



Evaluation of Antibiotics Activity among Hospitalized Patients in Iraq

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Authors' contributions

This work was carried out in collaboration between both authors. Author OJF designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author RTN managed the analysis of the study and literature searches proofreading. Both authors read and approved the final manuscript.

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ABSTRACT

Objectives: The study was conducted to evaluate the activity of different antibiotics used for various diseases and compare between their different effects among hospitalized patients.

Study Design: Randomized prospected clinical study.

Place and Duration of Study: It was carried out in Al-Zahraa Teaching Hospital and Al-Sader medical city, Iraq/Al-Najaf Town. The present study began at November 2017 and end at December 2018.

Methodology: Sample of 100 patients in Al-Zahraa teaching Hospital and al-Sader Medical City, was randomly collected 90 cases in Al Sader Medical City (35 cases of medical ward and 55 cases from Surgical ward). We collected 10 medical condition in Al-Zahra Teaching Hospital from Gynecological and obstetric ward in random manner.

Results: The results of present study reveal a significant difference between ceftriaxone and ceftazidime and meropenem in treatment intraabdominal operations infection (appendectomy and cholecystectomy) , the results of present study show that 70% of patient used ceftriaxone for treatment of appendectomy and only 30%of patients used ceftazidime for this condition so there is a significant difference between these two antibiotics (P-value less than 0.05) and only 10% of

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patients used meropenem (P-value less than 0.02). Other result of present study show significant difference in use meropenem over ceftriaxone in treatment diabetic foot ulcer(60% rate use meropenem over ceftriaxone 40%), in acute kidney injury, there's very high difference in use meropenem 80% versus 10% of vancomycin use (P-value 0.1).

Conclusions: From current study we concluded that the antibiotics used greatly in surgical ward of Hospital followed by medical ward , in addition to that antibiotics used in postoperation are more effective than those used in medical ward , so there are a significant differences obtained among antibiotics used in surgical ward.

Keywords: Ceftriaxone; vancomycin; appendectomy; diabetic foot; activity.

1. INTRODUCTION

Antibiotics also named antibacterial, are a type of antimicrobial agents [1]. They are used in prevention and treatment of bacterial infections [2-3]. They act either by kill or inhibit the growth of bacteria. A small number of antibiotics also have antiprotozoal activity [4-5]. Antibiotics have not activity against viruses such as the influenza or common cold; agents which effective against viruses are called antiviral agents or antivirals rather than antibiotics. Almost the term antibiotic (which means "opposing life") is refer to any substance used to irradiate microbes [6] synonymous with antimicrobial [7]. Some sources differentiate between antibiotic and antibacterial; antibacterial are used in disinfectants and soaps, while antibiotics are used as drug [8]. Antibiotics revolutionized drugs in the 20th century [9]. However, their easy access and effectiveness have also contribute to their overuse [10-12]. Prompting bacterial resistance develop [13]. This has led to common problems. World Health Organization classify antimicrobial resistance as a "serious threat which is happening right now in every area of the world and has the potential to influence anyone, at any age, in any country"[14]. Antibiotics are indicated to prevent or treat bacterial infection [15] and in many cases protozoan infections (Metronidazole is very effective against a number of parasitic infections). When an infection is suspected that responsible for illness but the causative pathogen has not been identified, an empirical therapy is indicated [16] Antibiotics may be used as a prophylactic and this is usually restricted to at-risk people such as immunocompromised patients (specially in HIV cases to prevent pneumonia), also patients taking immunosuppressive drugs, patients with cancer and those having surgery. The role of antibiotics in surgical procedures is to prevent infection of incisions [17-19]. Antibiotics are checked for any harmful effects before used clinically, and are

usually considered well tolerated and safe. However, some antibiotics have been linked with a wide range of adverse effects starting from mild to very severe based on the microbes targeted, the type of antibiotic used, , and the patient [19-20]. Side effects may reflect the toxicological or pharmacological characteristics of the antibiotic or may involve allergic or hypersensitivity reactions. Adverse effects begin from nausea and fever to major allergic reactions, including anaphylaxis and photo dermatitis [21].

2. MATERIALS AND METHODS

2.1 Patients

This is randomized prospective clinical trials study, it was carried out in November 2017 in Al-Zahraa teaching Hospital and Al-Sader Medical City Present study covered three main wards of the hospital (Surgical ward, Medical ward ,Obstetric ward) .Al-Zahraa teaching Hospital and Al-Sader Medical City are the only teaching hospitals in al Najaf and considered two of the biggest medical school in al Najaf in Iraq.

2.2 Inclusion and Exclusion Criteria

2.2.1 Inclusion criteria

Include the patients that admitted to hospital and diagnosed with serious infections , such patients suffered from (pneumonia, bronchitis , productive cough , acute kidney injury) also the patients subjected to surgery and there is evidence of infections such as (appendectomy, cholecystectomy lipomectomy, tonsillectomy, caesarean section and diabetic foot ulcer amputation)

2.2.2 Exclusion criteria

Patients admitted to hospital due to cardiovascular diseases without serious infection

conditions, patients who discharged from hospital without complete their antibiotic medicines course.

2.3 Sampling

The sample of study include 100 patients who admitted to hospital with serious of infections or evidence of infections.

2.4 Data Collection

The method of collecting information based on direct interview(patients) in Al-Zahraa teaching Hospital and Al-Sader medical city (surgical ward ,and also in medical ward) and, the source of information was orders of the patients , and also from patients relatives , as well as information from clinical pharmacists , the data collection occur in most days of week.

2.5 Questionnaires

These include direct interview by asking the patient or relative the following questions(previous diseases , medications taking in the past , past surgical procedure , present health problem , type of antibiotics taking , duration of taking antibiotics , which antibiotics give more effect.

