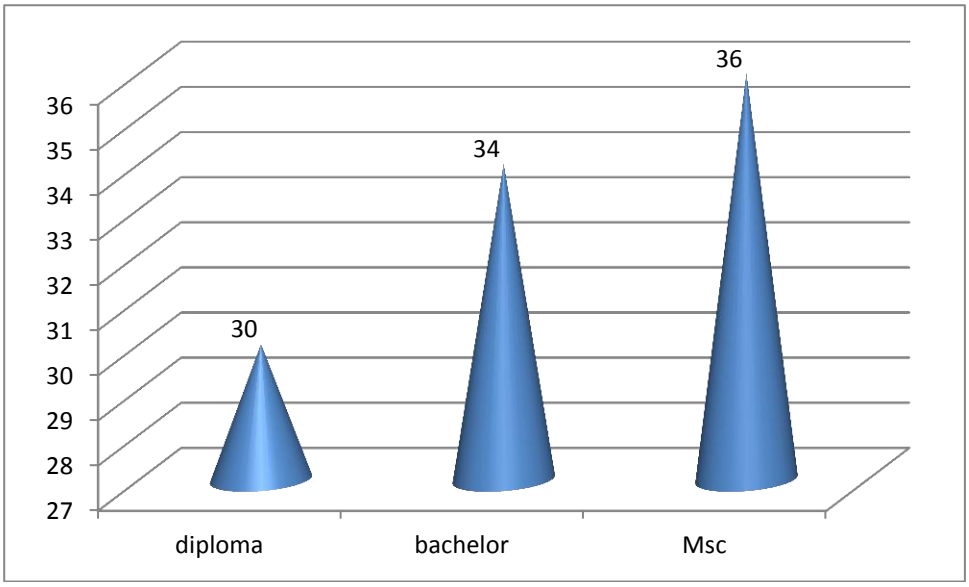


Figure (3) the degree of qualification among nurses

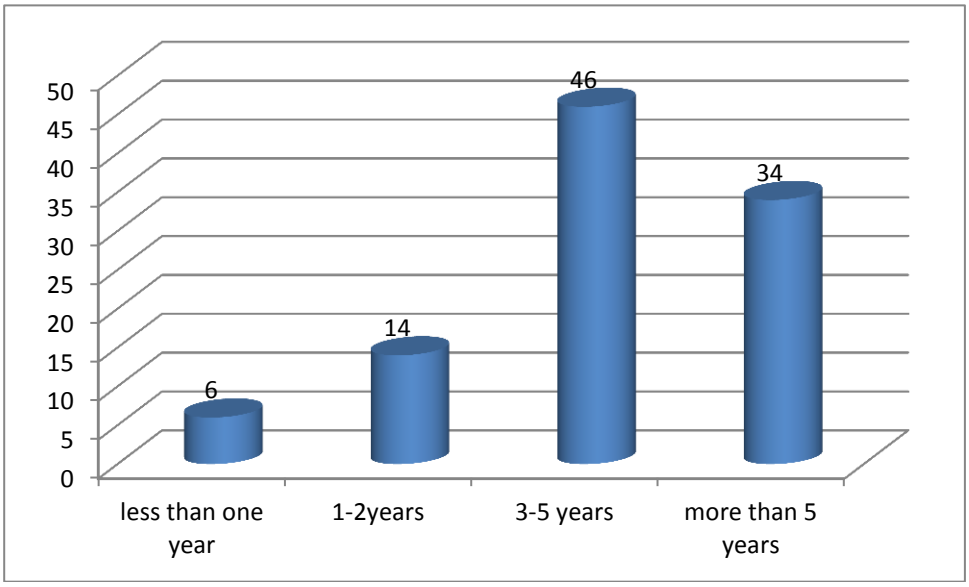
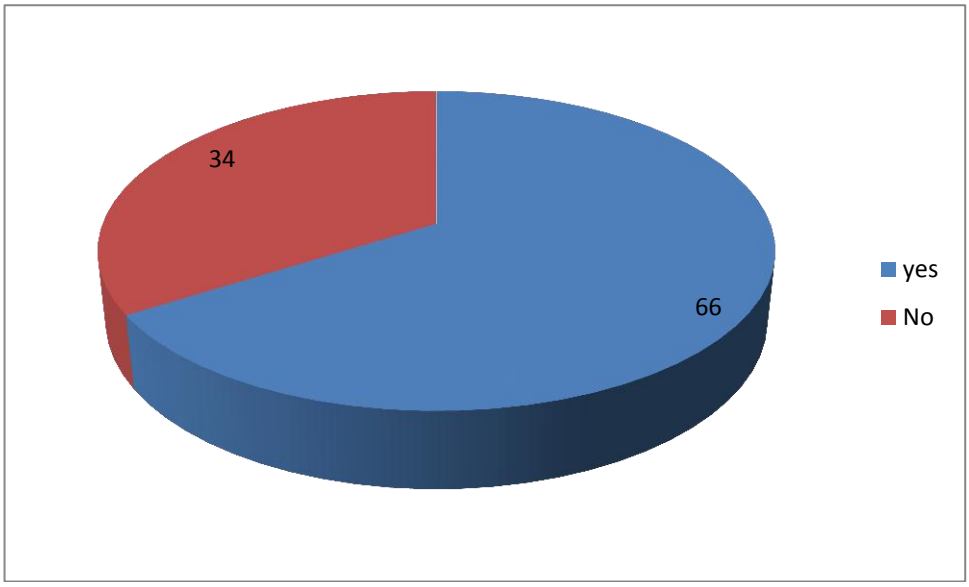


