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Knowledge, Attitudes and Practices for Standard Precautions in Infection Control among Hospitals Staff in Fezzan Regions Libya, (2018)

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بسم الله الرحمن الرحيم

قـــال تعـــالي :

شَهِدَ اللَّهُ أَنَّهُ لاَ إِلَهَ إِلاَّ هُوَ وَالْمَلآئِكَةُ وَأُوْلُوا
الْعِلْمِ قَائِمًا بِالْقِسْطِ لاَ إِلَهَ إِلاَّ هُوَ الْعَزِيزُ الْحَكِيمُ

[سورة آل عمران: الآية 18]

DEDICATION

I dedicate this work to my mother

my lovely wife Altoma Mohmmed

for her encouragement and patience,

my dear sons Nazar and mohmmed

My daughter Shahd ..

my brothers …

my sisters …

my friends…

my colleagues…

Mr.Abdelbagi ELgily

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Abstract

Abstract

Introduction: Standard Precautions are designed to prevent cross transmission from recognized and unrecognized sources of infection. These sources of infection include blood and other body fluid secretions or excretions (excluding sweat, non –intact skin or mucous membranes) and any equipment or items in the care environment which are likely to become contaminated. It should be applied at all times within a healthcare setting or where healthcare is being provided and must underpin all healthcare activities.

Objectives: The aim of the study was to assess the knowledge, attitudes and practices of standard precautions, the major factors that hampering to standard precautions in infection control among hospitals staff in Fezzan region southern Libya. .

Methodology: A descriptive cross-sectional study was done using a self-administered questionnaire, observational checklist and a structured interview to collect Study data. The study was conducted at Traghen Hospital, Murzug Hospital and Sabha Medical Hospital. The stratified random sample was used for this study to ensure adequate representation of all selected the four categories in this study. Which includes doctors 27, laboratory technicians 30, nurses 191 and 51cleaners. The sample size was 299 distributed according to percentage of total population and occupation in each hospital. After the data collected it was analyzed through the statistical program (SPSS) version 16.

Results: The results of the study showed that the employees knowledge about the standard precautions elements was very low in general 33%, but was high in the Hand washing (85.9%),uses of gown (87.3 %), respiratory

hygiene (86.9%), and Disposal of needles and sharps 94%. The practice of standard precautions was low among participants. The practice of hand hygiene participants was 69.%, use of personal protective equipment 74.2%, disposal of needles and sharp tools 66.6%, use of detergents and disinfectants in accordance with manufacturer's instructions 43.1% disinfection of equipment after use 70.9%.

Conclusion: knowledge of standard precautions is high among hospitals staff but was not translated into appropriate practices. The poor positive attitudes of hospitals staff, lack of supplies and infection prevention equipment , inadequate training for hospitals staff and lack of appropriate control system in standard precaution as barriers hampering to positive performance in decontamination, waste disposal, respiratory hygiene and others standard precautions in infection control. These results are useful in planning of appropriate measures to improve knowledge, attitudes and compliance with standard precautions.

المستخلص :

المقدمة: تم تصميم الاحتياطات القياسية لمنع انتقال العدوى من المصادر المعروفة و الغير معروفة من العدوى. وتشمل هذه المصادر الدم وإفرازات السوائل أو إفرازات السوائل الأخرى (باستثناء العرق والجلد أو الأغشية المخاطية) وأي معدات أو مواد في بيئة الرعاية من المحتمل أن تصبح ملوثة. وينبغي تطبيقها في جميع الأوقات في إطار الرعاية الصحية أو حيث يتم توفير خدمات الرعاية الصحية.

الاهداف: وكان الهدف من هذه الدراسة هو تقييم المعرفة والمواقف والممارسات للاحتياطات القياسية لمكافحة العدوى، والعوامل الرئيسية التي تعيق الاحتياطات القياسية في مكافحة العدوى بين موظفي المستشفيات في منطقة فزان جنوب ليبيا.

المنهجية: أجريت هذه الدراسة الوصفية المقطعية باستخدام استبيان يدار ذاتياً، وقائمة مرجعية للملاحظة ومقابلة منظمة لجمع بيانات من مستشفى تراغن ومستشفى مرزوق ومستشفى سبها الطبي. تم استخدام العينة العشوائية الطبقية لهذه الدراسة لضمان تمثيل كاف لجميع الفئات الأربعة المختارة في هذه الدراسة والتي تشمل27 طبيب و 30 فني مختبرات و 191 من التمريض و 51 عامل نظافة. كان حجم العينة 299 موزعا حسب نسبة السكان والمهنة في كل مستشفى. وبعد جمع البيانات تم تحليلها من خلال البرنامج الإحصائي (SPSS) الإصدار 16.

النتائج : أظهرت نتائج الدراسة أن معرفة الموظفين بعناصر الاحتياطات القياسية كانت منخفضة للغاية بشكل عام بنسبة 33٪، ولكنها كانت عالية في غسل اليدين (85.9٪)، استخدامات المريول (87.3٪)، نظافة الجهاز التنفسي (86.9٪) والتخلص من الإبر والأدوات الحادة 94٪.كانت ممارسة الاحتياطات القياسية منخفضة بين المشاركين. كانت ممارسة المشاركين في نظافة اليدين 69. ٪، واستخدام معدات الوقاية الشخصية 74.2 ٪ ، والتخلص من الإبر والأدوات الحادة 66.6 ٪ ، واستخدام المنظفات والمطهرات وفقا لتعليمات الشركة الصانعة 43.1 ٪ تعقيم المعدات بعد الاستخدام 70.9 ٪.**الخلاصة**: معرفة الاحتياطات القياسية عالية بين موظفي المستشفيات ولكن لم يتم ترجمتها إلى ممارسات مناسبة. ضعف المواقف الإيجابية لموظفي المستشفيات ونقص الإمدادات ومعدات الوقاية من العدوى والتدريب غير الكافي لموظفي المستشفيات وعدم وجود نظام رقابة مناسب كحواجز تعرقل الأداء الإيجابي في إزالة التلوث، والتخلص من النفايات، والنظافة التنفسية وغيرها من الاحتياطات القياسية في مكافحة العدوى. هذه النتائج المفيدة في تخطيط الاجراءات المناسبة لتحسين المعرفة والمواقف والامتثال للاحتياطات القياسية.

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Abbreviation

PPE	Personal Protective Equipment
HIV	Human Immunodeficiency Virus
AIDS	Acquired Immune Deficiency Syndrome
SPSS	Statistical Package for Social Sciences
HBV	Hepatitis B virus
WHO	World Health Organization
ABHR	Alcohol Based Hand Rub
HCF	Health Care facility
HCWs	Health Care Workers
HH	Hand Hygiene
ICPs	Infection Control Practitioners
MRSA	Methicillin Resistant Staphylococcus Aureus
NSI	Needle Stick Injury
SIP	Safe Injection Practices
SPs	Standard Precautions
Ups	Universal Precautions
WD	Waste Disposal
HCAI	Health Care Associated Infection
NIs	Nosocomial Infections
SICPs	Standard Infection Control Precautions
BSI	Body System Isolation
SARS	Severe Acute Respiratory Syndrome
CDC	Centers for Disease Control and Prevention
NHS	National Health Service
UBP	Universal Precautions Procedures

CHAPTER ONE

Introduction

1.1 Background

Hospital acquired infections are infections that are neither present nor incubating when a patient enters hospital. About nine per cent of inpatients have a hospital acquired infection at any one time, equivalent to at least 100,000 infections a year. Their effects vary from discomfort for the patient to prolonged or permanent disability and a small proportion of patient deaths each year are primarily attributable to hospital acquired infections [(1).] Standard Precautions represent the minimum infection prevention measures that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where healthcare is delivered. These evidence-based practices are designed to both protect healthcare personnel and prevent the spread of infections among patients [(2).]

Many infection control measures, such as appropriate hand hygiene and the correct application of basic precautions during invasive procedures are simple and of low-cost, but require staff accountability and behavioral change , in addition to improving staff education, reporting and surveillance systems [(3)] .

1-2 Problem statement :

During the past two decades, healthcare-associated infections have become a significant risk to patient safety. It is a worldwide hazard for both patients and healthcare providers. Prevalence surveys in Europe, Australasia and North America suggest that approximately 5–10 per cent of all inpatients

will have acquired a healthcare-associated infection during periods of hospital care. Many of these infections are serious and sometimes fatal [3].

Progress has been made in hospitals, but more needs to be done to protect patients from infection. New data show that 58% of fewer bloodstream infections occurred in hospital ICU patients with central lines in 2009. In 2009, about 18,000 bloodstream infections occurred in ICU patients with central lines. About 23,000 more happened to patients who got treatment in other areas of the hospital [4].

Health care associated infections are drawing increasing attention from patients, insurers, governments and regulatory bodies. This is due to the growing numbers, cost, and recognition that most of these are preventable [5].

In developed countries, HCAI represents 5–15% of hospitalized patients and can affect 9 – 37% of those admitted to intensive care units (ICUs). Recent studies in Europe have reported hospital-wide prevalence rates for patients with HCAI ranging from 4.6% to 9.3%. These studies also indicate that about 5 million HCAI occur in acute care hospitals in Europe annually, representing an additional 25 million days of hospital stay and a similar economic burden of €13–24 billion In general, attributable mortality due to HCAI in Europe is estimated to be 1% (50 000 deaths per year), but HCAI contributes to death in at least 2.7% of cases (135 000 deaths per year [6].

In developing countries the rates of -Healthcare Associated Infections (HAIs) ranging from 8.2 to 16.1 per 1,000 device - exposed - days - at least 3 to 5 times higher than international standards [7]. In the developing countries more than 25% of all hospital admissions develop nosocomial infections and these rates can be 20 times higher than in developed countries [8].

Libyan health-care system is very weak [9].There is very little information in the international literature about nosocomial infections in Libya whereas they are a cause of considerable morbidity and mortality in the industrialized and developing countries [8].

1-3 Study Justification:-

As it shown from studies, healthcare-associated infections have become a significant risk for both patients and healthcare provider's .Studies throughout the world document that nosocomial infections are a major cause of morbidity and mortality. A high frequency of nosocomial infections is evidence of a poor quality of health service delivery and leads to unavoidable costs.

Moreover The situation in Libya where the crises in recent years, including armed clashes that have led to thousands of people being killed and injured, large-scale displacements and damage to vital infrastructure [9]. The fighting has led to an increased number of war-related traumas and injuries. Large hospitals in Tripoli and Benghazi are overwhelmed with patients requiring emergency and trauma care. These hospitals are also challenged by shortages in essential medicines and qualified heath staff [10]. Generally crisis affected to the health system. Budgetary cuts are decreasing the number of patients sent abroad, which puts an additional burden on the already weakened Libyan health-care system [9].

In Fezzan region, there is no previous study conducted regarding this concern. As such this study is conducted with attempt to reveal the real fact of current situation on healthcare-associated infections in the southern part of Libya.

1-4 Objectives:-

1-4-1 General Objectives:-

To describe the knowledge, Attitudes and Practices (KAPs) for standard precautions in infection control among hospitals staff in Fezzan region southern Libya in the period from 2017 to 2018.

1-4-2 Special Objectives:-

- To assess the knowledge of standard precautions in infection control among hospitals staff.

- To assess the attitudes of hospitals staff toward standard precautions in infection control.

- To identify the major factors hampering implementation of standard precautions in infection control among hospitals staff.

Chapter (2)

2- Literature review

This chapter focuses on the literature review of the knowledge, attitudes and practices for standard precautions among hospital staff .This chapter also provides a review of literature on the factors that influence to the practices of hospitals staff for standard precautions.

Nosocomial infections (Nls) are new localized or systemic infections that develop in patients receiving medical care in a hospital or other healthcare facilities. The infections are not incubating or present during a patient's admission into the healthcare facility and are identified at least forty-eight to seventy-two hours following the patient's admission. Episodes of Nls are recognized in hospitalized patients world-wide and are prevalent in all age groups. They are caused by pathogens such as bacteria, viruses and parasites present in the air, surfaces or equipment and are often transmitted by indirect and direct contact. Some of the pathogens are resistant to antimicrobial agents. The burdens of (Nls) include prolonged duration of hospitalization for patients resulting in increased costs of healthcare and deaths. Implementation of safe patient care activities is the role of healthcare workers such as physicians, dental health care workers and nurses. Therefore these healthcare workers should be familiar with practices to prevent the occurrence and spread of Nls . It has been documented in the literature that at the time of their graduation from their professional education, healthcare professionals have sufficient knowledge to practice patient safety and infection control guidelines [(11)].

2-1 Definition of nosocomial infection:

The World Health Organization (WHO) defines Nosocomial Infection as an infection acquired in hospital or other health care facility by patient who was admitted for reason other than the infection present during admission. This includes an infection acquired in the hospital, or other healthcare facility, but appearing after the patient's discharge [12].

According to The World Health Organization (WHO) definition Health care-associated infections (HCAIs) are infections that patients acquire while receiving treatment for medical or surgical conditions and are the most frequent adverse event during care delivery [13].

HCAI is a major problem for patient safety and its impact can result in prolonged hospital stay, long-term disability, increased resistance of microorganisms to antimicrobial agents, a massive additional financial burden for the health system, high costs for patients and their families, and excess deaths. The risk to acquire HCAI is universal and pervades every health-care facility and system worldwide, but the true burden remains unknown in many nations, particularly in developing countries [14].

Nosocomial infections, also called “hospital-acquired infections” are infections acquired during hospital cares which are not present or incubating at admission. Infections occurring more than 48 hours after admission are usually considered nosocomial [14].

2-2 Types of nosocomial infections:

National Healthcare Safety Network with Centre for Disease Control (CDC) for surveillance has classified nosocomial infection sites into 13 types, with

50 infection sites, which are specific on the basis of biological and clinical criteria. The sites which are common include urinary tract infections (UTI), surgical and soft tissue infections, gastroenteritis, meningitis and respiratory infections. A change regarding nosocomial infection sites can be easily detected with time due to the elevated use of high techniques for diagnostic and therapeutic purposes. The perfect example of this can be seen in the case of pneumonia as prevalence of nosocomial pneumonia increased from 17% to 30% during five years [15].

2-3 Agents of nosocomial infections:

Nosocomial infections are caused by many microbes and each one can cause infection in healthcare settings. Bacteria are responsible for about ninety percent infections, whereas protozoans, fungi, viruses and mycobacterium are less contributing compared to bacterial infections [15] .

2-4 Disease transmission:

2-4-1 Chain of infection

The process of transmission of an infectious agent can be best explained by the epidemiologic model called the "chain of infection." An infectious disease results from specific interactions between an agent, host, and environment. Transmission occurs when the infectious agent leaves the reservoir (or host) through a portal of exit, travels by some mode of transmission, and enters through a portal of entry to infect a susceptible host [16].