2.6 Statistical Analysis

Statistical analysis were performed using SPSS 16.0 .An expert statistical advice was consulted for tests used .Data of quantitative variables were expressed as mean \pm SEM . Differences between each pair were compared using paired-sample Student's t-test in addition to use Microsoft Office Excel 2007 .In all tests, P-value less than 0.05 was considered to be statistically significant.

3. RESULTS AND DISCUSSION

Antibiotics taking before contamination of previously uninfected fluid or tissue are considered prophylactic. The aim of use prophylactic antibiotic are to prevent infection of surgical site from occurring .Prophylactic antimicrobials were chosen based on the type of surgical procedure, typically antibiotics acting on gram positive are included in the choice of surgical prophylaxis, because of organisms such as Staphylococcus epidermidis and

Staphylococcus aureus are common skin flora , in conditions where broader gram negative and anaerobic coverage is required, the anaerobic cephalosporin such as cefoxitin or cefotetan, are needed [22]. In figures number [15-16]. There's significant difference in use of third generation cephalosporin versus meropenem as prophylaxis in cases of intra-abdominal operations such as appendectomy and cholecystectomy , this is finding in agreement with study [23].This study said that because of its activity against pathogens resistant to other agents, the overuse of meropenem should be avoided, to reduce the potentialResistance. In figure number [17]. There is significant difference in use of meropenem versus ceftriaxone in diabetic foot ulcer, this is finding was in agreement with study [24] state that Enterobacteriaceae (particularly Enterobacter spp., Escherichia coli, Proteus spp., Klebsiella spp. and P. Aeruginosa) .Soft tissue and Complicated skin infections commonly associated with P.aeruginosa include infections of lower extremity (specially in patients with comorbidities such as diabetes or vascular insufficiency, chronic renal disease, surgical wound infections and diabetes or other immunocompromising diseases. Rapid development of resistance triggered by extended-spectrum β -lactamases among organisms like Klebsiella pneumonia. .In figure number [18] there was a significant difference in use of gentamicin versus ceftriaxone in patients subject to ceasarian sections, this is finding in agreement with Study [25] which state that gentamycin when use prophylaxis has lower cumulative occurrence of infection to surgical site when use in single dose preoperatively as compared to multiple doses of ceftriaxone. Previous studies have reported that there is no added benefit of using multiples doses over single dose of antibiotics for prophylaxis of surgical site infection .The patient management for postoperative intraabdominal infections is associated with the antibiotic administration. Although the role of postoperative antibiotics in reducing infection is still debatable, some studies show that antimicrobial prophylaxis should be considered due to reducing the morbidity related to infections (prolonged length of stay, readmission, and reoperation) [26]. Clinical practice guidelines of the American Society of Health-System Pharmacists (ASHP) stated that antimicrobial prophylaxis should be given before and after appendectomy. The antibiotic prophylaxis was identified as an effective intervention to prevent surgical site infections (SSIs) compared with placebo for patients who

received appendectomy [27]. Several investigations have showed that preoperative prophylactic antibiotics are recommended for reducing postoperative infections or complications. Furthermore, it is strongly suggested to use broad-spectrum postoperative antibiotics, especially for appendicitis with perforation, for at least 3-5 days to reduce SSIs rate [28]. There are several antibiotics recommended for appendectomy, such as second or third-generation cephalosporins. To prevent the infection related to appendicitis, a third-generation cephalosporin antibiotic (ceftriaxone, cefotaxime) can be administered alone or in combination with metronidazole [26]. This hospital does not have official guideline for antimicrobial prophylaxis. Therefore, the physicians used many antibiotics (single or combination) as prophylaxis following a postoperative appendectomy based on literatures and experience. For instance, cefotaxime, ceftriaxone, gentamycin, cefotaxime-metronidazole - ceftazidime, cefotaxime-metronidazole - ampicillin, cefotaxime-erythromycin - ampicillin, ceftaxime-metronidazole and ceftriaxone-metronidazole. However, the most commonly prescribed antibiotic combination for pediatric patients with perforated appendicitis are cefotaxime-metronidazole and ceftriaxone-metronidazole. In this study, other prophylactic antibiotics are excluded since their costs were not comparable because of less prescription. Several RCT studies performed by Andersen [29] and Helmer [30] have evaluated antibiotic prophylaxis for appendicitis. Most commonly used antibiotics were cephalosporins, particularly third-generation cephalosporins, such as cefotaxime and ceftriaxone, which effectively reduce postoperative SSI rates by <5%. However, when cefotaxime or ceftriaxone was combined with metronidazole, the postoperative SSI rates were reduced to 3%. Previous studies also found that

these combinations are effective against most aerobic and anaerobic organisms, reduce the rate of sepsis after appendectomy, and are more cost-effective compared with other regimens [28,31]. A study about interchange program of ceftriaxone/cefotaxime showed that both ceftriaxone and cefotaxime have equal microbiological and clinical efficacy. It was also found that ceftriaxone appeared to be cost-effective alternative to cefotaxime in this hospital. However, despite their efficacy, both of these antibiotics have considerably different pharmacokinetic properties (half-life and elimination routes). The efficacy of empirical monotherapy with meropenem in hospitalized patients with diabetic foot infections has been assessed in several comparative clinical trials. Patients with infections of varying severities were included in these trials; for ease of understanding, they have been divided into moderate, moderate to severe and severe categories. All studies were multicentre and randomized, and 1 trial was double-blind [32]. Although most clinical studies recruited patients with intra-abdominal infections only, 3 trials also included patients with other infection types [33-35]. Patients with moderate to severe infections were those with more difficult-to-treat infections, including lower bowel traumatic perforations and infections arising from previous surgery. These infections were usually community acquired (77 to 96%) [33,34,36]. Patients with severe infections were generally in intensive care and had difficult-to-treat infections which were often nosocomial or hospital acquired. Mortality rates in trials of patients with moderate to severe infection varied from 1 to 10%; [37,32,38,36,39,40] higher rates (16 to 28%) were reported in trials that recruited patients with more severe infections [33-35]. Meropenem was administered intravenously generally at a dosage of 1g every 8 hours in patients with moderate to severe infections for a duration of 5 to 10 days. A

