The Outcome of the Misuse of 3rd Generation Cephalosporins In Fallujah City, West of Iraq

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Abstract

Objectives: The main objective of this study is to identify the incidence of resistance pattern developed against 3rd generation Cephalosporins as a consequence to the misuse of this group of antibiotics in Fallujah city.
Subject & methods: One hundred laboratory samples were collected during the period from June 2008 to March 2009. The samples were cultured & checked for sensitivity toward Cefotaxime, Ceftazidime, & Ceftriaxone, which were commonly misused in Fallujah.
Results: Among the 100 samples (including urine, stool, semen, &ear throat & high vaginal swab), the bacteria isolated were Escherichia coli 51(51%), Streptococci 19(19%), Klebsiella 12(12%), Pseudomonas auroginosa 8(8%), Proteus 6 (6%), Staphylococci 4(4%) .The degree of resistance of these bacteria was ranging from 52.6% - 100% to Cefotaxime , 62.5% -75% to Ceftazidime , &25% - 66.6% to Ceftriaxone.
Conclusion: There is a significant degree of bacterial resistance against 3rd generation Cephalosporins as a consequence to the misuse of this group of antibiotics.
Keywords: 3rd generation Cephalosporins, misuse, resistance, Fallujah.

Introduction

3rd generation cephalosporins are group of wide range of activity against most gram psitive & gram negative bacteria[1]. Cefotaxime is a 3rd generation Cephalosporin with a bactericidal action, it is highly stable by most β-lactamases & has greater activity than 1st & 2nd generation Cephalosporins against g-bacteria & slightly less activity than 1st generation against g+ bacteria[2]. It is active invitro against many enterobacteria including Escherichia.coli, Klebsiella, Proteus, Providencia, Salmonella, Serratia,Shigella & Yersinea species. Other g-ve bacteria like penicillin resistant strains, H. influenze, N. gonorhea, N.meningetidis, Brucella melitensis, are reported to be moderately susceptible to it, but most are resistant [2,3]. The active metabolite is active against many of the G –ve bacteria but not Pseudomonas [5].

Regarding gram +ve bacteria, Cefotaxime is active against Streptococcus, Staphylococcus aureus including Penicillinase producing strains. Group B streptococci, Strept. Pneumoni, & Strept. pyogenis (group A streptococci) are all very sensitive to it. Enterococci & Listeria monocytogenis are resistant. It is also active against some anaerobic bacteria[4].

Ceftazidime has the same bactericidal action & broader spectrum of activity than cefotaxime but increased activity against Pseudomonas spp[2,4,5]. It is less active than staphylococci & streptococci[6] , it is active against some anaerobic bacteria although most strains of bacteroides fragilis & Clostridiadefficle are resistant.

The activity against Pseudomonas auroginosa & some Enterobacteria may be inhanced by Aminoglycosides. Antagonism happened with Chloramphenicol. Reistance is as for Cefotaxime [2,7].
Ceftriaxone activity is as for Cefotaxime but it has no active metabolite [9].

Materials & Methods:

This is across-sectional study including one hundred specimens collected from 100 patients referred to a private medical laboratory by many physicians in Fallujah during the period from June 2008 to March 2009, 92 of them were from inside Fallujah city & 8 from the villages outside Fallujah. The samples included urine , stool , throat swabs, semen high vaginal ,wound , ear swabs & csf .

Modified Kirby-bauer method was used for culture & sensitivity testing. Mueller-Hinton agar was prepared from dehydrated base the medium then cooled to 45-50C& poured into the plates, allowed to set on a level surface, to a depth of approximately 4mm. When the agar was solidified, the plates were dried for immediate use for 10-30 minutes at 37C by placing them in upright slightly tilted position in the incubator.

Small piece of the inoculums was taken from specific colony by sterile loop & dissolved in 5ml of normal saline in sterile tube under sterile conditions. The concentration of the suspension was measured by using spectrophotometer.

The plates then inoculated by dipping a sterile swab into the inoculum, the swab streaked all over the surface of medium 3 times, rotating the plate through an angle of 60 after each application, finally the swab passed round the edge of the agar surface, the inoculums then left to dry for few minutes at room temperature with the lid closed.
The antibiotic discs were placed on the inoculated plates by using a sterile needle tip. The plates were placed in the incubator at 35 C within 30 minutes of the preparation. After overnight incubation the diameter of each zone measured & recorded in mm. The results then interpreted according to the critical diameters.
The drugs included in the study are Cefotaxime, Ceftazidime, & Ceftriaxone, which are commonly prescribed by many physicians & other health care personales even for asimple fever or cough.
The patients are divided into 6 age groups < 1yr ,1-5 yrs , 6-10 yrs, 11-15 yrs ,16 -20 yrs & >20 yrs.

All data were analysed using the statistical package for social sciences (ssps program version 14), $p \leq 0.05$.

