

# AEROBIC BACTERIAL INFECTION FROM PATIENTS WHOM INJECTED AS RESULT OF BULLET INJURY<sup>+</sup>

البكتريا الهوائية من المصابين نتيجة الطلق الناري

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## Abstract:

The present research aimed to study various types of bacterial species that are considered as a majority cause of contamination to person with bullet injury. One hundred-fifty-patient-injured aged from 20 to > 50 from both male and female. Swabs were taken from wound infection and cultivated on different types of bacteriological media in Microbiology department. Baiker-Al-hakium-teaching Hospital (the old name AL-Nooor), Al-yarmok teaching Hospital, Al-Karkh teaching Hospital. Patient have no bacterial species in injured bullet. In time = zero, in time (1) = after 4-7 days from separation process of bullet bacterial culture lead to isolate either two bacterial spp from one patient or only one spp. The results reveals isolation of *Pseudomonas aeruginosa* in high rate, from all eighty patients, staphylococcus aureus from thirty patients, *Escherichia coli* from twelve patients, *Proteus spp* from ten patients and *Klebsiella spp* from eighteen patients. The present study show that the bullet or its particles have ability to penetrate the tissue and remains and the contamination resulted was not from the bullet only but also due to bullet particle like (jacketed).

Isolation of *S. aureus* together with *Pseudomonas auroginosia* (20 cases) *E.coli* together with *Klebsiella* (15 cases) and *E-coli* together with *P.aeruginosa* (5 cases).

Anti-microbial susceptibility test for both Gram-positive bacteria and Gram-Negative bacteria with more emphasis to the third generation Cephalosporines like Cefotaxime (claforan) and Cefixime for G +ve bacteria and Ceftazidime (fortum) and Cefoperazone for G-ve bacteria was done and the most effective antimicrobial agents were Erythromycin, Ampicillin, Penicillin, Gentamycin, Chloramphenicol, Amoxicillin, cephalexin, Rifampicin, Tetracycline, Neomycin.

## المستخلص:

البحث يهدف الى دراسة أكثر الأنواع البكتيرية شيوعا والتي تعتبر المسبب الرئيس للتلوث في الأشخاص المصابين بالجروح الناتجة عن الطلق الناري من خلال دراسة 150 مائة وخمسين مصابا بالطلق الناري تتراوح أعمارهم من اكثر من عشرين سنة والى اقل من خمسين سنة ومن كلا الجنسين اخذت المسحى من المنطقة المصابة وتم زرعها على أوساط زرعيه مختلفة في المختبرات التعليمية

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لمستشفيات، باقر الحكيم (النور سابقا) ومستشفى اليرموك التعليمي ومستشفى الكرخ العام وقد وجد ان المنطقة المصابة بالطلق الناري بعد ازالة الطلقة مباشرة والمسماة (T=0) , لا يوجد فيها اي نوع من التلوث البكتيري اما في (T=1) اي بعد مرور وقت من ازالة أو استخراج الطلقة والمتضمن (٢-٧) أيام فما فوق فقد تم عزل نوعين من الجراثيم او نوع واحد من نفس المريض وقد تم عزل *Pseudomonas aurogenosa* بنسبه عاليه من (٨٠) مريضا و *Staphylococcus aureus* من (٣٠) مريضا و *E.coli* من (١٢) مريضا و *Proteus* من (١٠) مرضى و *Klebsiella spp* من (١٨) مريضا وقد تبين ان الطلقة او اجزائها لها القدرة على البقاء وان التلوث الناتج ليس من وجود الطلقة بمفردها بل من وجود اجزائها ايضا. كذلك تم عزل *Pseudomonas aurogenosa* مع *Staphylococcus aureus* (٢٠) حالة ، *E.coli* مع *Klebsiella spp* (١٥) حالة ، *E.coli* مع *aurogenosa* حالات (٥) , ثم اجراء فحص الحساسية للجراثيم السالبة والموجبة لصبغة غرام باستخدام مضادات حيوية مختلفة مع التركيز على الجيل الثالث من السيفالوسبورين (كلافوران) وتبين ان اكثر المضادات الحيوية فعالية هي Cefxtizoxime للجراثيم الموجبة و Ceftazidime (fortum) و Cefoperazone للجراثيم السالبة ويليه

Erythromycin, Ampicillin, Penicillin, Gentamycin, Chloramphenicol, Amoxycillin, Cephalixin, Rifampicin, Tetracycline, Neomycin.

