Sudan University of science and Technology

College of Graduate Studies

Implementation of Quality Assurance to Reduce Hospital Acquired Infection

AN Applied Study on Emergency and Accidents Hospital, Omdurman Military Corporation

تطبيق ضمان الجودة لتقليل العدوى المكتسبة بالمستشفي

(دراسة تطبيقية علي مستشفي الطواري والإصابات – السلاح الطبي – أم درمان)

A thesis submitted as partial fulfillment of the requirements

For the master degree in Quality Management and Excellence

(2018)

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Chapter One
Introduction

1.1 Introduction

Infection is the entry and multiplication of an infectious agent in the tissues of the host. Healthcare Associated Infections (HAIs) (Nosocomial infections) is an infection that is acquired in a medical setting in the course of medical treatment HAI is an infection meeting the following criteria ; Not present or incubating on admission . Infection associated with admission to or a procedure done at a health-care facility. An infection incubating at the time of admission that is related to previous hospitalization at the same facility (CDC, 2018).

infection is considered an HAI if all elements of CDC site-specific infection criterion were first present together on or after the third hospital day (day of hospital admission is day 1) (*Klevens* et al, 2007).

(HCAI) is a major health problem today, (HAI) exacts a great way resulting in increased morbidity and mortality, and it increased health care of patients and their family's costs. Infection control is a quality standard of patient cares and is essential for the well being of the patients and the safety of both patients and staff. To accomplish a reduction in infection rates, an infection control program has to be given a high standard structure. At any time more than 1.4 million patients worldwide in developed and developing countries (HAIs). It is a major problem for patient safety. It affects a very large number of patients worldwide each year especially in resource-limited countries and has a high negative impact on patients, their families and healthcare systems. Infectious diseases are a global concern and the second commonest cause of death in the world. Of the annual 15 million deaths, 95% occur in the developing world, (WHO, 2008). It has been widely known for the last four decades, that the majority of (HCAIs) can be prevented by adequate though not

necessarily sophisticated, surveillance and control measures .A number of international initiatives are being undertaken to support developing countries to build and implement infection control effectively in their health care settings. Despite these growing efforts, infection control in most developing countries remains either non-existent or ineffective. In 2010 the WHO reported that only 23/147 developing countries have a functioning surveillance system for HCAI which is a core part of infection control programs (CDC, 2012).

1.2. Problem Statement

Health Associated Infections HAIs affect hundreds of millions of people worldwide and is a major global issue for patient safety. It complicates between 5 and 10% of admissions in acute care hospitals in industrialised countries. In developing countries, the risk is two to twenty times higher and the proportion of infected patients frequently exceeds 25%. A growing awareness of this problem prompted the (WHO) to promote the creation of the World Alliance for Patient Safety.

The last two decades have seen the greatest increase in nosocomial infections in hospitals in developing countries where infectious diseases remain the leading cause of death. Among HAIs, surgical site infections are leading causes of illness and death in certain hospitals in sub-Saharan Africa. This is happening at a time when the arsenal of drugs available to treat infections is being progressively depleted because of increasing resistance of the microbes to antimicrobial drugs. Thus the list of already scarce effective agents is further shortened.

The WHO Eastern Mediterranean Region has one of the highest frequencies of HAIs in the world. The prevalence of HAIs in several countries in the Region is reported to vary from 12% to 18%. The burden of transmissible infections among health-care workers due to unsafe health-care practices is also considerably high in the Region.

Although a substantial proportion of infections and deaths attributable to HAIs can be prevented and low cost interventions for infection prevention and control are available, progress in this field remains slow. This is due to several factors including:

1. Poor compliance of health-care workers with standard infection control practices
2. Risky behavioural practices of patients and visitors in health-care settings
3. Poor understanding and implementation of infection prevention and control programmes in health care
4. Lack of programme coherence, when it exists, with other public health services and interventions.

It has been estimated that in the next 40 to 50 years infections such as *Streptococci*, *Escherichia coli*, *P. aeruginosa*, *Enterobacter* spp., and *Klebsiella pneumoniae,* which have been problematic for years, will become even more of a problem.

1.3. Justification

The prevalence of HAIs in several countries in the Eastern Mediterranean Region was reported to vary from 12% to 18%. The burden of transmissible infections among health care workers due to unsafe health care practices is harmful and costly.

There are no similar previous Sudanese studies to barriers that hinder clinical staff and other hospital workers from implementation of infection control program. Inadequate infection control material and facilities cannot ignore the infection control program existence.

This study is an attempt to shed light on the important of implementing of quality assurance in reducing hospital acquired infection especially in emergency departments

1.4. Objectives of the study:

4.1General objective:

To assess the impact of implementation of quality assurance in reducing hospital acquired infection in trauma and emergency hospital in military hospital

4.2 Specific objectives:

1. To evaluate awareness of clinical staff and other hospital workers (including administrators) about nosocomial infections and antimicrobial resistance.
2. To identify the role of quality control in reduce hospital acquired infection
3. To identify the gap in knowledge and practice in quality control program for reducing infection in trauma and emergency hospital

Chapter Two

Literature Review

Introduction

A hospital-acquired infection (HAI), also known as a nosocomial infection, is an infection that is acquired in a hospital or other health care facility. To emphasize both hospital and nonhospital settings, it is sometimes instead called a health care–associated infection (HAI or HCAI). Such an infection can be acquired in hospital, nursing home, rehabilitation facility, outpatient clinic, or other clinical settings. Infection is spread to the susceptible patient in the clinical setting by various means. Health care staff can spread infection, in addition to contaminated equipment, bed linens, or air droplets. The infection can originate from the outside environment, another infected patient, staff that may be infected, or in some cases, the source of the infection cannot be determined. In some cases the microorganism originates from the patient's own skin microbiota, becoming opportunistic after surgery or other procedures that compromise the protective skin barrier. Though the patient may have contracted the infection from their own skin, the infection is still considered nosocomial since it develops in the health care setting (CDC, 2012)

In the United States, the Centers for Disease Control and Prevention estimated roughly 1.7 million hospital-associated infections, from all types of microorganisms, including bacteria and fungi combined, cause or contribute to 99,000 deaths each year. In Europe, where hospital surveys have been conducted, the category of gram-negative infections are estimated to account for two-thirds of the 25,000 deaths each

year.[citation needed] Nosocomial infections can cause severe pneumonia and infections of the urinary tract, bloodstream and other parts of the body. Many types display antimicrobial resistance, which can complicate treatment (Rodak S, 2012) .

2.1 Infection control

Infection control is the discipline concerned with preventing nosocomial or healthcare-associated infection, a practical (rather than academic) sub-discipline of epidemiology. It is an essential, though often under recognized and under supported, part of the infrastructure of health care. Infection control and hospital epidemiology are akin to public health practice, practiced within the confines of a particular health-care delivery system rather than directed at society as a whole.

Infection control addresses factors related to the spread of infections within the health-care setting (whether patient-to-patient, from patients to staff and from staff to patients, or among-staff), including prevention (via hand hygiene/hand washing, cleaning/disinfection/sterilization, vaccination, surveillance), monitoring/investigation of demonstrated or suspected spread of infection within a particular health-care setting (surveillance and outbreak investigation), and management (interruption of outbreaks). It is on this basis that the common title being adopted within health care is "Infection Prevention & Control (Miller and Sexton, 2010).

2.2. Infection control program

The recognition that infectious agents can be transmitted within hospitals to susceptible patients and health care workers began in the 1840s when Semmelweis noted that puerperal fever was associated with the lack of

handwashing among clinicians performing autopsies. This discovery, in turn, led to the introduction of hand dips with chlorinated lime at Vienna General Hospital. Eventually these ideas evolved into current guidelines about handwashing, although Semmelweis promoted hand cleansing and, paradoxically, was opposed to handwashing with soap and water (Harbarth S, 2008).

Infection control programs became a requirement in the United States largely as a result of the mandates of the Joint Commission For Accreditation of Hospitals (JCAHO) and the leadership guidelines and definitions of the Centers for Disease Control and Prevention (CDPC).