Table 1. Mean age , Weight , Height among patients with appendectomy , cholecystectomy , chest infection , diabetic foot , caesarean section , lipomectomy , tonsillectomy , acute renal failure

Disease	Age(years)	Weight(kg)	Height(cm)
Appendectomy	60.5	73	156
Cholecystectomy	58	80	154
Chest infection	55	76	162
Diabetic foot	57.5	72	164
Caesarean section	54.5	82	158
Lipomectomy	50	74	170
Tonsillectomy	53	68	152
Acute renal failure	62	78	160.5

lower dosage of 0.5g every 8 hours was used in [32,38]. Most patients underwent surgery in 2 trials of patients with moderate infections in conjunction with antibacterial therapy.

A comparison between different diseases among study population

Table 2. Relation between every two conditions in respect to significancy

Conditions	P-Value
Appendectomy & Acute Renal Failure	Significant
Appendectomy & Tonsillectomy	Significant
Appendectomy & Caesarean Section	Significant
Appendectomy & Diabetic Foot	Significant
Appendectomy & Lipomectomy	Significant
Appendectomy & Chest Infection	Non Significant
Chest Infection & Tonsillectomy	Significant
Chest Infection & Caesarean Section	Significant
Chest Infection & Diabetic Foot	Significant
Chest Infection & Lipomectomy	Significant
Chest Infection & Acute Renal Failure	Significant
Cholecystectomy & Diabetic Foot	Significant
Cholecystectomy & Acute Renal Failure	Significant

A comparison between different antibiotics among different diseases

Table 3. Relation between antibiotics used for each disease in respect to significancy

Diseases	Antibiotics	P-Value
Appendectomy	Ceftriaxone & Ceftazidime	Significant
Chlecystectomy	Ceftriaxone & Cefotaxime	Significant
	Ceftriaxone & Meropenem	Significant
	Cefotaxime & Meropenem	Non significant
Chest Infection	Ceftriaxone & Cefotaxime	Non significant
	Ceftriaxone & Vancomycin	Significant
	Ceftriaxone & Azithromycin	Significant
	Cefotaxime & Vancomycin	Non significant
	Vancomycin & Azithromycin	Non significant
	Cefotaxime & Azithromycin	Significant
Diabetic Foot	Meropenem & Ceftriaxone	Non significant
Caesarean Section	Gentamycin & Ceftriaxone	Significan
	Gentamycin & Amoxicillin	Significant
	Ceftriaxone & Amoxicillin	Non significant
Lipomectomy	Ceftriaxone & Cefotaxime	Significant
Tonsillectomy	Amicillin + Cloxacillin & Ceftriaxone	Non significant
Acute Renal Failure	Meropenem & Vancomycin	Significant

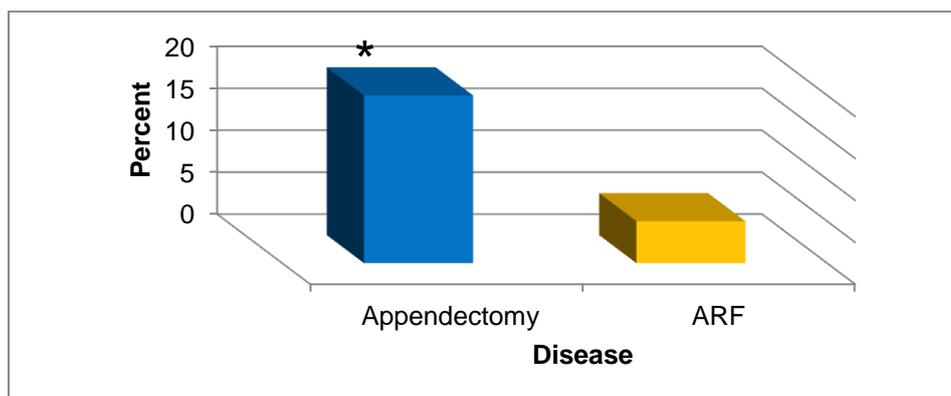


Fig. 1. A comparison between appendectomy and acute renal failure among study population demographic distribution among different diseases

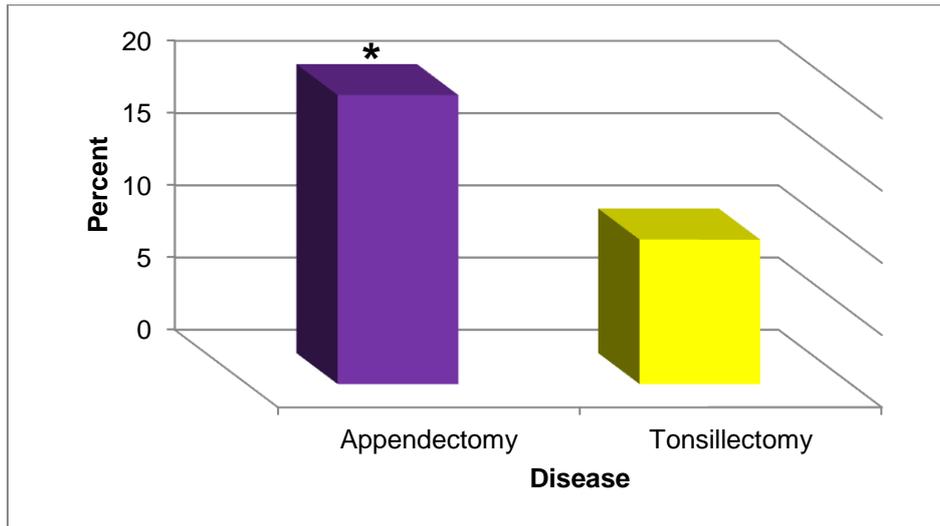


Fig. 2. A comparison between appendectomy and tonsillectomy among study population