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:

I. Causative agent.

II. Infectious reservoir.

III. Portal of exit from the reservoir.

IV. Mode of transmission.

V. Portal of entry into the host.

VI. Susceptible host [17].

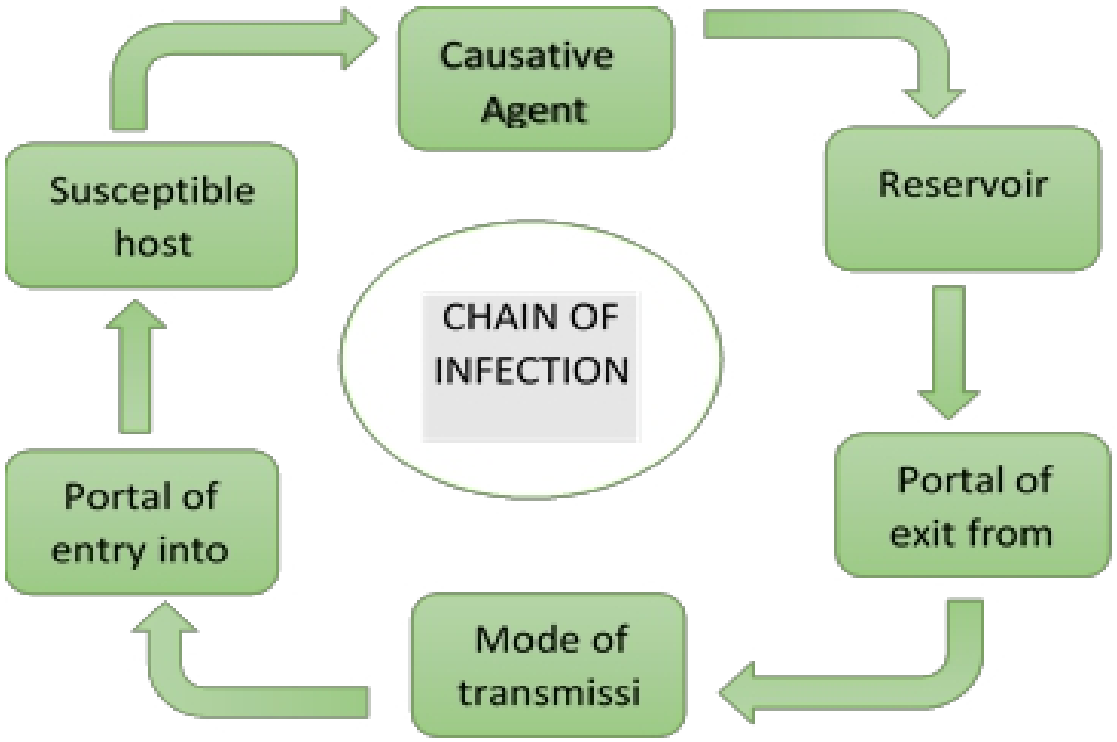

Figure 1: The chain of infection

9Each link in this chain of infection represents an opportunity for the interruption of the process [18].

Causative agent:

The causative agent is a biological, physical, or chemical entity capable of causing disease ([19].

2-4-1-2 Infectious reservoir:

A **reservoir** for an infectious agent is the habitat where the agent normally lives and grows. Reservoirs may be humans, animals, or the environment. In the case of blood borne infectious diseases, humans are generally the reservoirs [16].

2-4 Portal of exit from the reservoir :

The **portal of exit** is the path by which the infectious agent leaves its host. Blood borne pathogens can exit the host by crossing the placenta from mother to baby or through cuts, open wounds, or needles [16].

2-4-1-4 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 [17].

The mode of transmission is the method by which the organism reaches a susceptible host; three modes of transmission are of particular importance in the healthcare setting:

2-4-1-4-1 Contact Transmission is the most important and frequent mode of transmission in nosocomial infections. This transmission type is further divided into two sub-groups:

2-4-1-4-1-1 Direct Contact: involves direct physical contact between a susceptible host and an infected or colonized person, e.g., nurse-patient contact during routine care, patient-patient contact or patient-visitor contact. Such contact can cause direct transfer of microorganisms from one person to another.

2-4-1-4-1-2 Indirect Contact:

Involves the physical contact of a susceptible host with a contaminated intermediate object such as bed linen, instruments, dressings, shared equipment or healthcare environmental surfaces [(19)].

2-4-1-4-1-3 Droplet Contact involves the transmission of microorganisms in droplets generated from an infected or colonized person during talking, sneezing or coughing or generated during certain procedures such as suctioning and bronchoscopy. Microorganisms are aerosolized and deposited on the host's conjunctiva, nasal mucosa and/or mouth [(19)].

2-4-1-4-1-4 Airborne Transmission involves the dissemination of droplet nuclei or dust particles containing the infectious agent in the air. Organisms

carried in this manner can be widely dispersed by air currents before being inhaled [19].

2-4-1-5 Portal of entry into the host:

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 [17].

2-4-1-6 Susceptible host:

Susceptible Host occurs when the normal balance between microorganisms and their host may be disturbed by chronic diseases that cause an altered immune status e.g. diabetes , infancy, old age, invasive procedures, drug therapy, poor nutrition, radiation, chemotherapy, burns, etc. [20].

By breaking any link in the chain of infection, healthcare professionals can prevent the occurrence of new infection. Infection prevention measures are designed to break the links and thereby prevent new infections. The chain of infection is the foundation of infection prevention [16].

2-5 Factors influencing the development of nosocomial infections:

2-5-1 The microbial agent: The patient is exposed to a variety of microorganisms during hospitalization. Contact between the patient and a

microorganism does not by itself necessarily result in the development of clinical disease — other factors influence the nature and frequency of nosocomial infections. The likelihood of exposure leading to infection depends partly on the characteristics of the microorganisms, including resistance to antimicrobial agents, intrinsic virulence, and amount of infective material [21].

2-5-2 Patient susceptibility:

Important patient factors influencing acquisition of infection include age, immune status, underlying disease, and diagnostic and therapeutic interventions. The extremes of life — infancy and old age — are associated with a decreased resistance to infection. Patients with chronic disease such as malignant tumours, leukaemia, diabetes mellitus, renal failure, or the acquired immunodeficiency syndrome (AIDS) have an increased susceptibility to infections with opportunistic pathogens.

2-5-3 Environmental factors: Health care settings are an environment where both infected persons and persons at increased risk of infection congregate. Patients with infections or carriers of pathogenic microorganisms admitted to hospital are potential sources of infection for patients and staff. Patients who become infected in the hospital are a further source of infection. Crowded conditions within the hospital, frequent transfers of patients from one unit to another, and concentration of patients highly susceptible to infection in one area (e.g. newborn infants, burn patients, and intensive care) all contribute to the development of nosocomial infections [21].

2-5-4 Bacterial resistance: Many patients receive antimicrobial drugs. Through selection and exchange of genetic resistance elements, antibiotics promote the emergence of multidrug resistant strains of bacteria, microorganisms in the normal human flora sensitive to the given drug are suppressed, while resistant strains persist and may become endemic in the hospital. The widespread use of antimicrobials for therapy or prophylaxis (including topical) is the major determinant of resistance. Antimicrobial agents are, in some cases, becoming less effective because of resistance. As an antimicrobial agent becomes widely used, bacteria resistant to this drug eventually emerge and may spread in the health care setting. Many strains of pneumococci, staphylococci, enterococci, and tuberculosis are currently resistant to most or all antimicrobials which were once effective. Multiresistant Klebsiella and Pseudomonas aeruginosa are prevalent in many hospitals. This problem is particularly critical in developing countries where more expensive second-line antibiotics may not be available or affordable [21].

2-6 Fundamental Principles of Infection Prevention:

Infection prevention and control involves implementing work practices that reduce the risk of transmission of infectious agents through a two-tiered approach:

I- Standard Precautions - routinely applying basic infection prevention and control strategies to minimize infection risks to both patients and healthcare workers.

II- Transmission Based Precautions – used in addition to standard precautions when managing patients suspected or known to be being

infected with particular agents transmitted by the contact, droplet or airborne routes [22].

2-6-1 Standard Infection Control Precautions (SICPs:-

2-6-1-1 Historical Background:

The CDC first published a document in 1983 entitled 'Guidelines for Isolation Precautions in Hospital', which contained a section on precautions for blood and body fluids. The section recommended preventive measures to be taken when a patient is known or suspected to be infected with blood-borne pathogens [23].

The Universal Precautions were developed in 1985 to protect essentially health care workers against blood-borne infections through needle-sticks and mucous membrane exposure to contaminated blood and body fluids. But the Universal Precautions did not apply to faeces nasal secretions; sputum sweat; tears; urine; or vomits unless they contained visible blood [24].

In 1987, CDC published 'Recommendations for Prevention of HIV Transmission in Healthcare Settings'. In contrast to the 1983 guidelines, the Recommendations suggested that precautions be consistently used for all patients regardless of their blood-borne infection status. This extension became known as the Universal Precautions and it was defined by CDC (1996) as a set of precautions designed to prevent the transmission of HIV, HBV and other blood-borne pathogens when providing first aid or health care. Under the universal precautions, blood and certain body fluids of all patients were considered potentially infectious for HIV, HBV and other blood-borne pathogens. Thus, universal precautions replaced and eliminated

the need for the isolation category "blood and body fluid precautions" in the 1983 CDC Guidelines for Isolation Precautions in Hospitals [23].

In 1987, a new system of isolation called ‘Body Substance Isolation’ (BSI) was proposed by a separate group of infection control infectious body substances (blood, faeces, urine, sputum, saliva and wound drain professionals. The Body Substance Isolation isolated all moist and potentially in age and other body fluids) from all patients regardless of their presumed infection status primarily through the use of gloves [24].

BSI and UP shared many similar features designed to prevent the transmission of blood borne pathogens in hospitals. However, there was an important difference in the recommendation for glove use and hand washing. Under UP, gloves were recommended for anticipated contact with blood and specified body fluids, and hands were to be washed immediately after gloves were removed. Under BSI, gloves were recommended for anticipated contact with any moist body substance, but hand washing after glove removal was not required unless the hands visibly were soiled. The lack of emphasis on hand washing after glove removal was cited as one of the theoretical disadvantages of BSI. Using gloves as a protective substitute for hand washing may have provided a false sense of security, resulted in less hand washing, increased the risk of nosocomial transmission of pathogens, because hands can become contaminated even when gloves are used and are contaminated easily in the process of removing gloves, and contributed to skin problems and allergies associated with the use of gloves. On the other hand, proponents of BSI have noted that studies of hand washing have indicated that there is relatively low compliance by hospital personnel, that

glove use may have been easier to manage than hand washing, and that frequent hand washing may have led to eczema, skin cracking, or, in some persons, clinical damage to the skin of the hands. Although use of gloves may have been better than no hand washing, the efficacy of using gloves as a substitute for hand washing has not been demonstrated there was much local variation in the interpretation and use of UP and BSI, and a variety of combinations was common. Further, there was considerable confusion about which body fluids or substances required precautions under UP and BSI. Many hospitals espousing UP really were using BSI and vice versa. Moreover, there was continued lack of agreement about the importance of hand washing when gloves were used and the need for additional precautions beyond BSI to prevent airborne, droplet, and contact transmission [(24).]

Hence in 1996, the Centres for Disease Control, Atlanta addressed the issue by proposing a new set of guideline and recommended the Standard and Additional Precautions as a two-tier approach to infection control. This policy now replaces the previous Universal Precautions and reflects the current infection control practices in all health care settings [(23)].

The 2007 CDC Guidelines for Isolation Precautions in Hospitals contains two tiers of precautions. In the first and most important tier, are those precautions designed for the care of all patients in hospitals regardless of their diagnosis or presumed infection status. Implementation of these -Standard Precautions‖- is the primary strategy for successful health care associated infection control. In the second tier are precautions designed only for the care of specified patients. These additional -Transmission-Based

Precautions‖ are used for patients known or suspected to be infected or colonized with epidemiologically important pathogens that can be transmitted by airborne or droplet transmission or by contact with dry skin or contaminated surfaces. Resulting from the Severe Acute Respiratory Syndrome (SARS) epidemic, further revision of these Guidelines indicates that Expanded Precautions has replaced Transmission-based [25].

2-6-1-2 Definition of Standard Infection Control Precautions (SICPs):

According to World Health Organization (WHO) ―Standard precautions are meant to reduce the risk of transmission of blood borne and other pathogens from both recognized and unrecognized sources. They are the basic level of infection control precautions which are to be used as a minimum, in the case of all patients, [26].

Standard Precautions defined by (CDC) are the minimum infection prevention measures that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where healthcare is delivered. These evidence-based practices are designed to both protect healthcare personnel and prevent the spread of infections among patients. Standard Precautions replaces earlier guidance relating to Universal Precautions and Body Substance Isolation [27].

2-6-1-3 The elements of standard precaution: there are eight elements:

- Hand hygiene
- Use of personal protective equipment
- Prevention of occupational exposure
- Management of blood and body fluid spillage

- Cleanliness of care equipment
- Cleanliness of the environment
- Safe handling of linen
- Safe handling of waste

In some situations it may be necessary to use additional infection control precautions know as Transmission Based Precautions. Appropriate advice can be obtained from the Health Protection Team [28].

The infection control problems that emerge during outbreak investigations often indicate the need for new recommendations or reinforcement of existing infection control recommendations to protect patients. Because such recommendations are considered a standard of care and may not be included in other guidelines, they are usually added to the standard precautions [29].
New additions to the recommendations for Standard Precautions are Respiratory Hygiene/Cough Etiquette and safe injection practices, including the use of a mask when performing certain high-risk, prolonged procedures involving spinal canal punctures. The need for a recommendation for Respiratory Hygiene/Cough Etiquette grew out of observations during the SARS outbreaks where failure to implement simple source control measures with patients, visitors, and healthcare personnel with respiratory symptoms may have contributed to SARS corona virus (SARS-CoV) transmission [25].

2-6-1-3-1 Hand hygiene :

Appropriate hand hygiene can minimize micro-organisms acquired on the hands during daily duties and when there is contact with blood, body fluids, secretions, excretions and known and unknown contaminated equipment [30].

Hand hygiene procedures include the use of alcohol-based hand rubs (containing 60-95% alcohol) and hand washing with soap and water. Alcohol-based hand rub is the preferred method for decontaminating hands, except when hands are visibly soiled (e.g., dirt, blood, body fluids), or after caring for patients with known or suspected infectious diarrhoea (e.g., Clostridium difficile, norovirus), in which case soap and water should be used. Hand hygiene stations should be strategically placed to ensure easy access, [27].

Levels of hand hygiene:-

1- Social Hand Hygiene: To render the hands physically clean and to remove microorganisms picked up during activities considered 'social' activities (transient Micro-organisms).

2- Hygienic (aseptic) Hand Hygiene: To remove or destroy transient Micro-organisms. Also, to provide residual effect during times when hygiene is particularly important in protecting yourself and others (reduces those resident micro-organisms which normally live on the skin) .

3- Surgical scrub: To remove or destroy transient microorganisms and to substantially reduce resident micro-organisms during times when surgical procedures are being carried out [31].

Hand hygiene must be performed:

• Before and after contact with a client

• Before performing invasive procedures

• Before preparing, handling, serving or eating food

• After care involving the body fluids of a client (e.g. assisting client to blow nose, toileting the client or doing wound care) and before moving to another activity

• Before putting on and after taking off gloves

• After personal body functions, such as using the toilet or blowing one's nose.

• Whenever a health care provider is in doubt about the necessity for doing so.

• When hands accidentally come into contact with secretions, excretions, blood and body fluids (hands must be washed with soap and running water) .

• After contact with items in the client's environment [32].