In order to achieve the main goal of preventing or reducing the risk of hospital-acquired infections, a hospital epidemiology program should have the following oversight functions and responsibilities (Edmond, and Wenzel, 2005):

- Surveillance, either hospital-wide or targeted
- Education about prevention of infections (e.g. by hand disinfection)
- Outbreak investigations
- Cleaning, disinfection, and sterilization of equipment and disposal of infectious waste.
- Hospital employee health, specifically after exposure to either blood borne or respiratory pathogens.

- Review of antibiotic utilization and its relationship to local antibiotic resistance patterns
- Prevention of infections due to intravascular devices
- Development of infection control policies and procedures
- Oversight on the use of new products that directly or indirectly relate to the risk of nosocomial infections

Hospital infection control departments usually derive authority and communicate with other administrative components of hospitals via an infection control committee. This committee typically includes representatives from medical and surgical services, nursing, microbiology, hospital administration, and employee health.

In order to be successful, infection control programs must have administrative support, resources, and an organizational commitment to a safety culture. The authority of infection control personnel to direct policies and ensure compliance should be documented in writing and supported by the administrative leadership (Siegel et al, 20007) .

Four major areas of infection control will be reviewed here:

- Standard precautions, including hand hygiene
- Isolation precautions
- Environmental cleaning
- Surveillance

The prevention of specific infections, isolation policies, prophylaxis after exposure to blood-borne pathogens, and immunizations for healthcare workers are discussed in detail separately, as are infection control programs in other institutions such as long-term care facilities (Siegel et al, 20007) .

2.3 Infection healthcare facilities

Aseptic technique is a key component of all invasive medical procedures. Similarly, infection control measures are most effective when Standard Precautions (health care) are applied because undiagnosed infection is common (CDC, 2012) .

2.3.1 Hand hygiene

Independent studies by Ignaz Semmelweis in 1847 in Vienna and Oliver Wendell Holmes in 1843 in Boston established a link between the hands of health care workers and the spread of hospital-acquired disease. The Centers for Disease Control and Prevention (CDC) has stated that "It is well documented that the most important measure for preventing the spread of pathogens is effective handwashing." In the United States, hand washing is mandatory in most health care settings and required by many different state and local regulations (CDC, 2012).

In the United States, Occupational Safety and Health Administration (OSHA) standards require that employers must provide readily accessible hand washing facilities, and must ensure that employees wash hands and any other skin with soap and water or flush mucous membranes with water as soon as feasible after contact with blood or other potentially infectious materials (OPIM).

Drying is an essential part of the hand hygiene process. In November 2008, a non-peer-reviewed study was presented to the European Tissue Symposium by the University of Westminster, London, comparing the bacteria levels present after the use of paper towels, warm air hand dryers, and modern jet-air hand dryers. Of those three methods, only paper towels reduced the total number of bacteria on hands, with "through-air dried" towels the most effective.

The presenters also carried out tests to establish whether there was the potential for cross-contamination of other washroom users and the washroom environment as a result of each type of drying method. They found that:

- The jet air dryer, which blows air out of the unit at claimed speeds of 400 mph, was capable of blowing micro-organisms from the hands and the unit and potentially contaminating other washroom users and the washroom environment up to 2 meters away
- Use of a warm air hand dryer spread micro-organisms up to 0.25 meters from the dryer.
- Paper towels showed no significant spread of micro-organisms (Larson, 2009).

In 2005, in a study conducted by TUV Product und Umwelt, different hand drying methods were evaluated. The following changes in the bacterial count after drying the hands were observed:

The WHO approach recommends HCWs clean their hands:

- Before touching a patient
- Before clean/aseptic procedures
- After body fluid exposure/risk
- After touching a patient

- After touching patient surroundings (Larson, 2009).

There are a number of problems with handwashing with soap and water:

- In the past, compliance with handwashing rarely exceeded 45 percent, even under study conditions and even in intensive care units. However, aggressive programs to improve compliance with hand hygiene, as outlined by the 2010 National Patient Safety Goals, have been highly successful in many institutions[10] Unfortunately proper technique is often not followed when handwashing is performed. In one report, for example, the mean observed washing time was usually less than 10 seconds, compared with the recommended 15 to 30 seconds. The importance of duration of handwashing was illustrated in a study in which vancomycin-resistant enterococci (VRE) were inoculated onto the hands of healthy volunteers[11] (Quraishi et al, 2006). A 30-second wash with water plus soap was necessary to completely eradicate VRE hand carriage. In contrast, a 5-second wash with water alone produced virtually no change in VRE recovery
- The frequency of handwashing by HCWs is affected by the accessibility of sinks, and by the characteristics of the soap used (e. g, its smell, consistency, color, and even the ease in

which the soap induces lathering). In addition, the location and type of soap dispensers can affect compliance.

- Handwashing with plain soap does not consistently or reliably prevent microbial transmission.
- Frequent handwashing may cause skin damage and irritation, with resultant changes in microbial flora, increased skin shedding, and risk of transmission of microorganisms (Stone, 2009).

Alcohol based hand disinfection — Alcohol-containing hand disinfection (AHD) is an effective and practical alternative to standard soap and water. Alcohol-based hand hygiene products have rapid antimicrobial effects and are equally effective against gram-positive and gram-negative organisms (when compared with chlorhexidine). Alcohol-based preparations also require less time than chlorhexidine gluconate to affect a maximum reduction in bacteria counts and are at least as tolerable on skin as are antiseptic detergents (RACGP, 2008).

2.3.2 Cleaning, disinfection and sterilization

Sterilization is a process intended to kill all microorganisms and is the highest level of microbial kill that is possible. Sterilizers may be heat only, steam, or liquid chemical. Effectiveness of the sterilizer (e.g., a steam autoclave) is determined in three ways. First, mechanical indicators and gauges on the machine itself indicate proper operation of the machine. Second heat sensitive indicators or tape on the sterilizing bags

change color which indicate proper levels of heat or steam. And, third (most importantly) is biological testing in which a highly heat and chemical resistant microorganism (often the bacterial endospore) is selected as the standard challenge. If the process kills this microorganism, the sterilizer is considered to be effective. It should be noted that in order to be effective, instruments must be cleaned; otherwise the debris may form a protective barrier, shielding the microbes from the lethal process. Similarly care must be taken after sterilization to ensure sterile instruments do not become contaminated prior to use (Wilks et al, 2006). Disinfection refers to the use of liquid chemicals on surfaces and at room temperature to kill disease causing microorganisms. Ultraviolet cleaning devices have also been used to disinfect the rooms of patients infected with Clostridium difficile after discharge. Disinfection is a less effective process than sterilization because it does not kill bacterial endospores[14] .

Sterilization, if performed properly, is an effective way of preventing bacteria from spreading. It should be used for the cleaning of the medical instruments or gloves, and basically any type of medical item that comes into contact with the blood stream and sterile tissues (Wilks et al, 2006).

There are four main ways in which such items can be sterilized: autoclave (by using high-pressure steam), dry heat (in an oven), by using chemical sterilants such as glutaraldehydes or formaldehyde solutions or by radiation (with the help of physical agents). The first two are the most used methods of sterilizations mainly because of their accessibility and availability. Steam sterilization is one of the most effective types of sterilizations, if done correctly which is often hard to achieve. Instruments that are used in health care facilities are usually sterilized with this method. The general rule in this case is that in order to perform an effective sterilization, the steam must get into contact with all the surfaces that are meant to be disinfected. On the other hand, dry heat sterilization,

which is performed with the help of an oven, is also an accessible type of sterilization, although it can only be used to disinfect instruments that are made of metal or glass. The very high temperatures needed to perform sterilization in this way are able to melt the instruments that are not made of glass or metal (Walter C, 2013).

Steam sterilization is done at a temperature of 121 C (250 F) with a pressure of 106 kPa (15 lbs/in2). In these conditions, unwrapped items must be sterilized for 20 minutes, and wrapped items for 30 minutes. The time is counted once the temperature that is needed has been reached. Steam sterilization requires four conditions in order to be efficient: adequate contact, sufficiently high temperature, correct time and sufficient moisture. Sterilization using steam can also be done at a temperature of 132 C (270 F), at a double pressure. Dry heat sterilization is performed at 170 C (340 F) for one hour or two hours at a temperature of 160 C (320 F). Dry heat sterilization can also be performed at 121 C, for at least 16 hours (http://www.apic.org, 2013).