Figure (4) years of experience among nurses



Figer (5) Nurses who working in multiple centers

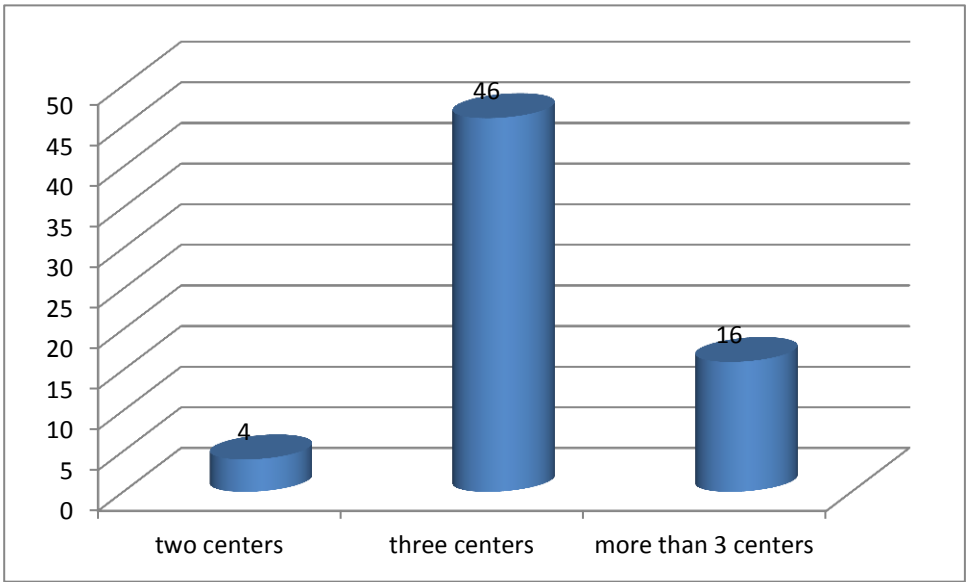


Figure (6) Number of centers that nurses work in

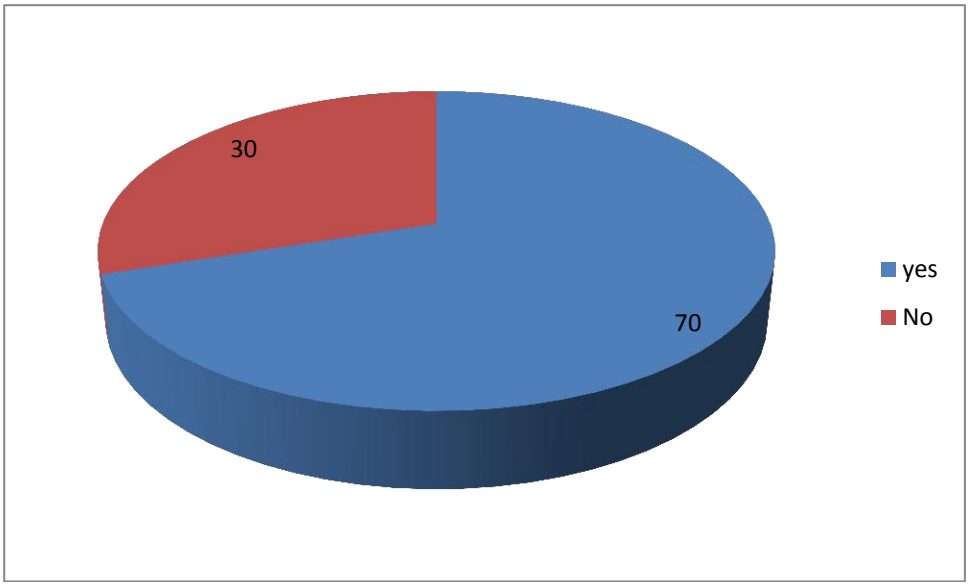


Figure (7) Explain courses attend about infection control

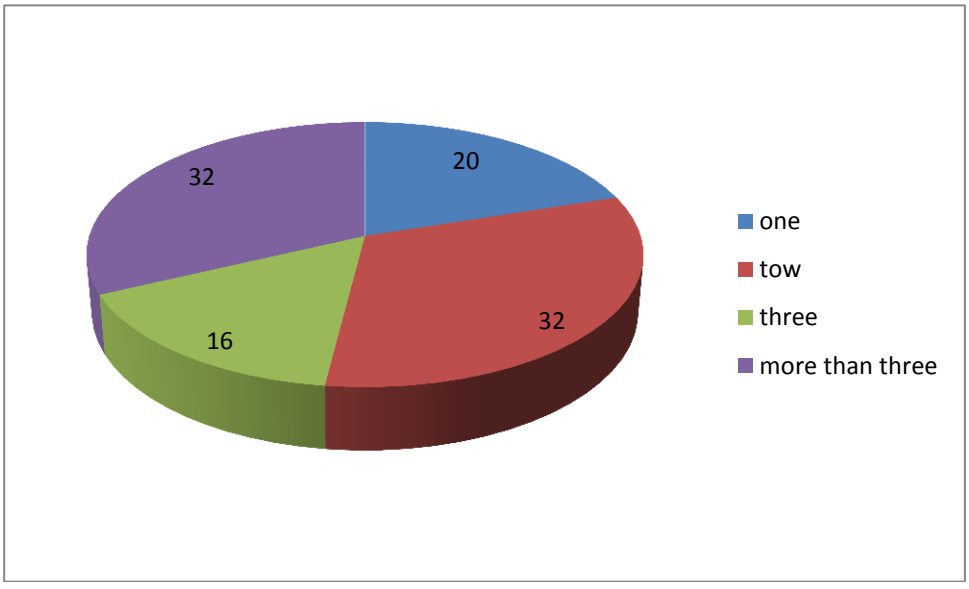


Figure (8) The number of courses that nurses do

Table (1) frequency distribution of the nurse level of knowledge about infection control

No	Known	Un known	Total
the chain of infection	29	21	50
	58%	42%	100.0%
The risk of infection	27	23	50
	54%	46%	100.0%
The strategies to control health care association infection	24	26	50
	48%	52%	100.0%
The infection control committee is	29	21	50
	58%	42%	100.0%
The stander p precaution steps	25	25	50
	50%	50%	100.0%
14-the type of Personal protective equipment [PPE]	40	10	50
	80%	20%	100.0%
15-the Sequence for removing personal protective equipments	23	27	50
	46%	54%	100.0%
The time for wash hands	43	7	50
	86%	14%	100.0%

Table (2) Explain the presence of good infection control management and practice

	Frequency	Percent%
present and activated	19	38.0
present but not activated	19	38.0
not present	12	24.0
Total	50	100.0

