Pattern of antibiotics sensitivity of bacteria causing surgical site infections in several hospitals in Kirkuk- Iraq

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Abstract. Wounds infection is one of the most major problems in surgical" department related" to surgery, burns unit and orthopedic unit..The present study was to isolate and identify the bacteria causing wound infection and to determine the most effective antibiotic resistance to bacteria.This study was conducted in Kirkuk city from November 2018 to March 2019 , the total number of samples 27, isolated from Kirkuk General Hospital and Azady Teaching Hospital .In this study,13 males and 14 females were taken . Samples were taken from various hospital units(surgical department, burns and orthopedic units). We cultured the samples on the MacConkey Agar and Blood Agar. Then the antibiotic sensitivity was determined against the bacterial isolated from wound infections.A total of 27 patients were studied of which 18 were completely followed up for wound infection. Females were predominant (72%). Of the 18 patients, (27.7%) were identified as *E. coli*,(22.2 %) *Klebsiella*,(16.6%) *Citrobacter*,(11.1%) *Proteus*, (11.1%) *Staphylococcus aureus* and (11.1%) *Staphylococcus epidermides* . the most bacteria that appeared in wound infection is *E. coli*, and the infection in females more than in males, the most effective antibiotics were Ciprofloxacin, Amikacin and Rifampicin 55.5%

Keywords: wound infections, bacteria, antibiotics, surgical.

1 Introduction

A wound is a type of injury which .happens relatively quickly in which skin is torn, cut or punctured can open wound or where blunt force trauma causes a contusion a closed wound [1]. In pathology, it specifically refers to a sharp injury which damages the dermis of skin [2]. Wound infection is a type of injury in which skin is torn, cut or punctured and therefore compromises its protective function. As a result, wounds can be contaminated by microorganism like bacteria and infection occurs when such organism multiplies and cause damage [3]. Surgical site infections are caused by bacteria that get in through incisions made during surgery. They threaten the lives of millions of patients each year and contribute to the spread of antibiotic resistance. In low and middle-income countries, 13% of patients who undergo surgery are infected in the process. In Asia, up to 30% of women who have a cesarean section contract a wound infection, compromising their health and their ability to care for their babies. But surgical site infections are not just a problem for poor countries. In the medial east, they contribute to patients spending more than 500 000 extra days in the hospital at a cost of an additional Dollar 8 billion per year [4].

Until December 4, 2015, WHO had not implemented evidence-based international guidelines before WHO embarked on its global guidelines for the prevention of infections at the surgical site, and there is a contradiction in the interpretation of evidence and recommendations. These new WHO guidelines are valid for any country and are suitable for local adaptation and take into account the strength of available scientific evidence, cost implications and resources, and patient values and preferences. It is estimated that around 20 million people worldwide suffer from chronic wounds, and in the United States alone they cost more than $ 31 billion a year. [5] Indirect costs are also important, which include reduced productivity and quality of life. As our percentage of older people grows, the frequency and importance of chronic wounds and wound infections increase [6].

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In women, the frequency of chronic wounds is higher than in men, and many of these wounds, including those associated with chronic venous insufficiency, peripheral artery disease, pressure injuries or ulcers, rarely heal quickly or without complications, such as infection. Chronic wounds may not heal or it may take years to do so. These wounds caused patients severe psychological and physical stress, as well as creating a significant financial burden on patients and the health care system as a whole [6]. The risk of surgical wound complications is greater for those over the age of 65, or who suffer from pulmonary disease, undernourishment, overweight, other diseases and high blood pressure [7].

Infection complicates the healing process and is usually observed [7] [8]. Most injuries are present during the first 30 days after surgery. [9] Surgical wounds can be infected by bacteria, regardless of whether bacteria are present on the patient's skin or whether bacteria are transmitted to the patient by contact with infected people. [9] Wound infections can be superficial or deep muscles and tissues or spread to the organ or space where the operation occurred [9]. The risk of complications from a surgical wound is higher for people over 67. Elderly or people with lung disease, malnutrition, weight gain, other illnesses, and high blood pressure [7].