Chemical sterilization, also referred to as cold sterilization, can be used to sterilize instruments that cannot normally be disinfected through the other two processes described above. The items sterilized with cold sterilization are usually those that can be damaged by regular sterilization. Commonly, glutaraldehydes and formaldehyde are used in this process, but in different ways. When using the first type of disinfectant, the instruments are soaked in a 2-4% solution for at least 10 hours while a solution of 8% formaldehyde will sterilize the items in 24 hours or more. Chemical sterilization is generally more expensive than steam sterilization and therefore it is used for instruments that cannot be disinfected otherwise. After the instruments have been soaked in the chemical solutions, they are mandatory to be rinsed with sterile water which will remove the residues from the disinfectants. This is the reason

why needles and syringes are not sterilized in this way, as the residues left by the chemical solution that has been used to disinfect them cannot be washed off with water and they may interfere with the administered treatment. Although formaldehyde is less expensive than glutaraldehydes, it is also more irritating to the eyes, skin and respiratory tract and is classified as a potential carcinogen (http://www.apic.org, 2013).

Other sterilization methods exist, though their efficiency is still controversial. These methods include gas sterilization, UV sterilization, and sterilization with other chemical agents such as peroxyacetic acid, paraformaldehyde and gas plasma sterilization.

Infections can be prevented from occurring in homes as well. In order to reduce their chances to contract an infection, individuals are recommended to maintain a good hygiene by washing their hands after every contact with questionable areas or bodily fluids and by disposing the garbage at regular intervals to prevent germs from growing (Walter C, 2013).

2.3.3 Personal protective equipment

Disposable PPE

Personal protective equipment (PPE) is specialized clothing or equipment worn by a worker for protection against a hazard. The hazard in a health care setting is exposure to blood, saliva, or other bodily fluids or aerosols that may carry infectious materials such as Hepatitis C, HIV, or other blood borne or bodily fluid pathogen. PPE prevents contact with a potentially infectious material by creating a physical barrier between the potential infectious material and the healthcare worker (Wilks et al, 2006).

In the United States, the Occupational Safety and Health Administration (OSHA) requires the use of Personal protective equipment (PPE) by workers to guard against blood borne pathogens if there is a reasonably anticipated exposure to blood or other potentially infectious materials.

Components of Personal protective equipment (PPE) include gloves, gowns, bonnets, shoe covers, face shields, CPR masks, goggles, surgical masks, and respirators. How many components are used and how the components are used is often determined by regulations or the infection control protocol of the facility in question. Many or most of these items are disposable to avoid carrying infectious materials from one patient to another patient and to avoid difficult or costly disinfection. In the United States, OSHA requires the immediate removal and disinfection or disposal of worker's PPE prior to leaving the work area where exposure to infectious material took place (Wilks et al, 2006).

2.3.4 Antimicrobial surfaces

Microorganisms are known to survive on non-antimicrobial in animate 'touch' surfaces (e.g., bedrails, over-the-bed trays, call buttons, bathroom hardware, etc.) for extended periods of time. This can be especially troublesome in hospital environments where patients with immunodeficiencies are at enhanced risk for contracting nosocomial infections (RACGP, 2008).

Products made with antimicrobial copper alloy (brasses, bronzes, cupronickel, copper-nickel-zinc, and others) surfaces destroy a wide range of microorganisms in a short period of time. The United States Environmental Protection Agency has approved the registration of 355 different antimicrobial copper alloys that kill E. coli O157:H7, methicillin-resistant Staphylococcus aureus (MRSA), Staphylococcus, Enterobacter aerogenes, and Pseudomonas aeruginosa in less than 2 hours of contact. Other investigations have demonstrated the efficacy of antimicrobial copper alloys to destroy Clostridium difficile, influenza A virus, adenovirus, and fungi. As a public hygienic measure in addition to regular cleaning, antimicrobial copper alloys are being installed in healthcare facilities in the U.K., Ireland, Japan, Korea, France, Denmark, and Brazil (RACGP, 2008).

2.4 Vaccination of health care workers

Health care workers may be exposed to certain infections in the course of their work. Vaccines are available to provide some protection to workers in a healthcare setting. Depending on regulation, recommendation, the specific work function, or personal preference, healthcare workers or first responders may receive vaccinations for hepatitis B; influenza; measles, mumps and rubella; Tetanus, diphtheria, pertussis; N. meningitidis; and varicella. In general, vaccines do not guarantee complete protection from disease, and there is potential for adverse effects from receiving the vaccine (Miller, Chris, 2010).

2.5 Post exposure prophylaxis

In some cases where vaccines do not exist Post Exposure prophylaxis is another method of protecting the health care worker exposed to a life threatening infectious disease. For example, the viral particles for HIV-AIDS can be precipitated out of the blood through the use of an antibody injection if given within 4 hours of a significant exposure (Miller, Chris, 2010). .

2.6 Surveillance for infections

Surveillance is the act of infection investigation using the CDC definitions. Determining the presence of a hospital acquired infection requires an Infection Control Practitioner (ICP) to review a patient's chart and see if the patient had the signs and symptom of an infection. Surveillance definitions exist for infections of the bloodstream, urinary tract, pneumonia, surgical sites and gastroenteritis (Miller, Chris, 2010).

Surveillance traditionally involved significant manual data assessment and entry in order to assess preventative actions such as isolation of patients with an infectious disease. Increasingly, computerized software solutions are becoming available that assess incoming risk messages from microbiology and other online sources. By reducing the need for data

entry, software can reduce the data workload of ICPs, freeing them to concentrate on clinical surveillance (Miller, Chris, 2010).

As approximately one third of healthcare acquired infections are preventable, surveillance and preventative activities are increasingly a priority for hospital staff. In the United States, a study on the Efficacy of Nosocomial Infection Control Project (ENICP) by the CDC found that hospitals reduced their nosocomial infection rates by approximately 32 per cent by focusing on surveillance activities and prevention efforts (Miller, Chris, 2010).

2.7 Isolation

In the health care context, isolation refers to various physical measures taken to interrupt nosocomial spread of contagious diseases. Various forms of isolation exist, and are applied depending on the type of infection and agent involved, to address the likelihood of spread via airborne particles or droplets, by direct skin contact, or via contact with body fluid[18] .

2.7.1 Standard precautions

Various forms of isolation have been used in an attempt to reduce the spread of nosocomial infections. In 1996, the CDC and Hospital Infection Control Advisory Committee (HICPAC) issued a new system of isolation precautions. These guidelines were updated in 2007 as outlined in the following sections.

Standard precautions are recommended in the care of all hospitalized patients. Standard precautions include the basic features of body substance isolation policies and universal precautions. When properly followed, they reduce the risk of transmission of infectious agents

between patient and healthcare worker even when the presence of an infectious agent is unknown or not apparent.

Standard precautions apply whenever contact with blood, other body fluids, nonintact skin, mucous membranes and secretions and excretions except sweat is likely or possible They entail (Whitehouse et al, 2015) .

- Hand hygiene before and after every patient contact (including hand hygiene after gloves are removed)
- The use of gloves, gowns and eye protection in situations in which exposure to body secretions or blood is possible or likely
- The safe disposal of sharp instruments and needles in impervious containers
- The placement of soiled linens in impervious bags and bloody or contaminated materials such as feces or urine in sanitary toilets

The 2007 CDC guidelines included several additional components:

- Safe injection practices.
- Use of a mask when prolonged procedures involving puncture of the spinal canal are performed (such as myelography, epidural anesthesia, and injection of chemotherapeutic agents).
- Respiratory hygiene/cough etiquette, which applies to all patients and accompanying family or friends who have signs of respiratory illness such as cough, congestion, rhinorrhea or increased volumes

of respiratory secretions. Such individuals should cover their nose or mouth when coughing, promptly dispose used tissues and practice hand hygiene after contact with respiratory secretions. Use of a mask and spatial separation of such patients in waiting or patient care areas is also recommended (Whitehouse et al, 2015)

2.8 Outbreak investigation

When an unusual cluster of illness is noted, infection control teams undertake an investigation to determine whether there is a true outbreak, a pseudo-outbreak (a result of contamination within the diagnostic testing process), or just random fluctuation in the frequency of illness. If a true outbreak is discovered, infection control practitioners try to determine what permitted the outbreak to occur, and to rearrange the conditions to prevent ongoing propagation of the infection. Often, breaches in good practice are responsible, although sometimes other factors (such as construction) may be the source of the problem.