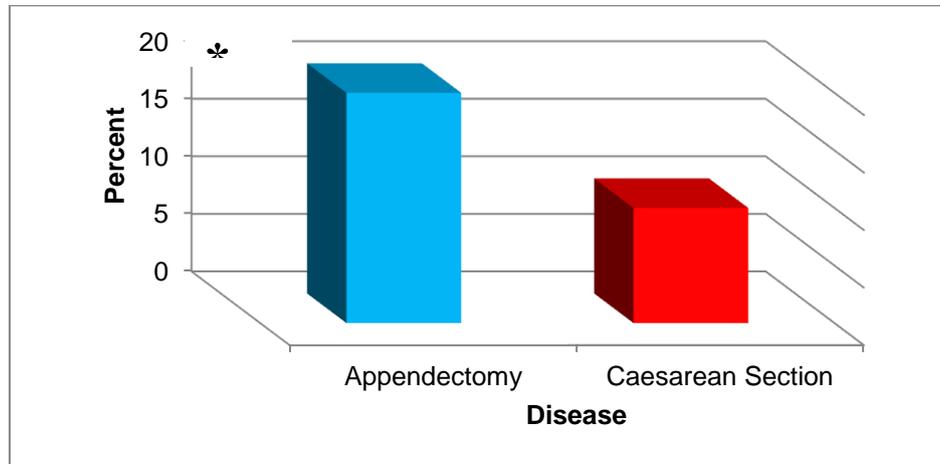


Fig. 3. A comparison between appendectomy and caesarean section among study population

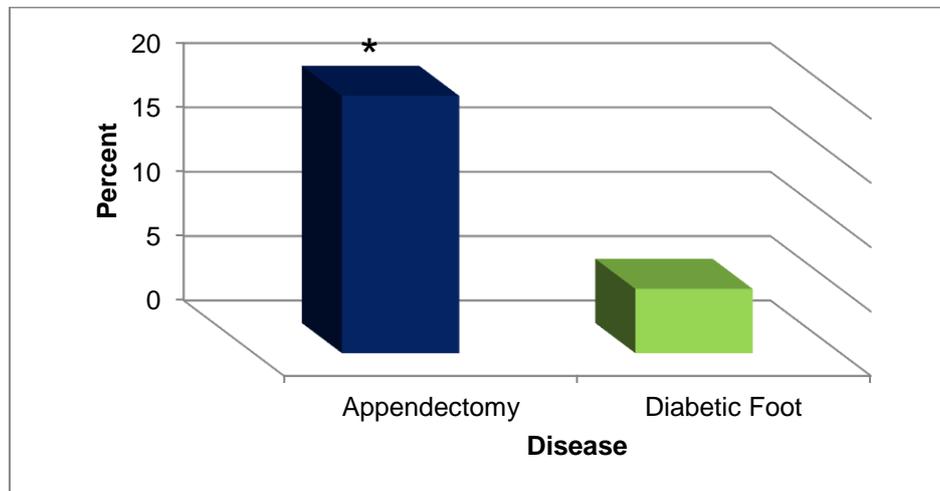


Fig. 4. A comparison between appendectomy and diabetic foot among study population

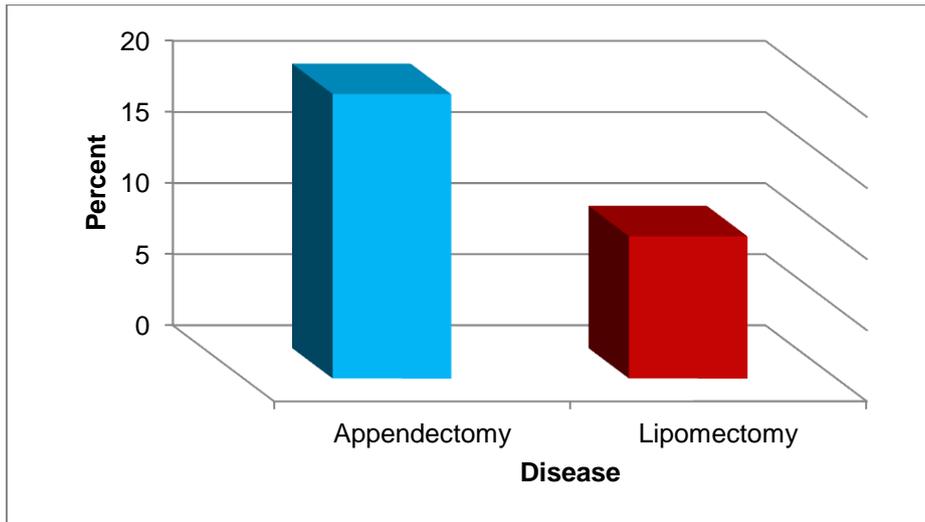


Fig. 5. A comparison between appendectomy and lipomectomy among study population

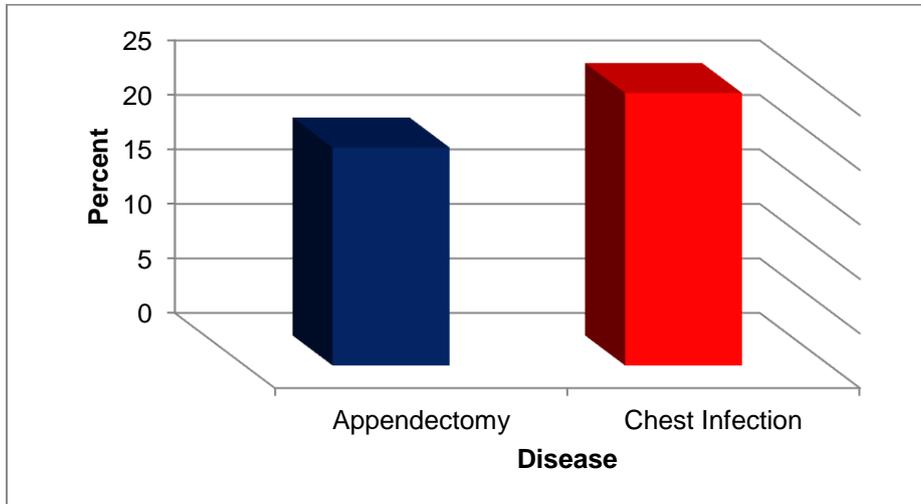


Fig. 6. A comparison between appendectomy and chest infection among study population