Table (3) Explain barrier to apply infection control

	Frequency	Percent%
yes	32	64.0
No	18	36.0
Total	50	100.0

Table (4) Explain nurses performance needle recapping

	Frequency	Percent%
never	18	36.0
sometime	28	56.0
always	4	8.0
Total	50	100.0

Table (5) Explain place for dispose of sharp instrument

	Frequency	Percent%
basket	4	8.0
safety box	44	88.0
with other medical waste like cotton-blood line-dialyzer	2	4.0
Total	50	100.0

Table (6) Explain the isolation of patient with hepatitis B virus

	Frequency	Percent%
isolated	46	92.0
Not isolated	4	8.0
Total	50	100.0

Table (7) Explain patient diagnose with hepatitis B or C virus

	Frequency	Percent%
yes	38	76.0
No	12	24.0
Total	50	100.0

Table (8) Explain isolation rooms for infected patient with hepatitis Band C

	Frequency	Percent%
completely isolated	24	63.2
partially isolated	14	36.8
Total	38	100.0

Table (9) Explain separated staff members in hepatitis B or C virus

	Frequency	Percent%
yes	20	51.3
No	19	48.7
Total	39	100.0

Table (10) Explain viral screening among nurses

	Frequency	Percent%
yes	42	84.0
No	8	16.0
Total	50	100.0

Table (11) Explain time for doing viral screening

	Frequency	Percent%
every month	4	9.8
every 3 month	12	29.3
more than 3 month	25	61.0
Total	41	100.0

Table (12) Explain exposed to needle stick injury among nurses

	Frequency	Percent%
immediately washed site of injury with soap and running water	16	32.0
no evidence that antiseptic are useful	1	2.0
promptly notify your supervisor and fill out the needle stick	17	34.0
all of them	16	32.0
Total	50	100.0

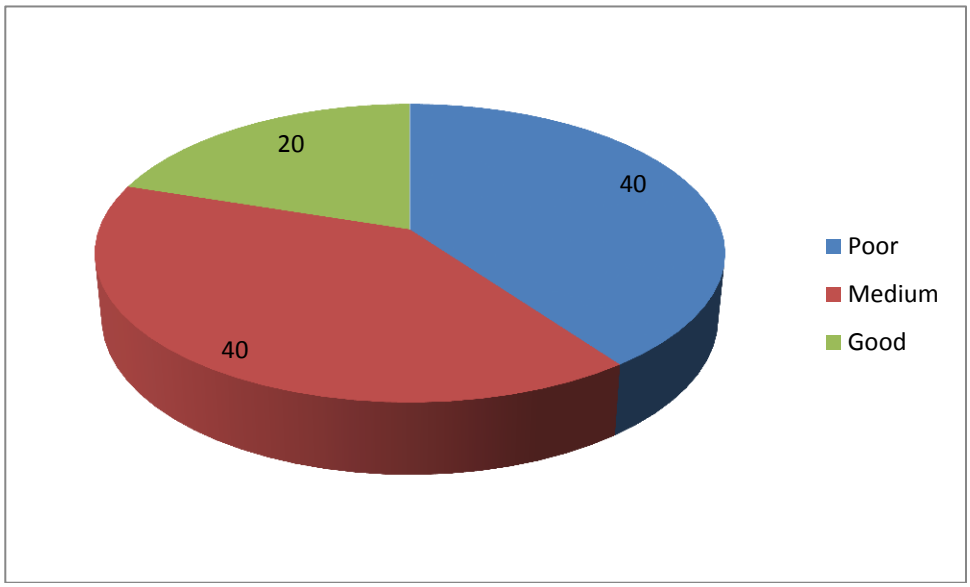


Figure (9) Explain nurses knowledge about infection control

Table (13) Relationship between age * knowledge of nurses regarding infection control.

			knowledge			Total	P- value
			Poor	Medium	Good		
age	20-30	Count	8	3	1	12	
		% within knowledge	40.0%	15.0%	10.0%	24.0%	
		% of Total	16.0%	6.0%	2.0%	24.0%	
	31-40	Count	12	12	7	31	
		% within knowledge	60.0%	60.0%	70.0%	62.0%	
		% of Total	24.0%	24.0%	14.0%	62.0%	.074+
	41-50	Count	0	5	2	7	
		% within knowledge	.0%	25.0%	20.0%	14.0%	
		% of Total	.0%	10.0%	4.0%	14.0%	
Total		Count	20	20	10	50	
		% within knowledge	100.0%	100.0%	100.0%	100.0%	
		% of Total	40.0%	40.0%	20.0%	100.0%	

+Not significant different at the 0.05 level.