### Introduction :

A wound is the result of physical disruption of the skin and one of the major problems to establish the infection by bacterial pathogens in internal and superficial tissues, when bacteria breach this barrier, infection can result. Wound infections can be classified into 2 major categories; skin and soft tissue infections, Although they after overlap as a consequence of disease progression [1,2]. World War I (WWI) resulted in new types wounds from high-velocity bullet and shrapnel injuries coupled with contamination by the mud from the trenches, Each bullet keeps a diary in its own way of where it has been and what it has done now you understand the function of a bullet, many of these changes become easy to interpret.

The jacket of bullet stop in the such cutaneous tissue and the bullet will continue to penetrate so that the wounds break the continuity of this skin and allow organisms to gain access to tissues and cause infection. wound infection result from bullet-injury due to deposition and multiplication of microorganisms and many of different ways can get into wounds.

1-Direct contact-transfer from surgical equipment or the hands of the surgeons or nurses.

2-Airborne dispersal-surrounding air contaminated with microorganisms that deposit onto the wound.

3-Self-contamination-physical migration of the patients own endogenous flora which are present on the skin, mucous membranes(mucosa)and gastrointestinal tract to the surgical site [3,4].So we aimed to Isolation and identification of bacteria responsible for wound bullet contamination, and study the Antimicrobial susceptibility test to give a more suitable antimicrobial agent.

### Materials and methods :

**Patients:-**

one hundred and fifty patients with restricted injury by bullet and one hundred and thirty underwent surgical treatment (bullet in internal tissue when it stability or fixedness) were enrolled in this study during 3-years period from August 2006 to April 2009 in [AL-Yarmouk.AL-Karkh and Baiker-AL-Hakium] teaching hospitals. All patients-injury presented signs and symptoms indicative of surgical wound infections .Patients age range between (+20to>50)from both sexes .

**Materials:-**

Antibiotic discs AL-Razi center for research and medical diagnostic products(Iraq)different antimicrobial agent were used in this study as the following Erythromycin(E15mg/ds),Ampicillin(AMP10mg/ds),Gentamycin(GM10mg/ds),Chloramphenicol(C30mg/ds),Amoxycillin(AMX10mg/ds),Cephalexin(KF30mg/ds),Rifampicin (RA5mg/ds),Tetracycline(TE30mg/ds),Neomycin(N30mg/ds),Nalidixic acid(NA30mg/ds)Nitrofurantion(FT30mg/ds),Cefotaxime(CTX30mg/ds),Ceftazidime (CAZ30mg/ds),Ceftriaxone(CRO30mg/ds).

**Sampling:-**

wound swabs were collected under septic condition after drawing out the bullet, and another swab from the same patient after 4-7 days as reclining in surgical unite of hospital and transfer immediately to the laboratory .Note (all swabs were collected should be in duplicate one for direct exam and anther for culture on different media (MacConky's agar, blood agar Nutrient agar, Mannitol Salt agar and incubated aerobically ,isolation and identifications of Gram +ve bacteria and Gram -ve bacteria were carried according to routine laboratory technique .

**Biochemical Test:**

**Catalase test** according to [5],**Coagulase test (slide processes)0**,**Growth on Mannitol salt agar** ,according to [6]Set of sugar,Indol test [6,7] ,Citrate utilization test [8,9 ,10 ,11], Kligler Iron [10,12],Urease test. [5], Oxidase test[7].