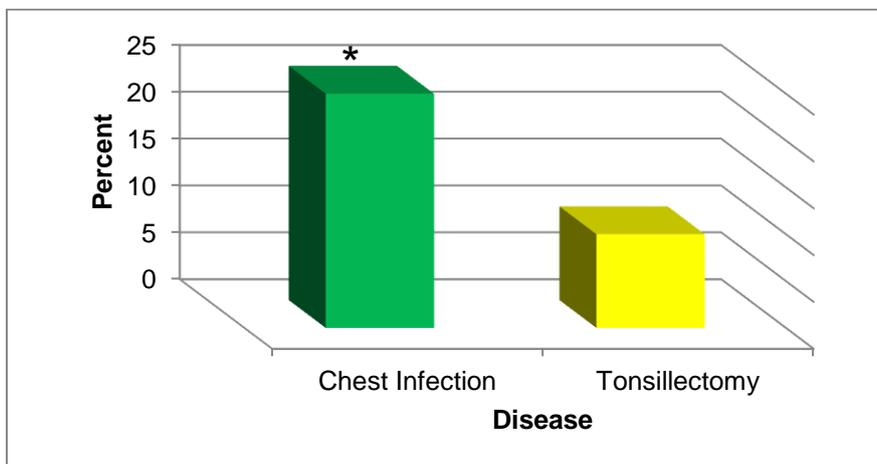


Fig. 7. A comparison between chest infection and tonsillectomy among study population

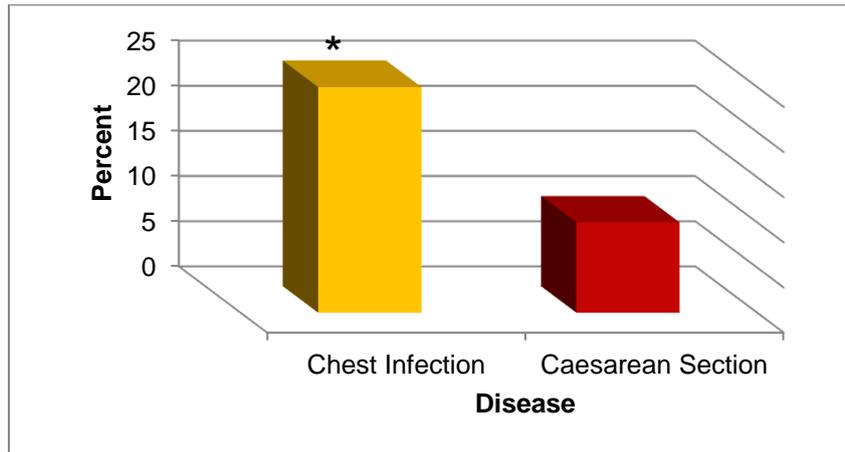


Fig. 8. A comparison between chest infection and caesarean section among study population

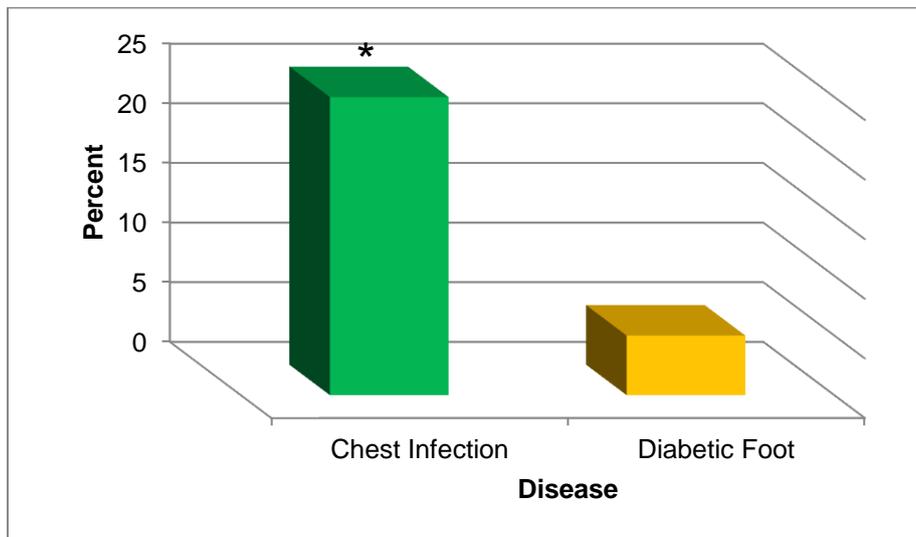


Fig. 9. A comparison between chest infection and diabetic foot among study population