Most open wounds occur in contamination, contaminated objects that carry various types of bacteria and organisms. Smelly, yellowish purulent drainage, fever, pain, inflammation. This may be the result of an immune response to a foreign substance that caused the wound. Inflammation can make the wound area red, hot, swollen, and painful. Many open wounds leave the scar after healing, and some may even cause deformation of the affected area, especially with penetrating, gunshot or deep lacerations. The main complications of having an open wound is the risk of infection. Although wound healing is a very natural physical process that the body has involuntarily, this process has taken place in a large number of people with diabetes. Diabetes has a major impact on wound warts and the ability of the body to fight the wound and various injuries due to the narrowness of the blood vessels, which results in a slow process of healing wounds resulting in complications of diabetes, which may reach the limit of amputation increases the delay of healing wounds to the feet due to inflammation of the nerves Which causes the loss of feeling in the patient, the patient does not feel the limbs are therefore more susceptible to injury so the patient to follow the periodic disclosure on his feet due to a defect in the functions of the nervous system, which causes the loss of the basic function of moving the foot or reactive when exposed For the wound in addition to not releasing the necessary moisturizing of the skin, which makes the skin more prone to injury wounds.

This study aims to isolate and identify the bacteria causing different surgical wound infections and test their antibiotic sensitivity.

2 Methodology

2.1 Sample collection

All wound isolates in Kirkuk Hospitals were collected from 27 people chosen from November 2018 to March 2019 (in vitro). Sterile swabs were used for selected individuals of both genders from 2 to 63 years old. The collected samples were transferred to the laboratory at the Northern Technical University. They were bred from wound samples on sterile nutrient agar plates and incubated at 37 ° C for 24 hours, then discovered, cultured on an agar diagonal, partly determined against the Gram reaction and kept at 4 ° C in a coolant until use [6].

2.3 Inoculum Preparation

After the initial propagation, all tested microbes grew for 24 hours on nutrient broth medium at 37 ° C, and vaccinations were prepared for analysis. The intensity of each microbial suspension was adjusted using a GENESYS 10S UV-Vis spectral wavelength to meet these 0.5 McFarland criteria (10^8 CFU/ml) [10].

2.4 Microscopy test

A smear was made from a single bacterial colony from each farm by the sterile carrier and placed on a clean glass slide was installed and stained with a dye and after drying the slide microscopically examined under the oily lens to note the response to the dye and the size, size and arrangement of bacterial cells.

2.5 Diagnosis of bacteria using APi 20 E Kit

The tape contains 20 small tubes for chemical tests, inoculating 5 ml of brine saline solution with bacteria to obtain a homogeneous suspension, transfer 0.12 ml of bacteria stuck to each test tube and add 0.28 bacteria vaccine to the test tubes GEL, VP, CIT, add 0.1 oil to the tubes ODC, LDC, ADH, URE, H2S test To provide anaerobic conditions, incubate the strip with an incubator at 37 ° C for 24 hours. Then the reagents were added according to the requirements of each test and the results read. The results are converted to numbers and then compared with the codes in the catalog prepared by the company to give the name of the gender and the type of bacteria.

2.5 Antimicrobial susceptibility test using disc diffusion method

Selected antibiotic against oral isolates:

All antibiotics used in this study were purchased from Mast disctm, Mast Diagnostics, Mast group, Mersey side, using disc diffusion method of Muller–Hinton agar from Hardy Diagnostics. According the manufacturer's recommendations, the media were autoclaved at 121 °C for 15 min and then cooled to 45–50 °C and poured into the plates. The antibiotic discs were allowed to set on a level surface to a depth of approximately 4 mm. The nine antibiotic discs 6 mm were placed onto the inoculated plates. Subsequently, they were placed in the chiller for 15 min and incubated at 37 °C for 24 hours, the diameter of each inhibition zone was measured and recorded in mm. All plates were prepared in triplicate for each test organism and the mean diameter were collected in this study and represented as antimicrobial susceptibility percentage against all wound isolates [11, 12, 13,14].

3 Results

The result showed that 18 out of 27 samples had infection and 5 of 18 (27.7%) were identified as *E. Coli*, 4 of 18 (22.2 %) *Klebsiella*, 3 of 18 (16.6%) *Citrobacter*, 2 of 18 (11.1%) *Proteus*, 2of 18 (11.1%) *Staphylococcus aureus* and 2 of 18 (11.1%) *Staphylococcus epidermldis* as shown in the table 1 and figure 2 .