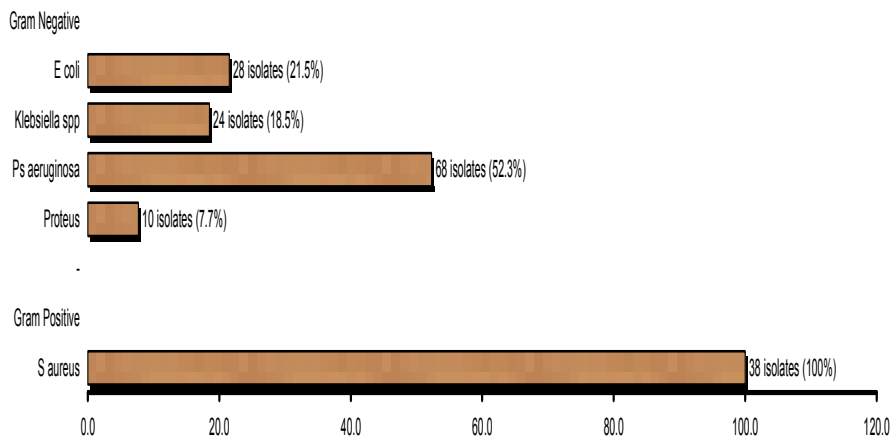
**-Sensitivity to antimicrobial agent:**method was done according to modified Kirby-Bauer method [13].

**Results :**

All one hundred and fifty patient's have been classified into 2 groups as follow  
 $T_0$  = Time zero(i.e) primary swab taken from wound directly after drawing out the bullet cultured on different media like Blood agar , MacConky's agar , Nutrient agar , all these swabs have shown, Negative growth culture , after (4-7) days from drawing out the bullet that what's called it  $T_1$  = Time one , duplicate swabs were taken from each patient , first for direct examination and the second for cultivation , five species of bacteria have been isolated from one hundred and thirty patients, ninety-two patient's with one isolate (70.8%), thirty-eight patent's (29.2% ) with mixed bacterial infection and no bacterial growth was identified in the wounds twenty patients the aerobic bacterial spp isolated were illustrated in table (1).

**Table(1)Type number and percentage of different bacterial spp. Isolated aerobically from bullet injury after 4-7 days .**

Bacteria spp.	NO of isolates	%
<i>Staphylococcus aureus</i>	38	100
<i>Pseudomonas aeruginosa</i>	68	52.3
<i>Escherichia coli</i>	28	21.5
<i>Protus spp</i>	10	7.7
<i>Klebsiella spp</i>	24	18.5



**Fig. (1)Bacterial spp and their percentage .**

patients with one isolate (70.8%) and the rest 38 (29.2%) with two isolates . The results showed that bullet injury found in both sexes and the workers are the more persons injected with bullet (43.8%) followed by employee (23.1%) then student ( 20.8%) finally teacher , farmer and house keeper as (6.2% , 5.4% )and (0.8%) respectively,one hundred and thirty patients with bullet injury their mean age  $29.19 \pm 10.31$  ranging from (14-64), twenty females (15.4%) with mean age  $33.00 \pm 11.81$  ranging from (17-55) and one hundred and ten males (84.6%) with mean age  $28.50 \pm 9.92$  ranging from (14-64).

**The role of the bullet:**

various shapes or patterns and size of the bullet lead to more rupture of soft external and eternal tissue and more contamination by the mud from the environment picture (1) shows various shape & size of bullets) .



Picture(1) shows various shape & size of bullets in 1.20MB.

### **Sensitivity test to Antimicrobial agent:**

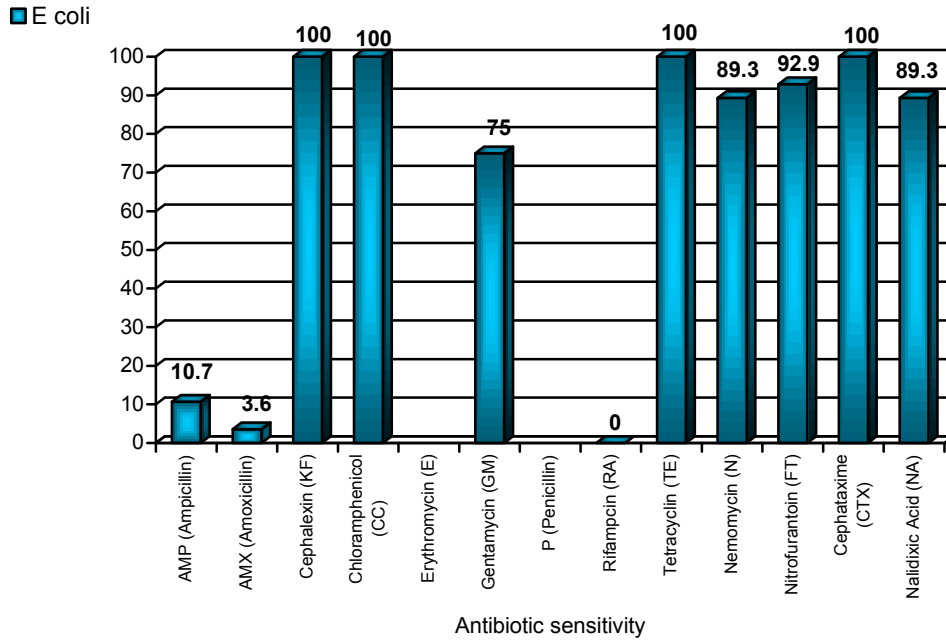
the antimicrobiotic sensitivity pattern of *Escherichia.coli* is shown Fig(1) it showed complete sensitivity to Cephalexin ,Chloranphenical, Tetracycline and Cephataxime as (100%) ,were less extent sensitive to nitrofurantoin (92.9%) Nalidixic acid and Neomycin( 89.3%) , Gentamycin (75%) while E. coli showed high resistance to Ampicillin and Amoxcillin (10.7% , 3.6% )respectively .