Types of microbes colonizing hands:

The resident flora, which consists of microorganisms residing under the superficial cells of the stratum corneum and the transient flora, which colonizes the superficial layers of the skin, and is more amenable to removal by routine hand hygiene. Transient microorganisms survive, but do not usually multiply on the skin. They are often acquired by health care workers (HCWs) during direct contact with patients or their nearby contaminated environmental surfaces and are the organisms most frequently associated with HCAIs [24].

2-6-1-3-2 Personal Protective Equipment:-

The main purpose of wearing personal equipment and clothing, such as gloves, aprons, masks and eye protection, is to protect healthcare workers from blood-borne pathogens and prevent the transmission of micro-organisms to both patients and staff [(33)].

The selection of protective equipment must be based on a risk assessment of the risk of transmission of micro-organisms to the patient or carer, and the risk of contamination with blood, body fluids, secretions and excretions, but healthcare workers are often unsure when to wear PPE, and haphazard and inconsistent practices can place both staff and patients at hazard [(33)].

- Gloves:

Gloves should be worn when it can be reasonably anticipated that contact with blood or other potentially infectious materials, mucous membranes, non-intact skin , or potentially contaminated intact skin , e.g. of a patient incontinent of stool or urine, could occur. Gloves with fit and durability appropriate to the task should be used. Disposable medical examination gloves should be worn for providing direct patient care such as wound dressing, phlebotomy, setting intravenous infusion etc.

For cleaning the environment or medical equipment, disposable medical examination gloves or re-usable utility gloves should be worn. Gloves should be removed after contact with a patient and/or the surrounding environment (including medical equipment) using proper techniques to prevent hand contamination. The same pair of gloves should not be 15 worn for the care of more than one patient and gloves should not be re-used, because this practice has been associated with the transmission of pathogens.

Gloves should be changed during patient care if the hands will move from a contaminated body site, e.g. perineal area, to a clean body site, e.g. face ([29].

- Masks:-

Wear a mask to protect mucous membranes of the mouth and nose when undertaking procedures that are likely to generate splashes of blood, body fluids, secretions or excretions. Wear surgical masks rather than cotton material or gauze masks. Surgical masks have been designed to resist fluids to varying degrees depending on the design of the material in the mask. Do not reuse disposable masks. They should be disposed of according to the health care facility protocol [(34).]

- Eye goggles or face shields:

Eye goggles or a face shield should be worn to protect mucous membranes Of the eyes; nose; and mouth only when performing patient-care procedures that are likely to generate splashes of blood, body fluids, secretions and excretions. Examples of such procedures are irrigation and suction procedures, delivery and dental procedures etc.

- **Plastic aprons/gowns**:

A separate disposable apron/gown should be worn for each patient. It is worn to prevent soiling of clothing when performing patient-care procedures that are likely to generate splashes of blood, body fluids, secretions or excretions [(35)].

The General Principles of use PPE should be observed:

. PPE is used to prevent contact with non-intact skin, blood, body fluid, excretions and secretions of the transmission of particular organisms that may be transmitted via the air, or by contact with intact skin.

• PPE is only effective in infection control and prevention when applied, used, removed and disposed of properly.

• Avoid any contact between contaminated PPE and surfaces, clothing or people outside the patient care area.

• Discard used PPE in the appropriate disposal bags.

• Do not share PPE.

• Remove PPE completely and thoroughly perform hand hygiene each time you leave a patient to attend to another patient or move to a nonpatient care area.

• The use of PPE does not replace the need for proper hand hygiene, which needs to be performed both before PPE is applied and after it is removed

• It is essential to perform a risk assessment to determine the PPE needed [36].

2-6-1-3-3 Occupational exposure:-

In order to avoid occupational exposure to potentially infectious agents, particularly those microorganisms that may be found in blood and other body fluids, precautions are essential while providing care. It must always be assumed that every person encountered could be carrying potentially harmful microorganisms that might be transmitted and cause harm to others. Therefore precautions to prevent exposure to these and subsequent harm in others receiving or providing care must be taken as standard. Occupational exposure management, including needle stick (or “sharps”) injury, is one of

the elements of Standard Infection Control Precautions (SICPs), which should be applied in all healthcare settings [31].

The main risk that is associated with infection comes from sharps contaminated with blood. Sharps include all objects and materials that pose a potential risk of injury and infection because of their puncture or cutting properties and these include syringes with needles, blades, wires, and broken glass. Syringes and needles should be disposed of immediately after use. The needle should not be recapped or removed from the syringe thus the whole combination should be inserted into the safety box directly after use. Sharps should be disposed of in safety boxes that are resistant to punctures and leakage and are designed so that items can be dropped in using one hand and no item can be removed. Sharps should not be handled unnecessarily to prevent needle prick injuries [37].

C).

Sharps Policy Statements:

1. All health care workers shall take precautions to prevent injuries caused by needles and other sharp instruments or devices during procedures; when cleaning used instruments; during disposal of used needles and when handling sharp instruments after procedures. 2/ Used needles shall NOT be recapped by hand; if necessary, use the single hand scoop‖ method. 3/ Handful of sharp instruments shall not be picked up simultaneously. 4/ Caution shall be exercised when rotating instruments are in use sharp end of instruments shall be positioned away from oneself and others.5/ Reusable sharps and surgical instruments shall be held in a puncture-resistant leak-proof container for transport to the reprocessing area 6/ Only Single-use

sharps used, it shall be disposed of immediately in designated puncture-resistant containers labeled with a biohazard symbol) located in the area where the items were used, for transport to the incinerator for disposal. These containers shall not be located in areas open to the public.7/ Heavy duty/strong utility gloves shall be worn during decontamination, cleaning, and disinfection of instruments [39].

2-6-1-3-4 Management of blood and body fluid spillage:-

body fluid spills need to be dealt with quickly and effectively When spills occur, all blood or body fluids (with the exception of sweat) need to be treated as potentially infectious and promptly dealt with by staff members wearing personal protective equipment appropriate to the situation, e.g. gloves, disposable aprons and masks. The exact management of the spill will depend on the type and volume of the body fluid spilt, the possible pathogens present and the type of surface or area where the spill has occurred, e.g. all blood spills on hard/vinyl surfaces should be disinfected using a diluted sodium hypochlorite solution. Ideally, practices will have fully-equipped spill kits available, i.e. containing protective equipment, waste bags and detergents, and have procedures in place to manage spills appropriate [40].

2-6-1-3-4 Reprocessing of instruments and equipment:-

The risk of equipment contamination is high but the risk of healthcare associated infection (HAI) to the patient depends on the exposure to non-intact skin or mucous membranes, or on whether the patient is immunocompromised. There is also a risk of secondary contact transmission through hand contamination via contaminated equipment [41].

Policies and procedures should be established for containing, transporting, and handling patient care equipment and instruments/devices that may be contaminated with blood or body fluids. Organic materials should be removed from critical and semi-critical instruments/devices using recommended cleaning agents before high-level disinfection and sterilization to enable effective disinfection and sterilization processes [29] .

Cleaning, disinfection, and sterilisation are the backbone for preventing the spread of infections. In spite of this, many health care facilities either lack these basic facilities for infection prevention and control (IPC) or their personnel receive insufficient training [42].

Care equipment can be classified single-use, single-patient use and reusable. It can also be classified according to the infection risk (low, medium or high) and as invasive and non-invasive. This review is concerned with non-invasive, reusable, communal care equipment [41].

Cleaning : - cleaning drastically reduces the number of microorganisms, including bacterial endospores, on instruments and other items. Cleaning refers to scrubbing with a brush, detergent, and water and is a crucial step in processing. Without cleaning, further processing might not be effective because:

- Microorganisms trapped in organic material may be protected and survive further processing.

- Organic material and dirt can make the chemicals used in some processing techniques less effective. Detergent is important for effective cleaning, because water alone will not remove protein, oils, and grease. When

detergent is dissolved in water, it breaks up and dissolves or suspends grease, oil, and other foreign matter, making them easy to remove [43].

Respiratory Hygiene/Cough Etiquette:-

Respiratory hygiene / cough etiquette infection prevention measures are designed to limit the transmission of respiratory pathogens spread by droplet or airborne routes. The strategies target primarily patients and individuals accompanying patients to the dental setting who might have undiagnosed transmissible respiratory infections, but also apply to anyone (including DHCP) with signs of illness including cough, congestion, runny nose, or increased production of respiratory secretions [44]

The following measures should be implemented to contain respiratory secretions in patients and accompanying individuals who have signs and symptoms of a respiratory infection, beginning at the point of initial encounter in a healthcare setting, e.g. triage, reception, and waiting areas in emergency departments, outpatient clinics, and physician offices:

Post signs at entrances and in strategic places, e.g. elevators and cafeterias, within ambulatory and in-patient settings with instructions to patients and other persons with symptoms of a respiratory infection to cover their mouth/nose when coughing or sneezing, use and dispose of tissues, and perform hand hygiene after hands have been in contact with respiratory secretions.

- Provide tissues and no-touch receptacles, e.g. foot pedal operated lid or open and plastic-lined waste basket, for disposal of tissues.

• Provide resources and instructions for performing hand hygiene in or near waiting areas in ambulatory and in-patient settings; provide conveniently located dispensers of alcohol-based hand rubs and, where sinks are available, supplies for hand washing.

• During periods of increased prevalence of respiratory infections in the community, e.g. as indicated by increased school absenteeism, increased number of patients seeking care for a respiratory infection, offer masks to coughing patients and other symptomatic persons, e.g. persons who accompany ill patients, upon entry into the facility or medical office and encourage them to maintain special separation, ideally a distance of at least 3 feet from others in common waiting areas. Some facilities may find it logistically easier to institute this recommendation year round as a standard of practice [30].

Experimental studies on the survival of respiratory pathogens suggest that, depending on the organism, the type of surface and the organic material load, they can survive for a limited time in the environment. Evidence shows that influenza viruses can be transferred from surfaces such as glass or plastic to hands up to 24 hours after contamination takes place; from materials such as pyjamas, magazines and tissues influenza viruses may be transferred for up to 2 hours.4 Hygiene and environmental cleaning are therefore important in helping to control spread. Patients should be instructed to follow the recommendations for respiratory hygiene and cough etiquette:

- use a disposable, single use tissue to cover mouth and nose when coughing, sneezing, wiping or blowing nose

- dispose of tissues promptly in a bin

- practice hand hygiene by washing hands with soap and water, and drying them thoroughly after coughing, sneezing or using tissues

Alcohol gel may be used for hand hygiene if the hands are visibly clean. Some patients, such as older people or children may require assistance to contain respiratory secretions.

HCWs assessing or caring for patients with a suspected (clinically diagnosed) or confirmed RTI are advised to wear a surgical face mask when in close contact with the patient (within two metres) [45].

2-6-1-3-5 Cleanliness of the environment:-

Housekeeping refers to the general cleaning of hospitals and clinics, including the floors, walls, equipment, furniture, and other surfaces. Cleaning entails removing dust, soil, and contaminants on environmental surfaces. Cleaning helps eliminate microorganisms that could come in contact with patients, visitors, staff, and the community. Cleaning ensures a clean and healthy hospital environment for patients and staff. Patient-care areas should be cleaned by wet mopping. Dry sweeping is not recommended. Ministry of Public health and sanitation and Ministry of medical Services [39].

Cleaning is the removal of visible soil (e.g., organic and inorganic material) from objects and surfaces and normally is accomplished manually or mechanically using water with detergents or enzymatic products. Thorough cleaning is essential before high-level disinfection and sterilization because

inorganic and organic materials that remain on the surfaces of instruments interfere with the effectiveness of these processes. Decontamination removes pathogenic microorganisms from objects so they are safe to handle, use, or discard [46] .

Routine cleaning is important to ensure a clean and dust-free hospital environment. There are usually many micro-organisms present in "visible dirt", and routine cleaning helps to eliminate this dirt. Administrative and office areas with no patient contact require normal domestic cleaning. Most patient care areas should be cleaned by wet mopping. Dry sweeping is not recommended [30]. A dirty clinical environment is one of the factors that may contribute towards infection rates . Conversely, high standards of cleanliness will help to reduce the risk of cross-infection. Good design in buildings, fixtures and fittings is also important to allow efficient cleaning. Cleaning removes contaminants, including dust and soil, large numbers of micro-organisms and the organic matter that may shield them, for example, faeces, blood and other bodily fluids [47].

Cleaning is required prior to any disinfection process to remove dirt, debris, and other materials and should begin from least soiled areas and progress to the most soiled areas and also from highest to lowest areas, so that the dirtiest areas and debris that fall on the floor will be cleaned last. Dry sweeping, mopping, and dusting should be avoided to prevent dust, debris, and microorganisms from getting into the air and landing on clean surfaces. Airborne fungal spores are especially dangerous, because they can cause fatal infections in immunosuppressed patients. Instructions for diluting

disinfectant cleaning solution should be followed to ensure effectiveness of disinfectants [48].

Areas that are visibly contaminated with blood or body fluids should be decontaminated with 0.5% chlorine for 10 minutes and then cleaned with detergent and water. Isolation rooms and other areas that have patients with known transmissible infectious diseases should be cleaned with a detergent and a disinfectant solution at least daily. Horizontal surfaces should be cleaned at least once daily and as needed. Toilets should be cleaned four times daily and as needed and floors should be cleaned twice daily [48].

Cleaning equipment that has been contaminated with blood or body fluids should be decontaminated by soaking in 0.5 % chlorine for 10 minutes followed by cleaning with soapy water and then rinsing with clean water and should then be dried completely before reuse by placing them upside down to avoid using wet mops or cloths which are usually heavily contaminated with microorganisms [39].

2-6-1-3-6 Safe Care of Linen including Uniforms

Soiled fabric/linen within healthcare settings in particular, can harbour large numbers of potentially pathogenic microorganisms however it is not considered that uniforms are a serious source of infection. Linen must, therefore be safely managed in order that it does not become a hazard leading to the spread of potentially pathogenic microorganisms to those receiving care, especially those who are most vulnerable through contact and all stages of linen management should be considered including storage, handling, bagging, transporting and laundering [31].

A disposable plastic apron should always be worn when handling used linen (and disposable gloves where linen is soiled /foul) e.g. during bed making. In some areas this can be a colour coded apron specifically for linen handling and local policy should be referred to.

- Always hold used linen away from yourself to avoid contamination of clothing from linen.
- Hand hygiene should be performed following handling of linen and removal of apron.
- Further guidance for infected linen should be provided locally [31].

The basic principles of linen management are as follows:

- Place used linen in appropriate bags at the point of generation.

- Contain linen soiled with body substances or other fluids within suitable impermeable bags and close the bags securely for transportation to avoid any spills or drips of blood, body fluids, secretions or excretions.

- Do not rinse or sort linen in patient care areas (sort in appropriate areas).

-Handle all linen with minimum agitation to avoid aeroionisation of pathogenic micro-organisms.

- Separate clean from soiled linen and transport/store separately.

- Wash used linen (sheets, cotton blankets) in hot water (70°C to 80°C) and detergent, rinse and dry preferably in a dryer or in the sun. (Heavyduty washers/dryers are recommended for the hospital laundry.).

-Autoclave linen before being supplied to the operating rooms/theatres.

-Wash woollen blankets in warm water and dry in the sun, in dryers at cool temperatures or dry-clean [29].30

2-6-1-3-7 Safe handling of waste:-

Hospital waste is a potential reservoir of pathogenic micro-organisms and requires appropriate, safe and reliable handling. The main risk associated with infection is sharps contaminated with blood. There should be a person or persons responsible for the organization and management of waste collection, handling, storage and disposal. Waste management should be conducted in coordination with the infection control team [30].