Table (14) Relationship between gander * knowledge of nurses regarding infection control.

			knowledge			Total	p- value
			Poor	Medium	Good		
gander	male	Count	9	6	2	17	
		% within knowledge	45.0%	30.0%	20.0%	34.0%	
		% of Total	18.0%	12.0%	4.0%	34.0%	
	female	Count	11	14	8	33	.351+
		% within knowledge	55.0%	70.0%	80.0%	66.0%	
		% of Total	22.0%	28.0%	16.0%	66.0%	
Total		Count	20	20	10	50	
		% within knowledge	100.0%	100.0%	100.0%	100.0%	
		% of Total	40.0%	40.0%	20.0%	100.0%	

+Not significant different at the 0.05 level.

Table (15) Relationship between degree of qualification * knowledge of nurses regarding infection control.

			knowledge			Total	p- value
			Poor	Medium	Good		
degree of qualification	diploma	Count	13	2	0	15	0.00**
		% within knowledge	65.0%	10.0%	.0%	30.0%	
		% of Total	26.0%	4.0%	.0%	30.0%	
	bachelor	Count	5	11	1	17	
		% within knowledge	25.0%	55.0%	10.0%	34.0%	
		% of Total	10.0%	22.0%	2.0%	34.0%	
	Msc	Count	2	7	9	18	
		% within knowledge	10.0%	35.0%	90.0%	36.0%	
		% of Total	4.0%	14.0%	18.0%	36.0%	
Total		Count	20	20	10	50	
		% within knowledge	100.0%	100.0%	100.0%	100.0%	
		% of Total	40.0%	40.0%	20.0%	100.0%	

**High significant different at the 0.05 level.

Table (16) Relationship between years of experience * knowledge of nurses regarding infection control.

			knowledge			Total	p- value
			Poor	Medium	Good		
years of experience	less than one year	Count	2	1	0	3	0.08+
		% within knowledge	10.0%	5.0%	.0%	6.0%	
		% of Total	4.0%	2.0%	.0%	6.0%	
	1-2years	Count	5	2	0	7	
		% within knowledge	25.0%	10.0%	.0%	14.0%	
		% of Total	10.0%	4.0%	.0%	14.0%	
	3-5 years	Count	11	7	5	23	
		% within knowledge	55.0%	35.0%	50.0%	46.0%	
		% of Total	22.0%	14.0%	10.0%	46.0%	
	more than 5 years	Count	2	10	5	17	
		% within knowledge	10.0%	50.0%	50.0%	34.0%	
		% of Total	4.0%	20.0%	10.0%	34.0%	
Total		Count	20	20	10	50	
		% within knowledge	100.0%	100.0%	100.0%	100.0%	
		% of Total	40.0%	40.0%	20.0%	100.0%	

+Not significant different at the 0.05 level.

Table (17) Relationship between nurses working in multiple centers * knowledge of nurses regarding infection control.

			knowledge			Total	p-value
			Poor	Medium	Good		
are you working in multiple centers	yes	Count	15	9	9	33	
		% within knowledge	75.0%	45.0%	90.0%	66.0%	
		% of Total	30.0%	18.0%	18.0%	66.0%	
	No	Count	5	11	1	17	0.02**
		% within knowledge	25.0%	55.0%	10.0%	34.0%	
		% of Total	10.0%	22.0%	2.0%	34.0%	
Total		Count	20	20	10	50	
		% within knowledge	100.0%	100.0%	100.0%	100.0%	
		% of Total	40.0%	40.0%	20.0%	100.0%	