Results:

One hundred laboratory samples were collected from 100 patients & tested for culture & sensitivity to 3rd generation Cephalosporins, the patients ages were ranging from <1yr to > 20 yrs, (table.1), with amean age of 19± 8 . There were 44(44%) males, & 56(56%) females, the majority of patients were >20 yrs which represent 42% of the total no. of patients. (table 1)

Table 1: Distribution of samples according to age & sex.

Age	Total no. of samples	Male	Female
<1	13(13%)	10(22.7%)	3(5.5%)
1-5	21(21%)	9(20.5%)	12(21.4%)
6-10	9(9%)	4(9%)	5(8.9%)
11-15	3(3%)	1(2.3%)	2(3.6%)
16-20	12(12%)	2(4.5%)	10(17.8%)
>20	42(42%)	18(41%)	24(42.8%)
Total	100(100%)	44(100%)	56(100%)

Table 2 shows that the urine & stool samples were the commenest 62(62%), 16(16%) respectively followed in order by throat swab 7(7%), semen & ear swab 4(4%), high vaginal swab 3(3%), csf & wound swabs each was 2(2%).

Table 2: Distribution of samples according to their source.

Source of sample	Frequency of samples
Urine	62(62%)
Stool	16(16%)
Throat swab	7(7%)
semen	4(4%)
Ear swab	4(4%)
High vaginal swab	3(3%)
Cerebrospinal fluid	2(2%)
Wound swab	2(2%)
Total	100(100%)

Table 3 shows the frequency & distribution of resistance of micro-organisms to 3rd generation cephalosporins. This table shows that Pseudomonas Auroginosa which constitute 8% of the total no. of the bacterial isolates developed the highest degree of resistance to Cefotaxime (100%), while Klebsiella & staphylococci (12% & 4% of the total isolates respectively) showed the highest resistance to Ceftazidime (75%), & Proteus which was 6% of the total isolates developed the highest resistance to Ceftriaxone(66.6%).

Table 3: Frequency & distribution of resistance of Micro organisms to 3rd generation Cephalosporins

Microorganism	Microorganism isolate No.(%)	Resistance to Cefotaxime No.(%)	Resistance to Ceftazidime NO.(%)	Resistance to Ceftriaxone No.(%)
E.Coli	51(51%)	33(64.7%)	35(68.6%)	26(50.9%)
Streptococci	19(19%)	10(52.6%)	11(57.9%)	6(31.6%)
Klebsiella	12(12%)	8(66.6%)	9(75%)	7(58.3%)
Pseudomonas A	8(8%)	8(100%)	5(62.5%)	5(62.5%)
Proteus	6(6%)	5(83%)	4(66.6%)	4(66.6%)
Staphylococci	4(4%)	2(50%)	3(75%)	1(25%)
Total	100(100%)	66(66%)	67(67%)	49(49%)

Discussion

The mean age of patients according to the current study was 19 ± 8, this is slightly lower than that reported in another study done in Zarqaa, Jordan (3), which was 21± 8, &also slightly lower than that found in a study done in Sharjah, UAE (8) & was 20 ± 8.

There was no statistical intersex association in relation to the development of resistance to 3rd generation cephalosporins.

In relation to the culture & susceptibility results this study showed that Esh. Coli developed 64.7% resistance to cefotaxime 68.6% resistance to ceftazidime & 50.9% resistance to Ceftriaxone, these results were compared with those found in astudy on gram- bacilli & antibiotic consumption in Zarqaa, Jordan (3) in which E.coli showed 31%, 23%, & 31% resistance respectively to the above antibiotics. Regarding Klebsiella isolates resistance was 66.6% to Cefotaxime ,75% resistance to ceftazidime & 58.3% resistance to Ceftriaxone in the current study compared to 10% ,15%, 10% respectively in the Jordanian article[3]. All of the pseudomonas isolates resisted Cefotaxime in this study (100%) ,62.5% resisted Ceftazidime & Ceftriaxone , compared to 95% resistance to Cefotaxime, 15% resistance to Ceftazidime & 38% resistance to Ceftriaxone in the Jordanian article[3].

The proteus isolates developed 83% resistance to Cefotaxime, 66.6% resistance to Ceftazidime & Ceftriaxone, compared to 100% susceptibility to the above drugs in Zarqaa study[3].

Regarding staphylococci isolates, our study detected 50% resistance to Cefotaxime, 75% resistance to Ceftazidime & 25% resistance to ceftriaxone, while streptococci showed 52.6% to Cefotaxime , 57.9% resistance to Ceftazidime & 31.6% resistance to Ceftriaxone , compared to 0% resistance of the 2 bacteria in a study conducted in Sharjah ,UAE[8].

This study suggested that there is a significant increase in the degree of resistance against 3rd generation Cephalosporins in Fallujah, it is recommended that all physicians have to be aware of this problem & antibiotics have to be prescribed only when there is a real need for them & if there a serious infection , culture & sensitivity test have to be done & antibiotics prescribed accordingly, We need also to activate the role of inspection committees in health offices , medical & pharmacist associations to observe & prevent misuse & prescription of drugs by unauthorized people & finally to Spread health awareness among medical staff & sub-staff & citizens about the consequences of misuse of antibiotics.

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