Outbreaks investigations have more than a single purpose. These investigations are carried out in order to prevent additional cases in the current outbreak, prevent future outbreaks, learn about a new disease or learn something new about an old disease. Reassuring the public, minimizing the economic and social disruption as well as teaching epidemiology are some other obvious objectives of outbreak investigations (Nicas et al, 2015).

According to the WHO, outbreak investigations are meant to detect what is causing the outbreak, how the pathogenic agent is transmitted, where it all started from, what is the carrier, what is the population at risk of getting infected and what are the risk factors.

The results of outbreak investigations are always made public in the means of a report in which the findings are communicated to the authorities, media, and scientific community and so on. These reports are commonly used as pedagogical tools (Rutala and Weber, 2014).

2.9 Environmental cleaning

Environmental cleaning, disinfection, and sterilization are basic and important measures used to prevent or reduce infections in the hospital environment. The oversight and monitoring of cleaning, sterilization, and disinfection practices are direct responsibilities of an infection control unit. The exact definition of each term is important, since protocols for each procedure are different and their use in hospital infection control has to be precisely determined.

Cleaning — Cleaning is the removal of all foreign material (eg, soil, organic material) from objects. It is normally accomplished with water, mechanical action, and detergents or enzymatic products. Meticulous physical cleaning must always precede disinfection and sterilization procedures, and is adequate alone for cleaning items such as blood pressure cuffs (Rutala and Weber, 2014).

Enforcement of routine environmental cleaning measures, as illustrated in a nonrandomized hospital based intervention study, was remarkably effective in reducing vancomycin-resistant enterococcus (VRE) acquisition among patients in a medical intensive care unit (Hayden et al, 2016).

The importance of environmental decontamination of rooms previously occupied by patients with MRSA and/or VRE in ICUs is illustrated by a retrospective cohort study of patients admitted to eight ICUs. Patients admitted to rooms previously occupied by patients colonized or infected with MRSA or VRE were significantly more likely to become MRSA or VRE colonized than patients admitted to rooms whose prior occupant was MRSA or VRE negative (adjusted odds ratio [AOR] 1.4 for either MRSA or VRE) (Hayden et al, 2016).

Ultraviolet markers may be used to assess the adequacy of environmental cleaning. In one study in which investigators evaluated for persistence of fluorescent markers on environmental surfaces, the efficacy of routine cleaning improved from 49 to 82 percent. Monitored environmental cleaning should be a fundamental component of all hospitals' commitment to basic hygiene (Miller and Sexton, 2010).

2.10 Training in infection control and health care epidemiology

Practitioners can come from several different educational streams. Many begin as nurses, some as medical technologists (particularly in clinical microbiology), and some as physicians (typically infectious disease specialists). Specialized training in infection control and health care epidemiology are offered by the professional organizations described below. Physicians who desire to become infection control practitioners often are trained in the context of an infectious disease fellowship.

In the United States, Certification Board of Infection Control and Epidemiology is a private company that certifies infection control

practitioners based on their educational background and professional experience, in conjunction with testing their knowledge base with standardized exams. The credential awarded is CIC, Certification in Infection Control and Epidemiology. It is recommended that one has 2 years of Infection Control experience before applying for the exam. Certification must be renewed every five years.

A course in hospital epidemiology (infection control in the hospital setting) is offered jointly each year by the Centers for Disease Control and Prevention (CDC) and the Society for Healthcare Epidemiology of America.

The Association for Professionals in Infection Control and Epidemiology, Inc. (APIC) offers training and courses in infection control (Miller and Sexton, 2010).

2.11 Previous studies

A study was conducted India to assess the impact implementing quality improvement strategies to reduce healthcare-associated infections:

The study searched MEDLINE, CINAHL, and EMBASE from 2006-2012 for English-language articles with ≥ 100 patients that described an implementation strategy to increase adherence with evidence-based preventive interventions and that met study design criteria. One reviewer abstracted and appraised study quality, with verification by a second. QI strategies included audit and feedback; financial incentives, regulation, and policy; organizational change; patient education; provider education; and provider reminder systems.

data was evaluated on HAIs from 30 articles reporting adherence and infection rates that accounted for confounding or secular trends. Many of the measures improved significantly, especially adherence. Results varied by QI strategy(s).

results revealed that Moderate strength of evidence supports improvement in adherence and infection rates when audit and feedback plus provider reminder systems or audit and feedback alone is added to organizational change and provider education. Strength of evidence is low when provider reminder systems alone are added to organizational change and provider education. There were no studies on HAIs in nonhospital settings that met the selection criteria (Mauger B, 2014).

Another study was conducted to assess the effect of a health education program regarding infection-control measures on health care providers knowledge and attitude in pediatric intensive care units at Cairo University hospitals.

This was a pre-post test interventional study in which a convenient sample of 125 health care providers was taken from the staff in different PICUs at Cairo University hospitals. The study took place in three phases. In the first phase, the participants knowledge, attitude and practice concerning infection-control measures were tested using a self-administered pretested questionnaire and an observation checklist. The second phase included health education sessions in the form of power point and video presentations; and in the third phase the participants knowledge and attitude on infection-control measures were reassessed.

A significantly higher level of knowledge was revealed in the post-intervention phase as compared with the pre-intervention phase with regards to the types of nosocomial infections (94.4 vs. 76.8%, $P<0.001$), the at-risk groups for acquiring infection (95.2 vs. 86.4%, $P=0.035$) and the measures applied to control nosocomial infections (89.6 vs. 68%, $P<0.001$). Nurses in the post-intervention phase had significantly more knowledge about the types of hand washing (99.2 vs. 91.2%, $P=0.006$). A significantly higher percent of nurses in the post-intervention phase knew

the importance of avoiding recapping syringes (72.8 vs. 34.4%, P<0.001) and believed that infection-control measures could protect them completely from acquiring infection (79.2 vs. 65.6%, P=0.033). Statistically significant higher total knowledge and attitude scores were revealed in the post-intervention phase as compared with the pre-intervention one (P<0.001).

The study concluded that there is scope for improvement in knowledge and attitude after educational program was offered. Educational training programs should be multidisciplinary interventions in the era of quality control to help healthcare workers realize the importance of basic infection-control measures in reducing pediatric morbidity and mortality and improving the quality of care (Galal et al, 2013).

Chapter Three

3. Materials and Methods

3.1Study design

Cross-sectional hospital- based study

3.2Area of the study

This study was conducted at Emergency and Accidents department at Omdurman Military hospital

3.3 Population of the study

All medical staff at ER in Omdurman Military hospital.