**High significant different at the 0.05 level.

Table (18) Relationship between attende courses about infection control * knowledge of nurses regarding infection control.

			knowledge			Total	p- value
			Poor	Medium	Good		
do you attend any courses about infection control	yes	Count	9	16	10	35	
		% within knowledge	45.0%	80.0%	100.0%	70.0%	
		% of Total	18.0%	32.0%	20.0%	70.0%	
	No	Count	11	4	0	15	0.00**
		% within knowledge	55.0%	20.0%	.0%	30.0%	
		% of Total	22.0%	8.0%	.0%	30.0%	
Total		Count	20	20	10	50	
		% within knowledge	100.0%	100.0%	100.0%	100.0%	
		% of Total	40.0%	40.0%	20.0%	100.0%	

**High significant different at the 0.05 level.

Table (19) Relationship between nurses knowledge * practice.

			practice			Total	p- value
			Poor	Medium	Good		
knowledge	Poor	Count	4	10	6	20	
		% within practice	22.2%	55.6%	42.9%	40.0%	
		% of Total	8.0%	20.0%	12.0%	40.0%	
	Medium	Count	7	6	7	20	
		% within practice	38.9%	33.3%	50.0%	40.0%	
		% of Total	14.0%	12.0%	14.0%	40.0%	0.08+
	Good	Count	7	2	1	10	
		% within practice	38.9%	11.1%	7.1%	20.0%	
		% of Total	14.0%	4.0%	2.0%	20.0%	
Total		Count	18	18	14	50	
		% within practice	100.0%	100.0%	100.0%	100.0%	
		% of Total	36.0%	36.0%	28.0%	100.0%	

+Not significant different at the 0.05 level.

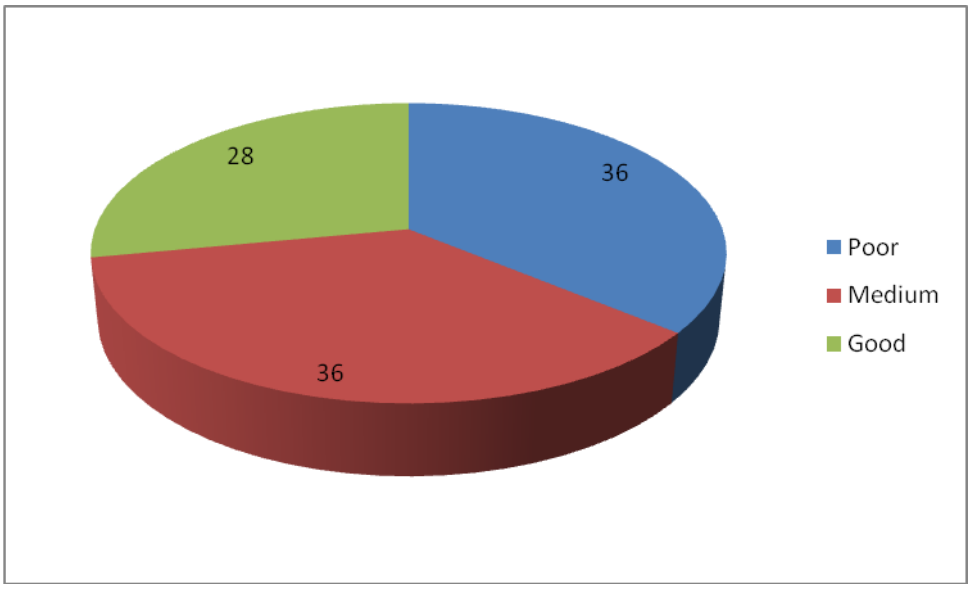


Figure (10) Explain nurses practice regarding infection control

Table (20) Explain nurses Practice regarding infection control

	Done	Not done	
1 Cleaning of the surface of the machines ,chairs, tables, equipments cleaned after every session	30	20	50
	60%	40%	100%
2 Hand hygiene facilities (Liquid, hard soap and antibacterial solution)are available	48	2	50
	%96.0	%4.0	100%
3 Alcohol hand rub is available for use at the Entrance, exits to department and Directly accessible at the point of care	46	4	50
	%92.0	%8.0	100%
4 Reusable equipments that my became readily contaminated is dedicated for that patients (Tourniquets, Blood pressure cuff)are cleaned	9	41	50
	%18.0	%82.0	100%
5 Wearing gloves pre any procedure	42	8	50
	%84.0	%16.0	100%
6 Linen changed after every session?	28	22	50
	%56.0	%44.0	100%
7 Safety boxes availability	48	2	50
	%96.0	%4.0	100%
8 Sterile and non sterile gloves are available in all clinical areas	27	23	50
	%54.0	%46.0	100%
9 Wash hands pre any procedures	44	6	50