Solid contaminated and non-contaminated waste should be disposed of separately. Solid contaminated waste should be placed in a plastic or galvanized metal container with a tightly fitting cover and housekeeping staff should wear personal protective equipment when handling contaminated waste. Waste containers for both contaminated and non-contaminated waste should be collected on a regular basis and the burnable ones transported to the incinerator or area for burning [49].

Collect and store sharps in sharps containers. Sharps containers should be made of plastic or metal and have a lid that can be closed. They should be marked with the appropriate label or logo, e.g. a biohazard symbol for clinical (infectious) waste [30].

2-6-2 Transmission-Based Precautions:-

Transmission-Based Precautions are intended to supplement Standard Precautions in patients with known or suspected colonization or infection of highly transmissible or epidemiologically important pathogens. These

additional precautions are used when the route of transmission is not completely interrupted using Standard Precautions. The three categories of Transmission-Based Precautions include: 1) Contact Precautions, 2) Droplet Precautions, and 3) Airborne Precautions. For diseases that have multiple routes of transmission, a combination of Transmission-Based Precautions may be used. Whether used singly or in combination, they are always used in addition to Standard Precautions. The risk of infection transmission and the ability to implement elements of Transmission-Based Precautions may differ between outpatient and inpatient settings (e.g., facility design characteristics). However, because patients with infections are routinely encountered in outpatient settings, ambulatory care facilities need to develop specific strategies to control the spread of transmissible diseases pertinent to their setting. This includes developing and implementing systems for early detection and management of potentially infectious patients at initial points of entry to the facility [(27)].

2-6-2-1 Airborne Precautions:-

Patients known or suspected to have illnesses such as measles, disseminated varicella zoster, active pulmonary tuberculosis which are transmitted by airborne route should be isolated as a single, well-ventilated room, ideally with an attached toilet and bathroom. Well-ventilated room may include an exhaust system leading to the outside. If there is no exhaust system, windows should be kept open and doors should be closed at all times [(18)].

2-6-2-2 Droplet Precautions:-

Droplet transmission occurs when droplets carrying an infectious agent exit the respiratory tract of a person. Droplets can be generated when a patient/ client talks, coughs or sneezes and through some procedures performed on

the respiratory tract (e.g., suctioning, bronchoscopy or nebulized therapies). Droplets do not remain suspended in the air and usually travel less than two meters [50].

Patients should be isolated in a single room preferably with attached bathroom and toilet. Single rooms are not available, patients may be cohorted. The door may remain open [18].

2-6-2-3 Contact Precautions should be used for patients known or suspected to have serious illnesses due to pathogens easily transmitted by direct patient contact or by indirect contact with items in the patient's environment. Such illnesses include enteric infections, Skin or wound infections resistant bacteria such as methicillin-resistant Staph aureus (MRSA) and Viral conjunctivitis. The patient should be placed in a single room preferably with attached bathroom and toilet. If single rooms are not available, patients may be cohorted. Hands must be washed and disposable, non-sterile gloves are worn before attending to each patient and changed immediately after having contact with infective materials. Sterile gloves should be worn for invasive procedures and disposed into clinical waste bin before leaving the patient's environment and hands must be washed immediately with antiseptic soap.

A clean, non-sterile gown/plastic apron should be worn upon entering the room if there is contact with patient, environmental surfaces or items and A separate gown/plastic apron should be used for each patient. Sterile gowns should be worn for invasive procedures and remove all PPE before leaving the isolation room [18].

2-7 Immunization:

Healthcare workers (HCWs) are at risk for exposure to serious, and sometimes deadly, diseases. If you work directly with patients or handle material that could spread infection, you should get appropriate vaccines to reduce the chance that you will get or spread vaccine-preventable diseases [(54)].

Maintenance of immunity is therefore an essential part of prevention and infection control programs for CWs .Optimal use of immunizing agents safeguards the health of workers and protects patients from becoming infected through exposure to infected workers. Consistent immunization programs could substantially reduce both the number of susceptible HCWs in hospitals and health departments and the attendant risks for transmission of vaccine-preventable diseases to other workers and patients. In addition to HCWs in hospitals and health departments, these recommendations apply to those in private physicians' offices, nursing homes, schools, and laboratories, and to first responders. Any medical facility or health department that provides direct patient care is encouraged to formulate a comprehensive immunization policy for all HCWs. The American Hospital Association has endorsed the concept of immunization programs for both hospital personnel and patients [(52)].

2-8 Education and training:

Effective education and training is a key measure in the prevention of hospital acquired infection but that the current provision falls below the basic requirement indicated in the Departmental guidance, namely that all staff should be provided with education in infection control procedures .A

second infection control activity which infection control teams undertake to help prevent and control hospital acquired infection is the production and dissemination a written policies and procedures and guidelines for prevention and control of infection and that they are reviewed regularly [53].

All new staff members shall be oriented to the health care facility infection prevention and control policies and guidelines and there shall be a facility-wide on-going in-service education programme on infection prevention and control well as compliance with infection prevention and control policies and guidelines. Periodic research shall be done in infection prevention and control, the findings used for review and adjustment as necessary and content on infection prevention and control shall be integrated into the curricula for education and training of all health care workers [39].

2-9 Knowledge and Attitudes of Healthcare Workers:

The importance of education as a measure to prevent nosocomial infections is implied in numerous studies. Studies exploring the knowledge, perceptions and attitudes of healthcare personnel towards the transmission of nosocomial infections in different patient groups suggest that education plays an important role in the prevention and spread nosocomial infections [54].

All new staff members shall be oriented to the health care facility infection prevention and control policies and guidelines and there shall be a facility-wide on-going in-service education programme on infection prevention and control well as compliance with infection prevention and control policies and guidelines. Periodic research shall be done in infection prevention and control, the findings used for review and adjustment as necessary and

content on infection prevention and control shall be integrated into the curricula for education and training of all health care workers [39].

2-10 previous studies:

A cross-sectional survey of 90 nurses working in medical, surgical, pediatric and maternity wards was conducted in Nairobi in 2013 showed 83.3% were females and 16.7% were males. A large proportion of the participants (64.4%) (n=90) were trained at diploma level. Only 17.8% (n=90) of the participants had adequate knowledge on the basic elements of infection prevention standard precautions. The association between knowledge on the elements of standard precautions and having attended formal training on infection prevention was statistically significant (p=0.015). A lower proportion of participants (33.3%) (n=18) performed hand hygiene always when indicated. Gloves were the most utilized personal protective equipment by 88.9% (n=18) of the participants, gowns by 61.1% (n=18) and 5.6% (n=18) used mouth and eye protection. The practice of recapping used needles was uncommon, 94.4% (n=18) of the participants disposed of the syringe and needle immediately into puncture resistant containers without recapping. Non availability of infection prevention materials and lack of regular continuous medical education on infection prevention were the major reported causes for noncompliance with standard precautions [49].

cross-sectional study was done using a structured interview schedule among 78 doctors, 151 nurses, 80 nursing assistants and 16 lab technicians working in the State health service institutions of Neyyatinkara Taluk in 2014.The findings of the study show that 86.5 percent of the health care personnel (HCP) had good awareness in hand hygiene (HH), 64 percent in use of

personal protective equipment (PPE), 78.8 percent in respiratory hygiene (RH), 93.5 percent in safe injection practices (SIP) and 18.5 percent in waste disposal and decontamination (WD). Good practice was seen in 9.2percent of HCP for HH, 69.5 percent in PPE, 94.2 percent in RH, 86.8 percent% in SIP and 97.8percent for WD respectively. When all elements were analyzed together nurses were the most likely to have good awareness (15.9%) and doctors were the most likely to have good practice (8.97%). Significant association was noted between age and awareness in HH (p=0.012) and RH (p=0.049), between availability of resources and practice in RH (p=0.004), PPE (p=0.042) and HH (p=0.045) and between trainings received and practice in RH (p=0.037). Hepatitis B vaccination was taken by 68.6 percent of respondents only [55].

A quantitative descriptive survey was conducted in public secondary health facilities in Abuja, the Federal Capital Territory of Nigeria in 2009 to examine the knowledge and practice of standard precautions among health care workers with 83 doctors and 194 nurses using a structured questionnaire. Findings show suboptimal knowledge and practice of the standard precautions among the health care workers. Knowledge of post-exposure prophylaxis for HIV was low as well as hepatitis B immunization among the respondents. A lack or irregular supply of essential materials, such as personal protective equipment, was the main reason the respondents did not comply to the precautions. This report recommends the development and implementation of a comprehensive infection prevention and control program in health facilities in order to ensure compliance to the standard precautions by health care workers [38].

Study conducted at Tygerberg Hospital in 2010 among nurses' .The findings of the study showed that nurses have inadequate knowledge regarding standard precautions and the mean score of the nurses overall self-reported compliance of standard precautions was 87.5%. The results also showed that when patients are HIV positive nurses intend to over comply the use of personal protective equipment. No association was found between the nurses' knowledge and compliance regarding standard precautions. It is therefore important that every nurse should be educated about the basic principles of standard precautions and also the policies and protocols of infection control in order to prevent each nurse from getting infected. Training needs to be implemented starting in the wards through the unit manager to improve all the nurses' knowledge and practice [56].

Study conducted in two university hospitals in Mazandaran Province, Islamic in 2006 to investigated knowledge of and practices towards universal precautions among 540 health care workers and medical students Republic of Iran The study showed an overall low understanding of universal precautions among the health staff and medical students, except concerning disposal of sharps, contact with vaginal fluid, use of mask and gown or clearing up spilled blood. Furthermore, the knowledge score in our study was less than optimal, especially in hospital A, where only 65.8% of staff had even heard about universal precautions. Most respondents in all the groups agreed that universal precautions should be used for all patients respective of their blood borne infection status. About 30% of third and fourth year students who already have experience in clinical practice described blood exposure accidents during their hospital training and only

45% of these accidents were reported. In our study, medical students were less knowledgeable than staff in some aspects: only 53.5% had heard about universal precautions and only 58.1% knew that used needles cannot be recapped. It seems that medical students have no systematic program of education about universal precautions during clinical practice. Occupational safety and health regulations require both employers and employees to reduce or eliminate occupational risks. Protective barrier use is a major element of universal precautions. To encourage their use, protective barriers must be readily available, easy to use, effective and comfortable. Therefore, staff managers and infection committee members should take a leadership role to ensure safe practices and resolve related practical issues. Also the education of medical students during the years of clinical practice is very important. Post educational surveys about universal precautions as practiced in clinical settings need further attention. Further studies should include physicians as well as support staff in order to gain a more comprehensive picture of the practice of universal precautions in hospitals [(57)].

A cross sectional survey was conducted in a 293 bedded tertiary care cardiac hospital in Delhi using a self-administered validated questionnaire to study the awareness , attitude and practice on needle stick and sharp injuries (NSSI). The 190 participants included doctors, nurses, technicians, and housekeeping staff. Maximum participants were in the age group of 20-30 years. Out of them 94.7 percent were aware about standard precautions. The procedure for reporting of NSSI was known by 91.5 percent of participants. Only 50.2 percent health care workers (HCW) gave correct answers regarding disease transmission through needle stick and sharp injury. The prevalence of NSSI was highest among nurses (38.4%), and the most

common source of NSSI was the needle on the disposable syringe (76.9%). The survey revealed a few gaps in the awareness amongst HCWs about NSSIs like risks associated with 12 needle-stick injuries and use of preventive measures, disassembling of needles prior to disposal [58].

In 2005, Kermode, Jolley, Langkham, Thomas, Holmes, & Gifford conducted a study in seven North Indian Health care settings. The researchers wanted to describe health care workers' knowledge and understanding of universal precautions and to identify the predictors of compliance. The majority of the respondents were female nurses. The health care workers had a good level of knowledge and a lack of compliance regarding universal precautions. The findings of the study showed that the health care workers working for a long period of time are more compliant and have higher level of knowledge regarding universal precautions. The results showed that 75% of the health care workers indicated that, it is not possible to wear protective clothing in an emergency situation, 56 % of the respondents feel that they are too busy to protect themselves when they are in contact with patients with blood, 46% of the respondents feel very uncomfortable wearing personal protective equipment, 41% of the respondents feel that personal protective equipment influences their work performance and 25 % of the respondents were not adequately trained in using the personal protective equipment so they don't know how to use it. These findings illustrate that the nurses who receive training regarding standard precautions adhere to standard precautions because they are taught when to use standard precautions and which personal protective equipment to use [59].

A study to assess the knowledge and compliance with universal precautions and their perceived risk of infection at the workplace in Ibadan, showed poor knowledge of and compliance with standard precautions. Some 77.5% of the respondents were aware but only 24% had the correct knowledge of the universal precautions. Knowledge was highest (36.9%) among surgical and medical residents; it was 10.8% among laboratory medicine residents and 15.4% among interns. Significantly, senior registrars had better knowledge 28 than junior doctors [60] .

Cross-sectional study design conducted in Mizan-Aman general hospital. The study showed Out of 135 respondents, 57 (42.2%) of HCWs think that they apply standard precaution always. About two-third (65.6%) of them had ever participated in training program. All of the respondents know that dirty needle and sharp materials could transmit disease causing agents. More than three fourth (76.3%) of health care workers think that they were at risk of acquiring HIV in their work place. Among HCWs 59 (43.7%) of them disposed sharp materials in open pails, 91 (67.4%) in sharp and liquid proof container without removing syringe. Ninety five (70.4%) HCWs know that gloves and gowns were required for any contact with patients. Among respondent 63 (46.8%) of HCWs practice standard blood and body fluid precautions always. One hundred three (76.5%) of HCWs wear gloves last time while they took blood sample. Ninety two (68.7%) of HCWs wash their hands before examining the patients and 84 (62.5%) of HCWs recap needle immediately after using them [61].

A study was conducted to assess the knowledge of health team in relation to infection control measures as well as their level of practice in the application of infection control measures at the endoscopy units in El-Kasr El-Ani

Hospital, The New Kasr El-Ani Teaching Hospital (French), and the Internal Medicine Hospital, all hospitals are affiliated to Cairo University. The selected sample consisted of 40 doctors, 50 nurses, and 30 workers. The result revealed that 5% of physicians, 10% of nurses had satisfactory knowledge and 30% of physicians and just 4% of nurses had adequate level of performance, while none of the workers had satisfactory level of knowledge or practice. The study recommended an educational program for the endoscopy staff about infection and infection control measures application for the protection of staff and patients [(62)].

Jain et al. (2012) conducted a study to assess the knowledge and practice of 400 health care personnel regarding hospital infection control practices in New Delhi, India. A structured questionnaire was distributed to the study respondents and collected the same day. Knowledge and practices of 329 nurses and 71 doctors regarding hand hygiene, standard precautions, hospital environment cleaning and needle stick injury were collected and analyzed. The findings revealed that 55.3% of the respondents' had knowledge regarding standard precautions and 31.8% had knowledge on risks associated with needle stick injuries. The lack of knowledge and practices regarding basic infection control protocols revealed in this study should be improved by way of educational intervention, in the form of formal training of doctors and nurses IP practices and reinforcement of the same [(63)].