3.3.1Inclusion criteria: medical staff with at least 2 years of experience, and who agree to participate in this study

3.3.2 Exclusion criteria medical staff with less than 2 years of experiences, trainees, medical students and those who refuse to participate in the study

3.4 Sample size and sampling technique

Sample size consisted of all available medical staff at ER during the period of data collection (total coverage)

3.5 Data collection tools

Data were collected by using semi-structures questionnaire

3.6 Data analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) program

3.7 Duration of the study

This study was conducted during the period from May-July 2017-05-01

3.8 Ethical considerations

- Ethical permission was obtained from ethical clearance committee.
- Objectives of the study were explained to the participants and written informed consent was obtained from participants
- Data will be collected during participants rest times

Respondents' knowledge was assessed according to the following scale

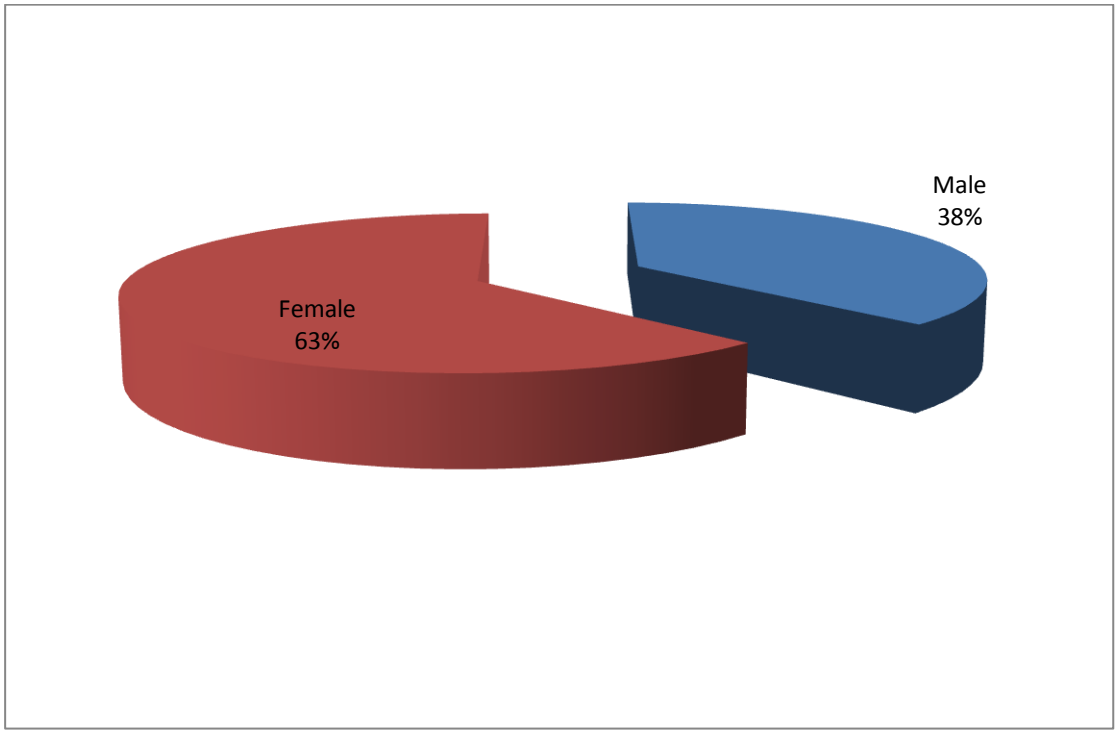
Level of knowledge	**Score**
Unacceptable	Less than 30%
Poor	31-55 %
Satisfactory	56-65 %
Good	66-75 %
very good	Above 75 %

Chapter Four

Results

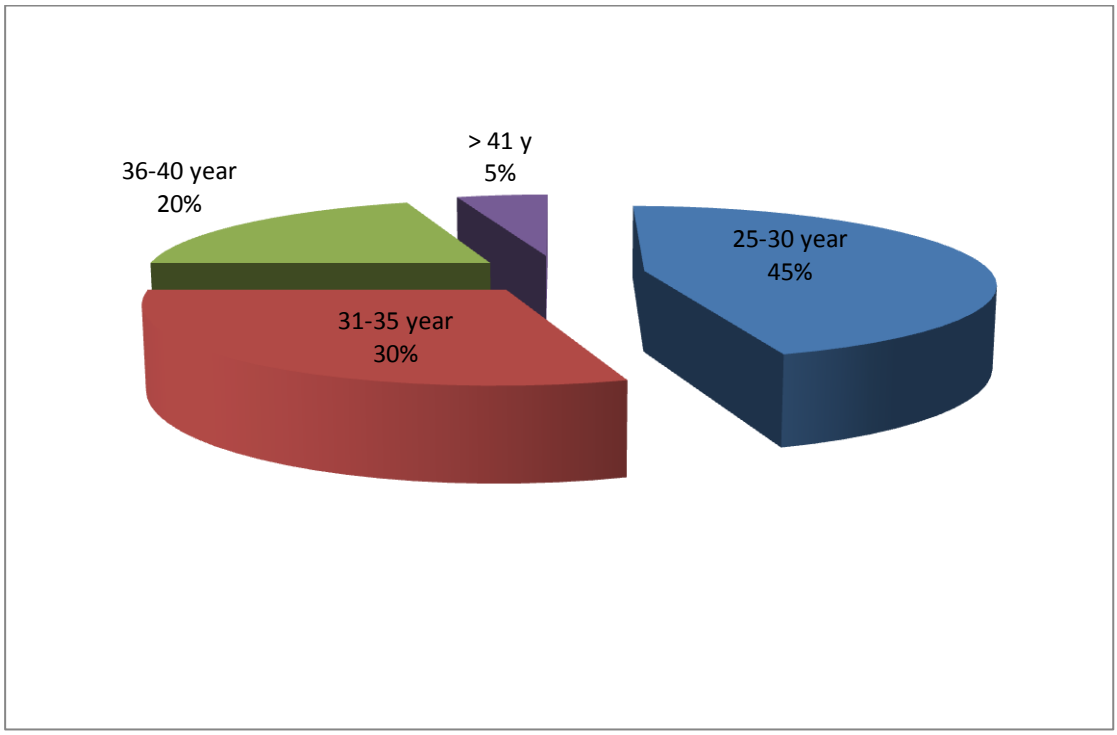
4.1 Results

Figure (1) Distribution of respondents by gender (N=80)



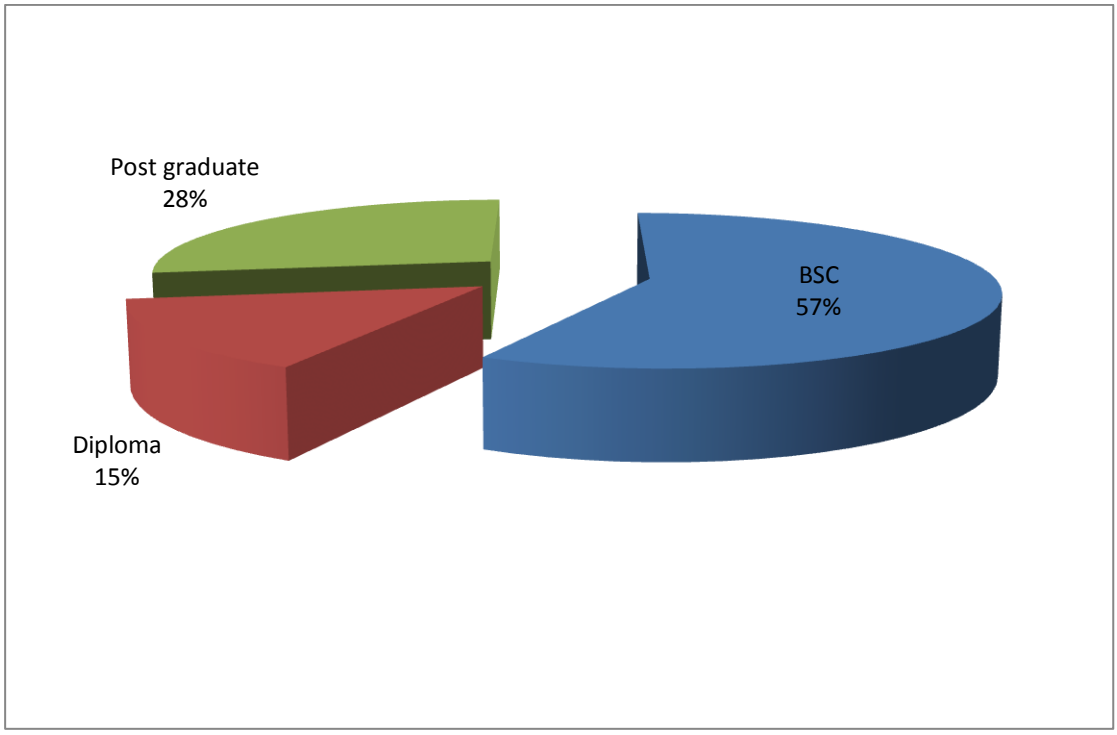
Results of figure (1) showed that the majority of respondents (62.5%) were females, 37.5% were males.