	%88.0	%12.0	100%
10 Hands are decontaminated following the removal of gloves	17	33	50
	%34.0	%66.0	100%
11 Full body fluid repellent gowns are worn with positive patient (B and C viruses	18	32	50
	%36.0	%64.0	100%
12 Facemasks and eye protection are warn	30	20	50
	%60.0	%40.0	100%
13 Disposable plastic aprons are worn.	13	37	50
	%26.0	%74.0	100%

Chapter Four

Discussion , Conclusion & Recommendation

Discussions

This is a descriptive study, was conducted to identify the application of infection control guideline among nurses working in selective hemodialysis units. (50) nurses were included in this study, in the period of (20/October -1/November).the majorty ofthem are female (33), their age renged between (31-40) years old , more than half are educated (Msc 36%) , years of experience between (3-5) years , two third of nurses working in multiple centers (66%).

This study show that most of nurses attended courses about infection control that indicated the awareness of staff about continuous training.

The study show the positive relation between degree of qualification working in multiple centers attend of courses about infection control(and knowledge p- value 0.05

The study show there no relation between knowledge and practice in addition no relation between years of experience, gender, age and knowledge p-value0.05

Regarding time for doing viral screening the study show that most of nurses 61% not doing viral screening on specific time.

In practice 82% not clean reusable equipment and 74% not wear disposable apron.66% not clean hand after removing gloves is contradicted to study done In Aspian 2003 the study show that staff wearing gloves is 92% .hand wash before patient connection 13.8% and after patient connection 92.9%

Regarding needle recapping 56% perform recapping comparing with other study done in Nigeria December 2011 45% perform recapping and develop needle stick injury . from this result nurses ignore the danger of needle recapping .the similar study done in Nigeria show that 24.5% had suffered needle stick injury.

Conclusion

Based on the result the study concluded that the hemodialysis nurses had satisfied knowledge about infection control guideline in general and poor practice. No significant association between practice, years of experience and knowledge of nurses regarding infection control

Their practice must be improved and should be on evidence base to ensure patient safety.

There is gab between knowledge and practice.

Recommendations

Based on conclusion of the study recommended by the following:-

1- Perform good hand hygiene pre and after any procedure and care to prevent transmission of microorganism and wear personal protective equipment
2- The important of routine test ,viral screening and vaccination for the staff and patient
3- The responsibility of hemodialysis unit to Perform continuous courses and training about infection control especially in self's training
4- Increase awareness among nursing staff about needle recapping
5- Provision infection control facilities
6- Importance of reporting and documentation when exposed to needle stick injury

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Appendixes

University of Shendi
Graduate College
Medical and Surgical Studies Board

This questionnaire used to assess knowledge of nurse about infection control guideline in selective hemodialysis center in Khartoum city

1-Age:

1- 20-30 { } 2- 31-40 { } 3- 41-50 { } 4- more than 50 { }

2-Gander:

1-Male { } 2- female { }

3-Degree of qualification:

1- Diploma { } 2- bachelor { } 3-Msc { } 4-BHD { }

4-Years of experience:

1-Less than one year { } 2- 1-2 years { } 3- 3-5 years { }
4-more { }

5-Are you working in multiple centers?

1- Yes { } 2- No { }

6-If yes who many centers?

1- One center { } 2- two centers { }
2- 3- three centers { } 4- cansel { }

7-Do you attend any courses about infection control?

1-Yes { } 2- No { }

8-If your answer {yes} how many courses do you do?

1-One { } 2- tow { } 3- three { } 4-more than three { }

9-What the chain of infection?