Fig(2) shows the sensitivity pattern of *Klebsiella spp* to Cephalexin, Chloramphenical , Tetracycline, Nitrofurantion, Cephataxime (100% ) but *Klebsiella spp* shownpear highly resistance to Gentamycin (41.7%) , Neomycin (12.5%) and Nalidixic acidand Ampicillin (8.3%)respectively .

Fig(3) shows the sensitivity pattern of *Pseudomonas aeruginosa* to Neomycin(100%)then Nitrofurantion ( 92.6%) and were less extent sensitive to Tetracycline (82.4%) Amoxicillin (64.7%) Gentamycin ,Nalidixic acid (58.8%) Cephataxim (52.9%) while complete resistance to Ampicillin (0%) Cephalexim (2.9% )and Rifampcin and Chloramphenical (10.3%) (27.9%) respectively.

*Proteus* is shown in Fig (4) it demonstrated complete sensitive of Chloramphenical 100% then Tetracycline (90%) and were less extent of sensitive to Cephalexin, Gentamycin and Cephataxime (80%) Nalidixic alid (60%) while resistance to Nitrofurantion (40%) Neomycin, Rifampcin (10%) and resistance to Ampincillin and Amoxcillin (0%) .

In Fig (5) *Staphylococcus aureus* were sensitivity to Nitrofurantion( 100%) ,Cephalexin (92.1%) Chloramphenical (78.9%) Rifampcin (65.8%) and Ampicillin (57.9%) while resistance to represented by Nalidixic acid,Neomycine ,pencillin and Gentamycin (0%) Amoxicillin(10.5%) Erythromycin (15.8%) ,Cephataxime (18.4%) and finally Tetracyclin (26.3%).



Fig(1) Antibiotic sensitivity pattern for *E.coli* isolated from bullet injury.