In Nepal, Paudyal et al (2008) conducted a study to assess infection control knowledge, attitudes and practices among health care workers. A total of 158 doctors and 166 nurses participated, 27% of whom had received infection control training. The findings revealed that only 16%, 14% and 0.3% of the respondents' achieved maximum scores for knowledge, attitude and practice

items respectively. Staff had good knowledge and positive attitudes toward most aspects of infection control, although only half had heard of methicillin-resistant staphylococcus aureus. Logistic regression revealed that profession, age, and having studied abroad significantly predicted markers of infection control knowledge, attitudes and practice [64].

In Cairo, Egypt, Abdelazi and Bakr (2009) assessed health care workers knowledge, attitude and practice of hand washing at Ain Shams University hospital. The study revealed that Doctors showed a significant higher compliance (37.5%) than other groups of health care workers; however, only 11.6% of the opportunities observed for doctors were done appropriately. the most common type of hand washing practiced among health care workers was the routine hand washing (64.2%) and the least was the use of the antiseptic hand rub (3.9%). Having a short contact time and improper drying (23.2%) were the most common errors that lead to inappropriate hand washing. Most of the wards had available sinks (80%) but none of them had available paper towels. The mean knowledge score was higher in nurses compared to Doctors. Most nurses believed that continuous administrative orders and continuous observation can improve hand washing practices [65].

According to health care workers estimation of their own hand hygiene practice, majority of health care workers 292 (82.5 %) had hand hygiene practice after completing the procedure they perform and about 180(50.8 %) wash their hand before the procedure. Majority the respondents of 310(87.6) had ever wore at least one type of personal protective equipment (PPE) while providing patient care or caring equipment. Among the participants who used PPE almost all 352(99.4%), of the healthcare providers. Regarding the respondents injection practice 190 (53.7 %) use safety box for needle

collection after injection , 259 (73.2 %) avoid recap needle after injection and the rest 156 (44.1 %) avoiding using swab before intramuscular and subcutaneous injection. Based on this response, their safe injection practice was 202 (57 %) and unsafe practice was 157 (43 %).7.4.4. Sharp injury history among respondents and actions taken [66].

In April 1993 a study on the knowledge, compliance and attitudes of doctors and nurses on "universal precautions" was done in Thailand. Questionnaires were sent to doctors and nurses working in government hospitals; 468 doctors and 4539 nurses responded. 94.9% of physicians and 85.5% of nurses were knowledgeable of universal precautions, but only 47.1% of the doctors and 27.9% of nurses reported that they would take precautions with all patients. The rest would apply universal precautions with patients known to be infected with HIV. 71.9% of doctors and 81.6% of nurses knew that 'sharp injuries' is the main cause of HIV transmission to health care personnel. Only 75% of doctors and 47% of nurses washed their hands after caring for patients, and 16% of doctors and 50% of nurses rubbed their hands with alcohol after washing them with an antiseptic [67].

An assessment of the knowledge, attitude and practice (KAP) of standard precautions by healthcare workers is a prerequisite for initiating and implementing a successful infection prevention and control (IPAC) strategy in any health facility. Many studies have shown that HCW display variable KAP of standard precautions according to their professional group and duration of professional experience, among other factors. Longer duration of professional experience, knowledge and training in standard precautions, and high risk perception have all been associated with improved compliance with standard precautions among health workers[68].

A cross-sectional study was undertaken in 2011/among HCW in Nigeria to assess Knowledge, attitude and practice of standard precautions of infection control. (91.6%) of the study participants had previously heard about standard precautions of infection control. Ninety seven per cent knew that standard precautions should be practiced on all patients and laboratory specimens irrespective of diagnosis. The majority of the participants (95.8%) knew that hands should be washed after touching a patient, while 96.5% knew that gloves should be worn before venipuncture. Seventy three per cent knew that hands should be washed after touching a patient's surroundings .Most (95%) of the study participants believed that standard precautions will prevent them from acquiring infection from the hospital. About 98.9% agreed that gloves should always be worn before venipuncture. Thirty nine per cent did not agree that sharps should never be recapped, while 13.4% felt that sharp needles can be bent or broken after use. With regard to the practice of hand hygiene, 58.5%, 28.1% and 63.6% always practiced hand hygiene after touching patients, after touching patients' surroundings and after removing gloves, respectively. In relation to injection safety, 63.6% had always disposed of sharps/needles in puncture proof containers in the prior six months [(69)].

A cross-sectional study carried out among 200 health workers in Nigeria Showed that majority 177(88.50%) of the respondents were aware of standard precaution and 83(41.50%) opined that standard precaution should be applied for all patients during treatment Attitude of the respondents shows that majority 172(86.0%) agreed that standard precaution can prevent the spread of infectious diseases, while 183 (91.50%) affirmed that they

would report to the hospital following a needle stick injuries and 133(66.50%) agreed that they will screen the patient for HIV following a needle stick injury [75] .

The study aimed at assessing the observance of universal precautions by HCWs in Abeokuta, Ogun State, Nigeria among Healthcare workers of 433 respondents, 211 (48.7%) of which were trained nurses. About a third of all respondents always recapped used needles. Compliance with non-recapping of used needles was highest among trained nurses and worst with doctors. Less than two-thirds of respondents (63.8%) always used personal protective equipment, and more than half of all respondents (56.5%) had never worn goggles during deliveries and at surgeries. The provision of sharps containers and screening of transfused blood by the institutions studied was uniformly high. A high percentage (94.6%) of HCWs observed hand washing after handling patients [71].

A study conducted in Saudi Standard Precautions and Infection Control, Medical Students' Knowledge and Behavior at a Saudi University: showed A total of 251 students were included. Knowledge scores in all domains were considerably low, 67 (26.7%) students scored ≥ 24 (out of 41points) which was considered as an acceptable level of knowledge, 22.2% in 4th year, 20.5% 12 in 5th year and 36.8% in 6th year. Sharp injuries, personal protective equipment and health care of the providers showed the least knowledge scores. The main sources of knowledge were self- learning, and informal bed side practices The majority of students' believed that the current teaching and training are insufficient in providing them with the necessary knowledge and skills regarding standard precaution [72].

study conducted in Nigeria assessing knowledge and compliance of health workers towards universal precaution showed that among 276 health workers Half (50%) of the respondents reported no knowledge of universal precautions; more than one third (37%) had average knowledge of universal precautions while 13% had good knowledge. Knowledge of universal precautions was highest among women than men, and among nurses (85.5%) compared with other health workers [73].

A study conducted in Ghana assessing KAP of medical residents to wards universal precaution showed that all respondents except one person said UBP reduce the risk of HIV transmission. Forty-eight (96%) of the respondents agreed that UBP should be practiced for all patients. One respondent (2%) said it should be so for only HIV positive patients and one person (2%) was silent on the issue. Forty-seven (94%) of the respondents agreed that it is important to wear gloves when doing invasive procedures but 3 respondents (6%) disagreed. In spite of this, 22 (44%) persons said every patient going for surgery should be screened for HIV, 27 (54%) said no to this whilst 1 person (2%) did not give their opinion. As many as 18 respondents (36%) admitted that they would be reluctant to perform an invasive procedure on an HIV positive patient but 31 (62%) had no problem with that. One (2%) respondent gave no answer [74].

Cross sectional study was conducted on 217 students from Addis Ababa university medical college 2015.the study showed that only 71(32.9%) of students had a ‘good’ knowledge score. A further 118(54.6%) had a fair knowledge score: whilst 27(12.5%) had poor knowledge. The majority, 200

(92%) of the respondents scored greater than half Knowledge of PPE was better than overall scores with 132 (61.1%) having good knowledge. However, 46 (21.3%) of students indicated erroneously that hand hygiene was not necessary between different patient contacts. 45(20.7%) medical students had participated in any training program dedicated to infection prevention; 172(79.3%) hadn't any such training program. Hepatitis B vaccination status of the students showed that 49(22.7%) have been vaccinated 167(77.3%) have not been vaccinated. The reasons not to be vaccinated were 36(23.1%) due to lack of availability 12(7.7%) due to lack of awareness 45(28.8%) being costly and 55(35.3%) due to other reasons such as negligence, fear of side effects and without reasons. 31(14.3%) respondents knew five of the diseases that could potentially transmitted through dirty needles and sharp instruments listed in the questionnaire i.e. (HIV, hepatitis B ,hepatitis C, malaria and tetanus mentioned. 85 (39.2%) knows four of the disease 63(29%) knows three 10 (4.6%) knows two and 1(0.5%) respondent knows nothing at all. Almost half, 94(43.3%) respond "I don't know" about the presence of infection prevention guideline in their health facility 58(26.7%) respond "yes "and 65(30%) respond "No" [75].

3- Material and methods

3-1 Study design :-

This is descriptive cross-sectional study, hospital based. The study is conducted to assess knowledge, attitudes and practice toward standard precautions in infection control among Traghen hospital staff, Sabha Hospital staff and Murzuq Hospital staff.

3-2 Study period:-

The study was conducted from, 2017 - 2018**.**

3-3 Study area:-

Fezzan region is a historic area in southwestern Libya. Most of them are desert lands, but there are Rocky Mountains, highlands, there are also many oases scattered in the desert. The main source of water in Fezzan is groundwater and there is also an oil reserve. Fezzan's climate is very hot in summer and cool in winter. Rainfall is scarce and irregular and is somewhat more plentiful in the north than in the south. Most of the residents of Fezzan inhabit nearly 200,000 residents in desert oases in the center and south, particularly in Murzuq and Sabha. It has three hospitals, Traghen Hospital, Sabha Hospital and Murzuq Hospital where 261 residents, including 30 doctors, 25 laboratory technicians, 170 nurses and 36 cleaners, have a total of 345 staff, including 23 doctors, 36 laboratory technicians, 213 nurses and 73 cleaners. Sabha Hospital has 727 of which 65 doctors, 75 laboratory technicians, 470 nurses and 117 cleaners.

3-4 Study population :-

Four categories of health providers from hospitals in Fezzan region southern Libya. The four categories include doctors, lab technicians, staff nurse, and cleaners. There were three General hospitals. The health care providers include 118 doctors, 136 lab technicians, 853 nursing and 226 cleaners' workers, and a total of 1333 healthcare providers.

3-5 Sample Size Determination:

The samples size for study was calculated using the following formula (Krejcie & Morgan, 1970):

$$n = \frac{Z^2 NP\,(1-P)}{d^2\,(N-1) + Z^2 P\,(1-P)}$$

Where

n: sample size

N: Population size

Z: confidence level at 95% (standard value of 1.96)

D: Degree of accuracy (5%), expressed as a proportion (.05); it is margin of error

P: Population proportion (expressed as decimal) (assumed to be 0.5 (50%) since this would provide the maximum sample size) [77].

$$n = \frac{(1.96)^2 \times 1333 \times 0.50\,(1-0.50)}{(0.05)^2 \times 1332 + (1.96)^2 \times 0.50(1-0.50)} = 298.4 = \underline{299\ .}$$

Sampling frame

Table (1) Distribution size according to occupation:

different occupational	Population size	%	Sample size
Doctors	118	9	27
lab technicians	136	10	30
Nurses	853	64	191
cleaners workers	226	17	51
Total	1333	100	299

Table (2) Distribution the different occupation sample size in each hospital:

different occupational	**Sabha**		**Murzuq**		**Traghen**		**Total Sample size**
	P-size	**S- size**	**P- size**	**S- size**	**P- size**	**S- size**	
doctors	65	15	23	5	30	7	27
lab technicians	75	17	36	8	25	6	30
Nurses	470	105	213	48	170	38	191
cleaners	117	26	73	16	36	8	51
Total	727	163	345	77	261	59	299

3-6 Sampling Technique : .

The stratified random sample was used for this study to ensure adequate representation of all selected the four categories in this study. Which includes doctors, laboratory technicians, nurses and cleaners.

Kothari R C.2004, stratified sampling technique is generally applied in order to obtain a representative Sample. Under stratified sampling the population is divided into several sub-populations that are individually more homogeneous than the total population (the different sub-populations are called 'strata') and then we select items from each stratum to constitute a sample. Since each stratum is more homogeneous than the total population, we are able to get more precise estimates for each stratum and by estimating more accurately each of the component parts, we get a better estimate of the whole. In brief, stratified sampling results in more reliable and detailed information [(76)].

Random stratified samples were used to select participants from hospitals according to the proportion of the study population for each hospital and the percentage of each category.

1. Initially calculate the total population of the three hospitals recorded was 1333
2. Secondly the percentage of occupation in each category is calculated according to the number in the total population of occupation to all three hospital (e.g doctor.nurses)
3. Calculation of the total number of participants for each category is calculated according to their percentages in the total population size.
4. the total number of participants for each category is divided to the three hospital according to percentage workers for each occupation category
5. Random selection is done to all Hospital for all units and categories by selecting all those staff who were in duty on the specific day of service.

3-7 Exclusion criteria:

Temporary job or not completed one a year.

3-8 Research Methods :

The following research methods use to collect data:

I. Questionnaire with open ended and closed questions use for assess their knowledge and attitude toward standard precautions in infection control among hospitals staff.

II. Observational checklist was used to record the practical activities performed by hospitals staff.

III. Interview: the interviews was conducted with the General Manager, the Administrative and the Medical Director of each hospital to assess the infection control team and the benefit of standard precaution and obstacles to standard infection control procedures.

3-10 Data analysis:

Data was analyzed using Statistical Package for Social Science (SPSS.16.0), Results had been displayed in the form of tables and figures.

3-11 Ethical consideration:

Ethical challenges associated with the design of biomedical and behavioral studies are embedded in sociocultural, economic and political contexts at all levels—local, national, and global. Recognition of the importance of conforming to international ethical guidelines for biomedical and behavioral research suggests that there is consensus regarding the acceptability of "universal" ethical principles governing scientific investigations [(78)].

Permission to conduct the study:

Informed consent is universally recognized as a key component of ethical conduct in scientific research. Requirements for informed consent in national and international guidelines are based upon and justified by the principle of respect for persons. Informed consent describes an interactive process in which individuals or their surrogates voluntarily agree to participate in a research study after the purpose, risks, benefits and alternatives have been thoroughly described and understood. Three conditions are foundational to informed consent—the provision of information, comprehension of information, and voluntary participation. [79]. Written permission to conduct the study was obtained from the general manager of Traghen General Hospital. An informed consent was taken from the medical superintendent of the establishment and a written informed consent was obtained from the respondents at the start of the interview.

II. Confidentiality:

The interview was conducted in the respective establishment and in a place convenient for both the respondents and the investigator. The respondents' names were not recorded on the questionnaires to ensure the anonymity and confidentiality of the general assistants. The respondents were informed that their participation was voluntary and that they had the right to terminate the interview at any time if they did not want to continue.

III. Benefits:

Respondents were informed that The data collected will be used for research purpose The results of this research will be used to make appropriate recommendations to improve compliance to standard precautions by health care workers' in the course of carrying out health care services, thus reducing the risk of infection transmission.