Table 1. number and percentage of the bacteria infection from wound

Bacteria	Number	Percentage
E.coli	**5**	**27.7**
Klebsiella	**4**	**22.2**
Citrobacter	**3**	**16.6**
Proteus vulgaris	**2**	**11.1**
Staphylococcus aureus	**2**	**11.1**
Staphylococcuc epidermidis	**2**	**11.1**
Total	**18**	**100%**

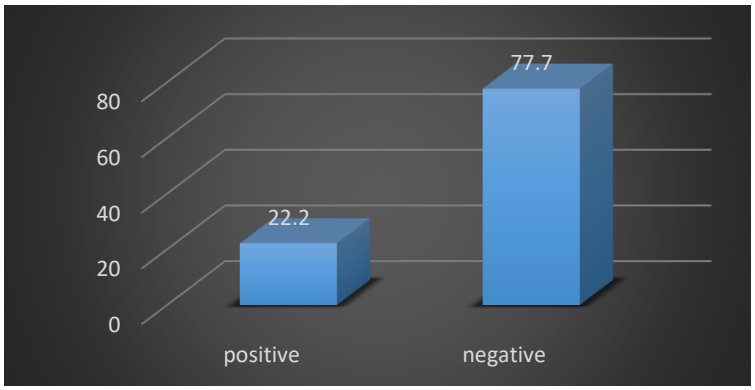


Fig. 1. percentage of bacteria gram positive and negative

E.coli

Klebsiella pneumoniae

Proteus vulgaris

Fig 2 . The diagnosis of *E. coli*, *Klebsiella*, *Proteus* using Api 20E

3.1 The relationship between age and wounds infection

The age ranged between (2- 63 years old) females and males. The percentage of females infection 72.2 % and males 27.7%.