Figure (2) Distribution of respondents by age (n=80)



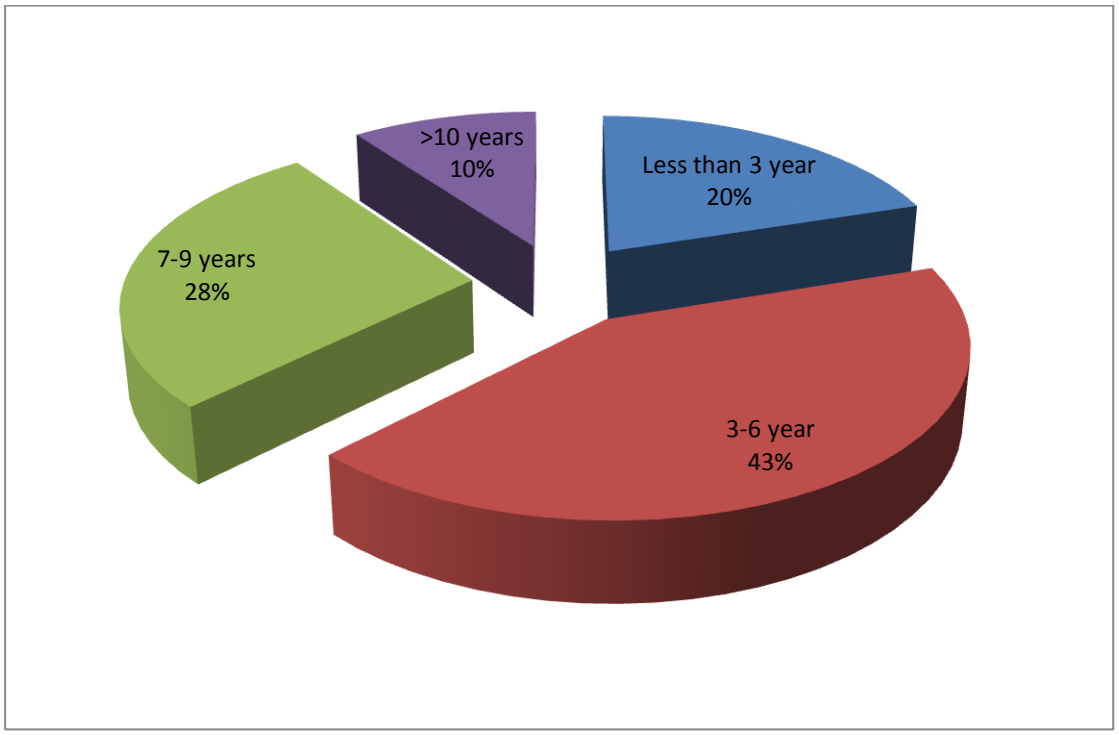
Results of figure (2) showed that 46.2% of respondents their ages between 25-30 years, 30% between 31-35, 20% between 36-40 years, only 5% their ages above 41% years.

Figure (3) Distribution of respondents by qualification (n=80)



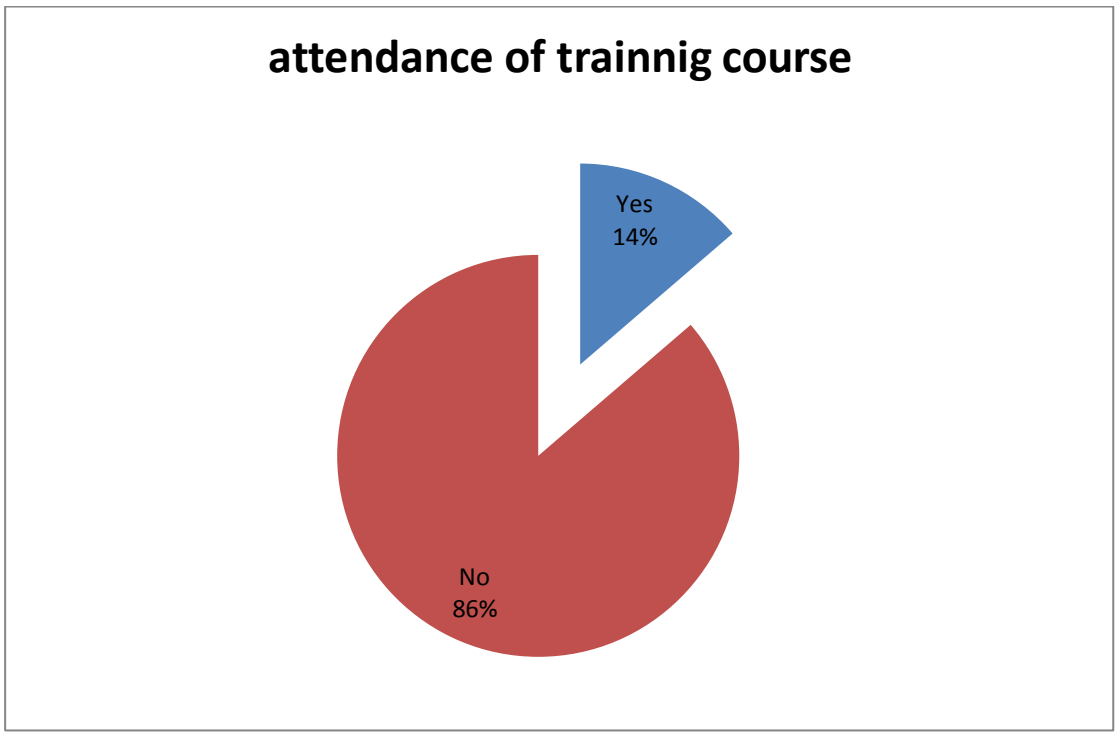
As shown in the above table, most of respondent (57%) were B. Sc holders, 28. % were post graduated and 15% were diploma holders.

Figure (4) Distribution of respondents by experience years (n=80)



As shown in the above figure, most of respondent nurses (44%) were with 3-6 years of experience.

Table (3) Attending of training courses regarding infection control (n=80)



The majority of respondent nurses in the above figure (86%) did not attended any training programs regarding infection control, only 14% attended programs regarding infection control.

Table (1) Availability of Posters (n=80)

	Yes		No	
	F	%	F	%
Is there any posters to the infection control in your section?	46	57. 5	34	42.5
Is there any posters to the hands washing in your section	61	76.3	19	23.7
Is there any posters to the medical waste	36	42.5	46	57. 5
Is there any posters to the safety injection in your section	38	47.5	42	52.5
Is there any posters to the dress and undress of personal protection in your section	22	27.5	58	72.5
is there any posters of sterilization and disinfection in your section	30	37.5	50	62.5
There are posters to treat the infections.	12	15.0	68	75.0

Results of the above table showed that the majority of respondents stated that posters to the infection control were not available specially when regarding stickers to treat the infections. (15%), posters to the dress and undress of personal protection (27.5%), and posters to the infection control of sterilization and disinfection , posters to the medical waste (42.5%) , posters to the safety injection (47.5%), whereas 76.3% and 57.5% stated that posters to the hands washing and the infection control are available.

Table (2) Follow-up and evaluation (n=80)

	Yes		No	
	F	%	F	%
1/ the periodic follow up of infection control program is available in your section	**20**	**25.0**	**60**	**80.0**
2/ There is periodic meeting to discuss the setup of the program with the staff.	**12**	**15.0**	**68**	**75.0**
3/ Presence of formalities and rules to the practitioner to follow the procedure of infection control at your corporation	50	62.5	30	37.5
4/ Presence of form for follow up of patients' vital signs	72	90.0	8	10.0
5/ Presence of form of antibiotic follow up	**12**	**15.0**	**68**	**75.0**

Results of the above table showed that follow-up and evaluation for infection control program was inadequate specially regarding presence of antibiotics forms and periodic meeting to discuss the setup of the program with the staff (15%), the periodic follow up of infection control program (25%).