Chapter (4)
Results
SECTION A: Characteristics of the Study Population

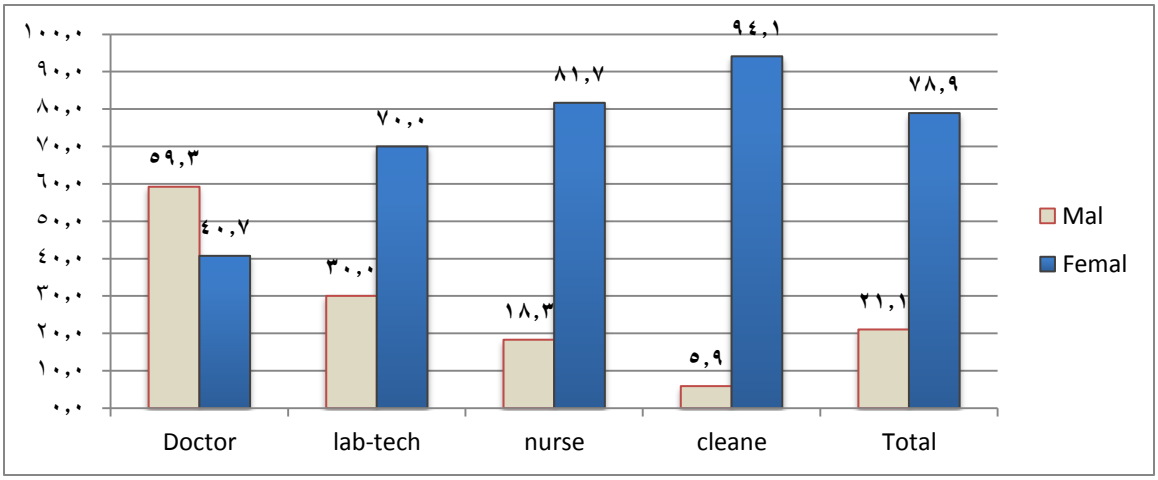

Figure (2): Sex distribution in the study population:

Figure (2) presents the sex pattern of the respondents, There were more than three quarters females 236(78.9%) male 63 (21.1%) in the population sample (N = 299). Also among doctors males were higher than females .Among laboratory technicians the male represented only about one-third. Among nurses, the male represents only a quarter. It was found that female population were higher in all the categories except doctors.

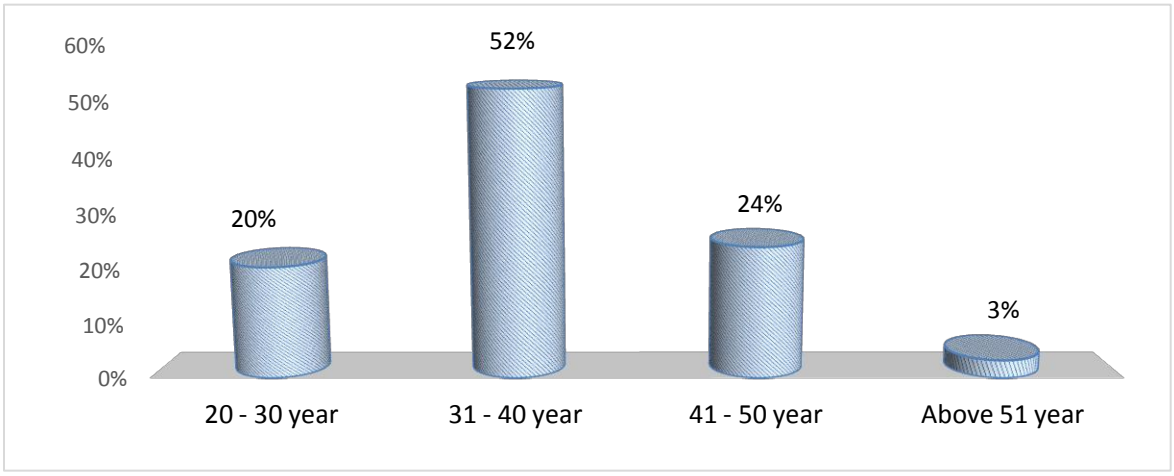

Figure (3): presents the age distribution in the study population:

Figure (3) presents the age distribution of respondents. Respondents' aged 31–40 years had the highest frequency156 (52.2%) and those aged above51 years had the lowest frequency (3.3%).

Table (3): presents the distribution of hospital staff according to years' Work experience

years' Work experience	Doctor	Lab-tech	Nurse	Cleaners	Total
1-5 years	6 (5.8%)	8 (7.7%)	67 (64.4%)	23 (22.1%)	104 34.8%
6 -10 years	21 (24.4%)	13 (15.1%)	39 (45.3%)	13 (15.1%)	86 28.8%
Above 11year	0	9 (8.3%)	85 (78%)	15 (13.8%)	109 36.4%
Total	27 9%	30 10%	191 63.9%	51 17.1%	299 100%

Table (3) shows the work experience of the respondents. It was found that about 104 (34.8%) of the respondents have work experience from1 to 5 years, about 86 (28.8%) of respondents have work experience of 6 to 10 years .About 109)36.4% of respondents have more than 11 years of work experience about 78% of them are nursing .

Table (4) presents the professional distribution of the respondents according to the training on standard precautions

Occupation	Yes	No	Total
Doctors	1 (3.7%)	26(96.3%)	27(100.0%)
Lab –tech	14 (46.7%)	16(53.3%)	30(100.0%)
Nurses	85(44.5%)	106(55.5%)	191(100.0%)
Cleaners	20(39.2%)	31(60.8%)	51(100.0%)
Total	120(40.1%)	179(59.9%)	299(100.0%)

Table (4) presents the professional distribution of respondents according to standard precautions training. , standard preventive training was less than half In the general study population ,but among doctors (3.7%) and laboratory technicians (46.7%), among nurses (44.5%) and among cleaning workers 39.2%.

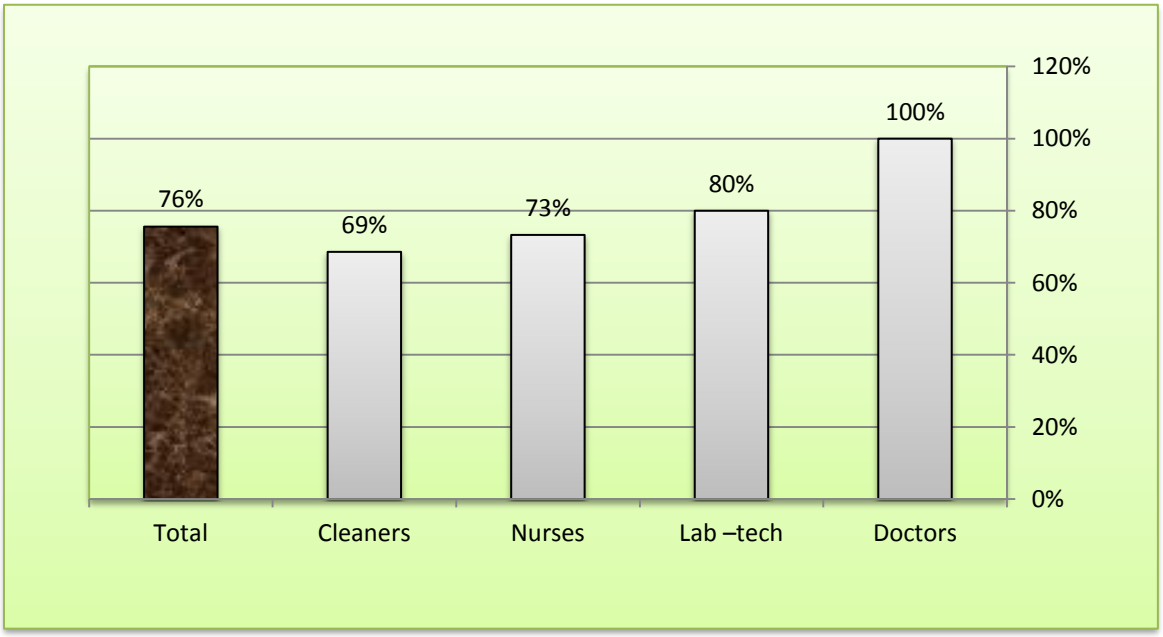

Figure (4) presents the hepatitis B vaccination status of the respondents:

Figure (4) shows that 226 (76%) of the respondents (27 Doctors, 24 laboratory technicians, 140 nurses and 35 cleaners) were vaccinated with Hepatitis B vaccine, while about 73(24%) of the respondents had unvaccinated with Hepatitis B vaccine. There was statistically significant statistical relationship between the case of vaccination in the profession and hepatitis B ($p = 0.012$).

SECTION B: Knowledge of Standard Precautions

Section B of the questionnaire consisted some questions, which were included to elicit information on knowledge of standard precautions by the hospital staff.

Table (5): Frequency distribution of hospital staff who knew the standard precautions:

Variable (n=299)	Frequency	%
- Standard Precautions	100	33.4%
- Standard Precautions must be used in the care of all patients , regardless of diagnosis	274	91.6%
- Standard Precautions involve treating the blood and body fluids of all patients as potentially infectious	215	71.9%
- Beds, Doors, Linen and equipments used for clinical diagnosis of patients If it is not clean and disinfected can help in the spread of infection among patients?	286	95.6%
- Medicals staff can transmit infections to patients sometimes	204	68.2%
- HIV, HBV and HCV can be transmitted by needle stick	251	83.9%
-Hand washing is the most effective means of preventing transmission of hospital acquired infections	257	85.9%
-Hand washing is necessary before gloves are worn.	234	78.3%
-Goggles , mask and gown should be worn for all procedures where blood and body fluids may splash	261	87.3%
-Gloves must be worn as single use time	263	87.9%
- Cover nose and mouth with disposable single use tissues when sneezing, coughing and wiping?	260	86.9%
-Disinfection cannot substitute sterilization for critical equipments	227	75.9%
-Waste contaminated with blood , blood fluids and secretions	150	50.2%

is collected in yellow plastic bags/ containers		
- Used needles and sharps should be disposed of separately from others medical waste.	281	93.9%

The Table (5) presents the basic elements of infection control and the frequency reported by the respondents. The results presented in table (4) highlights that only 100 (33.4%) of respondents knew the elements of standard precaution in infection control while the majority of respondents (66.6%) lack adequate knowledge of standard precautions elements, and 274(91.6%) of respondent knew that standard precaution must be used in the care of all patients regardless of diagnosis .215(71.9%) of respondents said standard Precautions involve treating the blood and body fluids of all patients as potentially infectious . There were 204 (68.2%) of the respondents answered correctly that Doctors , nurses and medical staff can transmit infections to patients sometimes and about 286 (95.7%) of respondents said that Beds , Doors , Linen and equipments used for clinical diagnosis of patients If it is not clean and disinfected can help in the spread of infection among patients . About 251 (83.9%) of respondents answered - HIV, HBV and HCV can be transmitted by needle stick (prick) when taking sample from infected patients. The majority, 257(85.9%) of respondents answered correctly, Hand washing is the most effective means of preventing transmission of hospital acquired infections and 234 (78.3%) of the respondents said it is necessary before gloves are worn . 261(87.3% of respondents reported goggles, mask and gown should be worn for all procedures where blood and body fluids may splash while 263(87.9%) of respondents said gloves must be worn as single use time. The results showed that 281 (93.9%) of the respondents answered correctly ,used needles and sharps should be disposed of separately from others medical waste but only

150(50.2%) of respondents answered that waste contaminated with blood , blood fluids and secretions is collected in yellow plastic bags/ containers.

SECTION C: practices

Table (6) Frequency distribution of hand washing after each patient contact by respondents

Hand hygiene		Always	Sometimes	Rarely	Never	P .Value
Sex	Male Female	31(49.2%) 178(75.4%)	20(31.7%) 47(19.9%)	8(12.7%) 7(3.0%)	4(6.3%) 4(1.7%)	0.000
Occupation	Doctor lab-tech nurse Cleaner	15(55.6%) 15(50%) 138(72.3%) 41(80.4%)	10(37%) 11(36.7%) 36(18.8%) 10(19.6%)	0 4(13.3%) 11(5.8%) 0	2(7.4%) 0 6(3.1%) 0	0.007
Total		209(69.9%)	67(22.4%)	15(5.0%)	8(2.7%)	

The result showed 209(69.9%) of respondents (49.2 percent of males and 75.4 percent of females) reported that they practiced hand washing with soap and water after any direct contact with patients, while 20 (31.7%) of males and 47 (19.9% of the females reported that they sometimes wash their hands. There was a statistically significant relationship (p = 0.000) between hand washing and sex.

Of the respondents 209 (69.9%) (15 doctors, 15 laboratory technicians, 138 nurses and 41 cleaners) reported that they practice hand washing after any direct contact with the patient. 67 (22.4%) of the respondents sometimes washed their hands, while 15 (5.0%) reported that they rarely practiced hand washing after any direct contact with the patient. 8 (2.7 %) never wash hands after direct contact with the patient. But there is no statistically significant relationship (p=0.007) between hand washing and Occupation.

Table (7) Observed Hand Hygiene Practices and facilities present :

Items	**Frequency**	%	N
Hand hygiene performed			
- Before contact with patients	23	39.7%	58
- After contact with individual patients or their immediate environment	15	60%	25
- After touching potentially contaminated objects or surfaces	10	45.5%	22
- Before putting on gloves	8	44.4%	18
- After removing gloves	13	48.1%	27
Total practical hand hygiene at import time of care	69	40.8%	169
Supplies necessary for adherence to hand hygiene was available :-			
- Water 22	15	68.2%	22
- Soap	6	27.3%	22
- paper towels	4	18.2%	22
- Alcohol-based hand rub	10	45.5%	22

Out of 169 participants observed in hand hygiene practices, less than half of the participants 69 (40.8%) practiced hand hygiene at important times of care or routine. As well as less than half (39.7%) (n = 58) performed hands hygiene before contact with patients and fifteen of the participants (60%) (n = 25) performed hand hygiene after contact with individual patients or their immediate environment. Approximately 45.5% of the sample washed their hands after touching the potentially contaminated objects or surfaces, 44.4% and 48.1% of participants performed hand hygiene before putting on gloves and after removing gloves respectively. . In addition, in most of working rooms and patient care sites the rate of availability of the water was 68.2%,

soap27.3%, paper towels 18.2 percent and alcohol (45.5%) But participants had not been utilized alcohol for hand hygiene.

Table (8) Frequency distribution of Use PPE in cases of suspected or confirmed patients with infectious diseases by respondents:

Use PPE		always	sometimes	Rarely	never	P .Value
Sex	Male	41(65.1%)	12(19%)	9(14.3%)	1(1.6%)	0.053
	Female	181(76.7%	33(14%)	13(5.5%	9(3.8%)	
Age	20-30	44(72.1)	8(14.8%)	9(14.8%)	0	0.000
	31-40	109(69.9%)	32(20.5%)	11(7.1%)	4(2.6%)	
	41-50	63(87.5%)	4(5.6%)	1(1.4%)	4(5.6%)	
	Above 51	6(60%)	1(10%)	1(10%)	2(20%)	
Occupation	Doctor	19(70.4%)	7(25.9%)	1(3.7%)	0	0.000
	lab-tech	21(70%)	8(26.7%)	1(3.3%)	0	
	nurse	149(78%)	23(12%)	17(8.9%)	2(1%)	
	cleaner	33(64.7%)	7(13.7%)	3(5.9%)	8(15.7%)	
Total		222(74.2%)	45(15.1%)	22(7.4%)	10(3.3%)	

About 222 (72.2%) of the respondents (19 doctors, 21 laboratory technicians, 149 nurses and 33 cleaners) reported using personal protective equipment in cases of suspected or confirmed patients with infectious diseases .Forty-five (15.1%) of the respondents sometimes use protective tools, while 22 (7.4%) reported they rarely use personal protective equipment . 10 (3.3%) Never use protective tools. There is statistically significant relationship (p=0.000) between using personal protective equipment and Occupation.