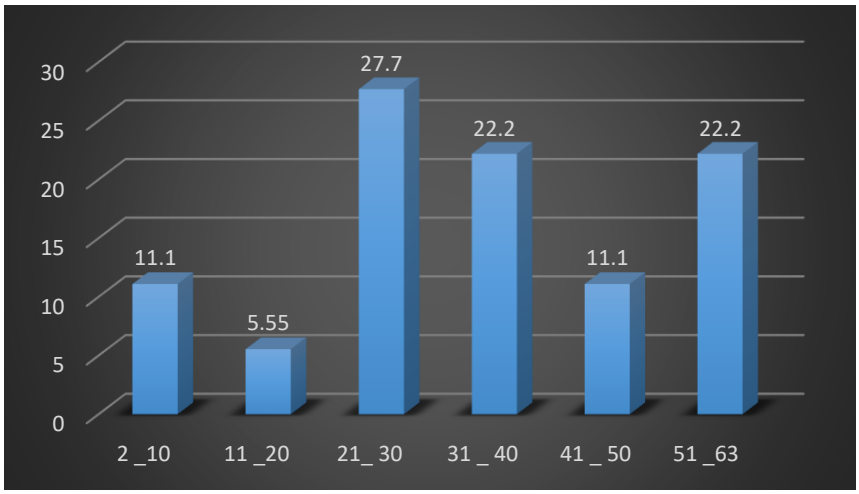


Fig. 3. percentage of relationship between age and wound infections

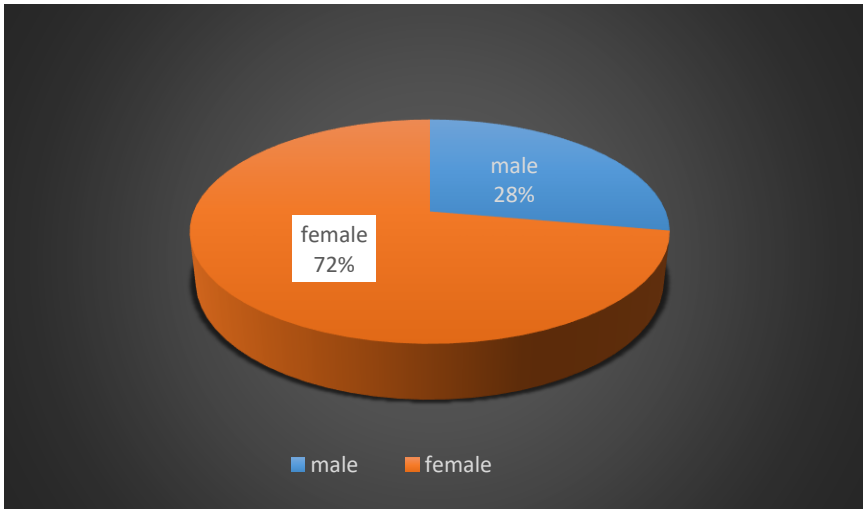


Fig. 4. percentage of relationship between gender and wound infections

3.2 Sources infection

The sources of wound infection included (55.5% burns), (16.6% diabetes foot), (16.6% post – operative) and (11.1%fractures) as shown in figure 5

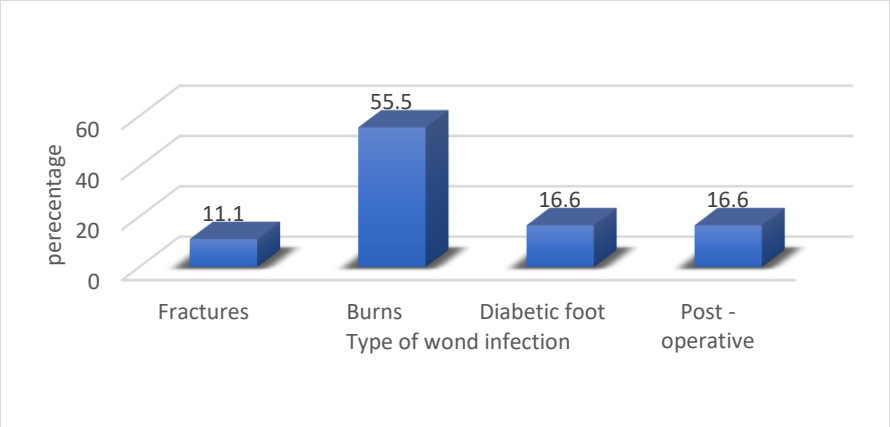
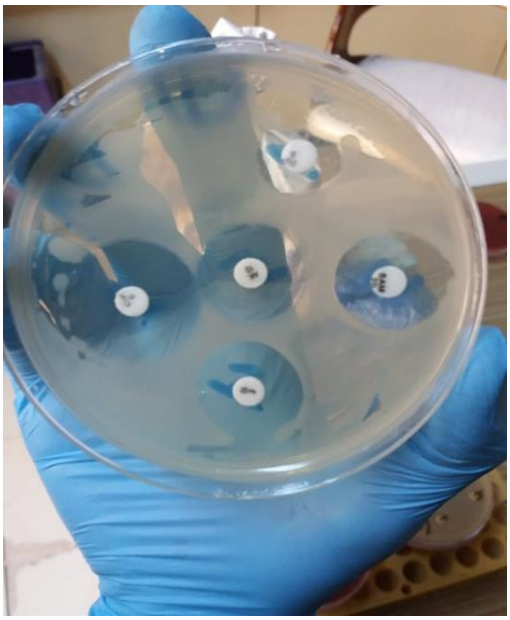


Fig.5. percentage of the Sources of wound infection

3.3 The antibiotic sensitivity test

As shown in figure 6 the most effective antibiotic to *E. coli* is Ciprofloxacin, Amikacin and Rifampicin) and to other bacteria too. The less effective antibiotic is Erythormycin. The reason for choosing five antibiotics for treating the wound infection was with the aim of identifying the extent of the impact of these different antibiotics on all study isolates regardless of age and to select the most effective antibiotics in preparation for obtaining the most effective antibiotic in treatment. Bacterial isolates against antibiotics were determined