Table (3) Respondents Knowledge regarding hand washing hygiene (n=80)

Items	Yes		No	
	F	%	F	%
1/ Hand wash is regarding as the best procedure of infection control	72	90.0	8	10.0
2/ The time of routine hand washing is from 20-40 sec.	36	40.0	44	60.0
3/ The time of alcoholic hand rub is less than 20 sec	36	40.0	44	60.0
4/ Hands should be washed at any Intervention from patient to another	70	87.5	10	12.5
5/ Hands should be washed Before and after using gloves	42	52.5	38	47.5
6/ Hands should be washed after any deep nursing Intervention only	72	90.0	8	10.0
8/ Hands should be washed whenever touch different body fluid.	76	92.5	4	7.5
9/ Hands should be washed after checking of any vital sign	42	52.5	38	47.5

Average percent of knowledge=70.6

Results of table (3) showed that the majority of the study sample (70.6%) responded with correct answers regarding hand washing hygiene. The highest percent was for washing hand whenever touch different body fluid (92.5%), washing hands after any deep nursing Intervention and Hand wash is regarding as the best procedure of infection control.

Table (4) Respondents Knowledge regarding disposal of medical waste (n=80)

Items	Yes		No	
	F	%	F	%
1/Medical waste is the main source of infection transmission in and out health institution	64	80.0	16	20.0
2/ Non-medical waste is more than other wastes coming out of hospital	32	40.0	48	55
3/ Waste sorting is the most important step to proper disposal of waste	56	70.0	24	30.0
4/ The disposal of domestic waste is collected in black plastic bags	68	85.0	12	15%
5/ The disposal of medical waste in red bags.	32	40.0	48	55

In the above table, it is clearly observed that the majority of respondents (80%) agreed that Medical waste is the main source of infection in hospitals, 85% responded with correct answer regarding disposal of domestic (non medical) waste, 70% responded with correct answers regarding waste sorting, on the other hand only 40% responded with correct answers regarding quantity of non medical waste in hospitals and disposal of medical waste in red bags respectively.

Results in the previous table showed that practice of sample size regarding medical waste disposal was inadequate especially for disposal of medical waste in red bags (0%), sorting waste (10%), and disposal of domestic waste (40%).

Table (5) respondents Knowledge regarding protection and protection equipments (n=80)

Items	Yes		No	
	F	%	F	%
1/ Wear protection equipments to protect patient and nurse	60	75.0	20%	25.0
2/protection equipments are mask, gloves, cap, glasses, Gwen	64	80.0	16	20.0
3/ The personal protection equipment should be disposed (gloves, head hat, pair of glass, mask immediately after medical intervention even at one unit	64	80.0	16	20.0
4/ The wear of personal protective equipment is one of the standard of infection control program	40	50.0	40	50.0
5/ Wear of personal protective equipment is only at isolation rooms.	16	20.0	64	80.0

As shown in the above table, 83.8% responded with correct answers regarding types of protection equipments and when to dispose protection equipment respectively, 75% answer correctly regarding causes for wearing protection equipments, 50% of respondents knew that wear of personal protective equipment is one of the standards of infection control program.

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Table (6) Respondents Knowledge regarding safe injection (n=80)

Items	Knowledge		Practice	
	Yes	No	Yes	No
1. The syringes must be used once time.	80	100.0	-	-
2. Medicine are used more than once time from the same container only when authorized by the company taking into account the expiry date	72	90.0	8	10.0
3. In case of medicine of multi dose a new needle is used after cleaning of dragging places	56	70.0	24	30.0
4. The hole of I.V. fluid bag for air discharge does not contribute to the transfer of infection	60	75.0	20	25.0
5. The use of some I.V. fluid bag many times to single patient has no relation with infection protection	64	80.0	16	20.0
6. Documentation is one of the important safe injection procedures.	44	55.0	36	80%45

In the above table results showed that knowledge of respondents regarding safe injection was adequate specially regarding using syringes only one time (100%),

Table (10) Respondents knowledge regarding Isolation (n=80)

	Yes	No
Isolate the patient from contacts	55.6	44.4%
Isolate the rooms of infectious disease .	95	5%
Isolate the patient from the other ones	60	40%
The patient isolation should be accordingly to type of disease transmission	75	25%
The patient isolation should be accordingly to patient status	75	25%
The sterilization of the isolation room should be from patient to another one.	80%	20%

Results of the previous table showed that the majority of respondents responded with correct answers regarding isolate the rooms of infectious disease (91.5%), methods of sterilization of the isolation room (79.5%), patient isolation according to his status (74.4%), and to the type of his disease (73.5%).

Chapter Five

5. Discussion

Infection control is the discipline concerned with preventing nosocomial or healthcare-associated infection, Controlling nosocomial infection is to implement QA/QC measures to the health care sectors, and evidence-based management can be a feasible approach, controlling and monitoring hospital indoor air quality needs to be on agenda in management, whereas for nosocomial rotavirus infection, a hand hygiene protocol has to be enforced.

Results of the current study revealed that the majority of respondents (63%) were females, with relative young years less than 35 years (76.2%). It is also observed that most of respondents (57%) with bachelor degree.

Also the study revealed that the majority of respondent nurses (86%) did not attend any training programs regarding infection control in hospitals which in turn increases the risk on both patients and staff.

This is differsfrom the study of (Galal et al, 2013) were the majority of the study sample attended health education sessions in the form of power point and video presentations;

Results of the study revealed that the posters concerning with the infection control were mostly unavailable. Specially when regarding posters to treat the infections. (15%), posters to the dress and undress of personal protection (27%), infection control of sterilization and disinfection (37.5%), safety injection (47.5%), on the other hand 76.3% stated that posters to the hands washing is available in their sections.

These tools are helpful for both staff and co-patients and so it is important in enhancing infection control procedures, absence of these posters is due to the lack of clear strategies in implementing infection control measures

Results showed that follow-up and evaluation for infection control program was inadequate specially regarding infection control program (25%), periodic meetings for evaluation, taking samples and presence of antibiotics forms (15%)

The study revealed that the 87.5% of sample size responded with correct answers regarding washing hands at any medical Intervention from patient to another, 90% answer correctly regarding hand washing as the best procedure of infection control, were 90% of respondents knew that Hands should be washed whenever touch different body fluid and after checking of any vital sign. Only 40% of the study sample responded with correct answers regarding the time of routine hand washing and the time of alcoholic hand rub.

The knowledge of respondent health workers regarding hand washing hygiene was adequate.

This is similar to (Galal et al, 2013) study were 86.5% had satisfactory knowledge Results revealed that (80%) agreed that Medical waste is the main source of infection in hospitals, 70% responded with correct answer regarding disposal of domestic (non medical) waste, 70.1% responded with correct answers regarding waste sorting, on the other hand only 40% responded with correct answers regarding quantity of non medical waste in hospitals and disposal of medical waste in red bags respectively.

Also 80% responded with correct answers regarding disposing protection equipment after nursing intervention, 75% answer correctly regarding causes for wearing protection equipments, types of protection equipments.

Results showed that knowledge of respondents regarding safe injection was adequate especially regarding using syringes only one time (100%).

Results showed that the majority of participants responded with correct answers regarding isolate the rooms of infectious disease (95%), methods of sterilization of the isolation room (75%), patient isolation according to his status (75%), and to the type of his disease (75%).

It can be concluded that lack of adequate training for health workers, lack of regular follow-up and lack of educational tools and posters resulted in a poor

knowledge regarding infection control program items such as hand washing, medical waste disposal and isolation.

6. Conclusion and Recommendations

6.1 Conclusions

Infection control has a particularly important role in emergency hospitals and must take into account the specificity of the needs and environment of the emergency patient. Emergency and accident Patients susceptible to many infections although health care workers play an important role in implementing infection control program in Emergency and accident hospitals results of the current study revealed that health care workers knowledge was inadequate.