1-Causative agent – portal of exit- reservoir- mode of transmission- portal of entry- susceptible host { }

2-Causative agent – portal of exit- reservoir- mode of transmission- susceptible host- portal of entry { }

3-Causative agent – reservoir- portal of exit- mode of transmission- portal of entry- susceptible host { }

4-portal of exit- mode of transmission- portal of entry- susceptible host- Causative agent –reservoir { }

10-Who is at risk of infection?

1- Staff - Patient { } 2-Any health worker { }
3- Community { } 4-All of them { }

11-The strategies to control health care association infection are?

1- Reservoir control { } 2- Control of transmission { }
3- Control or elimination of the infection agent { }
4- All of them { }

12-The infection control committee is?

1-Doctor { } 2- Infection control nurse { }

3- Other relevant departments { } 4-All of them { }

13-which of the following is Stander precaution steps?

1- Personal protective equipment and hand hygiene { }

2- 2- Decontamination { }

3-Waste disposal { } 4-All of them { }

14-What type of Personal protective equipment [PPE] would you wear?

1- Gloves and gowns only { }

2- Gloves – gowns – protective eye wear – face shields- masks- over head and shoo { }

3- Gloves- masks- gowns { } 4- Gloves only { }

15-Which of the following is Sequence for removing personal protective equipments?

1- Gloves –gowns- mask – face shield { }

2-Gloves- face shield- gowns- mask { }

3- Face shield- gowns- mask – Gloves { }

4- mask – face shield- Gloves –gowns { }

16-when do you wash your hands?

1-Before and after any procedure { }

2-After any procedure { }

3-Before any procedure { } 4-None of above { }

17-Do you think your center has good infection control management and practice?

1-Present and activated { } 2-present but not activated { }

3-Not present { }

18-Do you have any barrier to apply infection control?

1- Yes { } 2- No { }

19-Do you perform needle recapping?

1- Never { } 2- sometime { } 3- always { }

20-Place where dispose of sharp instrument?

1-Basket { } 2- safety box { }

3- with other medical waste like cotton – blood line-dialyzer { }

21- in your center patient with hepatitis B virus?

1-Isolated { } 2-Not isolated { }

22-are there patients diagnose with hepatitis B or C virus in your center?

1-yes { } 2- No { }

23- If yes: are rooms with machine for infected patient with hepatitis B and C ?

1-completely isolated { } 2- partially isolated { } 3- Not isolated { }

24-If rooms are isolated, are there any staff members working in the same rooms?

1- Yes { } 2- No { }

25- Did you do viral screening?

1- Yes { } 2-No { }

26-If your answer [yes] when did you do?

1-Every month { } 2- every 3 month { }

3-More than 3 month { } 4- Not done { }

27- If you exposed to needle stick injury what will you do?

1- Immediately washed site of injury with soap and running water { }
2- No evidence that antiseptics are useful { }
3- Promptly notify your supervisor and fill out the needle stick injury form { }
4- All of them { }

University of shendi

Graduate college

Medical and surgical studies board

This chick list use to determined application of infection control guideline among nurses working in selective hemodialysis center in Khartoum city

Ques. No	Question	Answer	
A	**Observational component**	**Yes**	**No**
1	Cleaning of the surface of the machines ,chairs, tables, equipments cleaned after every session		
2	Hand hygiene facilities (Liquid, hard soap and antibacterial solution)are available		
3	Alcohol hand rub is available for use at the Entrance, exits to department and Directly accessible at the point of care		
4	Reusable equipments that my became readily contaminated is dedicated for that patients (Tourniquets, Blood pressure cuff)are cleaned		
5	Wearing gloves pre any procedure		
6	Linen changed after every session?		
7	Safety boxes availability		
B	**Personal protective equipment**	**Yes**	**No**
8	Sterile and non sterile gloves are available in all clinical areas		
9	Wash hands pre any procedures		
10	Hands are decontaminated following the removal of gloves		
11	Full body fluid repellent gowns are worn with positive patient (B and C viruses)		
12	Facemasks and eye protection are warn		
13	Disposable plastic aprons are worn.		