Picture 1. Antibiotics sensitivity test on Mueller Hinton agar

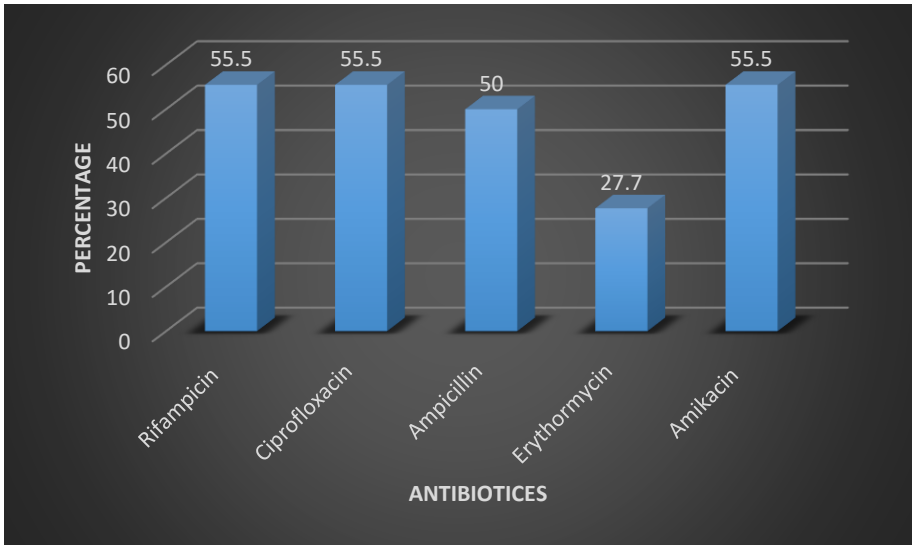


Fig. 6. percentage of effective antibiotic against isolated bacteria from wound infection

4. Discussion

The results of the current study were consistent with Arabishahi ,2006 who studied wound infections among patients, where it was found that (58.3%) of the infections were due to *E. coli* bacteria, due to the presence of special receptors from The type of glycolipids on the surface of the surgery is strongly correlated with E. coli by fimbriae, as the results were consistent with Pankey, 2004 who found that (48.4%) of injuries are due to these bacteria,

We note from the above that the increase in resistance to bacterial isolates may be due to the frequent random use of antigens as well as the possibility of bacteria acquiring the genetic factors that transmit the multiple resistance traits by conjugation**.**

Sujimoto et al .2018, description the following that we believe the peeling can be reduced by proper treatment with antibiotics, burned staph syndrome. Basically, children undergoing treatment for burns suffer from *Staphylococcus aureus* syndrome, and therefore it is difficult to control the entire body, including water management, if a patient with scaly burns, doctors must suspect the basic staples syndrome. Doctors need to prevent further skin peeling due to the early use of antibiotic treatment.

Elbur et al. 2013, reported that Most cases of wounds appeared in the current study after discharge, highlighting the need for a hospital observation program. Wound monitoring with phone calls indicates this parameter and can be used as an alternative method to diagnose wounds in the clinic.

Corcoran et al. 2017, reported that giving dexamethasone to surgical patients without a high risk did not increase the risk of wound infection or other adverse events up to 30 days, and it appears to be safe for patients with or without diabetes.

Wang et al .2016, reported that LPS treatment can reduce inflammation in a mouse model, and the optimal dose is 0.5 mg / kg / time, and at the same time, it does not harm organ function.. Saku et al. 2017, reported that the NPWT appears to be effective in treating a postoperative infection after restoring the Achilles tendon, even in cases of tendon loss.

Kowalewski et al. 2015, reported that the implanted gentamicin-collagenic sponge significantly reduces the risk of stroke wounds after heart surgery, with consistent evidence in randomized and observational data. However, the extent of this benefit may be mitigated in patients receiving internal bilateral thoracic artery grafting

Jarjis et al. 2016, Although additional studies are needed to reach final conclusions about the efficacy of honey, it is safe and, as shown in our case, under certain circumstances it is possible to reduce the need for surgical treatment of wounds and serve as a means of conventional treatment

the age factor consider The most important factors that play a large role in surgery infections and divide the groups of patients according to age groups into six groups (2 - 10 years), (12-20) (21-30), (31-40),(41-50) and (51-63) Infection into different age groups, the highest infection was in young (21-30) years The results of the current study begin in agreement with Mascio, 2007.

5 Conclusion

We found that most bacteria appeared is *E. coli* that is more infect than other types of bacteria in wound infection. In this case, the rate of infection was more in women (female) than man (male) in *E. coli* bacteria, also *E. coli* bacteria found in burns more than other types of wound and in this sample E. coli appeared in a burn of females more than males. From (5) types of antibiotics, the most effective antibiotics to *E. coli* were (Ciprofloxacin, Amikacin and Rifampicin) and to other bacteria too. The less effective antibiotic was (Erythormycin).

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