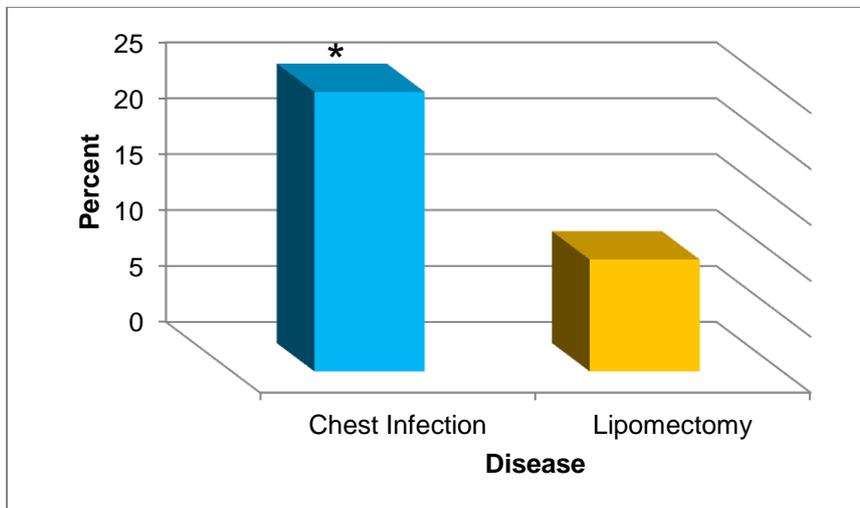


Fig. 10. A comparison between chest infection and lipomectomy among study population

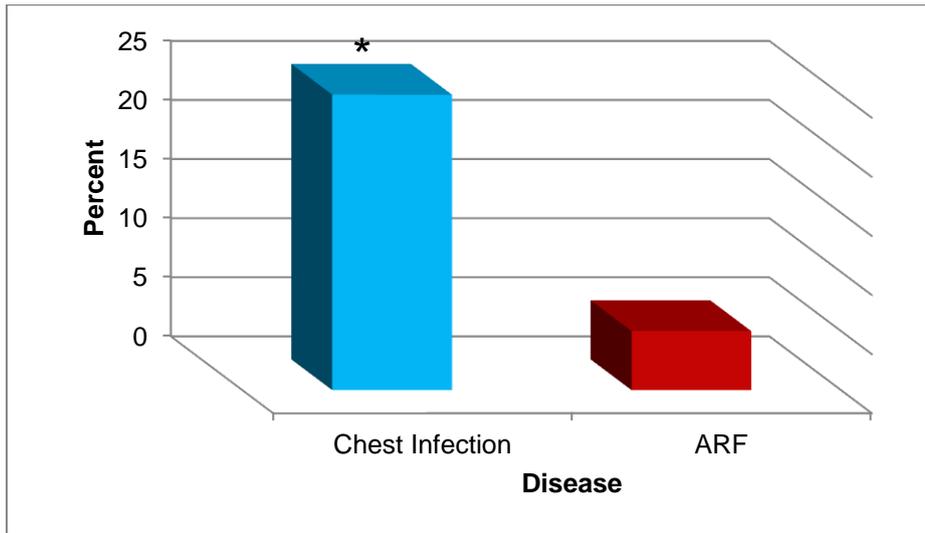


Fig. 11. A comparison between chest infection and acute renal failure among study population

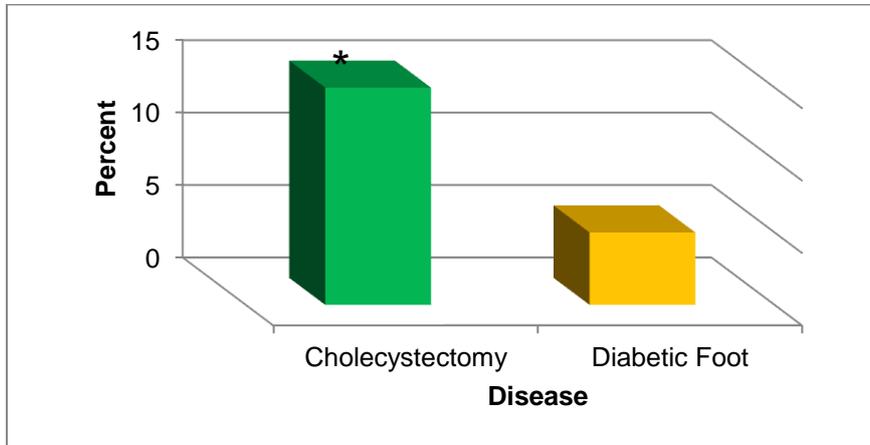


Fig. 12. A comparison between cholecystectomy and diabetic foot among study population

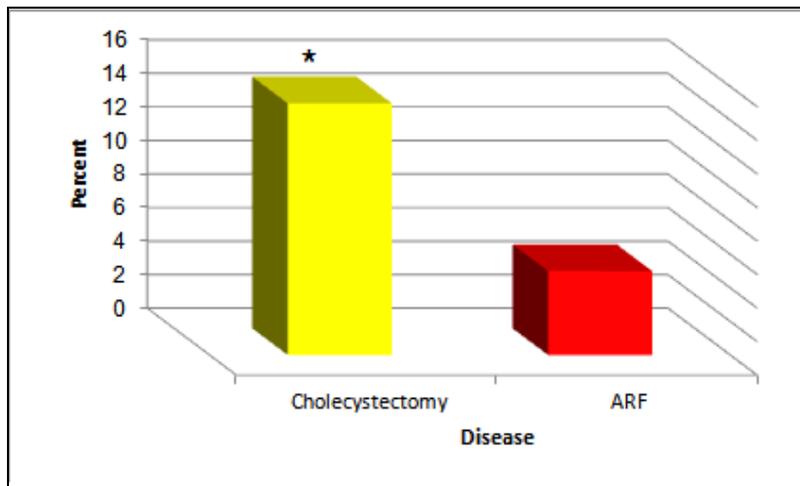


Fig. 13. A comparison between cholecystectomy and acute renal failure among study population