6.2 Recommendations

According to the results and finding of the study it is recommended that:

- Central and state ministries of health must give more attention to training programs about infection control for nursing staff.
- Availability of educational tools and equipments such as posters panes and leaflets concerning with different items of infection control guidelines such as hand washing and medical waste disposal.
- Conducting special training sessions in emergency and accident hospitals for health workers and establishing of special units in concerning with training and evaluation of infection control programs.

References

1. Carling PC, Parry MF, Bruno-Murtha LA, Dick B (2010). Improving environmental hygiene in 27 intensive care units to decrease multidrug-resistant bacterial transmission. Crit Care Med; 38:1054.
2. CDC Guideline for Hand Hygiene in Health-Care Settings". MMWR (2012). Available at http://en.wikipedia.org/wiki/Infection_control, accessed August 2018
3. CDC". HAI Data and Statistics | HAI |www.cdc.gov. 2018-01-10. Retrieved 2018-01-13.
4. Edmond, MB, Wenzel, RP (2005). Organization for Infection Control. In: Principles and Practice of Infectious Diseases, 6th ed. Mandell, GL, Bennett, JE, Dolin, R, (Eds), Churchill Livingstone, Philadelphia, PA 2005, p.3323.
5. Galal YS1, Labib JR, Abouelhamd WA (2013). Impact of an infection-control program on nurses' knowledge and attitude in pediatric intensive care units at Cairo University hospitals.Cairo, Egypt.
6. Harbarth S (2008). Handwashing-the Semmelweis lesson misunderstood. Clin Infect Dis; 30:990.
7. Hayden MK, Bonten MJ, Blom DW (2016). Reduction in acquisition of vancomycin-resistant enterococcus after enforcement of routine environmental cleaning measures. Clin Infect Dis 2016; 42:1552.
8. http://www.apic.org, 2013
9. *Klevens, R. Monina; Edwards, Jonathan R.; Richards, Chesley L.; Horan, Teresa C.; Gaynes, Robert P; Pollock, Daniel A.; Cardo,*

Denise M. (2007). "Estimating Healthcare-associated Infections and Deaths in U.S. Hospitals, 2002". Public Health Reports. 122 (2): 160–166

10. Larson E (2009). Skin hygiene and infection prevention: more of the same or different approaches. Clin Infect Dis; 29:1287.
11. Mauger B (2014).,Implementing quality improvement strategies to reduce healthcare-associated infections: A systematic review, North Carolina, USA
12. Miller BA, Sexton DJ (2010). Shedding light on new methods to improve hospital cleanliness: the use of ultraviolet monitors as surrogate markers for bacterial contamination. Crit Care Med 2010; 38:1212.
13. Miller BA, Sexton DJ (2010). Shedding light on new methods to improve hospital cleanliness: the use of ultraviolet monitors as surrogate markers for bacterial contamination. Crit Care Med 2010; 38:1212.
14. Miller, Chris H (2010). Infection Control and Management of Hazardous Materials for the Dental Team, 4th Edition. Mosby Elsevier Health Science,. chpt 11).
15. Nicas, Mark et al.; Nazaroff, WW; Hubbard, A (2015). "Toward Understanding the Risk of Secondary Airborne Infection: Emission of Respirable Pathogens". Journal of Occupational and Environmental Hygiene 2 (3): 143–154.
16. Quraishi ZA, McGuckin M, Blais FX (2006). Duration of handwashing in intensive care units: a descriptive study. Am J Infect Control; 12:83.
17. Rodak S (2012). Infection control and clinical quality. Available at http://www.beckersasc.com/asc-quality-infection-control/8-steps-to-effective-hospital-infection-con

18. Rutala WA, Weber DJ (2014). Disinfection and sterilization in health care facilities: what clinicians need to know. Clin Infect Dis 2014; 39:702.
19. Siegel JD, Rhinehart E, Jackson M, et al (2007). Healthcare Infection Control Practices Advisory Committee Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. CDC Guideline for Hand Hygiene in Health-Care Settings (2009).
20. Stone PW, Dick A, Pogorzelska M, Horan TC, Furuya EY, Larson E: **Staffing and structure of infection prevention and control programs.** *American Journal of Infection Control* 2009, **37**(5)**:**351-357.
21. The Royal Australian College of General Practitioners (2008). "Slides - RACGP Infection Control Standards for Office-based Practices (4th Edition)" (PDF).
22. Walter C,www. "Preventing Infections Adequately". Accessed December 2013.
23. Whitehouse JD, Sexton DJ, Kirkland KB (2015). Infection control: past, present, and future issues. Compr Ther 2008; 24:71.
24. Wilks, S.A., Michels, H., Keevil, C.W., (2006), The Survival of Escherichia Coli O157 on a Range of Metal Surfaces, International Journal of Food Microbiology, Vol. 105, pp. 445–454.
25. www.jointcommission.org, 2010.

Assessment of Health Workers' Knowledge towards infection control program in *Emergency and Accidents Hospital,* Omdurman Military Corporation, Sudan (2018)

1/ Sex:

Male ( ) female ( )

2/ Age:

25-30 year ( ) 31-35 year ( ) 36-40 year ( ) > 41 ( )

3/ Occupation: …….

3/ **Qualifications**

Secondary ( ) Diploma ( ) BSC ( ) higher Diploma ( )

Postgraduate ( )

4/ **experience years**

Less than 3 year ( ) **3-6 year ( )**

7-9 years ( ) **>10 years ( )**

5/ Did you attend **any training courses regarding infection control**?

Yes ( ) no ( )

6/ **Availability of Posters**

	Yes	
	Yes	No
1. Are there any posters to the infection control in your section?		
2. Is there any posters to the hands washing in your section		
3. Is there any posters to the medical waste		
4. Is there any posters to the safety injection in your section		
5. Is there any posters to the dress and undress of personal protection in your section		
6. is there any Indicative Pane of sterilization and disinfection in your section		
7. There are posters to treat the infections.		

7/ **Table Follow-up and evaluation**

	Yes	No
the periodic follow up of infection control program is available in your section		
There is periodic meeting to discuss the setup of the program with the staff.		
Presence of formalities and rules to the practitioner to follow the procedure of infection control at your corporation		
Presence of form for follow up of patients' vital signs		
Presence of form of antibiotic follow up		

8/

hand washing hygiene		
	Yes	No
1/ Hand wash is regarding as the best procedure of infection control		
2/ The time of routine hand washing is from 20-40 sec.		
3/ The time of alcoholic hand rub is less than 20 sec		
4/ Hands should be washed at any Intervention from patient to another		
5/ Hands should be washed Before and after using gloves		
6/ Hands should be washed after any deep nursing Intervention only		
8/ Hands should be washed whenever touch different body fluid.		
9/ Hands should be washed after checking of any vital sign		

9/ disposal of medical waste	Yes	No
1/Medical waste is the main source of infection transmission in and out health institution		
2/ Non-medical waste is more than other wastes coming out of hospital		
3/ Waste sorting is the most important step to proper disposal of waste		
4/ The disposal of domestic waste is collected in black plastic pags		
5/ The disposal of medical waste in red bags.		

10/ protection and protection equipments		
1/ Wear protection equipments to protect patient and nurse	Yes	No
2/protection equipments are mask, gloves, cap, glasses, Gwen		
3/ The personal protection equipment should be disposed (gloves, head hat, pair of glass, mask immediately after nursing intervention even at one unit		
4/ The wear of personal protective equipment is one of the standard of infection control program		
5/ Wear of personal protective equipment is only at isolation rooms.		
11/ Safe injection		
7. The syringes must be used once time.	Yes	No
8. Medicine are used more than once time from the same container only when authorized by the company taking into account the expiry date		
9. In case of medicine of multi dose a new needle is used after cleaning of dragging places		
10. The hole of I.V. fluid bag for air discharge does not contribute to the transfer of infection		
11. The use of some I.V. fluid bag many times to single patient has no relation with infection protection		
12. Documentation is one of the important safe injection procedures.		

12/Isolation	Yes	No
Isolate the patient from contacts		
Isolate the rooms of infectious disease		
Isolate the patient from the other ones		
The patient isolation should be accordingly to type of disease transmission		
The patient isolation should be accordingly to type of patient status		