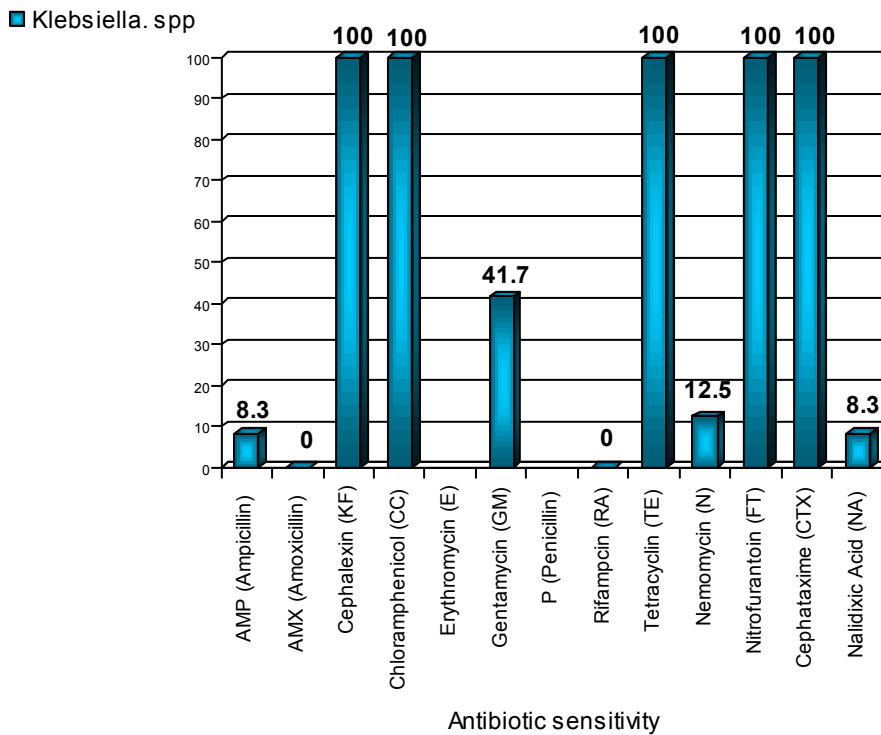


Fig (2) Antibiotic sensitivity pattern for *Klebsiella spp* isolated from bullet injury.

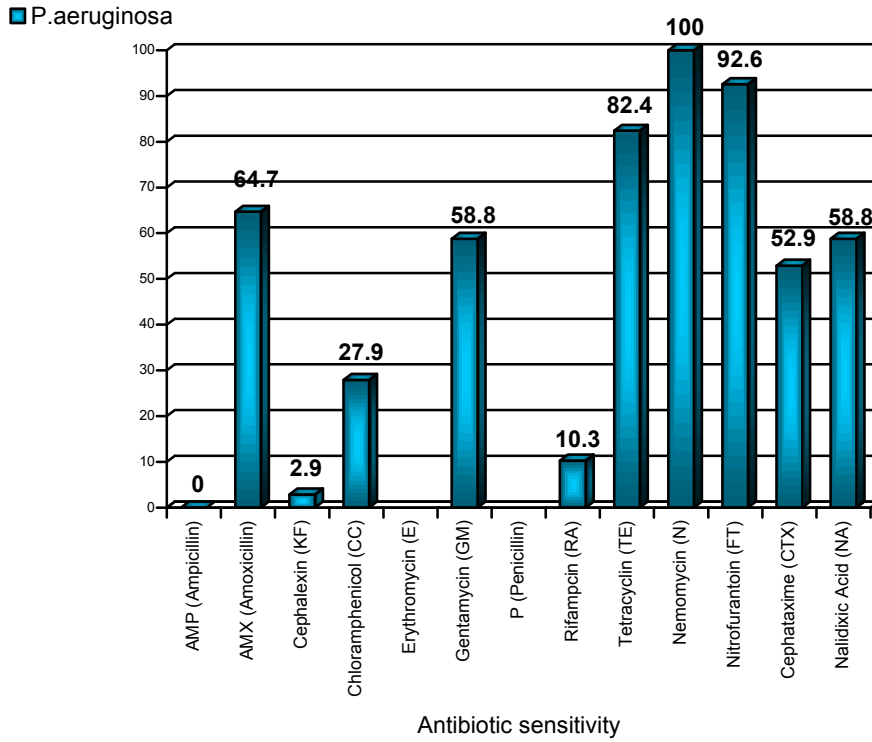


Fig (3) Antibiotic sensitivity pattern for *P.aeruginosa* isolated from bullet injury.