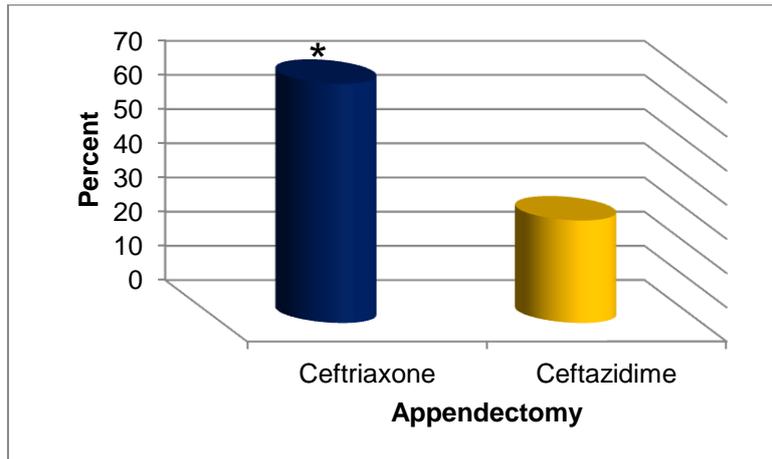


Fig. 14. A comparison between the effect of ceftriaxone and ceftazidime in patients with appendectomy among study population

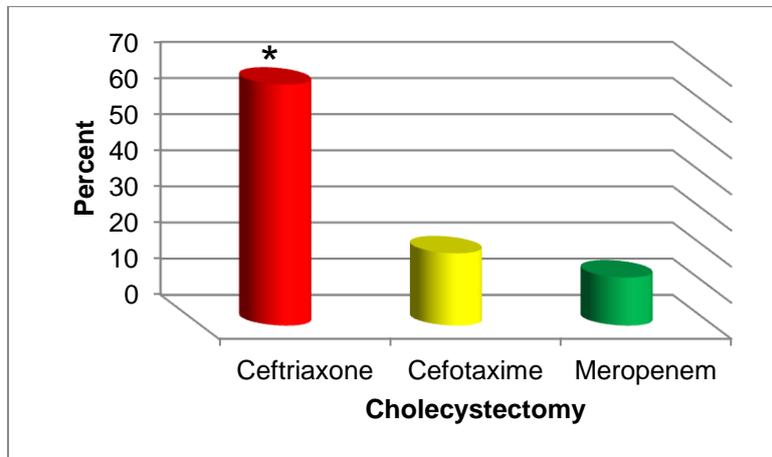


Fig. 15. A comparison between the effect of ceftriaxone, cefotaxime and meropenem in patients with cholecystectomy among study population

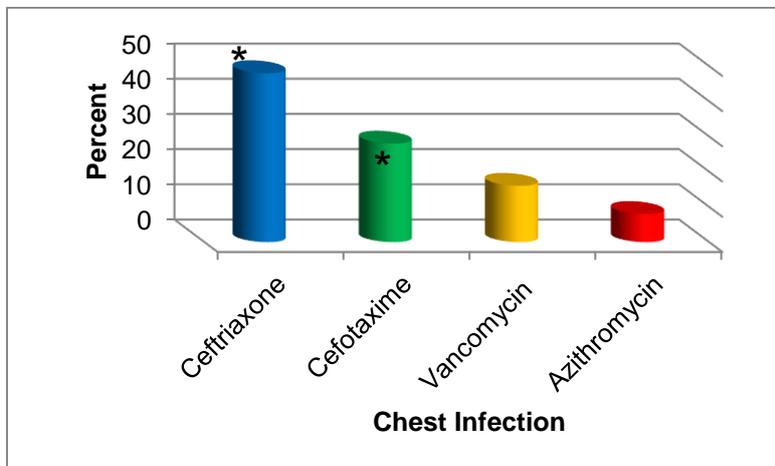


Fig. 16. A comparison between the effect of ceftriaxone, cefotaxime, vancomycin and azithromycin in patients with chest infection among study population

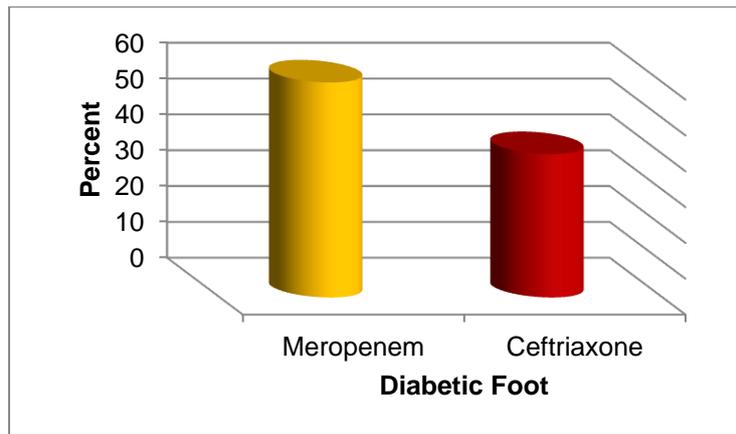


Fig. 17. A comparison between the effect of meropenem and ceftriaxone in patients with diabetic foot among study population

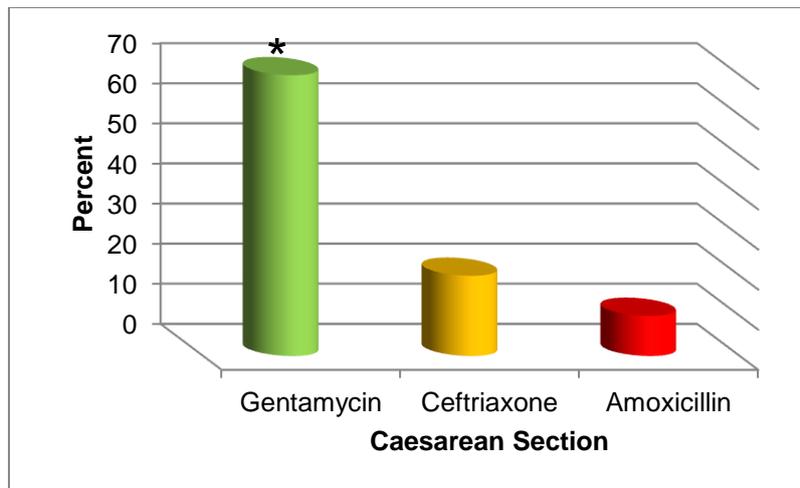


Fig. 18. A comparison between the effect of gentamycin , ceftriaxone and amoxicillin in patients with caesarean section among study population