Table (9): Observed Use of Personal Protective Equipment:-

Use of PPE :-	Yes	%	N
The following Personal Protective equipment are used as follows: - Gloves are worn when contact with blood, body fluids, mucous membranes, non-intact skin, or contaminated equipment	14	73.7%	19
- change gloves between patients	9	45.0%	20
Gowns are worn during procedures when contact with blood or body fluids is anticipated and during procedures which are likely to generate splashes or sprays of blood or other body fluids.	9	56.3%	16
TOTAL	32	58.2%	55

Fifty-five participants were observed for used personal protective equipment, more than half of participants (58.2%) used personal protective equipment during daily routine work and about three quarters of participants 14(73.7%) (n = 19) wore gloves when contact with blood, body fluids, mucous membranes, improper skin, or contaminated equipment. Less than half of participants observed that they changed gloves between patients. About 9 (56.3%) (n = 16) of the participants observed that they wore gowns during procedures when communicating with blood or expected body fluids and during procedures that might generate stains, blood sprays or other body fluids .

Table (10) Frequency distribution of disposed of used needles and sharps separate by respondents:

disposed of used needles & sharps		**always**	**sometimes**	**Rarely**	**never**	P .Value
Sex	Male	40(63.5%)	8(12.7%)	3(19%)	3(4.8%	0.206
	Female	159(67.4%)	42(17.8%)	23(9.7%)	12(5.1%)	
Occupation	Doctor	22(81.5%)	2(7.4%)	1(3.7%)	2(7.4%)	0.011
	lab-tech	17(56.7%)	9(30%)	1(3.3%)	3(10%)	
	nurse	120(62.8%)	35(18.3%)	30(15.7%)	6(3.1%)	
	cleaner	199(66.6%)	4(7.8%)	3(5.9%)	4(7.8%)	
Total		199(66.6%)	50(16.7%)	35(11.7%)	15(5. %)	

The table above shows about 199 (66.6 %) of respondents (40 (63.5 %) of males and 149 (67.4%) of females) reported that they always disposed of used needles and sharps separate from other wastes, while 50 (16.7 %) of respondents (8 (12.7 %) of males 42 (17.8%) of females) reported that they sometimes disposed of used needles and sharps separately from other wastes, and 35 (11.7%) of the respondents 3 (19%) males and 23 (9.7%) females reported that they rarely disposed of used needles and sharps separately from other wastes and 15 (5 %) of respondents(3 (4.8 %) of males and 12 (5.1 %) of females) reported that they never disposed of used needles and sharps. There is no statistically significant relationship (P=0.206)

Table (11) Frequency distribution of detergents and disinfectants used accordance with the manufacturer's instructions by respondents

Occupation	detergents and disinfectants				Total	P – value
	Always	sometimes	Rarely	never		
Doctor	15 %55.6	7 %25.9	0 %0.	5 %18.5	27 %100.0	0.000
lab-tech	11 %36.7	13 %43.3	4 %13.3	2 %6.7	30 %100.0	
nurse	65 %34.0	78 %40.8	22 %11.5	26 %13.6	191 %100.0	
cleaner	38 %74.5	9 %17.6	0 %0.	4 %7.8	51 %100.0	
Male	22 %34.9	30 %47.6	1 %1.6	10 %15.9	63 %100.0	0.020
Female	107 %45.3	77 %32.6	25 %10.6	27 %11.4	236 %100.0	
total	129 %43.1	107 %35.8	26 %8.7	37 %12.4	299 %100.0	

About 129 (43.1%) of the respondents (15(55.6%) Doctors, 11(36.7%) lab-technicians, 65(34%) nurse and 38(74.5%) cleaners) reported that detergents and disinfectants always use in accordance with the manufacturer's instructions. 107 (35.8%) of the respondents (7(25.9%) Doctors ,13(43.3%) lab- technicians, 78(40.8%)nurses and 9(17.6%) cleaners) reported that sometimes use detergents and disinfectants according to the manufacturer's instructions and 26 (8.7%) of respondents (4(13.3%) lab- technicians and 22(11.5%) nurses Rarely use detergents and Disinfectants accordance with the manufacturer's instructions during cleaning and disinfection, and 37 (12.4%) of respondents ((5(18.5%) Doctors, 2(6.7%) lab- technicians, 26(13.6%) nurse and 4(7.8%) cleaners) reported that detergents and

disinfectants were never used. There is statistically significant relationship (P=0.000).

Table (12) Frequency distribution of respondents that decontaminated equipment after use

Occupation	decontaminated equipment				Total	P – value
	always	Sometimes	Rarely	never		
Doctor	20 74.1%	4 14.8%	1 3.7%	2 7.4%	27	0.000
lab-tech	19 63.3%	10 33.3	1 3.3%	0 0	30	
nurse	144 75.4%	43 22.5%	4 2.1%	0 0	51	
cleaner	29 56.9%	11 21.6%	7 13.7%	4 7.8%	191	
total	212 70.9%	68 22.7%	13 4.3%	6 2.0%	299 100%	

About 212 (70.9%) of the respondents (74.1% Doctors, 63.3 % lab-technicians , 75.4% nurse and 56.9% cleaners) reported that they decontaminate equipment's , instrument and surfaces always after use while 107 (35.8%) of the respondents ((14.8% Doctors ,33.3% lab- technicians, 22.5% nurses and 21.6% cleaners) reported that they decontaminate equipments , instrument and surfaces sometimes after use and 13 (4.3%) of respondents (3.7% Doctors,3.3% lab- technicians and 2.1% nurses and 13.7% cleaners) reported that they decontaminate equipments , instrument and surfaces rarely after use. About 6 (2%) of respondents (7.2%) Doctors and 7.8% cleaners) reported that they never decontaminate equipment's,

instrument and surfaces after use and Disinfectants. There is statistically significant relationship (P=0.000).

Table (13) Frequency distribution of clean up spillage of blood, body fluid Secretions immediately with disinfectants by respondents

clean up spillage	Occupation				Total	P – value
	always	sometimes	Rarely	never		
Male	36 57.1%	23 36.5%	1 1.6%	3 4.8%	63	0.002
Female	168 71.2%	36 15.3%	15 6.4%	17 7.2%	236	
total	204 68.2%	59 19.7%	16 5.4%	20 6.7%	299 100%	

About 204 (68.2%) of the respondents (57.1% male and 45.3% female) reported that they always clean up spillage of blood , body fluid Secretions immediately with disinfectants, 59(19.7%) of respondents (36.5%male and 15.3% female) reported that they sometimes clean up spillage of blood , body fluid Secretions immediately with disinfectants, 16(5.4%) of respondents (1.6% male 6.4% female) reported that they rarely clean up spillage of blood , body fluid Secretions immediately with disinfectants and 20(6.7%) of the respondents (4.8%male and 7.2% female) reported that they rarely clean up spillage of blood , body fluid Secretions immediately with disinfectants .

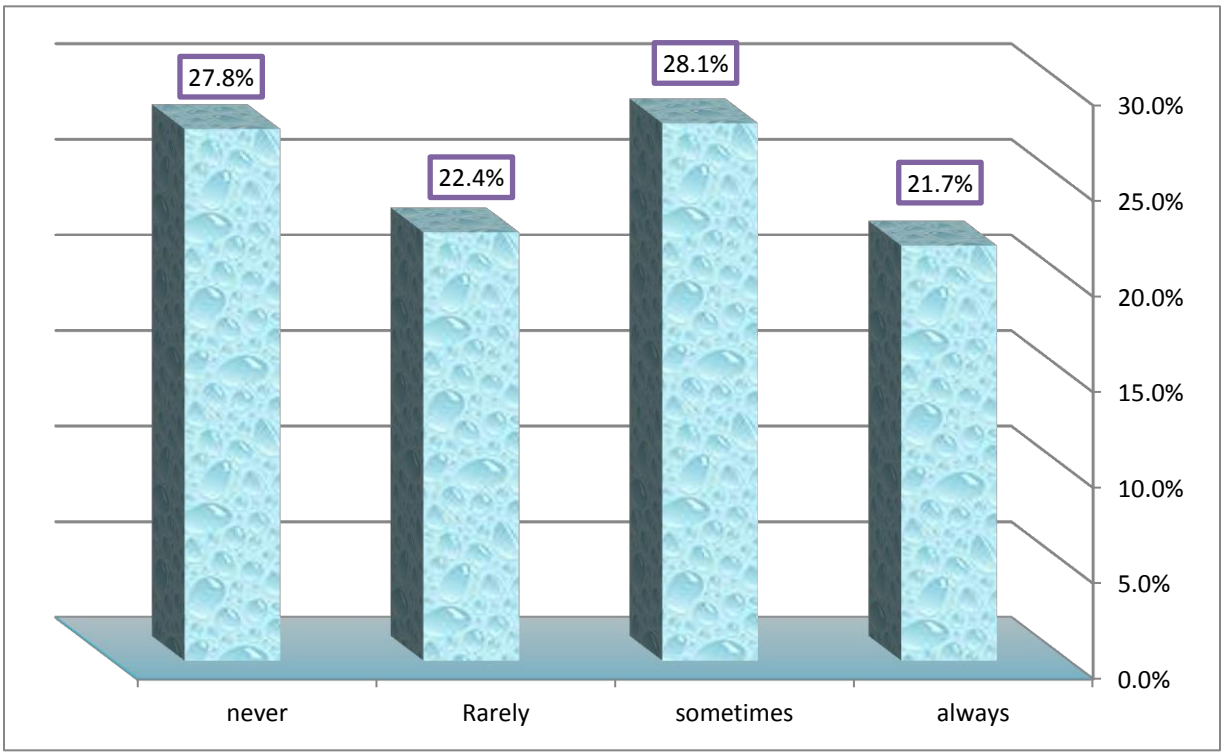

Figure (5) shows the follow-up of the infection control team to implement infection control policies in hospitals:

Figure (5) shows that 21.7% of the respondents said that the infection control team has always follow up the implementation of infection control policies in hospitals. While 28.1% of the respondents reported that the infection control team sometimes follow-up the implementation of infection control policies in hospitals. (22.4% of respondents reported that the infection control team rarely follow-up the implementation of infection control policies in hospitals. Finally 27.8% of of respondents reported that infection control team did not follow-up the implementation of policies Infection control in the hospital.

SECTION D: Evaluation of attitudes

Table (14) presents Frequency distribution of respondent's attitudes towards of standard precautions:

Statement	correct	incorrect
Do you think standard precautions will prevent hospital staff from acquiring infection from the hospitals?	148 %49.5	151 %50.5
Do you think that the workers who deal with the medical waste have enough training and knowledge about the dangers of this waste	102 %34.1	197 %65.9
Do you think that the lectures , seminars and orientation on the precautionary measures in this hospital are enough	79 %26.4	220 %73.6
Do you think we have need to wash or decontaminate hands after touching patients' surroundings	104 34.8	195 %65.2
Do Do you think that , this hospital is insisting and committed to implement the infection control policies and procedures as stated in the protocol of infection control	141 %47.2	158 52.8

About half only of the respondents believe that standard precautions will prevent hospital staff from acquiring infection in hospitals.

Most participants 197 (65.9%) of respondents believe that workers dealing with medical waste do not have enough training and knowledge about the risks of these wastes and about one-third of the respondents 102 (34.8%) believe that the respondents' training is adequate.

More than three-quarters of respondents (220.76%) do not believe that staff training is adequate to protect themselves from hospital-acquired infections, while 79 (26.4%) believe that training is adequate

about two thirds of respondents 195 (65.2%) believe there are no considerable need for washing or decontaminate after contact with the patient's surroundings, while the final third of respondents 104 (34.8%) believed that there is considerable need for washing and decontaminate hands after contact with the patient's surroundings.

about 104 (48.2%) of respondents believe that the hospital is insistent on applying infection control policies and procedures as stated in the protocol of infection control , while 158 52.8% of respondents do not believe that the hospital is insistent on applying infection control policies and procedures as stated in the protocol of infection control.

SECTION 4: Availability of Resources:

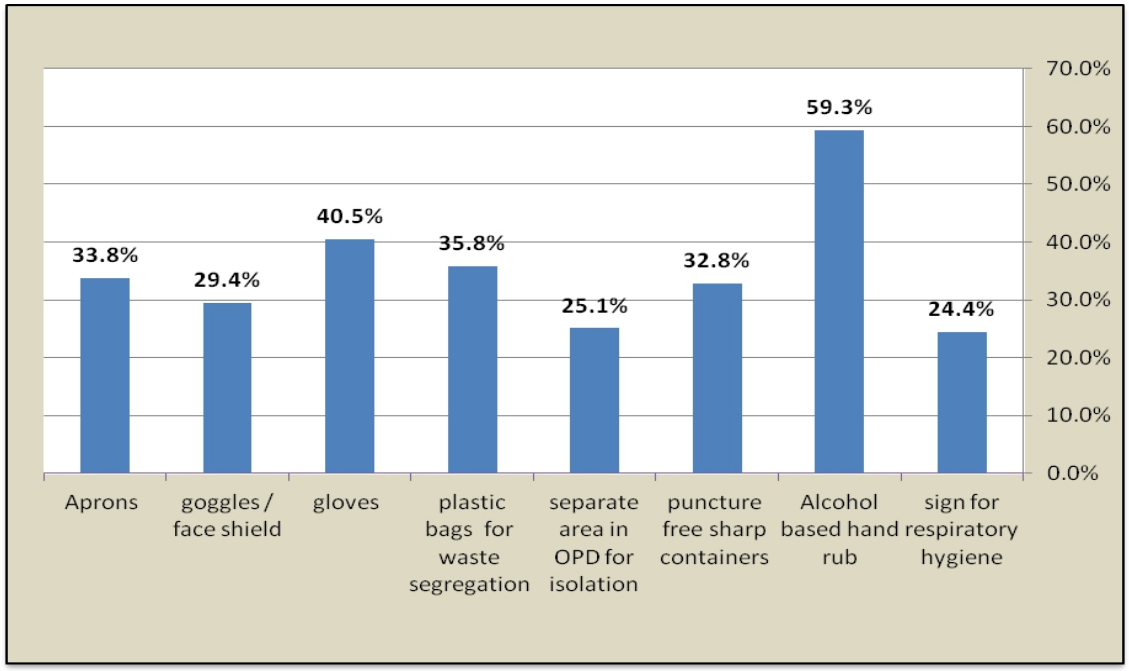

Figure (6) presents the proportion distribution of availability of requirements in healthcare facility by respondents:

Figure (6) presents the distribution of the availability requirements for the implementation the standard precautions in infection control by respondents, they reported More than half of respondents (59.4%) inform alcohol based hand rub was available in healthcare facility and 121(40.5%) of respondents inform that gloves was available .About two thirds of respondents reported that there was shortage in requirement for implementation the standard precaution in infection control (aprons , goggles / face shield , plastic bags and sharps containers and three quarters of respondents reported that sign board advising the respiratory hygiene practices and isolation area unavailable in hospital.

Interview:

The main interviews with the Manager (General Manager, the Administrative manager and the Medical Director) in each hospital. The interview was limited to the following main points.