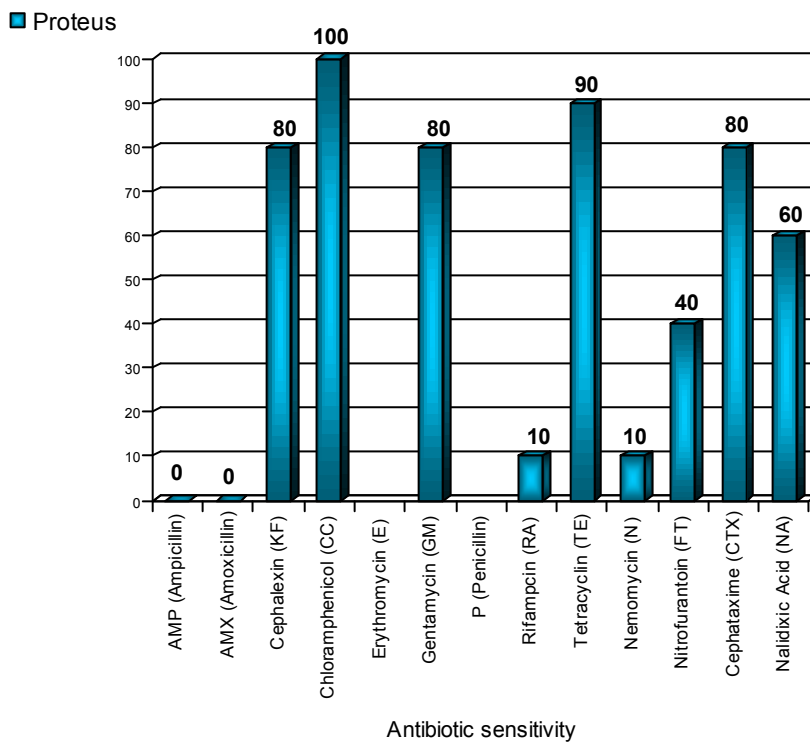


Fig (4) Antibiotic sensitivity pattern for *Proteus* isolated from bullet injury .

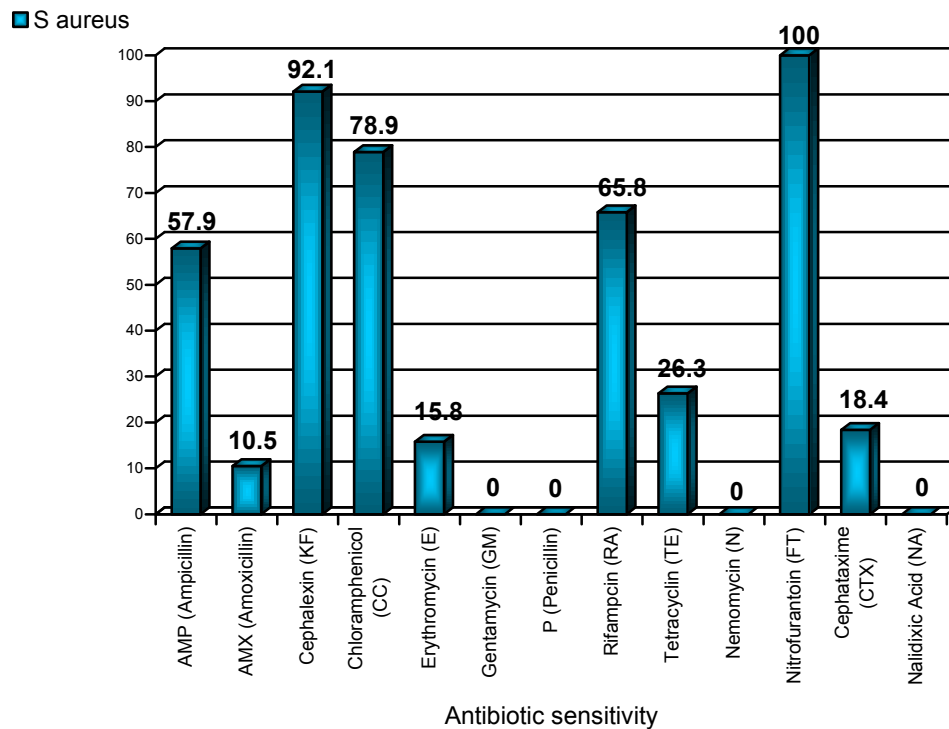


Fig (5) Antibiotic sensitivity pattern for *S.aureus* isolated from bullet injury.

### **Third generation cephalosporin antimicrobial agent:**

Cephalosporin are the most frequently prescribed class of antimicrobial agent .They are structurally and pharmacologically related to the penicillin , like the penicillin, cephalosporin have – beta – lactam ring structure that interferes with synthesis of the bacterial cell wall and so they are bactericidal [kill bacteria] .Cephalosporins will disrupt the synthesis of the peptidoglycan layer of bacterial cell walls , which causes the walls to break down and eventually the bacteria die .Third generation Cephalosporin as ceftazidime , was highly active against of *Staph.aureus* isolates (60%) were sensitive to it (33.3%) , *E. coli* isolate and *eighteen Klebsiella* isolate were (100%) sensitive, ten isolates of *Proteus* were sensitive (80%) while fifty isolates of *P.aeruginosa* ( 96%) were sensitive.The sensitivity pattern of ceftriaxon against different bacterial spp was as follows of staph aureus isolates (66%) .