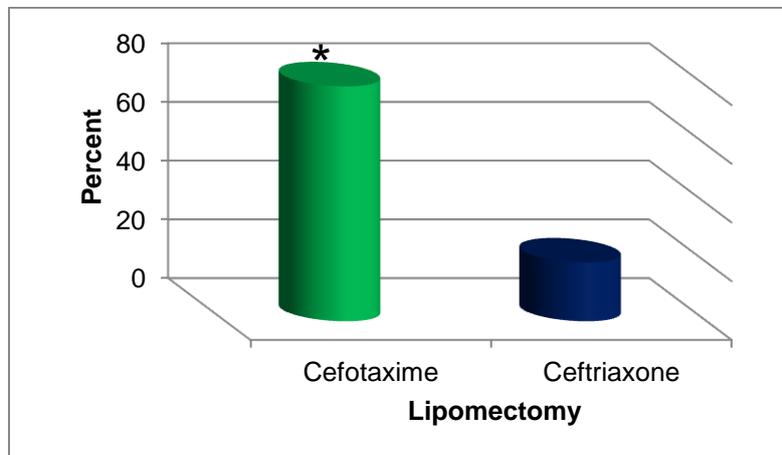


Fig. 19. A comparison between the effect of cefotaxime and ceftriaxone in patients with lipomectomy among study population

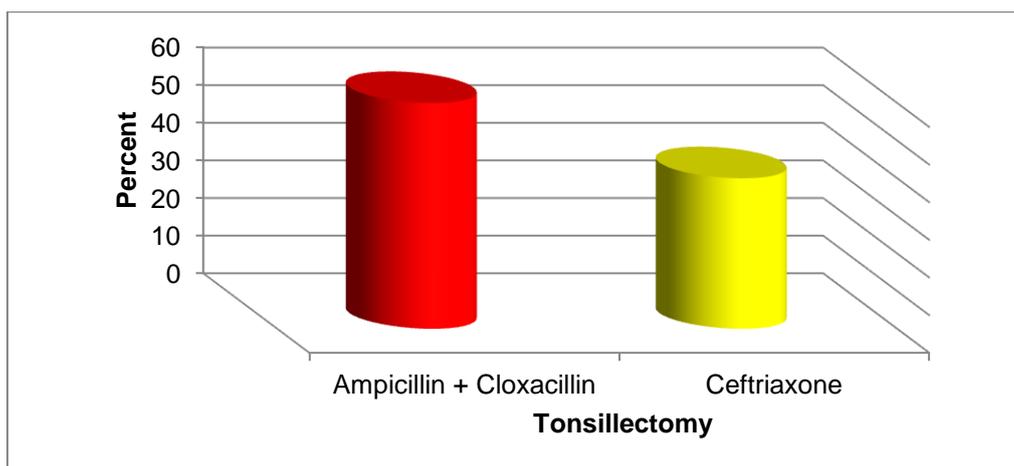


Fig. 20 .A comparison between the effect of ampicillin+cloxacillin and ceftriaxone in patients with tonsillectomy among study population

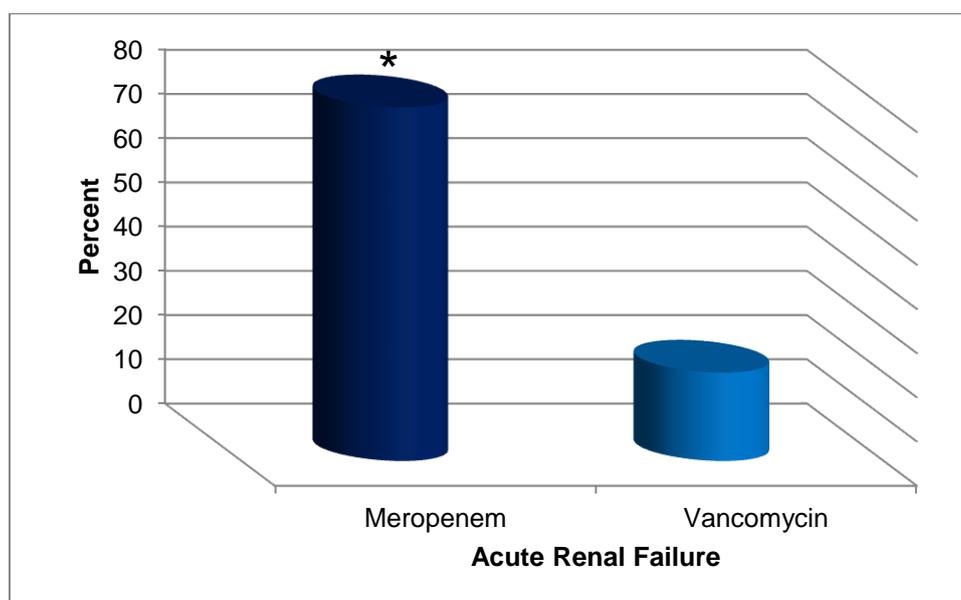


Fig. 21. A comparison between the effect of meropenem and vancomycin in patients with acute renal failure among study population

4. CONCLUSIONS

From current study we concluded that the antibiotics used greatly in surgical ward of Hospital followed by medical ward , in addition to that antibiotics used in postoperation are more effective than those used in medical ward , so there are a significant differences found among antibiotics used in surgical ward.

CONSENT

All patients or their relatives in this study were explained to them the aim of study protection of privacy , and then taking informed consent .

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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