- **Role of infection control team:**

Infection control team is responsible for the prevention and control of infection in the healthcare facility and follow up the infection control measures in healthcare facility.

- All Managers of hospital, except the Director General and the Medical Director of one of the three Hospital, agree that the staff in the infection control department do not have sufficient experience or training courses.

- All Managers of hospital have no a knowledge of infection control policies.
- The control team is limited to supervising cleanliness only. While the Medical Director of the Traghan Hospital as a control team that supervises and follow-up and daily inspection and the work of training courses to raise the level of knowledge of workers.

- **Benefits of standard infection control precautions:**

The benefits of standard infection control measures include the protection of health workers, patients and survivors of serious diseases such as HIV, hepatitis C and TB. "R1" The adherence to standard precautions prevents the spread of infection in the health care facility and reduces work injuries. "R2 said," unified preventive measures in the fight against infection and prevention and enhance the safety of health care workers and patients .

- **Obstacle :**

Most of the interviewers reported that there are many factors that hinder hospital staff from adhering to standard precautions lack of supply, personal protective equipment, detergents and disinfectants and lack of the training courses of standard precautions.

- **Improvement:**

Joint communication between the central administration and the infection control teams in hospitals in order to train and develop the work of infection control teams in hospitals. Paying attention to the practical training of cadres through the workshops through a specialized team in this field.

- New staff orientation and continuing medical education on infection prevention.

- Provide a shortage of supplies and materials for protection from infection.

Discussion

Characteristics of Study Participants:

A total respondents in this study 299, about 21.1% males and 78.9% females. More than half of respondents were aged between 31-40 year, three quarters of the population were vaccinated with hepatitis B vaccine The finding of the study indicate that (40.1%) of respondents attended training courses on standard precautions. Education is a critical element in the training of all HCWs, particularly in countries where there is a lack of formal and well-organized infection control programs. This result is lower than study conducted in Kenya in 2011 showed that 60% of respondents attended formal training on of standard precautions [49].

Level of knowledge in Standard Precautions:

Knowledge of the elements of the standard precautions was inadequate among the hospitals staff table (5). These findings are slightly higher than in a study published in 2012 among health workers in Nigeria where good knowledge was found in only 13 percent of the study respondents ([73][55] &[38] . These findings are in confirmation with a study published in France in 2013 showed that 39.3 percent of the study subjects had good knowledge on standard precautions [80] The results of this study also indicated that 91.6% of respondents knew that standard precautions must be used in the care of all patients, regardless of diagnosis This finding is consistent with the literature [29] Standard Precautions are the minimum infection prevention measures that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where healthcare is delivered.

Most of the respondents (85.9%) knew hand washing is the most effective means of preventing transmission of hospital acquired infections. This result is consistent literature (NHS 2010) Good hand hygiene is the most important practice in reducing transmission of infectious agents , including healthcare associated infections during delivery of care [31] and different form previous study conducted in Hong Kong in 2009 [81] . The majority of respondents (87%) knew that PPE should be worn for all procedures where blood and body fluids may splash and gloves must worn as a single use time. This finding is consistent with study conducted in Ghana in 2006 [82] .

Needle and sharps shall be disposed of immediately in designated puncture-resistant containers labelled with a biohazard symbol) located in the area where the items were used, for transport to the incinerator for disposal [39] . (93.9%) of respondents knew that used needles and sharps should be disposal of separately from others medical waste because they are responsible for transmission HIV, hepatitis B and hepatitis C. This result it not compatible with study done in Indonesian showed that Knowledge medical sharps disposal was poor [83].

Most of the respondents reported that they knew that beds, doors, linen and equipment used for clinical diagnosis of patients if they were not clean and disinfected could help spread the infection among patients

And that HIV, HBV and HCV can be transmitted through the needle stick but about third of respondents reported they do not knew that Medicals staff can transmit infections to patients sometimes.

Practice of Standard Precautions among hospitals staff:

More than two thirds of respondents reported that they always wash their hands with soap and water after any direct contact with patients table (6), which is the single most important Infection Prevention and Control precaution and one of the most effective means to prevent transmission of pathogens associated with health care services [(84)]. This finding is different from previous studies in Nigeria in 2009 which found lower level of practices among respondents (doctors (96.38%- nurses (94%)) [(38)] and This result was better than result study done in Nigeria in 2015 showed that 58.5% of respondents always practiced hand hygiene after touching Patients [(85)] . The major constraint reported by respondents who said they did not always wash hands with soap and water after any direct contact with patients was irregular availability of water and soap .

Based on our assessment of hand hygiene practice of healthcare workers. It was observed that all important times for hand-washing practices were less than 50% except for contact with patients or their environment table (7). In addition, in most of working rooms and patient care sites water hand washing logistics like soap and paper towels were not available.

Findings from the study show that the majority of the respondents (74.2%) reported using always personal protective equipment in cases of suspected or confirmed patients with infectious diseases like HIV and HCV and HBV table (8) XS [(86)]. There was statistical significant relationship (P=0.000) between using personal protective equipment and Occupation .Also here was statistical significant relationship (P=0.000) between using personal protective equipment and age. However, the main constraint given for the irregular use of PPE was the Shortage of regular supplies.

Our study found the practices of the respondents for decontamination were 70.9, but there was a severe weakness in the use of detergents and disinfectants according to the manufacturer's instructions, due to the poor practical training of the respondents for the standard precautions table (11) . The study showed a high level of knowledge reported by respondents regarding the disposal of needles and sharp instruments, but practically low table (10). This result confirms the lack of adherence of the hospitals staff to practice despite the high knowledge, and that led to an increase needle sticks or sharp injures (40.8%).

Attitude of Standard Precautions among hospitals staff:

About only half of the respondents have positive attitude towards standard Precautions .this result disagree with study conducted in Nigeria in 2014 showed 83.3% of the respondents have positive attitude towards standard Precautions [(86)]. Only one quarter of the respondents have positive attitude towards hand washing or decontaminate after contact with the patient's surroundings as against the three quarters of the respondents have a negative attitude figure (6). One quarter of respondents believe that the respondents' training is adequate.

The availability of resources had a positive influence on awareness in decontamination and waste disposal and on practice of hand hygiene and respiratory hygiene.

The coverage of hepatitis B vaccination among doctors was 100% but there was a gap in coverage of hepatitis B vaccination that among nurses 73 percent, among laboratory technicians 80 percent and among cleaners 69 percent. This points to the need to implement such protocols more effectively among all workers.

Conclusion:

The knowledge of standard precautions was high among respondents but not translated into appropriate practices. the Poor positive attitudes of respondents towards standard infection control measures, lack of understanding of the risk of infection , lack of attention to training and Update information of health care providers in the areas of infection prevention, lack of supplies and infection prevention equipment and Lack of good control systems on infection control policies are key factors impeding positive performance in decontamination, waste disposal, hygiene, respiratory health and other standard precautions in infection control. These results are useful in proper planning measures to improve knowledge, attitudes and practices.

Recommendations

- Hospital management should provide and purchase all essential supplies and infection prevention equipment and ensure that they are available in a consistent manner to enhance compliance with standard precautions to prevent infection.

- The hospital administration should ensure that all workers are trained on standard infection control precautions and conduct regular continuous education systems on standard precautions.

-The hospital administration should ensure that infection control policies exist for standardization and protection .

-More research is needed on this subject because there is very little literature in Libya. The same study can be repeated to enhance results or a prospective study can be conducted to assess knowledge, attitudes and practices of standard precautions among hospital staff.

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5-5 Appendix

University of Shendi

Faculty of Graduate Studies and scientific research

Form of survey for hospital staff in Fezzan region southern Libya

Date of survey: / / TO / /

General Information:

Hospital Name.....location.....

Identifications

1/ sex: 1/ Male ☐ 2/ Female ☐

2/ Age : ☐

3/ Nationality: ……..

4/ Occupation:

5 / For how many years you are working in this hospital? .....

No. Questions: - Yes ☐ No ☐

6/ Have you met the infection control team for orientation before starting work?

Yes N☐ ☐

7 /Have you completed the pre-employment medical examination before starting work ? Yes ☐ NO ☐

8 /Are you vaccinated against hepatitis B ? Yes ☐ NO ☐

9/ Are you vaccinated against influenza ? Yes ☐ NO ☐

10 /Are you screened for tuberculosis? Yes ☐ NO ☐

11 / Do you know what is the elements by standard precautions ? Yes ☐ NO ☐

12/ Have you attended any training courses or seminars on infection control policies , procedures and practices ? Yes ☐ NO ☐

13 - Did you expose to any needle sticks(prick) or sharp injures when you are making dressing , invasive procedures , operation or taking sample or doing any other task during your work? Yes ☐ NO☐

14 - Do you infected with any diseases or infections which was considered as hospital acquired infections during your work in this hosp ? Yes ☐ NO ☐

15 - In your work area is there a written policy and guidelines on waste handling and disposal ? Yes NO

Evaluation of Knowledge

(Judge the following statement by Agree , Disagree or Undecided)

No. The questions Agree Disagree Undecided

NO	The Questions	Agree	Disagree	Undecided
1	- Beds , Doors , Linen and equipments used for clinical diagnosis of patients If it is not clean and disinfected can help in the spread of infection among patients ?			
2	- Doctors , nurses and medical staff can transmit infections to patients sometimes			
3	Gloves must be worn as single use time ?			
4	- Hospital acquired infections can be transmitted by all modes of transmission that occur in the community			
5	- Hand washing is the most effective mean of preventing transmission of hospital acquired infections			
6	Hand washing is necessary before gloves are worn .			
7	Standard Precautions must be used in the care of all patients , regardless of diagnosis			
8	Cover nose and mouth with disposable single use tissues when sneezing , coughing and wiping ?			
9	Wast contaminated with blood , blood fluids and secretions is collected in yellow plastic bags/ containers ?			
10	- HIV, HBV and HCV can be transmitted by needle stick (prick)when taking sample from infected patient .			
11	- Contact transmission is the most important and frequent mode of transmission of hospital acquired infection .			
12	Goggles , mask and gown should be worn for all procedures where blood and body fluids may splash			
13	- Disinfection can not substitute sterilization for critical equipments			
14	Food wastes collected in red coloured plastic bags/ containers			
15	- Standard Precautions involve treating the blood and body			

	fluids of all patients as potentially infectious			
16	- Used needles and sharps should be disposed of separately from others medical waste .			

Evaluation of Practices

Judge the flowing questions by (1= Always ,2= Sometime ,3= Rarely ,4= Never)

NO	**The Questions**	**1**	**2**	**3**	**4**
1	- Do you use new gloves for each patient				
2	Hand washing is necessary before gloves are worn				
3	Do you washed your hands after each patient contact				
4	Do you wash your hands after removing gloves				
5	. Do you wear gown, mask , gloves when dealing with suspected or confirmed patients with infectious diseases				
6	Are equipments (Personnel Protective Equipments) necessary to protect staff from exposure to hospital acquired infections (such as HBV, HCV and TB are provided and available				
7	Do you disposed off used needles and sharps separately from others wastes				
8	Do you used needles and other used sharp articles inside the sharps containerate the point of use it self .				
9	- Needles and syringes are used for only one patient				
10	Do you have enough time at work to follow standard precautions				
11	Do the infection control team follow up the implementation of infection control policies , procedures and practices				
12	Cleaners and disinfectants are used in accordance with manufacturer's instructions (e.g., dilution, storage, shelf-life				
13	Do you clean up / make your staff clean up spillage of blood , body fluid. Secretions immediately with disinfectants (bleach solution)				
14	Do you decontaminated equipments , instrument and surfaces after use				

Attitudes

No. Attitudes Yes No

NO	The Questions	correct	incorrect
1	Do you think standard precautions will prevent hospital staff from acquiring infection from the hospitals?		
2	Do you think that the workers who deal with the medical waste have enough training and knowledge about the dangers of this waste		
3	Do you think that the lectures , seminars and orientation on the precautionary measures in this hospital are enough?		
4	do you think we have need to wash or decontaminate hands after		

	touching patients or patients' surroundings		
5	Do you think that , this hospital is insisting and committed to implement the infection control policies and procedures as stated in the protocol of infection control		

Availability of Resources

Please answer available (√) or unavailable (X) .

1/ Is Alcohol based hand rub available in your hospital for routine use for hand hygiene? ☐

2/ Are gloves freely available all the time for patient care? ☐

3/ Do you know if goggles / face shield are available in the hospital? ☐

4/. Are Aprons available for personnel protection against splashes? ☐

5/. Are coloured plastic bags available for waste segregation at all possible sites of waste formation like injection room, dressing room etc? ☐

6/. Is there any sign board advising the respiratory hygiene practices ? ☐

7/. Are safe receptacles available to be given to coughing patients admitted in wards and attending the OPD? ☐

8/. Are puncture free sharp containers available in your hospital to collect the sharps? ☐

9/ . Is there any facility available for isolation of patients with acute febrile respiratory infections like separate wards and separate area in OPD ☐

Appendix 2 : Key informant Interview Guide

Describe knowledge attitudes and practices for Standard Precautions among hospital staff in Fezzan region southern Libya

- In your opinion ,What is the role of the hospitals infection control team?

Are you satisfied with the performance of the infection control team?

Benefits :-

- what are the benefits of using standard infection control precautions?

Practice :-

Is there a report on any work injuries in previous years? what actions have been taken after the work injury ?

Obstacles :-

- What hinders hospital staff from adhering to standard precautions?

Improvement

- In your opinion, how can we improve our hospitals staff compliance for standard precautions?

Appendix (3): Observation Checklist

Assess the practices of standard precautions in infection control among hospitals staff in Fezzan region southern Libya

	Items	Yes	No
	Hand hygiene :-		
	Health care personnel routinely wash their hands with soap and water or a waterless alcohol-based hand antiseptic?		
	- Before contact with patients		
	- After contact with individual patients or their immediate environment		
	- Before manipulating medical devices, such as intravenous catheters, urinary catheters, or endotracheal tubes, or before handling wound dressing		
	- After touching potentially contaminated objects or surfaces		
	- Before putting on gloves		
	- After removing gloves		
	Supplies necessary for adherence to hand hygiene was available :-		
	- Water		
	- Soap		
	- paper towels		
	- Alcohol-based hand rub		
	Use of Personal Protective Equipment :-		
	The following Personal Protective equipment are used as follows: *Gloves :-* - Gloves are worn when contact with blood, body fluids, mucous membranes, non-intact skin, or contaminated equipment		
	- change gloves between patients		
	- use new gloves for each patient		
	- wear puncture- and chemical-resistant utility gloves when cleaning instruments and performing housekeeping		

	- Gowns are worn during procedures when contact with blood or body fluids is anticipated and during procedures which are likely to generate splashes or sprays of blood or other body fluids.		
	- Mouth, nose and eye protection is used when a procedure is likely to generate splashes or sprays of blood or other body fluids		
	Instrument processing:-		
	- Medical devices for sterilization are used according to manufacturer's instructions		
	- Used the medical disinfectant according to manufacturer's instructions		
	Waste management :-		
	Solid waste is segregated at point of use according to category		
	Waste containers are disposed of when ¾ full		
	Needles are not recapped or bent after use		
	- All sharps are disposed of in a puncture-resistant sharps container located as close as possible to the area in which the items are used		
	- The rubber septum on a medication vial is disinfected with alcohol before piercing		