*E-coli* isolates (83.3%) *Proteus spp*(70%) *Klebsiella spp*(83.3%) finally fifty *P.aeruginosa* (90%) ,83% *Staph.aureus* isolate were sensitive to cefataxime . For twelev *E.coli* isolate and *Proteus sp p*(90%) sensitive , *Klebsiella* were found (94.4%) sensitive finally *P.aeuroginosa* isolate (92%) were sensitive .

### **Discussion:**

one hundred and fifty patients with bullet have been imprinted in tissue of patients that lead to broken of soft tissue. Bullet have great active processes to damage injured area what called it a wound infection to further defined as, superficial incisional SSI-infection involves only skin and subcutaneous tissue of incision,that lead to arising path ways for depositional multiplication of



microorganisms to be creation of wound infections, bullet and its particles as result of high-velocity and shrapnel injures with contamination by dust, mud and clothes ,as well as direct contact-Transfer from surgical equipment or the hands of the surgeons or nurses as poor surgical technique and finally patient hospilization[14]. Now you understand the faction of a bullet many of these changes become easy to interpret , the bullet base contain irregular dimples marring the pressure delivered there in its acceleration , these may give a clue to the injury rendered for that the surgical pathology description would give dimensions as measured shape and appearance of surface ,photography will be valuable when analysis of the bullet lead is necessary but a copper jacket is present , the copper may be most efficiently removed without contamination of the lead by use concentrated nitric.

All these bullet particles have effective role in contamination with in soft tissue area even if an exit wound is present a search for bullet fragments or jacket [ the jacket stops in the subcutaneous tissue while the bullet will continue to penetrate will be form a good inhabitant for growth of bacteria as observed in our present survey study have been recorded in 130 patients.

The infection was resulted from self-contaminations physical migration of the patients own endogenous flora which are present on the skin, mucous membranes or gastrointestinal tract to the surgical site and this was in agreement with (the Newzeal and Dermatological society incorporated web.site.).

Most studies showed that *Pseudomonas aeruginosa* and *Staphylococcus aureus* with same degree of isolation were the most common pathogen with high morbidity and mortality rates may occurs after (4-10) days in all age groups[15,16]. The disseminative of *Staphylococcus occur* as primary diseases focus or as initiating disease so it could reach bone by blood stream and cause Osteomyelitis [17].In this study 130 wound isolates, only *Pseudomonas aurogenosa* have been found about (68 isolate) (52.3%) and also *Staphylococcus aureus* (38 isolate) (100%) was the most common cause of wound infection followed by *E-coli* (28 isolates) (21.5%), *Klebsiella spp* (24) (18.5%)*Proteus* (10) 7.7%.The pathogenicity of *Staphylococcus aureus* depends on their capacity for rapid multiplication and rapid spread through tissues and also production of a wide range of enzyme and toxins[18],such as hyaluronidase and possibly staphylokinase facilitated dissemination by their enzymatic break down of connective tissue ground substance and fibrin clots respectively [19,20], as well as production of protective glycocalyx coating protein called be adherence to smooth surfaces[21,18]

Resistance is an emerging problem making therapy difficult day by day and the resistant organisms were increasingly reported from various parts of the world. The susceptibility test suggests that multidrug resistance also a common problem in hospital pathogens for example bullet – wound injury isolates which were found to be resistant to Rifampcin. Ampincillin. Gentamycin ,Neomycin and Nalidixic acid, for thus can use Cephalexin. Chloramphenicol. Tetracycline, and Cephataxims so a combination of these drugs was the definitive treatment .

Ceftazidime has broad spectrum activity against Gram – positive of Gram – Negative bacteria , unlike most third generation agents , it was active against *Pseudomonas aeruginosa* and Gram – positive microorganism .

The present study showed that the bullet or its particles have ability to enter or penetration in to tissue and remains with its particles (jacketed), so that a search for bullet fragment or jacket material should be done because each particles of bullet could be a causative agent for contamination .

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